DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING

DIPLOMA IN ENGINEERING & TECHNOLOGY

N - SCHEME

FIRST YEAR SYLLABUS

IMPLEMENTED FROM 2020 - 2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

GUINDY, CHENNAI - 600 025.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020-2021 onwards)

CURRICULUM OUTLINE

FIRST SEMESTER (FULL TIME)

Col. No.	Subject Code	Subject	Hours Per Week				
			Theory	Drawing	Tutorial	Practical	Total
1	40011	Communication English I	5				5
2	40012	Engineering Mathematics I	5				5
3	40013	Engineering Physics I	5				5
4	40014	Engineering Chemistry I	5				5
5	40015	Engineering Graphics I		6			6
6	40006	Engineering Physics Practical (Semester examination in the second semester)				2	2
7	40007	Engineering Chemistry Practical (Semester examination in the second semester)				2	2
8	40001* 40002^	Communication Skill Practical * Computer Application Practical ^				2	2
			20	6		6	32
Extra / Co-Curricular activities		Physical Education					2
		Library					1
Total							35

* For Circuit Branches only

^ For Non-Circuit Branches only

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DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020-2021 onwards)

CURRICULUM OUTLINE

SECOND SEMESTER (FULL TIME)

Col. No.	Subject Code	Subject	Hours Per Week				
			Theory	Drawing	Tutorial	Practical	Total
1	40021	Communication English II	4				4
2	40022	Engineering Mathematics II	4				4
3	40023	Engineering Physics II	4				4
4	40024	Engineering Chemistry II	4				4
5	40025	Engineering Graphics II		5			5
6	40006	Engineering Physics Practical				2	2
7	40007	Engineering Chemistry Practical				2	2
8	40028	Basics of Industries and Workshop Practical	2			3	5
9	40001* 40002^	Communication Skill Practical * Computer Application Practical ^				2	2
			18	5		9	32
Extra / Co-curricular activities		Physical Education					2
		Library					1
Total							35

* For Non-Circuit Branches only

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STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implements from the Academic year 2020-2021 onwards)

CURRICULUM OUTLINE

FIRST SEMESTER (PART TIME)

Col .No.	Subject Code	Subject	Hours Per Week				
			Theory	Drawing	Tutorial	Practical	Total
1.	40011	Communication English I	3				3
2.	40012	Engineering Mathematics I	4				4
3.	40013	Engineering Physics I	4				4
4.	40014	Engineering Chemistry I	3				3
5.	40006	Engineering Physics Practical (Semester examination in the second semester)				2	2
6.	40007	Engineering Chemistry Practical (Semester examination in the second semester)				2	2
		Total	14			4	18

40015 Engineering Graphics I

40001* Communication Skill Practical } will be in the second year

40002^ Computer Application Practical

* For Circuit Branches only.

^ For Non-Circuit Branches only.

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SECOND SEMESTER (PART TIME)

Col. No.	Subject Code	Subject	Hours Per Week				
			Theory	Drawing	Tutorial	Practical	Total
1.	40021	Communication English II	3				3
2.	40022	Engineering Mathematics II	3				3
3.	40023	Engineering Physics II	3				3
4.	40024	Engineering Chemistry II	3				3
5.	40006	Engineering Physics Practical (Semester examination in the second semester)				2	2
6.	40007	Engineering Chemistry Practical (Semester examination in the second semester)				2	2
7.	40028	Basics of Industries and Workshop practical				2	2
		Total	12			6	18

40025 Engineering Graphics II
40001* Communication Skill Practical
40002^ Computer Application Practical
} will be in the second year

* For Non-Circuit Branches only.

^ ForCircuit Branches only.

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N SCHEME

(Implemented from the Academic Year 2020 - 2021 onwards)

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Subject: Engineering Mathematics I & II

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Subject: Engineering Physics I &II and Engineering Physics Practical

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Subject: Engineering Chemistry I &II and Engineering Chemistry Practical

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Central Polytechnic College, Chennai – 113.

Subject: Engineering Graphics I & II

Convener

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Tmt. J.Prema
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GRG Polytechnic College, Coimbatore

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STATE BOARD OF TECHNICAL EDUCATION& TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

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Co-ordinator

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Subject: Basics of Industries and Workshop Practical & Computer Applications Practical

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ANNEXURE- I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special Programmes except HMCT and film &TV.

Subject Code : 40011

Semester : I

Subject Title : COMMUNICATION ENGLISH – I

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
COMMUNICATION ENGLISH – I	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Time
1	Functional Grammar and Usage	17
2	Vocabulary Enrichment	15
3	Situational English	15
4	Creative English	15
5	English for Scholarly Presentation/ Fluency	11
Test & Model Exam		7
Total		**80 Hrs.**

RATIONALE:

- With the advent and supremacy of the Internet, smart phones, e-Commerce and Social Media in global communication, English has metamorphosed itself with new dimensions to get the communicator's thoughts, feelings and interactions dressed in alien colours.
- To execute the tasks in Technical Environment, whether academic, professional or social, proficiency in English plays a vital role and a requisite for communication skills has gained momentum both for e-communication, higher studies abroad and placement in MNCs.
- Amazing and inconceivable developments in technology has led various industries to coin and employ their own new words every day and hence revision of syllabus, especially to cater to the need for essential updated vocabulary has become in evitable.
- In addition to the retention of certain functional grammar parts to attest accuracy in communication, new components such as vocabulary enrichment, situational English, Creative English and English for Scholarly Presentation have been introduced to equip the learners to cope up with revamping technical scenario.

OBJECTIVES:

At the completion of the study of I and II semesters, the students will be able to

- Apply functional grammar to produce pristine presentations in English.
- Carry out effective interaction with the aid of formation of interrogatives.
- Enrich his/her vocabulary to cater to the needs of changing linguistic requirements.
- Understand and respond to the e-content available elsewhere in academic, professional and social environments.
- Understand and review e-books, movies and TV programmes and post his/her reviews online.
- Execute dialogues with his/her friends, teachers and colleagues in day-to-day situations.
- Describe and interpret visuals, images, machine drawings, events in books and on the Net.
- Understand, acquire and employ new structures in scholarly presentations with an exposure to works of Great personalities.
- Communicate effectively with idioms and phrases appropriate to real-life situations.

40011 COMMUNICATION ENGLISH –I

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Functional Grammar and Usage** Parts of Speech Functional Units Use of Main Verb & Auxiliary Verb Application of Tense Forms (Simple Present, Present Continuous, Present Perfect, Simple Past, Past Continuous, Past Perfect, Simple Future, Future Continuous only) Framing Yes / No Questions Framing Wh-Questions Application of Active Voice and Passive Voice Use of Prepositions	17
II	**Vocabulary Enrichment** Word Conversion (selective 25 words) Collocation - Noun with Verb, Adjective with Noun (Selective 25collocations) Homophones (selective 25 homophones) One-word Substitution (Textual) Idiomatic expressions for Daily Life (frequently used 25 expressions) Frequently Used Phrasal verbs (selective 25 phrasal verbs)	15
III	**Situational English** Dialogue for Day to Day Situations Short Messages for e-Communication Letter Writing for Academic Purpose (Leave Application, Requisition for Bonafide Certificate, Applying for TC) Writing the Essentials Comprehension	15
IV	**Creative English** Review Writing (Book / Movie / TV Program) Visual Description	15

	Advertisement Writing Word Cloud Transforming Verbal Passage into Graphics	
V	**English for Scholarly Presentation/ Fluency** "A Snake in the Grass" by R.K. Narayan “Of Parents and Children” by Francis Bacon "On His Blindness" by John Milton "When I Have Fears" by John Keats	11

Reference Books

Glossaries

https://www.engineering-dictionary.com/

https://techterms.com/definition/

http://dictionary.tamilcube.com/

https://www.lexilogos.com/english/tamil_dictionary.htm

Grammar

1. Just Enough English Grammar Illustrated, Gabriele Stobbe, McGraw-Hill Osborne Media, 2008
2. Visual Guide to Grammar and Punctuation, DK Publishing, 2017
3. English Grammar in Use, Raymond Murphy, Cambridge University Press, 2019
4. Intermediate English Grammar, Raymond Murphy, Cambridge University Press, Second Edition.
5. Essential English Grammar, Raymond Murphy, Cambridge University Press, New edition.

Motivation

1. An Autobiography; Or, The Story of My Experiments with Truth, Mahatma Gandhi, Penguin Books, 2001
2. You Can Win, Shiv Khera, New Dawn Press, 2004
3. Chicken Soup for the Soul, Jack Canfield, Mark Victor Hansen, 2001

MODEL QUESTION PAPER

COMMUNICATION ENGLISH – I

Time – 3 Hours [Maximum Marks: 100]

I. Answer any TEN of the following: 10x4=40

1. Frame a sentence by using the parts of speech given below:
   a) Adjective: brilliant
   b) Verb: live
   c) Noun : office
   d) Adverb: well

2. Frame a sentence for the first two patterns and write the patterns of the last two:
   a) S+V+O+A
   b) S+V+C+A
   c) She was tired.
   d) People elected him the new president.

3. Make use of each of the following main verb or auxiliary verb to make four sentences of your own.
   a) bring
   b) have
   c) discuss
   d) is

4. Frame four sentences by using the subject - Children and verb - play in the following tense forms:
   a) Simple Present
   b) Past Continuous
   c) Present Perfect
   d) Simple Future

5. Frame four Yes/No questions for the given situations:
   a) Context: Talking to your friend about next week exam
   b) Context: Talking to your sister at home
   c) Context: Talking to your teacher about weekend classes.
   d) Context: Talking to your uncle about his arrival

6. Ask four WH questions to the following people you contact:
   a) To the bus conductor
   b) To your HOD
   c) To your mother
   d) To your college librarian

7. Fill in the blanks by writing suitable active or passive form of the verb given in bracket:
   a) The report _____ to the Head of the Committee.(submit)
   b) He has _____ from Delhi. (return)
   c) The data on computer _____ by somebody in his absence.(access)
   d) About 150 injured people _____ in the hospital. (admit)

8. Fill in the blanks by using suitable prepositions:
   a) The meeting will be held_____ Tuesday.
   b) His continuous lecture_____three hours bored everyone.
   c) Candidates_____hall ticket will not be permitted into the exam hall.
   d) I will be available here _____ Monday _____Friday.

9. Write down any four possible derivatives of the following word. collect

10. Match the following and form collocations:

a)	Heavy	-	Ambassador
b)	Fast	-	a record
c)	bottle up	-	News
d)	Make	-	Food
e)	Have	-	your emotions
f)	Break	-	a difference
g)	Hot	-	Rain
h)	Brand	-	a headache

11. Frame a sentence for the homophones given below: Peace – piece

12. Write one word substitutes for the following:
    a. Rest or sleep in the early afternoon
    b. Statements which are ordinary, uninteresting, and unimportant
    c. Future generations especially the descendants of a specific person
    d. an undesirable event such as an accident

13. Frame a sentence for each of the following idioms:
    a. Once in a blue moon
    b. At the eleventh hour
    c. Beat about the bush
    d. A fish out of water

14. Frame a sentence for each of the following phrasal verbs:
    a. Take care of
    b. Log in
    c. Go through
    d. Call off

II. Answer any FOUR of the following: (**4x5=20)**

1. Complete the Dialogue:

Friend 1 : Hi Ranjani,_____?

Friend 2 : I didn't expect a heavy traffic. Sorry for coming late.

Friend 1	:	_____as we planned?
Friend 2	:	Sure! I'm very much interested in shopping. But Where is Geeta?_____?.
Friend 1	:	_____
Friend 2	:	What happened to her? Anything serious?
Friend 1	:	Her father is not feeling well and has been admitted in the hospital.
Friend 2	:	_____Shall we go to the hospital now?
Friend 1	:	That sounds right. It's Vijaya Hospital just a mile away from here.

2. Write a short message to your friend asking him to send study materials for the forthcoming examinations.

3. Draft a letter to your HOD requesting him to issue bona fide certificate for opening a savings bank account.

4. Write the essentials for the purchase of a mobile phone

5. Read the passage below and answer the questions that follow.

Information technology (IT) is the use of computers to store, retrieve, transmit, and manipulate data or information. IT is typically used within the context of business operations as opposed to personal or entertainment technologies. IT is considered to be a subset of Information and Communications Technology (ICT). An information Technology system (IT system) is generally an information system, a communication system or, more specifically speaking, a computer system – including all hardware, software and peripheral equipment – operated by a limited group of users.

Humans have been storing, retrieving, manipulating, and communicating information since the Sumerians in Mesopotamia developed writing in about 3000 BC, but the term *information technology* in its modern sense first appeared in a 1958 article published in the Harvard Business Review; authors Harold J. Leavitt and Thomas L. Whisler commented that "the new technology does not yet have a single established name. We shall call it Information Technology (IT)".

The term is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephones. Several products or services within an economy are associated with information technology, including computer hardware, software, electronics, semiconductors, internet, telecom equipment, and e-commerce.

Questions:

1. Humans have been storing information for more than 5000 years – True or False
2. Who coined the term “Information Technology”?
3. The term “Information Technology” was first used in_____.
4. What do you mean by Information Technology?
5. Name the products and services that are associated with Information Technology.

III. Answer any Four of the following : (4x5=20)

1. Write a review of the book “My Experiments with Truth” in about 50 words.
2. Describe the picture below in about 50 words.

3. Write an advertisement for a Home Appliances Show Room highlighting Diwali festival offers.
4. Frame 5 sentences using any five words from the given word cloud.

5. Read and transform the following passage into a pie-chart.

A survey was conducted to study people using different browsers in Europe. Five browsers – Firefox, Chrome, Opera, Safari and Internet Explorer were selected for this purpose to

see the impact of browsers on the Internet Users. It was found that as much as

37.9 % people used Firefox that was the highest of all other browsers accessed through the Net. Next came the Internet Explorer that was used by 36.9% of people, a little less than that of Firefox. Next to Internet Explorer, Chrome was accessed by 15.5% of the internet users. The number of users of the remaining two browsers equally fell around 4.55%. It was also found that all other browsers were used by less number of people who were around less than 1 percentage.

IV. Answer any FOUR of the following in about 50 words. (4 x 5 = 20)

1. Bring out the observations of Bacon on the duties of Parents towards children.
2. How does Milton arrive at the conclusion-“They also served who only stand and wait.”?
3. Explain the irony at the end of the Snake in the Grass.
4. Explain by listing out the fears that Keats refers to in his poem?

5 . Elucidate the narrative skill of R. K. Narayan with reference to the short story you studied.

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ANNEXURE- I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special Programs except DMOP, HMCT and Film &TV.

Subject Code : 40012

Semester : I

Subject Title : ENGINEERING MATHEMATICS I

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
ENGINEERING MATHEMATICS I	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks will be reduced to 75 marks.**

TOPICS AND ALLOCATION OF HOURS:

Sl. No.	Topics	Time (Hrs)
1	Algebra	15
2	Complex Number	15
3	Trigonometry	14
4	Differential Calculus – I	15
5	Differential Calculus – II	14
Test & Model Exam		7
TOTAL		**80**

40012 ENGINEERING MATHEMATICS – I

DETAILED SYLLABUS

Contents: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**ALGEBRA**	
	1.1 MATRICES AND DETERMINANTS:	**3**
	MATRICES: Definition, Concept and Types of Matrices. OPERATIONS ON MATRICES: Multiplication of a Matrix by a scalar, Addition/Subtraction of two Matrices. Multiplication of two Matrices - properties. Reducing a Matrix into triangular and echelon form. Transpose of a Matrix and its properties. DETERMINANTS: Definition and Evaluation of 2^{nd} and 3^{rd} order Determinants. Properties of determinants, product of Determinants. Determinant of a square Matrix – singular and non – singular Matrices - simple problems.	
	1.2 APPLICATIONS OF MATRICES AND DETERMINANTS:	
	Co-factor, Adjoint of Matrix, Inverse of Matrix and Rank of a matrix – Simple problems. Solution of simultaneous equations using Cramer's rule - Matrix Inversion method - Gaussian Elimination method – simple problems. Characteristic Equation – Eigen Values and Eigen Vectors of a real matrix – consistency and inconsistency of system of linear equations.	**7**
	1.3 BINOMIAL THEOREM:	
	Introduction – Factorial, Permutation and Combinations – Values of nP_r and nC_r. Statement of Binomial theorem for positive integral index. Expansion of Binomial - Finding general term – Middle term – Coefficient of x^n and Term independent of x – Binomial Theorem for rational index up to -3. Applications of binomial theorem – Finding the remainder, digits of a number and greatest term – simple problems.	**5**
II	**COMPLEX NUMBERS**	
	2.1 ALGEBRA OF COMPLEX NUMBERS	**6**
	Introduction – Complex Numbers – Conjugates – Algebra of complex	

	numbers (without geometrical proof), Properties of complex conjugates - Modulus and Amplitude - Polar and Euler form of a complex number – Simple problems. Argand Diagram – Collinear points, four points forming square, rectangle, rhombus and parallelogram only - Simple problems. **2.2 DE MOIVRE'S THEOREM** De Moivre's Theorem (Statement & Applications) – related simple problems. **2.3 ROOTS OF COMPLEX NUMBERS** Finding the n^{th} roots of unity – solving the equations of the form $x^n \pm 1 = 0$ where $n \leq 7$ - Simple problems. APPLICATIONS OF COMPLEX NUMBERS An application of Complex numbers: AC Circuits - Definitions – Impedance and Admittance - Simple Problems	**5** **4**
III	**TRIGONOMETRY** **3.1 TRIGONOMETRIC FUNCTIONS & ALLIED ANGLES** Trigonometric functions – Properties of Trigonometric functions - Relation between Degree & Radian Measure – Simple problems. Applications of Radian Measure – Length of an arc of a sector – Linear and angular velocity - Trigonometric Ratios of Allied angles – Simple problems. **3.2 TRIGONOMETRIC IDENTITIES** Trigonometric Ratios of sum & difference of two angles – Multiple and Sub multiple angles – Functions of 3A angles – Sum and Product Identities - Simple problems. **3.3 PROPERTIES OF TRIANGLE & INVERSE TRIGONOMETRIC FUNCTIONS** Properties of Triangle – Law of Sines and Law of Cosines - Inverse Trigonometric Functions – Principal value – Properties of Inverse Trigonometric functions – simple problems.	**5** **5** **4**
IV	**DIFFERENTIAL CALCULUS - I** **4.1 LIMITS** Introduction to Calculus - The calculation of limits – Theorems on limits – Limits at infinity – Limits of rational functions – Trigonometrical limits – other limits – Applications of limits – Simple problems.	**5**

	4.2 DIFFERENTIATION The derivative of a Function – Differentiation of constant, x^n, $sinx$, $cosx$, $tanx$, $cotx$, $secx$, $cosecx$, $logx$, e^x, a^x, $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$, $\cot^{-1}x$, $\sec^{-1}x$, $cosec^{-1}x$ (Formulae only) - Differentiation Rules: $u \pm v, uv, uvw$, $\frac{u}{v}$ & Chain rule – Simple problems. **4.3 DIFFERENTIATION METHODS** Differentiation by Substitution method – Differentiation of Implicit functions – Logarithmic differentiation – Derivatives of parametric functions – Differentiation of one function with respect to another function – Simple problems.	**5** **5**
V	**DIFFERENTIAL CALCULUS – II** **5.1 SUCCESSIVE DIFFERENTIATION** Successive differentiation upto second order (parametric form not included). Definition of differential equation, order and degree, formation of differential equation. Simple problems **5.2 GEOMETRICAL APPLICATIONS** Curvature and Radius of curvature (cartesian form only) - Envelope of family of curves – Simple problems. **5.3 PARTIAL DIFFERENTIATION** Definition - Partial Differentiation of two variables upto second order only - simple problems. Jacobian and its properties. Euler's theorem for homogeneous function – Simple problems.	**5** **5** **4**

Reference Book

1. Higher Secondary +1 Mathematics volume I&II. Tamil Nadu Text book corporation.
2. Higher Secondary +2 Mathematics Volume I&II. Tamil Nadu Text book corporation.
3. Engineering Mathematics V. Sundaram, R. Balasubramanian
4. Engineering Mathematics – I C.B.Gupta ,A.K.Malik, New age international Publishers, 1st edition – 2008.
5. Differential Calculus S. Balachandra Rao, CK Shantha New age Publishers
6. Probability Theory and Stochastic Process B.Prabhakara Rao, TSR Murthy, BS Publishers.
7. Vectors and Geometry GS. Pandey, RR Sharma, New age international publishers.
8. Engineering Mathematics – I Guruprasad Samanta, New age international publishers, 2nd edition 2015.

9. Engineering Mathematics Reena Garg, Khanna publishing house, New Delhi, Revised edn. – 2018.
10. Engineering Mathematics Volume I P. Kandasamy and K. Thilagavathy, S. Chand & Company Ltd.

Board Examination-Question Paper Pattern

For all theory subjects except Communication English I & II and Engineering Graphics I & II.

Note: Clarkes Table and Programmable Calculators are not permitted.

Relevant data should be provided in the question paper for solving the problems if any required.

Time: 3 Hrs. Max.Marks:100

PART – A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked Either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions. (7 + 8)

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks *

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

MODEL QUESTION PAPER

40012 ENGINEERING MATHEMATICS - I

Time: 3.00 hrs. Max.Mark:100

Note:

1. Answer all questions in PART A. Each question carries one mark.
2. Answer any ten questions in PART B. Each question carries two marks.
3. Answer all question by selecting either A or B. Each question carries fifteen marks.
4. Clarkes Table and programmable calculators are not permitted.

PART – A (5×1=5)

1. If $A=\begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix}$, $B=\begin{bmatrix} 5 & 0 \\ 3 & 6 \end{bmatrix}$ find A+B.
2. Find the values of $i^2+i^3+i^4$
3. Convert $\frac{2\pi}{5}$ into Degree measure.
4. Evaluate: $\lim_{x\to 0}\frac{\sin 7x}{9x}$
5. If $u=e^{x^2+y^2}$ then show that $\frac{\partial u}{\partial x}=2xu$

PART – B (10×2=20)

6. Reduce the matrix $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$ to a echelon form.
7. Find the adjoint of $A=\begin{bmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ -1 & 1 & 2 \end{bmatrix}$
8. Find the general term in the expansion of $(x+2y)^3$.
9. Find the real and imaginary parts of $\frac{7+2i}{2-3i}$
10. If $x=\cos\theta+i\sin\theta$, find $x^m+\frac{1}{x^m}$
11. The voltage and current of a circuit are given by the Complex numbers $2+j$ and $3-2j$ respectively. Find the Impedance of the circuit.
12. If a ball is travelling in a circle of diameter 10m with velocity 20m/s, Find the angular velocity of the ball.
13. Prove that $\frac{sin2A}{1+cos2A}=\tan A$
14. Suppose that a boat travels 10km from the port towards east and then turns 60° to its left.If the boat travels further 8 km, how far from the port is the boat?
15. Evaluate: $\lim_{x\to 3}\frac{x^4-8}{x^4-9}$

16. Differentiate: $\frac{1}{x^2}+\frac{1}{3x}+\frac{1}{\sin x}+\frac{1}{2}$

17. Differentiate: $x^2 \sin y = c$

18. Find $\frac{d^2y}{dx^2}$, if $y = \tan x$

19. If $y = ae^x + be^{-x}$ Prove that $y_2 = y$.

20. Show that $u = x^3 - x^2y + xy^3$ is a homogenous function.

PART – C (5×15=75)

21. A) i. Find the inverse of $\begin{bmatrix}1 & 2 & -1\\ 3 & 8 & 2\\ 4 & 9 & 1\end{bmatrix}$ (7)

ii) Solve the equations $x + 2y - z = -1,\ 3x + 8y + 2z = 28,\ \&\ 4x + 9y - z = 14$ by Cramer's rule. (8)

(OR)

B) i. Find the eigen values and eigen vectors of the matrix $\begin{bmatrix}1 & 1 & -2\\ -1 & 2 & 1\\ 0 & 1 & -1\end{bmatrix}$ (7)

ii. Find the coefficient of x^{30} in the expansion of $\left(x^4+\frac{1}{x^6}\right)^{15}$ (8)

22. A) i. Express the Complex number $\frac{1+3\sqrt{3}i}{\sqrt{3}+2i}$ in polar form (7)

ii. Prove that $\left(\frac{\cos\theta+\sin\theta}{\sin\theta-i\cos\theta}\right)^4 = 1$ (8)

(OR)

B) i. Solve $x^7 + x^4 + x^3 + 1 = 0$ (7)

ii. Two impedances $z_1 = 10 + 6j$ and $z_2 = 8 - 12j$ are connected in parallel across 200volts, 50 cycles per second A.C. mains. Calculate the magnitude of the current in each branch and magnitude of the total current in the circuit. (8)

23. A) i. Find the values of all trigonometric functions of θ if $\cos\theta = -\frac{1}{2}$ & θ lies in III quadrant. (7)

ii. The point A(9,12) rotates around the origin O in a plane through 60° in the anticlockwise direction to a new position B. Find the co ordinates of the point B. (8)

(OR)

B) i. Prove that $(cos\alpha - cos\beta)^2 + (\sin\alpha - sin\beta)^2 = 4sin^2\left(\frac{\alpha-\beta}{2}\right)$ (7)

ii. Prove that $\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \sin^{-1}\left(\frac{77}{85}\right)$ (8)

24.A) i. Suppose that the diameter of an animal's pupils is given by $f(x) = \frac{80x^{-0.2}+45}{2x^{-0.2}+9}$, where x is the indensity of light and f(x) is in mm. Find the diameter of the pupils with(a) Minimum light b) Maximum light. (7)

ii. Differentiate: (i) $(1 + \sin x)(x - \cos x)$ (ii) $\frac{1+\cos}{1-\cos}$ (8)

(OR)

B) i. a)Find $\frac{dy}{dx}$ if $y = \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$ (7)

b) Find $\frac{dy}{dx}$ if $x = acos^3t, y = asin^3t$

ii. a) Find $\frac{dy}{dx}$ if $y = \sqrt{x}e^x \sin^{-1} x$ (8)

b) Find the derivative of x^x with respect to $3x^2 + 2x + 5$

25. A) i. If $y = x^2 \cos x$, then prove that $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + (x^2+6)y = 0$. (7)

ii. Find the radius of curvature for $y^2 = 4x$ at (1, 1) (8)

(OR)

B) i. If $u = x^3 + y^3 + 3xy^2$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3u$ (7)

ii. Show that the functions $u = x^2 + y^2 + z^2,\ v = x + y + z,\ w = xy + yz + zx$ and are dependent. (8)

ANNEXURE- I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and film &TV.

Subject Code : 40013

Semester : I

Subject Title : ENGINEERING PHYSICS I

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
ENGINEERING PHYSICS I	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks will be reduced to 75 marks.**

Topics and Allocation of Hours:

Sl.No	Topic	Duration (Hrs)
1	S I UNITS AND STATICS	15
2	PROPERTIES OF MATTER	15
3	DYNAMICS- I	15
4	DYNAMICS–II	14
5	SOUND AND MAGNETISM	14
	TEST & MODEL	7
	Total	**80**

40013 ENGINEERING PHYSICS – I

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**S I UNITS AND STATICS**	
	1.1 UNITS AND MEASUREMENTS: -	5
	Unit – Definition - Fundamental Quantities – Definition - Seven fundamental quantities; their SI units and symbol for the units - Supplementary quantities - plane angle and solid angle; their SI units and symbol for the units Derived physical quantities. Dimensional formula for length, mass and time-derivation of dimensional formula for area, volume, density, velocity, momentum, acceleration, force, impulse, work or energy and power. Uses of Dimensional formula. Conventions followed in SI Units Multiples & sub-multiples and prefixes of units – Unit conversions (Horse Power to watt & calorie to joule) - Applications of the method of dimensional analysis.	
	1.2 STATICS: -	10
	Scalar and vector quantities – Definitions and examples – Concurrent forces and coplanar forces – Definition - Resolution of a vector into two perpendicular components - Resultant and equilibrant – Definitions - Parallelogram law of forces-statement - Expressions for magnitude and direction of the resultant of two forces acting at a point with an acute angle between them - Lami's theorem - Statement and explanation - Experimental verification of parallelogram law of forces and Lami's theorem. Simple problems based on expressions for magnitude and direction of resultant. Moment of a force - Clockwise and anti-clockwise moments - Principle of moments – Couple – Torque acting due to a Couple – Experimental determination of mass of the given body using principle of moments - Solved problems.	
II	**PROPERTIES OF MATTER**	
	2.1 ELASTICITY: -	5
	Elastic and plastic bodies – Definition - stress, strain – Definitions – Hooke's	

	law – statement - three types of strain – Elastic and plastic limit – Young's modulus, Bulk modulus, Rigidity modulus – Definitions - Uniform and non-uniform bending of beams - Experimental determination of the Young's modulus of the material of a beam by uniform bending method - Poisson's ratio - Simple problems based on stress, strain and Young's modulus – Applications of elasticity.	
	2.2 VISCOSITY: -	5
	Viscosity – Definition - Coefficient of viscosity - Definition, SI unit and dimensional formula - Stream line flow, turbulent flow – Explanation - Critical velocity – Reynolds number – Definition - Experimental comparison of coefficient of viscosity of two low viscous liquids – Terminal velocity – Definition - Experimental determination of coefficient of viscosity of a highly viscous liquid by Stokes method – Practical applications of viscosity – Practical applications of Stoke's law.	
	2.3 SURFACE TENSION: -	5
	Surface tension & angle of contact – Definitions - Expression for surface tension of a liquid by capillary rise method - Experimental determination of surface tension of water by capillary rise method – Practical applications of capillarity. Simple problems based on expression for surface tension – Applications of surface tension – Solved problems.	
III	**DYNAMICS–I**	
	3.1. STRAIGHT LINE MOTION: -	2
	Introduction-Newton's Laws of motion-Fundamental Equations of motion for objects- horizontal motion-falling freely-thrown vertically upwards.	
	3.2 PROJECTILE MOTION: -	5
	Projectile motion, angle of projection, trajectory, maximum height, time of flight, and horizontal range–Definitions-Expressions for maximum height, time of flight and horizontal range–Condition for getting the maximum range of the projectile. Path of the projectile (the trajectory) is a Parabola - Simple problems based on expressions for maximum height, time of flight and horizontal range – Examples of projectile motion.	
	3.3 CIRCULAR MOTION: -	8
	Circular motion, angular velocity, period and frequency of revolutions –	

	Definitions – Relation between linear velocity and angular velocity – Relation between angular velocity, period and frequency – Normal acceleration, centripetal force and centrifugal force – Definitions – Expressions for normal acceleration and centripetal force. Banking of curved paths – Angle of banking – Definition – Expression for the angle of banking of a curved path. $\{\tan\theta = v^2/(r\,g)\}$ - Simple harmonic motion, amplitude, frequency and period - Definition. Simple problems based on the expressions for centripetal force and angle of banking - Applications of centripetal force and centrifugal force – Solved problems.	
IV	**DYNAMICS–II** **4.1 ROTATIONAL MOTION OF RIGID BODIES: -** Rigid body – Definition - Moment of inertia of a particle about an axis - Moment of inertia of a rigid body about an axis – expressions – Radius of gyration – Definition – Expression for the kinetic energy of a rotating rigid body about an axis – Angular momentum – Definition – Expression for the angular momentum of a rotating rigid body about an axis – Law of conservation of angular momentum – Examples.	7
	4.2 GRAVITATION: - Newton's laws of gravitation – Acceleration due to gravity on the surface of earth – Expression for variation of acceleration due to gravity with altitude	3
	4.3 SATELLITES: - Satellites – Natural and artificial – Escape velocity and orbital velocity – Definitions – Expression for escape velocity and Orbital velocity – Polar and Geostationary satellites – Uses of artificial satellites. Simple problems based on the expressions for escape velocity and Orbital velocity.	4
V	**SOUND AND MAGNETISM** **5.1 SOUND**: - Wave motion – Introduction and definition – Audible range – Infrasonic – Ultrasonics - Progressive waves, longitudinal and transverse waves – Examples - Amplitude, Wave length, period and frequency of a wave – Definitions – Relation between wavelength, frequency and Velocity of a wave - Stationary or	9

	standing waves. Vibrations - Free & forced vibrations and resonance – definitions and examples - Laws of transverse vibration of a stretched string – Sonometer – Experimental determination of frequency of a tuning fork. Acoustics of buildings – Echo - Reverberation, reverberation time, Sabine's formula for reverberation time (no derivation) – Coefficient of absorption of sound energy – Noise pollution. Simple problems based on expression for frequency of vibration. Doppler effect – Definition and Applications – Ultrasonic and its uses – SONAR – Solved Problems. **5.2 MAGNETISM: -** Pole strength – Definitions – Magnetic moment, intensity of magnetisation, magnetising field intensity, magnetic induction, Permeability, hysteresis, saturation, retentivity and coercivity – Definitions - Method of drawing hysteresis loop of a specimen using a solenoid – Uses of Hysteresis loop. Simple problems based on intensity of magnetization – Types of magnetic materials and their applications – Solved problems.	5

Reference Book:

1. Physics – Resnick and Haliday – Wisley Toppan publishers–England
2. Engineering Physics – B.L.Theraja – S. Chand Publishers
3. A text book of sound – R.L. Saighal & H.R. Sarna – S.Chand & Co.
4. Mechanics – Narayana Kurup – S. Chand Publishers.

Board Examination-Question Paper Pattern

For all theory subjects except Communication English I & II and Engineering Graphics I & II.

Note: Clarkes Table and Programmable Calculators are not permitted.
Relevant data should be provided in the question paper for solving the problems if any required.

Time: 3 Hrs. Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked Either / Or type. One question from every unit. Answer either A or B. Each question carries 15 marks.

A and B have subdivisions. (7 + 8)

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1= 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks *

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

ENGINEERING PHYSICS - I

Model Question Paper

TIME: 3hrs MARKS: 100

PART A (5 X 1 = 5)

Note: Answer ALL questions. All questions carry equal marks.

1. Mention any two fundamental physical quantities.
2. Why rain drops fall slowly?
3. What is the condition for maximum range of a projectile?
4. Define moment of inertia of a rigid body.
5. Define magnetic moment.

PART B (10 X 2 = 20)

Note: Answer any TEN questions. All questions carry equal marks.

6. What are the uses of dimensional formula?
7. What is meant by coplanar force?
8. State Lami's theorem.
9. What are three moduli of elasticity?
10. Explain turbulent flow.
11. Define angle of contact.
12. State Newton's laws of motion.
13. Define normal acceleration.
14. Define angle of banking.
15. State law of conservation of angular momentum.
16. State Newton's law of gravitation.
17. Write any two uses of artificial satellites.
18. Define resonance.
19. Define Doppler effect.
20. Explain hysteresis.

PART B (5 X 15 = 75)

Note: Answer ALL questions by choosing either A (**OR**) B

21.A. i) State the conventions to be followed in the SI units. (8)

ii) Explain how to resolve a vector quantity in to two rectangular components. (7)

OR

B. i) Describe an experiment to verify the parallelogram law of forces. (8)

ii) If the resultant of two equal forces is $\sqrt{3}$times each force. Find the angle between the forces. (7)

22.A. i) Explain uniform and non-uniform bending of beams. (8)

ii) Describe an experiment to determine the Young's modulus of the material of the beam by uniform bending method. (7)

OR

B. i) Describe an experiment to compare the coefficient of viscosities of two liquids. (8)

ii) Calculate the surface tension of water if it rises to a height of 4.2 cm in a capillary tube dipped vertically in it. Radius of the capillary tube is 3.5×10^{-4} m and density of water is 1000 kgm^{-3} (7)

23.A. i) Derive an expression for the maximum height and time of flight reached by the projectile. (8)

ii) Derive expression for normal acceleration and centripetal force acting on a body executing uniform circular motion. (7)

OR

B. i) Derive an expression for the angle of banking. (8)

ii) A ball weighing 0.5 kg tied to one end of a string of length 2 m is rotated at a constant speed of 10 ms^{-1} in a horizontal plane. Calculate the centripetal force on the ball. (7)

24.A. i) Derive an expression for angular momentum of rotation of a rigid body rotating about an axis. (8)

ii) Derive an expression for variation of acceleration due to gravity with altitude. (7)

OR

B. i) Write short notes on polar and geostationary satellites. (8)

ii) If the radius of the earth is 6400 km, and acceleration due to gravity is 9.8 ms^{-2}. Calculate the escape velocity on the surface of the earth. (7)

25.A. i) Distinguish between longitudinal and transverse wave. (8)

ii) Write a note on acoustics of buildings. (7)

OR

B. i) Explain the method of drawing hysteresis loop of a given specimen. (8)

ii) The vibrating length of 0.24 m of a sonometer wire is unison with a tuning fork when stretched by a weight of 4.5 kg. The linear density of the wire is 0.65×10^{-3} kgm^{-1}. Calculate the frequency of the fork. (7)

ANNEXURE- I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 -2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and film &TV.

Subject Code : 40014

Semester : I

Subject Title : ENGINEERING CHEMISTRY I

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
ENGINEERING CHEMISTRY I	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and will be reduced to 75 marks.**

Topics and Allocation of Hours:

UNIT	Topic	Duration (Hrs)
I	**Basic concepts in chemistry** – Atomic Structure and Chemical bonding, Periodic Table, Acids and Bases	15
II	**Surface Chemistry -** Colloids, Nanotechnology, Catalysis	15
III	**Minerals and Metallurgy**– Metallurgy of Iron, Metallurgy of Tungsten and Titanium, Powder Metallurgy	15
IV	**Industrial Chemistry** – Nuclear Chemistry, Cement, Ceramics, Refractories and Glass	15
V	**Chemistry of Engineering Materials** – Polymer, Abrasives, Composite Materials	13
Test & Model Exam		7
	Total	**80**

RATIONALE:

The subject Engineering Chemistry I lay foundation of all the elements, structure and periodic classification. The latest trends on nano technology, its application on various fields of engineering is also dealt with. It provides basic concepts about minerals and its resources, the metal extraction, heat treatment and powder metallurgy. It also imparts knowledge about few Engineering Materials like cement, ceramics, refractory and glass. It also deal with polymers, abrasives and composite materials.

OBJECTIVES:

The objective of this Course is to make the student:

1. Know about atomic structure, chemical bonding, periodic classification and acids and bases.
2. Learn about surface chemistry, colloidal particles and nano-particles and their application.
3. Know about the mineral resources of Tamilnadu and the fundamentals of metal extraction, iron and steel manufacture, heat treatment and powder metallurgy.
4. Study about the importance of Engineering Chemistry in industry.
5. Know about Engineering materials like cement, ceramics, refractory, glass, rubber, plastic and composites.

40014 ENGINEERING CHEMISTRY I

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hrs.
I	**BASIC CONCEPTS IN CHEMISTRY**	
	1.1 Atomic Structure and Chemical Bonding	**6**
	Fundamental particles – proton – electron – neutron – atomic number – mass number – extra nuclear part – filling up of electrons – aufbau principle –s–p–d– f orbitals – electronic configuration – definition of atomic mass, molecular mass, equivalent mass, valency (definitions only) – octet rule – electrovalent bond – sodium chloride formation – covalent bond – formation of ammonia.	
	1.2 Periodic Table	**4**
	Modern periodic law – periodic classification of elements – features of modern periodic table – properties of s–p–d–f block elements.	

	1.3 Acids and Bases Properties of acids and bases – Lewis concept of acids and bases – advantages – pH and pOH – Definition – Numerical problems – Indicator – Definition – Buffer solution – Definition – Types of buffer solution with examples – Application of pH in industries	**5**
II	**SURFACE CHEMISTRY** **2.1 Colloids** Colloids – Definition – True solution and Colloidal solution – Differences – Types of colloids – Lyophilic and Lyophobic colloids – Differences – Properties – Tyndall effect – Brownian movement – Electrophoresis and Coagulation – Industrial applications of colloids – Smoke Precipitation by Cottrell's method, Purification of water, Cleansing action of soap, Sewage disposal – tanning – and artificial rain. **2.2 Nanotechnology** Nano particles – definition – properties – application of Nanotechnology – Engineering – medicine – biomaterial. **2.3 Catalysis** Catalyst – Definition – Positive – Negative catalyst – Definition – Types of catalysis – Homogeneous and Heterogeneous – Promoter – Catalyst poison – active centre – Definition – Characteristics of a catalyst – Industrial applications of catalysts.	**6** **4** **5**
III	**MINERALS AND METALLURGY** **3.1 Minerals and Metallurgy** Mineral – Minerals of Tamilnadu – Sources and Uses (Basic concepts only) – Extraction of iron – Blast furnace – cast iron – steel manufacture – Bessemer converter – heat treatment of steel – hardening – annealing – tempering. **3.2 Metallurgy of tungsten and Titanium** Extraction and uses of Tungsten and Titanium **3.3 Powder metallurgy** Definition – Powder metallurgical process – Preparation of Metal Powder – Atomization – Reduction of Metal Oxide – blending – compacting – sintering – finishing – Applications of Powder Metallurgy.	**7** **4** **4**

IV	**INDUSTRIAL CHEMISTRY** **4.1 Nuclear Chemistry** Nuclear reaction – Differences between nuclear reaction and ordinary chemical reaction – Radioactive decay – alpha emission – beta emission – gamma emission – half-life period – simple problems– Nuclear fission – nuclear fusion – chain reaction - components nuclear reactor, reactor core, nuclear reactor coolant, Control rods, neutron moderator – steam turbine – Application of radioactive isotopes. **4.2 Cement and ceramics** Definition – Manufacture of Portland Cement – Wet Process – Setting of Cement (No equation) – Ceramics **–** White pottery – Definition – Manufacture of White pottery – Uses – Definition of glazing – purpose – Method – Salt glazing – liquid glazing. **4.3 Refractories and Glass** Definition – requirements of a good refractory – types with examples and uses – uses of silica, fire clay and alumina. Composition of Glass – Manufacture of Glass – annealing of glass – varieties of glass – Optical glass, wind shield glass and Photo chromatic glass.	**6** **5** **4**
V	**CHEMISTRY OF ENGINEERING MATERIALS** **5.1 Polymer** Definition – Natural polymer – Rubber – Defects of natural rubber – Compounding of rubber – Ingredients and their functions – Vulcanization –Plastics – types – Thermoplastics and Thermosetplastics – Differences –Mechanical properties of plastics – Polymers in Surgery – Biomaterials – Definition – Biomedical uses of Polyurethane, PVC, Polypropylene and Polyethylene. **5.2 Abrasives** Definition – classification – hardness in Moh's scale – Natural abrasives – Diamond, Corundum, Emery and Garnet. Synthetic abrasives – Carborundum – Boroncarbide manufacture – properties and uses. **5.3 Composite Materials** Definition – examples – Classification of composites – Advantages over metals and polymers – General application	**6** **4** **3**

References

1. Introduction to Engineering Chemistry, Shradha Sinha , S S Dara & Sudha Jain, S. Chand Publishers, 2004.
2. S.Chand's Engineering Chemistry, S S Dara, Sudha Jain & Shradha Sinha, 2005.
3. A Textbook of Engineering Chemistry, Dr. Uday Kumar, 2013.
4. Chemistry – Higher Secondary – 1 st and 2nd year, Vol. I & II, Tamil Nadu Text Book Corporation, 2018.
5. Engineering Chemistry Fundamentals and Applications, Shikha Agarwal, Cambridge University Press, 2019.
6. Government of India, Geological Survey of India, Geology and Mineral Resources of The States of India Part VI – Tamil Nadu and Pondicherry
7. Indian Minerals Yearbook 2011, Government of India Ministry of Mines, Indian Bureau of Mines Indira Bhavan, Civil Lines, Nagpur – 440 004

Website references:

1. https://bookboon.com/en/fundamentals-of-chemistry-ebook

Board Examination-Question Paper Pattern

For all theory subjects except Communication English I & II and Engineering Graphics I & II.

Note: Clarkes Table and Programmable Calculators are not permitted.
Relevant data should be provided in the question paper for solving the problems if any required.

Time: 3 Hrs. Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked Either / Or type. One question from every unit. Answer either A or B. Each question carries 15 marks.A and B have subdivisions. (7 + 8)

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1= 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks *

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

ENGINEERING CHEMISTRY I
MODEL QUESTION PAPER

Part A

NB: 1. Answer all questions. 5x 1 = 5 Marks

2. All questions carry equal marks

1. How many electrons are there in the ultimate orbital of sodium atom?
2. What is the relationship between pH and pOH?
3. Name an ore of tungsten?
4. What is added to delay the setting of cement?
5. What is the hardness of diamond on Moh's scale?

Part B

NB: 1. Answer any 10 questions 10 x 2 = 20 Marks

2. All questions carry equal marks

6. State octet rule.
7. Write down the modern periodic law.
8. Define Lewis concept of acids and bases.
9. Mention the types of colloids.
10. What are catalytic promoters?
11. Define biomaterial.
12. Mention the composition of stainless steel.
13. Mention the uses of titanium.
14. Define powder metallurgy.
15. What is meant by radioactive decay?
16. Write down the importance of glazing in ceramics.
17. Define refractory.
18. What is meant by annealing of glass. Mention the importance of it.
19. Give any 2 defects of natural rubber?
20. How is Carborundum prepared?

Part C

NB: 1. Answer all questions5 x 15= 75 Marks

2. Answer any one of the subdivisions, either (A) or (B) from each question

21.A (i) Explain in detail about aufbau principle for filling of electrons in an atom with suitable example. (7)

(ii) Define valency of an element. Explain electrovalent bond with suitable example With a neat diagram (8)

(**or**)

B (i) Distinguish between s and d-block elements in the periodic table (7)

(ii) Define pH of a solution. Calculate the pH of 0.025 N sodium hydroxide solution (8)

22.A (i) Distinguish between lyophilic and lyophobic colloids. (7)

(ii) Define colloid. Describe any four industrial applications of colloids. (8)

(or)

B (i) List the industrial applications of catalyst. (7)

(ii) What is called nanotechnology? Illustrate the various applications of nanotechnology in various fields of Engineering. (8)

23.A (i) Describe the manufacture of steel by Bessemer process. (7)

(ii) What is meant by heat treatment of steel? Write notes on various heat treatment of steel. (8)

(or)

B (i) Explain the extraction of tungsten from its ore. (7)

(ii) Describe the process and applications of powder metallurgy. (8)

24.A. (i) Distinguish between ordinary chemical reaction and nuclear reaction. (7)

(ii) Define half-life period. The decay constant of Co-60 is 0.132/yr. Calculate its half-life period. If the quantity of Co-60 is 2.5g, what will be the quantity that remain after 10.5 years. (8)

(or)

B (i) Describe the manufacture of Portland cement (7)

(ii) Define refractory. What are the requirements of a refractory? (8)

25.A (i) Explain vulcanization of rubber and give the properties of vulcanized rubber (7)

(ii) Write a note on advantage of composite materials over metals and polymers (8)

(or)

B (i) What are bio-materials? List biomedical uses of use following:

(a) Polyurethane (b) PVC (c) Polypropylene (d) Polyethylene (7)

(ii) Write a note on the following abrasives.

(a) Diamond (b) Corundum (c) Emery (d) Garnet (8)

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME
(Implemented from the Academic year 2020 – 2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and Film &TV.

Subject Code : 40015

Semester : I

Subject Title : ENGINEERING GRAPHICS - I

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
ENGINEERING GRAPHICS - I	6	6	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and will be reduced to 75 marks.**

Topics and Allocation of Hours

Sl. No.	Topic	Duration
1	Drawing Office Practice and Dimensioning	19
2	Geometric Constructions and Construction of Conics	19
3	Projection of Points & Straight Lines and Construction of Special Curves	19
4	Orthographic Projections	32
	Test & Model Exam.	07
Total		**96Hrs**

RATIONALE:

Engineering Graphics is a basic subject for all branches of diploma in engineering and technology. Since engineering drawing is considered as the language of engineers, the proper understanding and practice is required with proper use of instruments.

This subject is aimed at providing basic understanding of the fundamentals of Engineering Graphics; mainly visualization, graphics theory, standards of drawings, the tools of drawing and the use of drawings in engineering applications.

The topics covered are based on the syllabus for diploma studies in engineering. The subject is planned to include sufficient practices which would help the student in visualization of two-dimensional objects and developing the drawing.

The chapters are arranged in sequence and starts from the basic concepts of lettering, dimensioning, geometrical constructions, conic sections, projection of points and straight lines, construction of engineering curves, proceeds to the orthographic projection techniques. By learning this subject, it is expected that the students would be matured to visualize the engineering components by reading an engineering drawing.

OBJECTIVES:

At the end of the subject, the students will be able to,

- Understand the importance of drawing
- Identify and use the drawing instruments
- Practice the rules and methods of dimensioning
- Acquire knowledge about geometric constructions
- Construct conic curves
- Understand the concepts of projection of points and straight lines
- Acquire knowledge about the construction of special curves
- Draw orthographic views from the given pictorial drawing

Note: While practicing, usage of drawing instruments like drawing board, mini drafter, compass, divider, drawing clips / cello tape, H, 2H and HB grade drawing pencils, eraser etc., are mandatory for class work and examinations. Size of drawing sheet recommended: A2 size (420 x 594 mm). Use both sides of drawing sheets for practice.

40015 ENGINEERING GRAPHICS - I

DETAILED SYLLABUS

Contents: Theory

<table>
<tr><th>Unit</th><th>Name of the Topic</th><th>Hours</th></tr>
<tr><td>I</td><td>
DRAWING OFFICE PRACTICE AND DIMENSIONING
1.1 Drawing Office Practice
Importance of engineering drawing as a graphic communication– drawing practice as per BIS code–drawing instruments: drawing board, mini-drafter, compass, divider, protractor, drawing sheets, drawing pencils, set squares etc., – title block– layout and folding of drawing sheets.
Lettering and numbering as per BIS –importance of legible lettering and numbering–single stroke letters–upper case and lower case letters–slanting / inclined letters–general procedures for lettering and numbering–height of letters–guidelines–practices.
Scales–full size scale, reducing scale and enlarging scales (Description only).
<table>
<tr><td colspan="2">Minimum criteria for class assessment</td></tr>
<tr><td>No. of Drawing sheets</td><td>No. of Exercises</td></tr>
<tr><td>1</td><td>Upper case, lower case, slanting letters and numerals – each 5 sentences with different heights</td></tr>
</table>
1.2 Dimensioning
Dimensioning – need for dimensioning–dimensioning terms and notations as per BIS – dimension line, extension line and leader line – dimensioning systems – methods of placement of dimensions – uni-directional and aligned systems – important dimensioning rules – dimensioning of common features – diameters, radii, holes, chamfers – addition of letters and symbols – parallel, chain and progressive dimensioning – practice of dimensioning the given drawing as per BIS code (one view of the object).
<table>
<tr><td colspan="2">Minimum criteria for class assessment</td></tr>
<tr><td>No. of Drawing sheets</td><td>No. of Exercises</td></tr>
<tr><td>1</td><td>8 - 2D drawings</td></tr>
</table>
</td><td>06

13</td></tr>
</table>

<table>
<tr>
<td>II</td>
<td>
GEOMETRIC CONSTRUCTIONS AND CONSTRUCTION OF CONICS
2.1 Geometric Constructions
Bisect a straight line – bisect an arc – bisect an angle – divide a straight line into any number of equal parts – divide the circle into number of equal divisions – construct an arc touching two lines at any angle – construct an arc touching two arcs.
<table>
<tr><td colspan="2">Minimum criteria for class assessment</td></tr>
<tr><td>No. of Drawing sheets</td><td>No. of Exercises covering all methods</td></tr>
<tr><td>1</td><td>10</td></tr>
</table>
2.2 Construction of Conics
Conic sections – definition of locus, focus, directrix, axis, vertex and eccentricity – practical applications of ellipse, parabola and hyperbola.
Ellipse: Construction of ellipse by concentric circle method, rectangular method when major and minor axis are given and eccentricity method when focus and directrix are given–exercises in practical applications.
Parabola: Construction of parabola by rectangular method, parallelogram method when major and minor axis are given and eccentricity method when focus and directrix are given – exercises in practical applications.
Hyperbola: Construction of hyperbola by eccentricity method when focus and directrix are given – exercises in practical applications.
<table>
<tr><td colspan="2">Minimum criteria for class assessment</td></tr>
<tr><td>No. of Drawing sheets</td><td>No. of Exercises covering all methods</td></tr>
<tr><td>2</td><td>7</td></tr>
</table>
</td>
<td>06

13</td>
</tr>
<tr>
<td>III</td>
<td>
PROJECTION OF POINTS & STRAIGHT LINES AND CONSTRUCTION OF SPECIAL CURVES
3.1 Projection of Points and Straight Lines
Projection of points – position of a point on four quadrants and on the reference planes – system of notation–Place a point on four quadrants with different distances – exercises.
Projection of straight lines–line in the first quadrant and on the reference planes – parallel to one plane and perpendicular to other
</td>
<td>11</td>
</tr>
</table>

<table>
<tr><td></td><td>plane – inclined to one plane and parallel to the other plane – parallel to both the planes – simple exercises.
<table><tr><td colspan="2">Minimum criteria for class assessment</td></tr><tr><td>No. of Drawing sheets</td><td>No. of Exercises</td></tr><tr><td>2</td><td>12</td></tr></table>
3.2 Construction of Special Curves
Definition and construction of cycloid – epicycloid – hypocycloid – involute of a circle – Archimedean spiral for one revolution – helix – practical applications – exercises.
<table><tr><td colspan="2">Minimum criteria for class assessment</td></tr><tr><td>No. of Drawing sheets</td><td>No. of Exercises covering all methods</td></tr><tr><td>2</td><td>6</td></tr></table></td><td>08</td></tr>
<tr><td>IV</td><td>ORTHOGRAPHIC PROJECTIONS
4.1 First angle: Simple components Introduction – projection terms –orthographic projection – planes of projection – principal orthographic views – designation of views – four quadrants – first angle projection – third angle projection – symbols and arrangement of views for first angle and third angle projections –comparison – Simple exercises in first angle projection with minimum two views of simple components (Without curves and circles).
<table><tr><td colspan="2">Minimum criteria for class assessment</td></tr><tr><td>No. of Drawing sheets</td><td>No. of Exercises</td></tr><tr><td>1</td><td>6</td></tr></table>
4.2 First Angle Projections only: Engineering components
Draw the projections of the simple engineering components using first angle projection – exercises in drawing orthographic views – three views–front view, top view and right / left side views. (For Board Examinations any two views can be asked.)
<table><tr><td colspan="2">Minimum criteria for class assessment</td></tr><tr><td>No. of Drawing sheets</td><td>No. of Exercises</td></tr><tr><td>3</td><td>12</td></tr></table></td><td>11

21</td></tr>
</table>

Reference Books:

1. Bhatt N.D, “Engineering Drawing”, Charotar Publishing House Pvt. Ltd.
2. Gill P.S, “Engineering drawing”, S.K.Kataria&Sons.
3. Gopalakrishna.K.R., "Engineering Drawing", (Vol 1 & 2 combined), Subhas Publications.
4. Venugopal. K, Prabhu Raja V, “Engineering Graphics”, New Age International Publishers.

5. Natarajan K V “A Text Book of Engineering Drawing and Graphics” N Dhanalakshmi Publishers.
6. Shah M B, Rana B C, “Engineering Drawing”, Pearson.
7. Basant Agrawal, Agrawal C M “Engineering Drawing”, McGraw hill HED.
8. Parkinson A C, "First Year Engineering Drawing", Sir Isaac Pitman & Sons Ltd.
9. Thomas E. French, Charles J. Vierck, “The Fundamentals of Engineering Drawing”, McGraw Hill Book Co. Inc.

Internal Assessment Marks:

Class assessment drawings	10
Average of Two Assessment Tests	05
Model Examination	05
Attendance	05
Total	**25**

BOARD EXAMINATION

QUESTION PAPER PATTERN

Time: 3 Hrs **Max. Marks: 100**

Note: 1. Answer all the questions only in the drawing sheet.

2. Assume missing dimensions suitably, if required.

3. Proper drawing instruments and board should be used

PART – A (4x5 = 20)

Note: Five questions will be asked (Sl. No: 1 to 5). Answer any four questions.

Each question carries five marks.

Minimum one question should be asked from each unit first chapter.

(Chapters: 1.1, 2.1, 3.1, 4.1)

PART – B (4x20 = 80)

Note: Six questions will be asked (Sl. No: 6 to11). Answer any four questions.

Each question carries twenty marks.

Minimum one question should be asked from each unit second chapter. (Chapters: 1.2, 2.2, 3.2, 4.2)

MODEL QUESTION PAPER

ENGINEERING GRAPHICS - I

Time: 3 Hrs **Max. Marks: 100**

Note:
1. Answer all the questions only in the drawing sheet supplied.
2. Assume missing dimensions suitably, if required.
3. Use proper drawing instruments and drawing board.
4. First angle projection is to be followed.
5. All dimensions are in `mm'.

PART – A (4x5 = 20)

Answer any four questions. Each question carries five marks.

1. Write the following statements in a single stroke in upper case letters of 10 mm height.

   DRAWING IS THE LANGUAGE OF ENGINEERS

   ALL DIMENSIONS ARE IN MM

   ALL LETTERS SHOULD BE UNIFORM IN SHAPE, SIZE AND SPACING

   DIMENSION LINES SHOULD NOT CROSS EACH OTHER

   BUREAU OF INDIAN STANDARDS (BIS) IS OUR NATIONAL STANDARD.

2. Construct an arc of 50 mm radius touching two arcs of 25 mm and 50 mm radius externally, at a centre offset distance of 120 mm.
3. A point 'C' is 50 mm below the HP and 30 mm behind the VP. Draw the front view and top view.
4. A straight line AB 50 mm long is parallel to the VP and inclined at an angle of 30^{o} to the HP. The end A is 20 mm above the HP and 15 mm in front of the VP. Draw the projections of the line.
5. The pictorial view of a component is given in Fig: 1. Draw its front view and right side view.

PART – B (4x20 = 80)

Answer any four questions. Each question carries twenty marks.

6. Redraw the object shown in Fig: 2 and make the correct dimensioning as per BIS standards.
7. The major and minor axes of an ellipse are 120 mm x 80 mm respectively. Draw the ellipse using rectangular method.
8. Construct a parabola, when the distance of the focus from the directrix is 40 mm.

9. A circle of diameter 40 mm rolls on the outside of another circle of diameter 160 mm without slipping. Draw the path traced by a point on the smaller circle.
10. The pictorial view of the machine component is given in Fig: 3. Draw the front view and right hand side view.
11. The pictorial view of the machine component is given in Fig: 4. Draw the front view and top view.

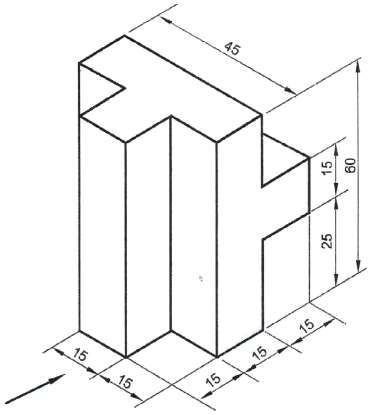

Fig: 1

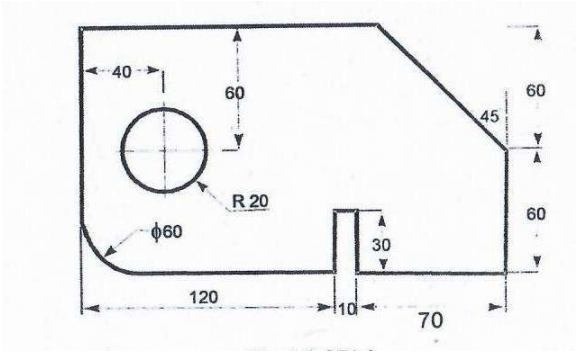

Fig: 2

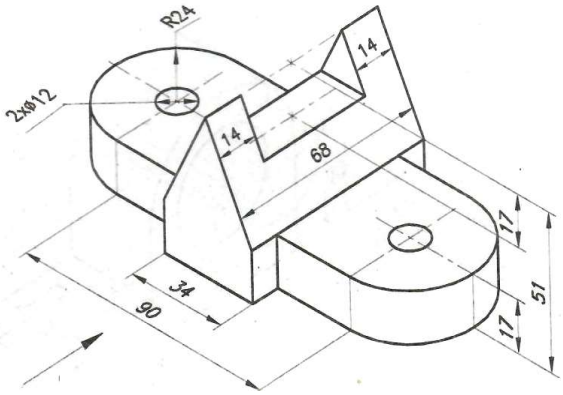

Fig: 3

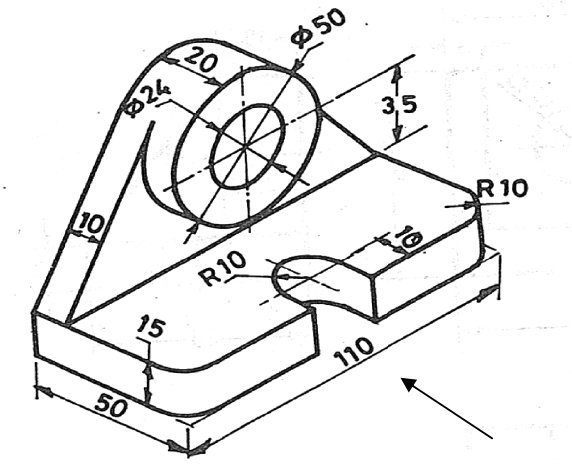

Fig: 4

ANNEXURE- I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020-2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special Programmes except HMCT and film &TV.

Subject Code : 40001

Semester : I Circuit Branches
II Non-Circuit Branches

Subject Title : COMMUNICATION SKILL PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
COMMUNICATION SKILL PRACTICAL	2	32	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and will be reduced to 75 marks.**

Topics and Allocation of Hours

Sl.No.	Topic	Duration (Hrs)
1	Listening Skill	10
2	Reading Skill	6
3	Speaking Skill	10
4	Writing Skill	6
Total		**32**

RATIONALE:

- **“**The quality of your life is in the quality of your communication” opined Antony Robins. Language is the means of self-expression and one of the prime most tools for communication. Communicative fluency augments one’s personal, academic, social and professional life.
- The present syllabus, focusing on four Communication Skills, viz. Listening, Reading, Speaking and Writing, enables the students at Diploma level gain confidence and fluency in communication which in turn would enhance them face their career commitments with globalized standards.

OBJECTIVES:

At the completion of the study, the students will be able to

- Improve their auditory skills to attentively listen, effectively comprehend and to identify important information and keywords.
- Fine tune their reading skills and make them articulate lucidly with proper stress and intonation
- Perfect their reading comprehending skills using the techniques like Skimming to get the general idea and scanning to grasp specific information.
- Pronounce words with renewed confidence.
- Express their needs, obligations, suggestions, gratitude and apology with poise and conviction.
- Introduce themselves and others in a self-assuring manner.
- Partake in face to face conversation with skilled agility.
- Emphatically write and complete the missing parts.
- Acquire a sound knowledge on the usage of non-verbal communication.

40001 COMMUNICATION SKILL PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Unit	Name of the Topic	Hours
I	**Listening Skill** Listening to Speeches by Great Speakers/ TV News (Assessment Through note taking) Listening to Short Stories (Assessment by Vocabulary Check) Listening to Indian / British / American English (Assessment by Cloze)	10
II	**Reading Skill** Stress & Intonation Tongue Twisters / Tongue Modulators Frequently Mispronounced Words Reading Newspaper – (Skimming & Scanning)	06
III	**Speaking Skill** Polite Expressions (Greeting, Requesting, Thanking, Apologizing, Opinions, Suggestions) Introducing Yourself/ Friends/ Family Recite - quotes of Leaders / Scholars / Scientists Face to Face Conversation	10
IV	**Writing Skill** Thought Fillers Completing an Incomplete Story How to prepare PPT Non-Verbal Communication	06

BOARD PRACTICAL EXAMINATIONS

Note:

1. The students should be given proper practice in all the exercises. All the exercises should be completed before the examinations.
2. The students should maintain a record notebook. The record note book should be submitted during the Board Practical Examinations.
3. The external examiner should verify the availability of the facility for the batch strength before the commencement of Practical Examination.
4. PART D should be conducted first for all the students. Part A, Part B and Part C can be conducted by both examiners by dividing the students into two groups.

Part A - Listening (No. of Exercises: 3, Duration:45 min.)

Question No.1: The examiner shall play either the audio of the speech of a great speaker or that of TV news running from 3 to 5 min. The audio can be played twice. The candidates may be given 10 minutes to take notes as directed in the question paper.

Question No.2: A short story selected by the external examiner shall be played only once without transcript. The objective of this exercise is to test the Listening ability of the candidate and therefore questions should be framed accordingly in the pattern of question and answer. The time to complete this exercise is 5 minutes.

Question No.3: Any one of the audios (British English, American English or Indian English) may be selected by the external examiner and the same shall be played only once. Maximum of 5 questions for filling in the blanks may be given and the candidates may be provided maximum of 10 minutes to answer the questions.

This part shall be completed within 45 minutes including the time used for playing listening audios.

Part – B – Reading (No. of Exercises 3, Duration: 45 min.)

Each batch may be divided into two. Both examiners may engage all the students.

Question No. 1:Readout the tongue twister.

Question No. 2: A passage from newspaper can be given for reading.

Question No.3: Pronounce the words correctly. Part B shall be completed within 45 minutes.

Part – C – Speaking (No. of Exercises: 4, Duration: 45 min)

Divide the students to make it convenient for conversations in English by a pair. Both examiners can handle.

Question No.1: Polite expressions for the context provided.

Question No. 2: Self-introduction for the interview.

Question No.3: Any five quotes can be recited from the given list of quotes of Leaders, Scholars and Scientists.

Question No. 4: The candidates have to speak as directed by the concerned examiner. All the questions are mandatory. Part C shall be completed within 45 minutes.

Part D – Writing (No. of Exercises: 3, Duration: 45 min.)

All students should appear for this part.

Question No.1: Five questions with blanks shall be asked based on a list of 25 frequently used thought fillers already trained during lab classes.

Question No. 2: shall consist of an unknown incomplete story providing scope for further development and application of imagination. (minimum 3 lines for completion with suitable title and moral)

Question No. 3: Questions can be taken from a list of fifteen important questions covering the core areas of non-verbal communication. (Five out of eight questions to be answered)

Students shall be provided maximum of 30 minutes to complete Part-D.

DETAILED ALLOCATION OF MARKS

Sl. No	Detailed Allocation of Marks	Maximum Marks
A	Listening	30
B	Reading	20
C	Speaking	30
D	Writing	20
	Total	100

Guidelines for Conduct of Practical Classes and Writing Record Note:

There are 13 experiments in total equally distributed to each skill as follows:

Sl. No	Name of the exercise	Minimum Exercises to be Practiced / written in Record Note
Listening Skill		
1	Listening to Speeches by Great Speakers/ TV News	**Each One exercise**
2	Listening to Short Stories	**Minimum of two exercises**
3	Listening to Indian / British / American English	**Minimum of two exercises**
Reading Skill		
4	Reading Tongue Twisters	**A list of 25 tongue twisters**
5	Reading English Newspapers	**Minimum 2 passages from any English Newspaper**
6	Frequently mispronounced words	**List of 25 words**
Speaking Skill		
7	Making Polite Expressions	**Polite expressions - Greeting, Requesting, Thanking, Apologizing, Opinions, Suggestions**
8	Introducing oneself / friends/family	**Minimum two exercises for introducing oneself and introducing others**
9	Reciting quotes	**Quotes of Leaders/Scholars/Scientists (List of 25 quotes)**
10	Face to face conversation	**Minimum two exercises**
Writing Skill		
11	Use of Thought Fillers	**A list of 25 frequently used thought fillers**
12	Completing an Incomplete Story	**Minimum of two exercises.** **(conclusion – minimum 3 lines, title & moral)**
13	Non-Verbal Communication	**A list of 10 questions and answers relating to non- verbal communication.**

Notes:

1. Each experiment shall be awarded 20 marks and the total marks secured in all experiments shall be averaged to 20marks.
2. Attendance mark shall be calculated for 5 marks as per the given norms.
3. Total internal mark is 25 (Record 20 marks + Attendance 5 marks)
4. Observation note is not applicable for this practical.
5. Listening Skill Exercises:

For each exercise under Listening Skill, minimum exercise should be provided for practice and should be recorded in the record note.(as per the tabular column)

Open sources available online on the sites such as

www.youtube.com,

www.letstalk.co.in,

http://www.bbc.co.uk/learningenglish/english/features/6-minute-english, and

https://esl-lab.com/,

can be utilized for sessions on improving listening skill.

Note:

Since there is no observation note for English Communication Practical, the worksheets practiced by the students should be preserved along with the Record Note.

BOARD EXAMINATIONS

Model Question Paper

40001 – Communication Skill Practical

Time: 3Hrs Maximum marks:100

PART A: LISTENING (30 Marks)

I Answer the following:

1. Listen to the speech of a Great Speaker / TV News played to you and take notes. (10)
2. Listen to the Short Story / conversation read out / played to you and answer the questions. (10)
3. Listen to the following American English / British English / Indian English Audio and fill in the blanks.(10)

PART B: READING (20 Marks)

II Answer of the following:

1. Read out the following tongue twisters as fast as possible:(10)

a. Find a kind mind to wind and bind you with the kind mind like a wind.

b. How many cookies could a good cook cook if a good cook could cook cookies?

c. We should fight for our rights as fight is might.

d. Can you can a can as a canner can can a can?

e. Lesser leather never weathered wetter weather better.

2. Read the given newspaper passage with proper intonation. (5)
3. Pronounce the following commonly mispronounced words rightly. (5)

a)pizza b)dengue c) bury d)asthma e)Wednesday

PART C: SPEAKING (30Marks)

III. Answer the following:

1. Make polite expressions for the contexts provided: (5)

a. Request your teacher for a book.

b. How will you politely apologize for coming late to the meeting?

2. Introduce yourself /friend/family member as a candidate appearing for the interview.(10)
3. Recite any five quotes of Leaders/scholars/Scientists. (5)
4. Attempt a face to face conversation with your friend about the addiction to mobile phone by youngsters.(5exchanges) (10)

PART D: WRITING (20 Marks)

IV. Answer the following:

1. Fill in the blanks with suitable thought fillers given in the brackets. (5)

(look, I mean, you know, well, anyway)

a. I can't tell her name,_____, she may grow angry.

b. ___What do you want me to do for that?

c. Nobody told me about this marriage,_____no one even in my own department.

d. ___as I said, I'm going to talk to the manager to cancel this meeting.

e. ___it is not the way to talk to your senior.

2. Complete the following story by adding three more lines and give a suitable title to it.(5)

Once upon a time there was a poor farmer in a village. He had two sons and a daughter. Both sons were lazy whereas the daughter was so intelligent. One day the father was sick at bed. The daughter who went to market in the morning did not return till late night….

3. Answer any FIVE of the following in about50 words: (5x2=10)

Questions from Non Verbal Communication

LABORATORY REQUIREMENT:

1. An echo-free room.
2. A Projector.
3. A minimum of two computers with internet access.
4. DVD player with home theatre.
5. P.A system with two nos. of wired/wireless mike.
6. Any Two Standard English Newspapers.
7. A White Board with Markers.
8. Comics / Story books – 2 Nos

Blank Page

ANNEXURE- I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N-SCHEME
(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and film &TV.

Subject Code : 40002

Semester : I Non-Circuit Branches
II Circuit Branches

Subject Title : COMPUTER APPLICATION PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

Number of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
COMPUTER APPLICATION PRACTICAL	2	32	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and will be reduced to 75 marks.**

TOPICS AND ALLOCATION OF HOURS

UNIT	Contents	Time (Hrs.)
1	BASICS OF COMPUTER	5 Hrs.
2	WORD PROCESSING	9 Hrs.
3	SPREAD SHEET	9 Hrs.
4	PRESENTATION	9 Hrs.
Total		32 Hrs.

40002 COMPUTER APPLICATIONS PRACTICAL

OBJECTIVES

To learn fundamentals of the computer

To understand documentation using word processor.

To understand the spread sheet and its uses.

To understand the presentation.

Contents: Practical

Units	Topic	Hrs.
I	**Basics of Computer:** Computer Basics – Hardware & Software - General understanding of various computer hardware components – CPU – Memory – Display – Keyboard- Mouse - HDD & Other Peripheral Devices – Types of Software – Application Software & System Software.	5
II	**Word Processing:** Creating new document – Opening an existing document – Edit & Save a document – Typing a text – Deleting a text – Inserting a text – Finding a text – Replacing a text – Copying & Moving a text – Selecting Font & Font Size – Justifying Texts – Bold – Italic – Underline – Strike – Double Strike – Coloring Text – Spell Check – Ruler – Formatting Page – Line Spacing – Margins – Page Size – Page Border – Page Color – Page Columns – Watermark – Page Break – Section Break – Portrait – Landscape – Inserting Symbols, Equations & Shapes – Text Box – Word Art – Hyperlink – Inserting Pictures – Picture Arrangement - Align Objects – Bullets & Numbering – Working with Tables – Header & Footer – Table of Contents – Inserting Page Number – Changing Character width & Line Spacing – Printing the document – Print Preview – Shortcuts for various activities in Word – Exercises.	9
III	**Spread sheet:** Creating a new worksheet - Opening an existing worksheet - Editing and Saving a worksheet - Creating, Renaming and Deleting worksheets in a workbook - Types of data like Numeric, text etc. - Entering in a cell- Manipulation of a cell, row and column (deleting, inserting, finding, replacing, copying and moving) -	9

	Justifying in a cell, Merging cells and columns - Addition, Subtraction and using formula - Selecting Font and Font Sizes - Using and manipulating tables, inserting / deleting of rows and columns - Sorting Columns- Using Header and footer, Inserting Page number - Border and Shading of cells, rows and columns - Formatting page, margins, page size, portrait and landscape - Selecting area for printing, Printing of a worksheet and workbooks, Using print preview - Copy / moving text between two different worksheets and workbooks - Using Chart Wizard, Creation of different types of charts – Protect sheet using password - Shortcuts for various activities in spreadsheet – Exercises.	
IV	**Presentations:** Creating New Presentations - Opening Presentations - Saving Presentation - Inserting new Slides - Slide Layout - Slide Design - Presentation View - Adding Text - Font formatting - Paragraph formatting – Inserting Clipart & Pictures - Inserting and Manipulating Smart Art - Running a slide show - - Insert Slide Number - Slide Header & Footer - Applying Slide Animation – Custom Animation - Inserting Shapes - Insert Video & Sound - Insert Action - Hyperlinks - Charts - Tables – Page Setup - Print Preview - Printing - Shortcuts of various activities in presentations – Exercises.	**9**

EXERCISES

EXERCISE 1 (WORD PROCESSING)

Prepare a report from the given printed document of minimum 250 words. (Use text formatting tools, header & footer, page number, line spacing, font & images)

- **Page Setup:**

Set Margin: Left-1.5, Right-1.5, Top-1.5 & Bottom-1.5 / Orientation: Portrait / Paper Size: A4 / No. of Columns: 2

- **Page Background Settings:**

Watermark / Page Color / Page Borders

- **Text & Paragraph Settings:**

Title: Font size: 16 – Centered – Bold – Suitable font

Heading: Font size: 14 – Left Aligned – Underlined – Set the Suitable Font Face

Body Text: Font size: 12 – Justified – 1.5 Line Spacing – Set the Suitable Font Face

- **Header & Footer:**

Header – Seminar Name, Name of the student, Reg. No. & Branch

Footer – Page No., Date and Time

- **Insert:**

Picture / Clipart / Shapes / Table.

- **Minimum No. of Words:** 250 words

EXERCISE 2 (WORD PROCESSING)

Create a resume for placement from the given printed template with your personal details. Publish a copy of the resume as PDF.

- **Page Setup:**

Margin: Left-0.5, Right-0.5, Top-0.5 & Bottom-0.5 / Orientation: Portrait / Paper Size: A4 / No. of Columns: As per the given resume format.

- **Page Borders:**

Insert Page Border if required.

- **Font & Paragraph:**

Heading : Font size: 12 - Bold – Underlined – Set the Suitable Font Face

Body Text : Font size: 12 – Justified – 1 Line Spacing – Set the Suitable Font Face

Insert Bullets & Numberings were ever required.

- **Insert:**

Photo for your Resume / Tables for Academic Records.

- **Save as PDF:**

Publish a copy of the resume as PDF using any PDF Converting Tools.

EXERCISE 3 (WORD PROCESSING)

Create a standard covering letter and use mail merge to generate the customized letters for applying to a job in various organizations. Also, create a database and generate labels for the applying organizations.

- **Page Setup:**

Margin: Left-1.5, Right-1.5, Top-1.5 & Bottom-1.5 / Orientation: Portrait / Paper Size: A4

- **Page Background:**

Add Page Border for the Letter

- **Font & Paragraph:**

Title: Font size: 16 – Centered – Bold – Suitable font

Heading: Font size: 14 – Left Aligned – Underlined – Set the Suitable Font Face

Body Text: Font size: 12 – Justified – 1.5 Line Spacing – Set the Suitable Font Face

- **Mailings:**

Select Recipients and add a New List of HR Database.

Start Mail Merge through Step by Step Mail merge wizard.

EXERCISE 4 (SPREAD SHEET)

Create a worksheet for the given relational data (minimum ten records) and show the data in the Line Chart, Bar Chart and Pie Chart.

- **10 Records**

Add text to the spreadsheet to the various fields require to analyze the data in Chart

- **Font & Alignment**

Font Face – Font Size – Font Color

- **Formulae**

Use Formulae for the selected data for Calculation

- **Insert**

Charts – Line Chart, Bar Chart & Pie Chart

EXERCISE 5 (SPREAD SHEET)

Create a worksheet for the given data with various functions like Sum, Average, Count, Min, Max & Logical functions [IF, AND].

- **Data**

Create a Worksheet and Insert the various records to the cells.

- **Formatting**

Set the Font using Font Name, Font Size and with various Alignment tools.

- **Formulas and Functions**

Use some functions like Sum, Average, Count, Min, Max and Logical Functions. [IF, AND]

EXERCISE 6 (SPREAD SHEET)

Create a worksheet for the given data and analysis the data with various filters and conditional formatting.

- **Data**
- **Formatting**

Text: Font Face – Font Size – Font Color – Alignment

- **Functions**
- **Conditional Formatting**
- **Filters**

EXERCISE 7 (PRESENTATION)

Create a presentation of minimum 10 slides from engineering related topic.

- **Design & Layout**

Add a suitable Theme and Layout according to the content of all 10 slides.

- **Header & Footer**

Header: Insert the Title & Author

Footer : Insert the Date & Slide Number

- **Font & Paragraph**

Font Face – Font Size – Font Color - Alignment – Bullets & Numberings

- **Insert**

Images & Tables

EXERCISE 8 (PRESENTATION)

Create a presentation of 10 slides about your college with Slide & Custom Animation, Shapes, Header & Footer, Slide number, Video, Audio, Picture, Tables and Hyperlink between slides.

- **Design & Layout**

Add a suitable Theme and Layout according to the content of all 10 slides.

- **Header & Footer**

Header: Insert the Title & Author

Footer : Insert the Date & Slide Number

- **Font & Paragraph**

Font Face – Font Size – Font Color - Alignment – Bullets & Numberings

- **Insert**

Video / Audio / Tables / Shapes

- **Hyperlink**

Use hyperlink to link between slides.

- **Animation**

Custom Animation for individual Objects / Slide Transition to all slides

Custom Animation for individual Objects / Slide Transition to all slides

40002 Computer Application Practical

BOARD PRACTICAL EXAMINATIONS

Note:

1. The student should be given proper training in all the exercises. All the exercises should be completed before the examinations.
2. The student should maintain observation note book / manual and record notebook. The record note book should be submitted during the Board Practical Examinations. Common printout for the record note book should not be allowed. Individual student output for every exercise should be kept in the record note book.
3. All exercises should be given in the question paper and student is allowed to select any one by lot. All exercises with the hard copy of the template related to the exercise should be provided by the external examiner for the examination. Template can be varied for every batch.
4. The external examiner should verify the availability of the infrastructure for the batch strength before the commencement of Practical Examination.

DETAILED MARK ALLOCATION

	Description	Marks Awarded
A	Aim & Procedure	20
B	Execution *	50
C	Output Printout / Handout ^	20
D	Vivavoce	10
Total Marks		**100**

* Should be evaluated during the execution by the examiners only.

^ Students all actual output should be printed and submitted with the exam paper for evaluation.

Hardware and Software Requirements

Minimum Hardware Requirements:

Desktop Computers – 30Nos

Processor: 1 GHz, RAM: 1 GB, Hard Drive: 500 GB, Monitor: 15”, Keyboard & Mouse, other accessories

Overhead Projector: 1 No.

Laser Printer: 1 No.

Minimum Software Requirements:

Operating System: Any GUI Operating System

Office Package (Open Office Packages)

ANNEXURE- I
STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME
(Implemented from the Academic year 2020-2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and film & TV.

Subject Code : 40006

Semester : I and II

Subject Title : ENGINEERING PHYSICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
I SEMESTER ENGINEERING PHYSICS I PRACTICAL	2	32	25	100*	100	3 Hrs.
II SEMESTER ENGINEERING PHYSICS II PRACTICAL	2	32				

*** Examinations will be conducted for 100 marks and will be reduced to 75 marks.**

RATIONALE:

In Diploma level engineering education skill development plays a vital role. The skill development can be achieved by on hand experience in handling various instruments, apparatus and equipment. This is accomplished by doing engineering related experiments in practical classes in various laboratories.

GUIDELINES:

- All the first eight experiments should be completed in the First Semester and the remaining Eight experiments should be completed in the Second Semester. All the experiments should be given for the practical examination at the end of the Year.
- In order to develop best skills in handling Instruments / Equipment and taking readings in the practical classes, every two students should be provided with a

separate experimental setup for doing experiments in the laboratory.

- The external examiners are requested to ensure that a single experimental question should not be given to more than two students while admitting a batch of 30 students during Board Examinations.

I SEMESTER

ENGINEERING PHYSICS - I PRACTICAL

LIST OF EXPERIMENTS WITH OBJECTIVES:

1. MICROMETER (SCREW GAUGE).

   To measure the thickness of the given irregular glass plate using micrometer. To determine the area of the glass plate using a graph sheet and to calculate the volume of the glass plate.

2. VERNIER CALIPERS.

   To measure the length and diameter of the given solid cylinder using Vernier calipers and to calculate the volume of the solid cylinder.

3. PARALLELOGRAM LAW.

   To verify the parallelogram law using concurrent force.

4. LAMI'S THEOREM

   To verify Lami's theorem using concurrent forces.

5. COMPARISON OF VISCOSITIES

   To compare the co-efficient of viscosities of two low viscous Liquids by capillary flow method.

6. STOKES' METHOD.

   To determine the coefficient of viscosity of a highly viscous liquid.

7. SONOMETER.

   To determine the frequency of the given tuning fork.

8. DEFLECTION MAGNETOMETER

   To compare the magnetic moments of the two bar magnets using Deflection Magnetometer in Tan A position, by equal distance method.

II SEMESTER
ENGINEERING PHYSICS-II PRACTICAL

LIST OF EXPERIMENTS WITH OBJECTIVES:

9. REFRACTIVE INDEX

To determine the refractive index of a transparent liquid (water) using travelling Microscope.

10. SPECTROMETER.

To measure the angle of the prism using Spectrometer.

11. SOLAR CELL.

To draw the V – I characteristics of the solar cell.

12. LAWS OF RESISTANCES.

To verify the laws of resistances by connecting the two given standard resistances in series and parallel, using Ohm's law.

13.JOULE'S CALORIMETER.

To determine the specific heat capacity of water.

14. COPPER VOLTAMETER.

To determine the electro chemical equivalent (e.c.e.) of copper.

15. P-N JUNCTION DIODE.

To draw the voltage – current characteristics in forward bias and to find the 'dynamic Forward resistance' & 'knee voltage' from the graph.

16. LOGIC GATES.

To find the output conditions for different combinations of the input for NOT gate and 2 inputs AND, OR, NAND & NOR logic gates, using IC chips. (IC 7404 –NOT Gate,IC 7408 – AND Gate, IC 7432 – OR gate, IC 7400 – NAND Gate,IC 7402 – NOR Gate).

BOARD PRACTICAL EXAMINATIONS

Note:

- The students should be given proper practice in all the experiments. All the experiments should be completed before the examinations.
- The students should maintain observation note book / manual and record notebook. In the observation, the student should draw diagram, mention the readings / observations, calculations and result manually. The same have to be evaluated for the observation mark.
- The record note book should be submitted during the Board Practical Examinations. The record work for the experiments should be completed and evaluated in the respective semesters.
- All experiments should be given and the students are allowed to select any one by lot.
- The external examiner should verify the availability of the infrastructure for the batch strength before the commencement of Practical Examination.
- The examiners should ensure the proper safety measures before the commencement of practical examinations.

DETAILED MARK ALLOCATION

Description		Detailed Allocation
A	Formula & Diagram	20
B	Tabulation with proper units	10
C	Observation (including taking readings)	40
D	Calculation	15
E	Result	10
F	Vivavoce	5
Total Marks		**100**

LIST OF EQUIPMENTS

Minimum Two set of equipment / components are required for the Batch of 30 Students.

1. MICROMETER (SCREW GAUGE).
   Screw gauge, graph sheet and irregular glass plate.
2. VERNIER CALIPERS.
   Vernier Calipers and Solid Cylinder
3. PARALLELOGRAM LAW.
   Vertical drawing board, two Z pulleys, three sets of slotted weights (5 x 50g) and twine thread.
4. LAMI'S THEOREM
   Vertical drawing board, two Z pulleys, three sets of slotted weights (5 x 50g) and twine thread.
5. COMPARISON OF VISCOSITIES
   Burette stand, graduated burette without stopper, rubber tube, capillary Tube, beaker, digital stop watch, two liquids and funnel.
6. STOKES' METHOD.
   Stokes' Apparatus, highly viscous liquid (Castrol oil), glass beads of different radii, digital stop watch and screw gauge.
7. SONOMETER.
   Sonometer, screw gauge, tuning fork, rubber hammer, slotted weight hanger set (5 x 0.5kg) and paper rider.
8. DEFLECTION MAGNETOMETER
   Deflection Magnetometer, meter scale and two bar magnets
9. REFRACTIVE INDEX
   Travelling Microscope, Beaker with transparent liquid and Saw dust.
10. SPECTROMETER.
    Spectrometer, Sodium vapour lamp, Reading lens and Glass prism
11. SOLAR CELL.
    Solar cell Kit for drawing the V - I characteristics
12. LAWS OF RESISTANCES.
    Battery Eliminator, key, rheostat, ammeter, voltmeter, Connecting wires and two known standard resistances.
13. JOULE'S CALORIMETER.
    Joule's Calorimeter, Battery eliminator, Rheostat, Key, Ammeter, voltmeter, stop clock, thermometer, digital Balance and connecting wires.
14. COPPER VOLTAMETER.
    Copper Voltameter, Battery eliminator, Rheostat, Key, Ammeter, stop clock, digital

balance, emery sheet and Connecting wires.

15. P-N JUNCTION DIODE.
    P-N Junction Diode forward characteristics kit.
16. LOGIC GATES.
    Logic gates testing apparatus kit with bread board for Mounting ICs and Integrated circuit chips (IC 7404 –NOT Gate, IC 7408 – AND Gate, IC 7432 – OR gate, IC 7400 –NAND Gate, IC 7402 – NOR Gate)

40006 ENGINEERING PHYSICS PRACTICAL

MODEL QUESTION PAPER

All experiments should be given for examination and the students are allowed to select any one by lot.

1. Measure the thickness of the given irregular glass plate using micrometer. Determine the area of the glass plate using a graph sheet and calculate the volume of the glass plate.
2. Measure the length and diameter of the given solid cylinder using Vernier calipers and then calculates the volume of the solid cylinder.
3. Verify the parallelogram law of forces using concurrent forces.
4. Verify the Lami's theorem using concurrent forces.
5. Compare the coefficient of viscosity of two Liquids by capillary flow method, using graduated burette.
6. Determine the coefficient of viscosity of a highly viscous liquid by Stokes' method.
7. Determine the frequency of the given tuning fork using Sonometer.
8. Compare the magnetic moments of the two bar magnets using deflection magnetometer in Tan-A position, by equal distance method.
9. Determine the refractive index of the given transparent liquid using travelling Microscope.
10. Measure the angle of the prism using Spectrometer.
11. Draw the V – I characteristics of the solar cell.
12. Verify the laws of resistances by connecting the two given standard resistances in (i) series and (ii) in parallel, using Ohm's law.
13. Determine the specific heat capacity of water, using Joule's calorimeter.
14. Determine the electro chemical equivalent (e.c.e.) of copper using Copper Voltameter.
15. Draw the voltage – current characteristics of a P-N junction diode in forward bias and then find the 'dynamic forward resistance' & 'knee voltage' from the graph.
16. Find the output conditions for different combinations of the input for NOT gate and two inputs AND, OR, NAND & NOR logic gates using IC chips.

ANNEXURE- I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS
N-SCHEME
(Implemented from the Academic year 2020-2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and film &TV.

Subject Code : 40007

Semester : I and II

Subject Title : ENGINEERING CHEMISTRY PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
I SEMESTER ENGINEERING CHEMISTRY I PRACTICAL	2	32	25	100*	100	3 Hrs.
II SEMESTER ENGINEERING CHEMISTRY II PRACTICAL	2	32				

*** Examinations will be conducted for 100 marks and will be reduced to 75 marks.**

OBJECTIVES:

1. At the end of the program the student will have knowledge about volumetric analysis in acidimetric, alkalimetric and permanganometric titration and their applications.
2. To get knowledge of estimation of total hardness, temporary and permanent hardness in the hard water sample.
3. To get knowledge about measurement of TDS, pH and to calculate Hydrogen ion concentration in a solution.
4. To get knowledge of estimation of dissolved chlorine in a water sample.

I SEMESTER

ENGINEERING CHEMISTRY – I PRACTICAL

Intellectual Skills

1. Carrying out Volumetric titrations and calculation of masses
2. Knowing units for Concentrations of solutions

Motor Skills

1. Measure quantities accurately
2. Observe chemical reactions
3. Handle the apparatus carefully

EXPERIMENTS

i) Acidimetry and Alkalimetry

1. Estimate the amount of sulphuric acid present in ……. ml of a given solution using Standard solution of HCl of strength…….N and an approximately decinormal solution of NaOH.
2. Estimate the amount of NaOH present in …….ml the given solution using a standard solution of KOH of strength …….N and approximately decinormal solution of H_2SO_4
3. Compare of strength of two given hydrochloric acids and estimate the stronger/weaker solution present in …….ml using a standard solution of sodium hydroxide of strength ……N

ii) Permanganometry

4. Estimation of the amount of Mohr salt present in…….ml of the given solution using a standard solution of ferrous sulphate of strength ……N and an approximately decinormal solution of $KMnO_4$.
5. Estimation of the amount of Fe 2+ present in…….ml of the given solution using a standard solution of ferrous ammonium sulphate of strength ……N and an approximately decinormal solution of $KMnO_4$.
6. Compare of strength of two given KMnO4 solution and estimate the stronger/weaker solution present in …….ml using a standard solution of ferrous ammonium sulphate of strength ……N

iii) Water Analysis

7. Water analysis for residual chlorine
8. Estimation of total hardness of a sample using EDTA
9. Water quality testing, pH (3 sample)
10. Water quality testing TDS (3 sample)

Determination of pH and TDS using a pH meter and TDS meter respectively and calculation of hydrogen ion Concentrations (For three given samples, one of the samples brought from home by each student) **(This question must be given to any two students per batch in the Board Examination).**

II SEMESTER

ENGINEERING CHEMISTRY–II PRACTICAL

Intellectual Skills

1. Studying the effect of heating on substances and reagents
2. Study of the reactions of the following radicals leading to qualitative analysis of the given Inorganic simple salt soluble in water or dilute acids
3. Studying the harmful effects of effluents

Acid Radicals: Carbonate, Chloride, Nitrate and Sulphate

Basic Radicals: Lead, Copper, Aluminium, ferrous iron, Zinc, Barium, Calcium, Magnesium and Ammonium

Motor Skills

1. Handling the apparatus carefully
2. Awareness on Industrial safety

EXPERIMENTS

I. Analysis of Inorganic simple salt (QUALITATIVE ANALYSIS)

Analysis of nine inorganic simple salts containing any one acid radical and basic radical without omitting any of the above – mentioned radicals.

II. Analysis of Effluent containing Lead, Copper and Zinc metal ions (EFFLUENT ANALYSIS)

Analysis of three effluents, each containing the above – mentioned metal ions.

Report on the metallic pollutant with procedure (Basic Radical Analysis Procedure) and their harmful effects.

BOARD PRACTICAL EXAMINATIONS

Note:

- The students should be given proper practice in all the experiments. All the experiments should be completed before the examinations.
- The students should maintain observation note book / manual and record notebook. In the observation, the student should draw diagram, mention the readings / observations, calculations and result manually. The same have to be evaluated for the observation mark.
- The record note book should be submitted during the Board Practical Examinations. The record work for the experiments in the concerned semester should be completed and evaluated in the respective semesters. Both Volumetric and Salt analysis shall be recorded in the in the same record note book. During the completion of First semester, Volumetric analysis needs to be completed and record needs to be submitted. The second semester, Salt analysis also be recorded in the same record note book.
- All experiments should be given as per the model question paper and the students are allowed to select any one by lot.
- The external examiner should verify the availability of the infrastructure for the batch strength before the commencement of Practical Examination.
- The examiners should ensure the proper safety measures as per the guidelines before the commencement of practical examinations.

DETAILED MARK ALLOCATION

Description		**Detailed Allocation**
A	PART A Engineering Chemistry I Practical	53
B	PART B Engineering Chemistry II Practical	42
C	VIVAVOCE	05
Total Marks		**100**

Guide lines for Evaluation

PART A: ENGINEERING CHEMISTRY I PRACTICAL

Volumetric Analysis - Distribution of Marks

FOR	MARKS
Short procedure	5
Titration I	18
Titration II	18
Calculations (3 X 4)	12
Total	**53**
Volumetric Analysis	
Titration value accuracy for Titration I and II	
Accuracy	**Marks**
±0.2ml	18
above ±0.2 ml to ±0.4 ml	15
above ±0.4 ml to ±0.6 ml	12
above ±0.6 ml	5

Determination of pH: Distribution of marks

FOR	Marks
Answer for short questions on pH and TDS	5
Determination of pH of three samples (3 x 7)	21
Calculation of H^+ (3X2)	6
Determination of TDS - three samples (3X7)	21
Total	**53**
Accuracy per pH value	
Accuracy	**Marks**
±0.2	7
above ±0.2 to ±0.4	5
above ±0.4	2
TDS Value accuracy	
Accuracy	**Marks**
±2%	7
above ±2% to ±4%	5
above ±6%	2

Note: All the students should be given same question and each batch of student is given different inorganic simple salt and effluent. (Nine salt and three effluents)

PART B: ENGINEERING CHEMISTRY II PRACTICAL

Qualitative Analysis

FOR	Marks
Identification Procedure of Acid Radical with Systematic procedure	21
Identification Procedure of Basic Radical with Systematic procedure	21
TOTAL	**42**
Without systematic procedure	
Identification of Acid Radical with confirmatory test only	13
Identification of Basic Radical with confirmatory test only	13
Mere Spotting of Acid Radical and Basic Radical (3+3)	6

EFFLUENT ANALYSIS (two samples to be given)

FOR	Marks
Identification of metallic pollutant procedure with systematic procedure Effluent sample	16
Harmful effects of metallic pollutant	5
Identification of metallic pollutant procedure with systematic procedure Effluent sample II	16
Harmful effects of metallic pollutant	5
TOTAL	**42**
Without systematic procedure	
Group Identification Tests of metallic pollutant	13
Confirmatory Test of metallic pollutant	13
Mere Spotting of the pollutant (3+3)	6

MODEL QUESTION PAPER

MODEL1

PART A:

Estimate the mass of Iron present in whole of the given ferrous sulphate solution using a standard solution of ferrous ammonium sulphate of strength 0.1N and an approximately decinormal solution of potassium permanganate. (53marks)

PART B:

Analyse the given Inorganic simple salt and report the acid radical and basic radical present in it. (42 marks)

MODEL2

PART A:

Calculate the total hardness of the given sample of water using a standard hard water solution of molarity 0.01M and an approximately decimolar solution of EDTA. (53marks)

PART B:

Analyse the given samples (two samples) of effluent and report the metallic pollutant present in it with procedure and its harmful effects. (42 marks)

MODEL3

PART A:

Determine the pH of three given samples using pH meter and calculate the hydrogen ion concentration of the samples determine the TDS of the same sample. (Any two students per batch). (53marks)

PART B:

Analyse the given Inorganic simple salt and report the acid radical and basic radical present in it. (42marks)

MODEL4

PART A:

Estimate the amount of sulphuricacid present in the whole of the given sulphuric acid using a standard solution of hydrochloric acid of strength 0.1N and an approximately decinormal solution of sodium hydroxide. (53 marks)

PART B:

Analyse the given Inorganic simple salt and report the acid radical and basic radical present in it. (42marks)

Note:

Determination of pH using a pH meter and calculation of hydrogen ion concentrations in the solutions and TDS using TDS meter (For three given samples) (This question may be given to any two students per batch).

A single experiment with different skill value may be given for a batch. The eighth experiment (Determination of pH) may be given to any two students per batch.

SAFETY MEASURES (DO'S & DON'TS)

Experiment should be carried out with the supervision of Lab instructor / staff i/c.

- Do not enter into the Laboratory without proper supervision.
- Do wear protective equipment for eye protection and make sure to wear a laboratory coat.
- Do not smell, inhale taste of chemicals.
- Do label all containers with chemicals
- Do avoid direct contact with chemicals, far from your hands face, clothes and shoes.
- Do not use Hazardous chemical without proper directions
- Do Use separate cabinets for acid solutions with concentration more than 6M.
- Whenever, accidentally when concentrated acids fallen on hands / cloth wash thoroughly with running water, and after taking first aid, and the student may be taken to hospital.
- Do attach chemical labels with all necessary information to all containers.
- Do read the warning labels when opening newly received reagent chemicals. This will help to be aware of any special storage precautions such as refrigeration or inert atmosphere storage.
- Do periodic check on chemical containers for rust, corrosion and leakage.
- Do Store bottles in chemicals afe bags especially those hazardous and moisture absorbing chemicals.
- Do not use of mouth suction to fill a pipette. Use a pipette bulb or other filling devices.
- Do not Smoke, drink, eat and the application of cosmetics is forbidden in areas where hazardous chemicals are used or stored.
- Do use chemicals with adequate ventilation.
- Do wash thoroughly with soap and water whenever you leave the lab after handling any chemicals.
- Do Keep your hands and face clean free from any trace of chemicals.
- Do not play with chemicals.

List of Apparatus to be provided for each student in Chemistry Laboratory during the Engineering Chemistry –I&II Practical Classes / Board Examination in addition to the required reagents:

LIST OF EQUIPMENTS

List of Equipment Required for a Batch of 30 Students

Non-Consumable Items

Sl. No.	Name of the item	Quantity
1	LPG Connection	
2	Exhaust Fan (High Capacity)	Sufficient Nos.
3	Fire Extinguisher	1
4	First Aid Box (Full Set)	2
5	Safety Chart	1
6	Chemical Balance	1
7	Fractional Weight Box	1
8	pH Meter	2
9	TDS meter	2
10	Working Table with all accessories	8

GLASSWARE AND OTHER ITEMS

Sl. No.	Name of the item	Quantity
1	Burette(50ml)	35
2	Burette Stand	35
3	Pipette(20ml) (With safety bulb)	35
4	Pipette(10ml)	35
5	Conical Flask(250ml)	35
6	Funnel (3”)	50
7	Porcelain Tile	35
8	Measuring Cylinder (10 ml)	5
9	Measuring Cylinder (1000 ml)	2
10	Reagent Bottle (White) (250ml)	60
11	Reagent Bottle (White) (125ml)	100
12	Reagent Bottle (Amber)(250ml)	80
13	Test Tube(15mmx1.5mm)	1000
14	Test Tube(15mmx2.5mm)	500
15	Test Tube Stand	35
16	Test Tube Holder	35
17	Test Tube cleaning brush	35

18	Glass Trough	5
19	Beaker(100ml)	35
20	Glass Rod(15cm)	100
21	Watch Glass (3”)	35
22	Wash Bottle (Polythene)	35
23	Nickel Spatula	35
24	Bunsen Burner for Gas connection	35
25	Plastic Bucket(15L)	10
26	Filter Papers (Round)	Sufficient
27	Pipette bulb / filling devices	35

DIPLOMA IN ENGINEERING AND TECHNOLOGY

1010, 2010 & 3010

DIPLOMA IN CIVIL ENGINEERING

SEMESTER PATTERN

N - SCHEME

IMPLEMENTED FROM 2020-2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION
CHENNAI - 600 025, TAMIL NADU

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STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING AND TECHNOLOGY SYLLABUS (II & III YEAR)

N- SCHEME

(To be implemented for the students from the year 2020-21 onwards)

Syllabus Revision Committee

Chairperson

Tmt. G.Laxmi Priya, I.A.S.,
Director of Technical Education
Directorate of Technical Education
Chennai – 600025

Co-ordinator & Convener

Dr.V.Karthikeyan, M.E., Ph.D., MCMI(UK)., FIE.,
Principal, Thiagarajar Polytechnic College
Salem-636005

DIPLOMA IN CIVIL ENGINEERING (1010, 2010 & 3010)	
Members	
Thiru.S.Loganathan, M.E., HoD/Civil, Thiagarajar Polytechnic College, Salem-636 005.	**Dr. M. Geetha , Ph.D.,** Principal CSI Polytechnic College, Salem-636 007.
Dr. T. Arulkumar, Ph.D., HoD/Civil Government Polytechnic College, Dr.R.K.Nagar, Chennai - 600 081	**Tmt.S. Santhi, M.E.,** Lecturer (Sr.G.)/ Civil AMK Technological Polytechnic College, Chennai-600 123
Tmt.N.Sivakami, M.E., Lecturer (SG)/Civil Algappa Polytechnic College Karaikudi - 630 004.	**Thiru. N.G. Muralidharan, B.E.,** Chief Executive Officer M/s. Westart Communication India Pvt. Ltd., No. 15 & 17, Lalith Towers 3rd Floor, Alandur,Chennai - 600 016
Thiru.P.Raja, M.E., Assistant Executive Engineer Public Works Department Building Construction and Maintenance Division-Medical Works Salem - 636 007.	**Dr.D.Shoba Rajkumar, Ph.D.,** Professor & Head of Department/Civil Government College of Engineering Salem - 636 011.

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DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

N — SCHEME

(Implemented from 2020 - 2021)

R E G U L A T I O N S*

**Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology.*

1. Description of the Course:

a. Full Time (3 years)

The Course for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Sandwich Diploma in Engineering shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4^{th} and/or during 7^{th} semester the students undergo industrial training for six months / one year. Industrial training examination will be conducted after completion of every 6 months of industrial training.

c. Part Time (4 years)

The course for the Part Time Diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*. The subjects of 3 years full time diploma courses being regrouped for academic convenience.

**** Each* Semester *will* have *16 weeks duration of study with 35 hrs. / Week for Regular Diploma Courses and 18 hrs. / Week for Part Time Diploma Courses.***

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2020 — 2021 academic year onwards.

2. Conditions for Admission:

Condition for admission to the Diploma courses shall be required to have passed in The S.S.L.C Examination of the Board of Secondary Education, Tamil Nadu.

(Or)

The Anglo Indian High School Examination with eligibility for Higher Secondary Course in Tamil Nadu.

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamil Nadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board with eligibility for University Courses of study or equivalent examination & Should have studied the following subjects.

A pass in 2 Years ITI with appropriate Trade or Equivalent examination.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational		Industrial Training **Institutes** Courses
		Subjects Studied	Subjects Studied		
			Related subjects	**Vocational** subjects	
1	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Maths / Physics / Chemistry	Related Vocational Subjects Theory& Practical	2 years course to be passed with appropriate Trade
2	Diploma Course in Commercial Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretaryship	

- For the Diploma Courses related with Engineering/Technology, the related/equivalent subjects prescribed along with Practicals may also be taken for arriving the eligibility.
- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.
- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Commercial Practice Diploma courses the candidates studied the related subjects will be given first preference.

- Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.

4. Age Limit: No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, Tamil Nadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses are as given below:

Diploma Course	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
Full Time (Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

This will come into effect from N Scheme onwards i.e. from the academic year 2020-2021.

7. Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical subjects.

The curriculum outline is given in Annexure — I.

8. Examinations:

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment. Board Examinations are conducted for 100 marks and reduced to 75.

The total marks for result are 75 + 25 = 100 Marks.

9. Continuous Internal Assessment:

A. For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

i) Subject Attendance **5 Marks**

(Award of marks for subject attendance to each subject Theory/Practical will be as per the range given below)

80%	-	83%	1 Mark
84%	-	87%	2 Marks
88%	-	91%	3 Marks
92%	-	95%	4 Marks
96%	-	100%	5 Marks

ii) Test # **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Average of these two test marks will be taken and the marks to be reduced to: 5 Marks

The Test-III is to be the Model Examination covering all the five units and the marks obtained will be reduced to: 5 Marks

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	Model Examination: Covering all the Units. (Board Examinations- question paper-pattern).	End of 16th week	100	3 Hrs

From the Academic Year 2020—2021 onwards.

Question Paper Pattern for the Test - I and Test — II is as follows. The tests should be conducted by proper schedule. Retest marks should not be considered for internal assessment.

Without Choice:

Part A Type questions:	6 Questions x 1 mark	06 Marks
Part B Type questions:	7 Questions x 2 marks	14 Marks
Part C Type questions:	2 Questions x 15 marks	30 Marks
	Total	**50 Marks**

iii) Assignment **5 Marks**

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 5 marks.

iv) Seminar Presentation **5 Marks**

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second Year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2½ marks for the material submitted in writing and 2½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks.

All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of Board Exam results and produced to the flying squad and the inspection team at the time of inspection/verification.

B. For Practical Subjects:

The Internal Assessment mark for a total of 25 marks which are to be distributed as follows:-

a) Attendance : 5 Marks (Award of marks as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related Work : 10 Marks

c) Record writing : 10 Marks

TOTAL : 25 Marks

- All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examination.
- The observation note book / manual should be maintained for 10 marks. The observation note book / manual with sketches, circuits, programme, reading and calculation written by the students manually depends upon the practical subject during practical classes should be evaluated properly during the practical class hours with date.
- The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 10 marks for each exercise as per the above allocation.
- At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks (including Observation and Record writing) and the marks awarded tor attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)

- Only regular students, appearing first time have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Log Book of the staff, who is handling the theory subject.

The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Log Book of the staff, who is handling the practical subject.

10. Communication Skill Practical, Computer Application Practical and Physical Education:

The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase the Communication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physical education is introduced to encourage students to remain healthy and fit by including physical activities and sports.

11. Project Work and Internship:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work & Internship:

Project Review 1	:	10 marks
Project Review II	:	10 marks
Attendance	:	05 marks (Award of marks same as theory subject pattern)
TOTAL	**:**	**25 Marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work & Internship in Board Examinations:

Demonstration/Presentation/Viva voce	:	25 marks
Report	:	25 marks
Writtent test	:	30 marks
Internship Report	:	20 marks
TOTAL	**:**	**100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year “Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Board examination.

12. Scheme of Examinations:

The Scheme of examinations for subjects is given in Annexure - II.

13. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than 40% in Theory subjects and 50% in practical subjects out of the total prescribed maximum marks including both the Internal Assessment and the Board Examinations marks put together, subject to the condition that he/she secures at least a minimum of 40 marks out of 100 marks in the Board Theory Examinations and a minimum of 50 marks out of 100 marks in the Board Practical Examinations.

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2023 onwards (Joined first year in 2020 -2021) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

Second Class:

All other successful candidates will be declared to have passed in Second Class.

The above classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2023 /April 2024 onwards (both joined First Year in 2020 -2021)

15. Duration of a period in the Class Time Table:

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

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ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1010 : DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N- SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

THIRD SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010310	Mechanics of Solids	6	-	-	6
4010320	Construction Materials and Construction Practice	5	-	-	5
4010330	Surveying	6	-	-	6
4010340	Building Planning and Drawing	-	4	-	4
4010350	Civil Engineering Drawing and CAD Practical – I	-	-	4	4
4010360	Material Testing Laboratory– I	-	-	3	3
4010370	Surveying Practice –I	-	-	4	4
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**17**	**4**	**11**	**35**

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1010 : DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

FOURTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010410	Theory of Structures	6	-	-	6
4010420	Hydraulics	6	-	-	6
4010430	Transportation Engineering	5	-	-	5
4010440	Hydraulics Laboratory	-	-	4	4
4010450	Material Testing Laboratory–II	-	-	3	3
4010460	Construction Practice Laboratory	-	-	4	4
4010470	Surveying Practice –II	-	-	4	4
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**17**	**-**	**15**	**35**

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1010 : DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

FIFTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010510	Structural Engineering	6	-	-	6
4010520	Environmental Engineering	5	-	-	5
	Elective Theory–I	5	-	-	5
4010531	Remote Sensing and Geoinformatics				
4010532	Concrete Technology				
4010533	Geotechnical Engineering				
4010540	Civil Engineering Drawing and CAD Practical – II	-	3	3	6
4010550	Environmental Engineering Laboratory	-	-	3	3
	Elective Practical –I	-	-	3	3
4010561	Advanced Surveying and Basic GIS Practical				
4010562	Concrete Technology Practical				
4010563	Geotechnical Engineering Laboratory				
4010570	Entrepreneurship and Startups	-	-	4	4
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**16**	**3**	**13**	**35**

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1010 : DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

SIXTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010610	Construction Management	6	-	-	6
4010620	Estimation, Costing and Valuation	6	-	-	6
	Elective Theory–II	5	-	-	5
4010631	Sustainable and Green Building Technology				
4010632	Urban Planning and Development				
4010633	Water Resources Engineering				
4010640	Computer Applications in Civil Engineering Practice	-	-	5	5
	Elective Practical – II	-	-	4	4
4010651	Estimation and Costing Laboratory				
4010652	Highway Engineering Laboratory				
4010653	Water Resources Engineering Laboratory				
4010660	Project Work and Internship	-	-	6	6
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**17**	-	**15**	**35**

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010:DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

THIRD SEMESTER (PART TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010310	Mechanics of Solids	6	-	-	6
4010320	Construction Materials and Construction Practice	4	-	-	4
4010340	Building Planning and Drawing	-	3	-	3
40001	Communication Skill Practical	-	-	2	2
40015	Engineering Graphics - I	-	3	-	3
	TOTAL	**10**	**6**	**2**	**18**

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

FOURTH SEMESTER (PART TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010330	Surveying	4	-	-	4
4010430	Transportation Engineering	4	-	-	4
4010360	Material Testing Laboratory-I	-	-	2	2
4010370	Surveying Practice-I	-	-	2	2
40002	Computer Application Practical	-	-	3	3
40025	Engineering Graphics - II	-	3	-	3
	TOTAL	**8**	**3**	**7**	**18**

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

FIFTH SEMESTER (PART TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010420	Hydraulics	5	-	-	5
4010520	Environmental Engineering	4	-	-	4
4010350	Civil Engineering Drawing and CAD Practical-I	-	-	3	3
4010440	Hydraulics Laboratory	-	-	3	3
4010470	Surveying Practice-II	-	-	3	3
	TOTAL	**9**	**-**	**9**	**18**

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

SIXTH SEMESTER (PART TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010410	Theory of Structures	5	-	-	5
4010620	Estimation, Costing and Valuation	4	-	-	4
4010540	Civil Engineering Drawing and CAD Practical – II	-	2	2	4
4010550	Environmental Engineering Laboratory	-	-	3	3
4010450	Material Testing Laboratory–II	-	-	2	2
	TOTAL	**9**	**2**	**7**	**18**

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

SEVENTH SEMESTER (PART TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010510	Structural Engineering	6	-	-	6
	Elective Theory – I	4	-	-	4
4010531	Remote Sensing and Geoinformatics				
4010532	Concrete Technology				
4010533	Geotechnical Engineering				
4010460	Construction Practice Laboratory	-	-	3	3
	Elective Practical – I	-	-	3	3
4010561	Advanced Surveying and Basic GIS Practical				
4010562	Concrete Technology Practical				
4010563	Geotechnical Engineering Laboratory				
4010570	Entrepreneurship and Startups	-	-	2	2
	TOTAL	**10**	**-**	**8**	**18**

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

EIGHTH SEMESTER (PART TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010610	Construction Management	5	-	-	5
	Elective Theory–II				
4010631	Sustainable and Green Building Technology				
4010632	Urban Planning and Development	4	-	-	4
4010633	Water Resources Engineering				
4010640	Computer Applications in Civil Engineering Practice	-	-	3	3
	Elective Practical –II				
4010651	Estimation and Costing Laboratory				
4010652	Highway Engineering Laboratory	-	-	3	3
4010653	Water Resources Engineering Laboratory				
4010660	Project Work and Internship	-	-	3	3
	Total	**9**	-	**9**	**18**

ANNEXURE – I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

CURRICULUM OUTLINE

THIRD SEMESTER (SANDWICH)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010310	Mechanics of Solids	5	-	-	5
4010320	Construction Materials and Construction Practice	4	-	-	4
4010330	Surveying	5	-	-	5
4010430	Transportation Engineering	4	-	-	4
4010340	Building Planning and Drawing	-	3	-	3
4010350	Civil Engineering Drawing and CAD Practical – I	-	-	4	4
4010360	Material Testing Laboratory– I	-	-	3	3
4010370	Surveying Practice –I	-	-	4	4
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**18**	**3**	**11**	**35**

ANNEXURE – I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

CURRICULUM OUTLINE

FOURTH SEMESTER (SANDWICH)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010410	Theory of Structures	5	-	-	5
4010450	Material Testing Laboratory–II	-	-	2	2
4010491	Industrial Training-I	-	-	-	-

ANNEXURE – I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

CURRICULUM OUTLINE

FIFTH SEMESTER (SANDWICH)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010510	Structural Engineering	5	-	-	5
4010520	Environmental Engineering	4	-	-	4
	Elective Theory–I				
4010531	Remote Sensing and Geoinformatics				
4010532	Concrete Technology				
4010533	Geotechnical Engineering	4	-	-	4
4010540	Civil Engineering Drawing and CAD Practical – II	-	3	3	6
4010550	Environmental Engineering Laboratory	-	-	3	3
4010460	Construction Practice Laboratory	-	-	3	3
	Elective Practical –I				
4010561	Advanced Surveying and Basic GIS Practical				
4010562	Concrete Technology Practical	-	-	3	3
4010563	Geotechnical Engineering Laboratory				
4010570	Entrepreneurship and Startups	-	-	4	4
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**13**	**3**	**16**	**35**

ANNEXURE – I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

CURRICULUM OUTLINE

SIXTH SEMESTER (SANDWICH)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010610	Construction Management	5	-	-	5
4010620	Estimation, Costing and Valuation	6	-	-	6
	Elective Theory–II	5	-	-	5
4010631	Sustainable and Green Building Technology				
4010632	Urban Planning and Development				
4010633	Water Resources Engineering				
4010420	Hydraulics	5	-	-	5
4010440	Hydraulics Laboratory	-	-	3	3
4010470	Surveying Practice-II	-	-	4	4
	Elective Practical –II	-	-	4	4
4010651	Estimation and Costing Laboratory				
4010652	Highway Engineering Laboratory				
4010653	Water Resources Engineering Laboratory				
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**21**	-	**11**	**35**

ANNEXURE – I

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STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

CURRICULUM OUTLINE

SEVENTH SEMESTER (SANDWICH)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010640	Computer Applications in Civil Engineering Practice	-	-	2	2
4010660	Project Work and Internship	-	-	5	5
4010492	Industrial Training-II	-	-	-	-

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1010 : DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF EXAMINATION

THIRD SEMESTER (FULL TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Examination Marks (Converted to 75)	Total Marks		
4010310	Mechanics of Solids	25	100	100	40	3
4010320	Construction Materials and Construction Practice	25	100	100	40	3
4010330	Surveying	25	100	100	40	3
4010340	Building Planning and Drawing	25	100	100	40	3
4010350	Civil Engineering Drawing and CAD Practical – I	25	100	100	50	3
4010360	Material Testing Laboratory– I	25	100	100	50	3
4010370	Surveying Practice –I	25	100	100	50	3
TOTAL			**700**	**700**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF EXAMINATION

FOURTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Examination Marks (Converted to 75)	Total Mark		
4010410	Theory of Structures	25	100	100	40	3
4010420	Hydraulics	25	100	100	40	3
4010430	Transportation Engineering	25	100	100	40	3
4010440	Hydraulics Laboratory	25	100	100	50	3
4010450	Material Testing Laboratory–II	25	100	100	50	3
4010460	Construction Practice Laboratory	25	100	100	50	3
4010470	Surveying Practice –II	25	100	100	50	3
TOTAL			**700**	**700**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1010 : DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF EXAMINATION

FIFTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Examination Marks (Converted to 75)	Total Mark		
4010510	Structural Engineering	25	100	100	40	3
4010520	Environmental Engineering	25	100	100	40	3
	Elective Theory – I					
4010531	Remote Sensing and Geoinformatics	25	100	100	40	3
4010532	Concrete Technology					
4010533	Geotechnical Engineering					
4010540	Civil Engineering Drawing and CAD Practical – II	25	100	100	50	3
4010550	Environmental Engineering Laboratory	25	100	100	50	3
	Elective Practical–I					
4010561	Advanced Surveying and Basic GIS Practical	25	100	100	50	3
4010562	Concrete Technology Practical					
4010563	Geotechnical Engineering Laboratory					
4010570	Entrepreneurship and Startups	25	100	100	50	3
TOTAL			**700**	**700**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1010 : DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF EXAMINATION

SIXTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Examination Marks (Converted to 75)	Total Mark		
4010610	Construction Management	25	100	100	40	3
4010620	Estimation, Costing and Valuation	25	100	100	40	3
	Elective Theory – II					
4010631	Sustainable and Green Building Technology					
4010632	Urban Planning and Development	25	100	100	40	3
4010633	Water Resources Engineering					
4010640	Computer Applications in Civil Engineering Practice	25	100	100	50	3
	Elective Practical – II					
4010651	Estimation and Costing Laboratory					
4010652	Highway Engineering Laboratory	25	100	100	50	3
4010653	Water Resources Engineering Laboratory					
4010660	Project Work and Internship	25	100	100	50	3
TOTAL			**600**	**600**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF THE EXAMINATION

THIRD SEMESTER (PART TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam. Marks (Converted to 75)	Total Mark		
4010310	Mechanics of Solids	25	100	100	40	3
4010320	Construction Materials and Construction Practice	25	100	100	40	3
4010340	Building Planning and Drawing	25	100	100	40	3
40001	Communication Skill Practical	25	100	100	50	3
40015	Engineering Graphics- I	25	100	100	40	3
TOTAL			**500**	**500**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF THE EXAMINATION

FOURTH SEMESTER (PART TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam Marks (Converted to 75)	Total Mark		
4010330	Surveying	25	100	100	40	3
4010430	Transportation Engineering	25	100	100	40	3
4010360	Material Testing Laboratory-I	25	100	100	50	3
4010370	Surveying Practice-I	25	100	100	50	3
40002	Computer Application Practical	25	100	100	50	3
40025	Engineering Graphics-II	25	100	100	40	3
TOTAL			**600**	**600**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF THE EXAMINATION

FIFTH SEMESTER (PART TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam Marks (Converted to 75)	Total Mark		
4010420	Hydraulics	25	100	100	40	3
4010520	Environmental Engineering	25	100	100	40	3
4010350	Civil Engineering Drawing and CAD Practical – I	25	100	100	50	3
4010440	Hydraulics Laboratory	25	100	100	50	3
4010470	Surveying Practice-II	25	100	100	50	3
TOTAL			**500**	**500**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF THE EXAMINATION

SIXTH SEMESTER (PART TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam. Marks (Converted to 75)	Total Mark		
4010410	Theory of Structures	25	100	100	40	3
4010620	Estimation, Costing and Valuation	25	100	100	40	3
4010550	Environmental Engineering Laboratory	25	100	100	50	3
4010540	Civil Engineering Drawing and CAD Practical – II	25	100	100	50	3
4010450	Material Testing Laboratory–II	25	100	100	50	3
TOTAL			**500**	**500**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF THE EXAMINATION

SEVENTH SEMESTER (PART TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam Marks (Converted to 75)	Total Mark		
4010510	Structural Engineering	25	100	100	40	3
	Elective Theory II					
4010531	Remote Sensing and Geoinformatics					
4010532	Concrete Technology	25	100	100	40	3
4010533	Geotechnical Engineering					
4010460	Construction Practice Laboratory	25	100	100	50	3
	Elective Practical –I					
4010561	Advanced Surveying and Basic GIS Practical					
4010562	Concrete Technology Practical	25	100	100	50	3
4010563	Geotechnical Engineering Laboratory					
4010570	Entrepreneurship and Startups	25	100	100	50	3
Total			**500**	**500**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

3010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF THE EXAMINATION

EIGHTH SEMESTER (PART TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam Marks (Converted to 75)	Total Mark		
4010610	Construction Management	25	100	100	40	3
	Elective Theory-II	25	100	100	40	3
4010631	Sustainable and Green Building Technology					
4010632	Urban Planning and Development					
4010633	Water Resources Engineering					
4010640	Computer Applications in Civil Engineering Practice	25	100	100	50	3
	Elective Practical-II	25	100	100	50	3
4010651	Estimation and Costing Laboratory					
4010652	Highway Engineering Laboratory					
4010653	Water Resources Engineering Laboratory					
4010660	Project Work and Internship	25	100	100	50	3
TOTAL			**500**	**500**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

SCHEME OF THE EXAMINATION

THIRD SEMESTER (SANDWICH)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam. Marks (Converted to 75)	Total Mark		
4010310	Mechanics of Solids	25	100	100	40	3
4010320	Construction Materials and Construction Practice	25	100	100	40	3
4010330	Surveying	25	100	100	40	3
4010430	Transportation Engineering	25	100	100	40	3
4010340	Building Planning and Drawing	25	100	100	40	3
4010350	Civil Engineering Drawing and CAD Practical – I	25	100	100	50	3
4010360	Material Testing Laboratory– I	25	100	100	50	3
4010370	Surveying Practice –I	25	100	100	50	3
TOTAL			**800**	**800**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

SCHEME OF THE EXAMINATION

FOURTH SEMESTER (SANDWICH)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam Marks (Converted to 75)	Total Mark		
4010410	Theory of Structures	25	100	100	40	3
4010450	Material Testing Laboratory–II	25	100	100	50	3
4010491	Industrial Training- I	25	100	100	50	3
TOTAL			**300**	**300**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

SCHEME OF EXAMINATION

FIFTH SEMESTER (SANDWICH)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam. Marks (Converted to 75)	Total Mark		
4010510	Structural Engineering	25	100	100	40	3
4010520	Environmental Engineering	25	100	100	40	3
	Elective Theory I	25	100	100	40	3
4010531	Remote Sensing and Geoinformatics					
4010532	Concrete Technology					
4010533	Geotechnical Engineering					
4010540	Civil Engineering Drawing and CAD Practical – II	25	100	100	50	3
4010550	Environmental Engineering Laboratory	25	100	100	50	3
4010460	Construction Practice Laboratory	25	100	100	50	3
	Elective Practical-I	25	100	100	50	3
4010561	Advanced Surveying and Basic GIS Practical					
4010562	Concrete Technology Practical					
4010563	Geotechnical Engineering Laboratory					
4010570	Entrepreneurship and Startups	25	100	100	50	3
TOTAL			**800**	**800**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

SCHEME OF EXAMINATION

SIXTH SEMESTER (SANDWICH)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam Marks (Converted to 75)	Total Mark		
4010610	Construction Management	25	100	100	40	3
4010620	Estimation, Costing and Valuation	25	100	100	40	3
	Elective Theory II	25	100	100	40	3
4010631	Sustainable and Green Building Technology					
4010632	Urban Planning and Development					
4010633	Water Resources Engineering					
4010420	Hydraulics	25	100	100	40	3
4010440	Hydraulics Laboratory	25	100	100	50	3
4010470	Surveying Practice-II	25	100	100	50	3
	Elective Practical - II	25	100	100	50	3
4010651	Estimation and Costing Laboratory					
4010652	Highway Engineering Laboratory					
4010653	Water Resources Engineering Laboratory					
TOTAL			**700**	**700**		

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

2010: DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

SEVENTH SEMESTER (SANDWICH)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam Marks (Converted to 75)	Total Mark		
4010640	Computer Applications in Civil Engineering Practice	25	100	100	50	3
4010660	Project Work and Internship	25	100	100	50	3
4010492	Industrial Training-II	25	100	100	50	3
TOTAL			**300**	**300**		

List of Equivalent subjects for M-Scheme and N-Scheme

Sem	M Scheme		N Scheme (Implementing academic year 2020 - 21)	
	Sub Code	Subject Name	Sub Code	Subject Name
III w.e.f. Oct 2021	31031	Engineering Mechanics	4010310	Mechanics of Solids
	31032	Construction Materials and Construction Practice	4010320	Construction Materials and Construction Practice
	31033	Surveying I	4010330	Surveying
	31034	Civil Engineering Drawing I	4010340	Building Planning and Drawing
	31035	Material Testing Lab I	4010360	Material Testing Laboratory– I
	31036	Surveying Practice I	4010370	Surveying Practice –I
	30001	Computer Application Practical**	40002	Computer Application Practical
IV w.e.f Apr 2022	31041	Theory of Structures	4010410	Theory of Structures
	31042	Transportation Engineering	4010430	Transportation Engineering
	31043	Surveying II	4010330	Surveying
	31044	Estimating and Costing I	4010620	Estimation, Costing and Valuation
	31045	Material Testing Lab II	4010450	Material Testing Laboratory–II
	31046	Surveying Practice II	4010470	Surveying Practice –II
	31047	CAD in Civil Engineering Drawing I	4010350	Civil Engineering Drawing and CAD Practical – I

List of Equivalent subjects for M-Scheme and N-Scheme

Sem	M-Scheme		N-Scheme (Implementing academic year 2020 - 21)	
	Sub Code	**Subject Name**	**Sub Code**	**Subject Name**
V **w.e.f Oct 2022**	31051	Structural Engineering	4010510	Structural Engineering
	31052	Environmental Engineering and Pollution Control	4010520	Environmental Engineering
	Elective Theory – I		**Elective Theory - I**	
	31071	Advanced Construction Technology	4010532	Concrete Technology
	31072	Remote Sensing and GIS	4010531	Remote Sensing and Geo Informatics
	31073	Soil Mechanics and Foundation Engineering	4010533	Geotechnical Engineering
	31074	Water Resources Management	4010633	Water Resources Engineering
	31054	Civil Engineering Drawing II	4010540	Civil Engineering Drawing and CAD Practical – II
	31055	Construction Practice Lab	4010460	Construction Practice Laboratory
	31056	CAD In Civil Engineering Drawing II	4010540	Civil Engineering Drawing and CAD Practical – II
	30002	Life and Employability Skills Practical	40001	Communication Skill Practical

List of Equivalent subjects for M-Scheme and N-Scheme

Sem	M-Scheme		N-Scheme (Implementing academic year 2020 - 21)	
	Sub Code	**Subject Name**	**Sub Code**	**Subject Name**
VI **w.e.f Apr 2023**	31061	Construction Management with MIS	4010610	Construction Management
	31062	Hydraulics	4010420	Hydraulics
		Elective Theory- II	**Elective Theory–II**	
	31081	Steel Structures	--	No equivalent
	31082	Town Planning	4010632	Urban Planning and Development
	31083	Earthquake Engineering	--	No equivalent
	31084	Building Services	--	No equivalent
	31064	Estimating and Costing II	4010620	Estimation, Costing and Valuation
	31065	Hydraulics Lab	4010440	Hydraulics Laboratory
	31066	Computer Applications In Civil Engineering Practice	4010640	Computer Applications in Civil Engineering Practice
	31067	Project Work	--	No equivalent

III SEMESTER

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

III SEMESTER

MECHANICS OF SOLIDS

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMIL NADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010310

Semester : III Semester

Subject Title : **MECHANICS OF SOLIDS**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MECHANICS OF SOLIDS	**6 Hrs**	**96 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	Simple Stresses and Strains	20
II	Shear Force and Bending Moment	17
III	Geometrical Properties of Sections	18
IV	Stresses in Beams and Shafts	17
V	Pin Jointed Frames	17
	Test & Model Exam	7
TOTAL		**96**

RATIONALE:

Being the basic engineering subject, this imparts basic knowledge and skill regarding properties of materials, concept of stresses and strains, bending moment and shear force diagrams, second moment of area, bending and shear stresses, slope and deflection and analysis of trusses. The above knowledge will be useful for designing simple structural components. This subject is very important to develop basic concepts and principles related to structural mechanics. This subject is much essential for the students to continue their further education.

OBJECTIVES:

On completion of the course, the student will be able to:

- Analyse the mechanical properties of engineering materials, elastic constants, relationship between elastic constants, different types of stresses and strains, the deformation of elastic bodies under simple stresses, the use and principles of composite sections;
- Analyse the structural behaviour of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beams and loading Conditions, application of stress and strain in engineering field. Articulate practical applications of moment of inertia of symmetrical and unsymmetrical structural sections.
- Determine the different types of stresses induced in beams and shafts due to bending and twisting moments respectively
- Analyse perfect frames for vertical loads by analytical as well as graphical methods.

DETAILED SYLLABUS
4010310 - MECHANICS OF SOLIDS

Contents: Theory

Unit	Name of the Topics	Hours
I	**SIMPLE STRESSES AND STRAINS** **1.1 INTRODUCTION TO STRESSES AND STRAINS** Definitions of: Force, Moment of force, Actions and reactions, Statics, Static equilibrium of bodies, Mechanics, Engineering Mechanics - Conditions of static equilibrium - Types of forces on structural members - Study of strength of material - Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability - Definitions of stress and strain - Types of stresses - Tensile, Compressive and Shear stresses - Types of strains - Tensile, Compressive and Shear strains - Elongation and Contraction - Longitudinal and Lateral strains - Poisson's Ratio - Volumetric strain - Simple problems in computation of stress, strain, Poisson's ratio, change in dimensions and volume etc- Hooke's law - Elastic Constants - Definitions of: Young's Modulus of Elasticity – Shear modulus (or) Modulus of Rigidity - Bulk Modulus - Relationship between elastic constants **(Derivations not necessary)-** Simple problems . **1.2 APPLICATION OF STRESS AND STRAIN IN ENGINEERING FIELD** Behaviour of ductile and brittle materials under direct loads - Load Extension curve (or) Stress Strain curve of a ductile material - Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Actual / Nominal stresses - Working stress - Factor of safety - Percentage elongation - Percentage reduction in area - Significance of percentage elongation and reduction in area of cross section - Deformation of prismatic and stepped bars due to uniaxial load - Deformation of prismatic bars due to its self weight - Numerical problems. Composite Sections – Examples of composite sections in Engineering field- Advantages - Assumptions made – Principles of analysis of Composite sections - Modular ratio - Equivalent area (No problems).	**10** **10**

Unit	Name of the Topics	Hours
II	**SHEAR FORCE AND BENDING MOMENT** **2.1 TYPES OF LOADS AND BEAMS** Definitions of: Axial load, Transverse load, Concentrated (or) Point load, Uniformly Distributed load (UDL), Varying load – Types of Supports and Reactions: Simple support, Roller support, Hinged support, Fixed support; Vertical reaction, Horizontal reaction, Moment reaction- Types of Beams based on support conditions- Diagrammatic representation of beams, loads and supports– Static equilibrium equations – Determinate and indeterminate beams. **2.2 SHEAR FORCE AND BENDING MOMENT IN BEAMS** Definitions of Shear Force and Bending Moment – Conventional signs used for S.F. and B.M – S.F and B.M of general cases of determinate beams – S.F and B.M diagrams for Cantilevers, Simply supported beams– Position of maximum BM - Derivation of Relation between intensity of load , S.F and B.M. – Numerical problems on S.F and B.M. (Determinate beams with concentrated loads udl and couple).	**8** **9**
III	**GEOMETRICAL PROPERTIES OF SECTIONS** **3.1 CENTROID** Geometrical properties – Definitions and examples of Symmetrical, Anti Symmetrical, Asymmetrical shapes - Definitions of centre of gravity and centroid - Centroid of Symmetrical shapes (solid / hollow square, rectangular, circular, I Sections) - Centroid of Asymmetrical shapes (triangular, semi circular, quadrant, trapezoidal, parabolic sections) - Centroid of Anti Symmetric shapes (S, Z sections) – Built up structural sections – Problems.	**8**

Unit	Name of the Topics	Hours
III	**3.2 MOMENT OF INERTIA** Definitions of: Inertia, Moment of Inertia, Polar moment of inertia, Radius of gyration, Section Modulus, Polar modulus - Parallel and perpendicular axes theorems - Derivation of expressions for M.I / Polar M I, Section modulus and Radius of gyration of regular geometrical plane sections (rectangle and circle only) – M.I about centroidal axis / base, Section modulus, Radius of gyration of symmetric, asymmetric, anti symmetric and built up symmetrical sections – Numerical problems.	**10**
IV	**STRESSES IN BEAMS AND SHAFTS** **4.1 STRESSES IN BEAMS DUE TO BENDING** Types of Bending stresses – Neutral axis – Theory of simple bending – Assumptions – Moment of resistance – Derivation of flexure/bending equation $M / I = E / R = \sigma / y$ – Bending stress distribution – Curvature of beam – Position of N.A and centroidal axis – Stiffness equation – Flexural rigidity – Strength equation – Significance of Section modulus – Numerical problems. **4.2 STRESS IN SHAFTS DUE TO TORSION** Definitions of: Shaft, Couple, Torque (or) Twisting moment - Types of Shafts (one end fixed and the other rotating, both ends rotating at different speeds) - Theory of Pure Torsion – Assumptions -Derivation of Torsion equation, $T / Ip = \sigma_{max} / R = G\Theta / l$ - Shear stress distribution in circular section due to torsion - Strength and Stiffness of shafts – Torsional rigidity - Torsional modulus - Power transmitted by a shaft - Numerical problems.	**8** **9**

Unit	Name of the Topics	Hours
V	**PIN JOINTED FRAMES** **5.1 ANALYSIS BY ANALYTICAL METHOD (METHOD OF JOINTS)** Definitions of: Frame / Truss, Pin Joint, Nodes, Rafters, Ties, Struts, Slings - Determinate and indeterminate frames - Classification of frames - Perfect and imperfect frames – Deficient / Instable and redundant frames - Formulation of a perfect frame - Common types of trusses - Support conditions - Resolution of a force - Designation of a force - Nature of forces in the frame members - Analysis of Symmetrical Frames – Assumptions - Methods of analysis - Analytical methods - Method of Joints and Method of Sections - Problems on Analysis of cantilever and simply supported perfect frames (with not more than ten members) with vertical nodal loads by method of joints only. Identification of members with nil force in a determinate truss. **5.2 ANALYSIS BY GRAPHICAL METHOD** Graphic statics - Advantages - Space diagram - Bow's notation- Resultant force (or) Equivalent force -Equilibrant force - Vector diagram - Determination of magnitude and nature of forces in the members of a cantilever / simply supported determinate trusses (with not more than eight members) with vertical nodal loads only.	**10** **7**
	Test & Model Exam	**7 Hrs.**

Reference Books

1. R.S.Khurmi "Strength of Materials", S.Chand & Company Ltd, New Delhi
2. S.Ramamirtham, "Strength of Materials", Dhanpat Rai (2003)
3. Vazirani & Ratwani, "Analysis of Structures-Vol 1", Khanna Publishers(2003)
4. S.B.Junnarkar, "Mechanics of Structures- Vol 1", Charotar Publishing House
5. Sanchayan Mukherjee, "Elements of Engineering Mechanics", PHI Learning Pvt. Ltd.
6. R K Bansal, "Engineering Mechanics", Laxmi Publications Pvt.Ltd.

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N - SCHEME

III SEMESTER

CONSTRUCTION MATERIALS AND CONSTRUCTION PRACTICE

IMPLEMENTED FROM 2020- 2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI-600 025, TAMIL NADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020-2021 onwards)

Course Name : 1010 : DIPLOMA CIVIL ENGINEERING

Subject Code : 4010320

Semester : III Semester

Subject Title : **CONSTRUCTION MATERIALS AND CONSTRUCTION PRACTICE**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CONSTRUCTION MATERIALS AND CONSTRUCTION PRACTICE	5 Hrs.	80 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	Building Materials	15
II	Building Materials (Contd.)	15
III	Foundations And Masonries	15
IV	Doors,Floors,Roofs, etc.,	14
V	Pointing, Plastering, Painting, Form Work, etc.,	14
	Test & Model Exam	7
	TOTAL	**80**

RATIONALE:

Civil Engineering diploma holders have to supervise construction of various types of civil works involving, the use of various materials like stones, bricks and tiles, cement and cement based products, lime, timber and wood based products, paints and varnishes, metals and other miscellaneous materials. The students should have requisite knowledge regarding the characteristics, uses and availability of various building materials and skills in conducting tests to determine the suitability of materials for various construction purposes. In addition, specifications of various materials should also be known (PWD/BIS) for effective quality control.

To perform the above tasks, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, stair cases, floors etc., and their constructional details. Therefore, the subject of Construction Materials and Construction Practice is very important for Civil Engineering diploma holders.

OBJECTIVES:

On completion of the course, the students will be able to:

- State different construction materials and their properties.
- Explain the different types of cement, grades of cements and tests on cement.
- State and explain the different types of modern building materials such as ceramic products, glass, metals and plastics.
- Explain the method of preparation of mortar, cement concrete and state the different types of structures.
- Describe the different types of foundations.
- Describe the classification of stone masonry & brick masonry. State the different types of doors, windows, lintels & stairs.
- Describe the types of floors and roofs.
- Describe the different methods of pointing, plastering and termite proofing.
- Explain the methods of scaffolding, shoring & underpinning and form work.
- Describe procedure of colour washing, white washing, painting and varnishing.

DETAILED SYLLABUS

4010320-CONSTRUCTION MATERIALS AND CONSTRUCTION PRACTICE

Contents: Theory

Unit	Name of the Topics	Hours
I	**1.1 INTRODUCTION** Physical properties of materials - Density, Bulk density, Specific gravity, porosity, water absorption, permeability, chemical resistance, fire resistance, weathering resistance, thermal conductivity, Durability. (Definitions only). **1.2 ROCKS AND STONES** Rocks - Classification of Rocks - Geological, Physical and Chemical classification - Uses of stones - Requirements of a good building stone - Natural and Artificial stones for flooring - Examples (Detailed description not required). **1.3 BRICKS** Definition - Brick earth - Composition of good brick earth - Manufacturing process - classification of bricks - properties of bricks - special types of bricks and their uses - compressive strength of bricks - Tests on bricks(Names only) - grades and corresponding requirements of bricks as per BIS. **1.4 LIME AND POZZOLANAS** Sources of lime - classification of lime - Fat, Hydraulic and Poor lime - uses of lime - Pozzolanic materials - Surki, Flyash, Ground blast furnace slag, Rice husk ash - Advantages of adding pozzolanas to cement.	**2** **2** **2** **2**

Unit	Name of the Topics	Hours
I	**1.5 CEMENT** Definition - Composition of ordinary Portland cement - Functions of cement ingredients - Different types of cements - Grades of cement (33,43 and 53) - Storage of cement - Tests on cement (Names only) - objects of each test - Test requirements/ BIS specifications of OPC – Admixtures - Definition, types and uses.	**3**
	1.6 WATER General requirement of water used in construction works - Use of sea water in construction works- Permissible limits of deleterious materials in construction water as per BIS- Effects of Sulphates and Chlorides in ground water - Minimum pH value.	**2**
	1.7 GLASS Definition - Constituents of glass - Classification of glass - Functions and Utility - Types of glass, sizes and thickness used in buildings.	**2**
II	**2.1 MORTAR** Definition - Properties and uses of mortar - M sand for mortar - Types of mortar - Cement and Lime mortar - Mix ratio of cement mortars for different works.	**1**
	2.2 CONCRETE Definition - Constituents of concrete and their requirements - uses of concrete - Types of concrete: Lime concrete, cement concrete and light weight concrete, Self compacting concrete and ready mixed concrete - Definitions only.	**2**
	2.3 PAINTS AND VARNISHES Definition - Functions of paint Types of paints and their uses - Oil, Enamel, Emulsion, Distemper, Cement, Aluminium, Bituminous and Plastic paints - Varnishes, Definition Characteristics of a good varnish -Types of varnish and their uses Oil, Turpentine, Spirit and water varnish.	**3**

Unit	Name of the Topics	Hours
II	**2.4 METALS AND PLASTICS** Types of metals used in construction - Cast Iron, Steel, Aluminium, GI, Stainless steel - Market forms of steel Steel for reinforced concrete - steel for pre stressed concrete - Plastics Characteristics and Uses of plastics -Types - Thermoplastics and Thermosetting plastics - Various plastic products: pipes, taps, tubs, basins, doors, windows, water tanks, partitions sizes, capacity and uses - Advantages and disadvantages of plastic products- Asbestos - uses of asbestos. **2.5 TIMBER AND TIMBER PRODUCTS** Types of Timber -Teak, Sal, Rosewood, Mango, and Jack - Defects in timber seasoning of timber- objectives - Timber Products - Veneers, Ply woods, Particle Board, Fibre board, Hard board, Block board, Laminated board Uses. **2.6 ROOF COVERINGS** Definition - objectives and uses - AC Sheets - FRP Sheets - G.I. sheets- Steel sheets- Polycarbonate sheets- Shell roof - R C C roof Advantages - Types**.** **2.7 DAMP PROOFING MATERIALS** Materials used for damp proofing - Properties and functions of various types of water proofing materials - commonly available chemicals used for grouting / Coating porous concrete surfaces - Admixtures for cement mortar and cement concrete - Functions of Admixtures, Accelerators, Retarders, Air repelling chemicals.	**3** **2** **2** **2**

Unit	Name of the Topics	Hours
III	**3.1 INTRODUCTION TO STRUCTURES** Permanent and temporary structures - Life of structures - Sub structure - super structure - load bearing structure - framed structure - concept of framed structure - advantages of framed structure.	2
	3.2 FOUNDATION Definition - objectives of foundation - Bearing capacity of soil – Definition - maximum/ultimate and safe bearing capacity - Bearing capacity of different types of soils - Requirements of a good foundation - Types of foundations - Shallow foundation: Spread foundation, Isolated column footing, combined footing, continuous footing, Raft foundation - Deep foundation: Pile, Stone columns Types of piles : Bearing pile, Friction pile, under reamed pile - Causes of failure of foundation - Remedial measures.	3
	3.3 STONE MASONRY Definition - Common terms used : Natural bed, sill, corbel, course, cornice, coping, weathering, throat, spalls, quoins, string course, lacing course, through stone, plinth, jambs Classification of stone masonry - Rubble masonry : Coursed, un coursed & Random rubble masonry - Ashlar masonry - points to be considered in the construction of stone masonry - Tools used(Names only).	2
	3.4 BRICK MASONRY Definition - Common terms used - Header, stretcher, bed joint, lap, perpend, closer, king, queen & bevelled, bat permissible loads in brick masonry - Bond - Types Header, stretcher, English bond & Flemish bond one brick thick and one and a half brick thick - 'T' junction in English bond - Points to be considered in the construction of brick masonry - Cavity bond masonry - Defects in brick masonry - Maintenance of brick masonry - Reinforced brick masonry - purpose - Its Advantage with respect to strength and Earthquake resistance.	3

Unit	Name of the Topics	Hours
III	**3.5 PARTITION** Definition - Requirements of good partition wall - Types Brick, Concrete, glass, Aluminium frame with Glass sheet, timber, straw board, wood wool, Asbestos Cement board and plastic board partitions.	**2**
	3.6 WATER PROOFING AND DAMP PROOFING Dampness - Causes of dampness - Effects of dampness - Damp proofing - Damp proof courses (DPC) - Method of mixing - Bad effects of excessive Admixtures in RCC - Water proofing coats for sump / overhead tank wall - Methods of grouting.	**3**
IV	**4.1 DOORS, WINDOWS AND VENTILATORS** Standard sizes of doors and windows - Location of doors and windows - Different materials used - Doors Component parts Types - Framed and panelled, glazed, flush, louvered, collapsible, rolling shutter and sliding doors - Windows Types - Casement, Glazed, Bay, Corner, Pivoted, Circular and Dormer windows- Ventilators – Definition, purpose,Types - Ventilator combined with windows / doors.	**3**
	4.2 HOLLOW BLOCK CONSTRUCTIONS Hollow blocks - Advantages of hollow blocks - load bearing and non load bearing hollow blocks - Open cavity blocks - face shells, web, gross area, nominal dimensions of blocks, minimum thickness of face shells and web, grades of hollow concrete blocks - Materials used, admixtures added - mixing, moulding, placing and compacting, curing, drying.	**2**
	4.3 STAIRS Definition - Terms used - Location of stair types - Straight, Dog legged, Open well, bifurcated and spiral stairs - Moving stairs (Escalators) - Lift components uses and advantage of lifts over stairs.	**2**

	4.4 FLOORS AND FLOORING Floors - Definition - Types - Timber, Composite, RCC floors Flooring - Definition- Materials used - Selection of flooring types - Construction Methods (As per C.P.W.D/P.W.D Specifications) - Mosaic, Granolithic, Tiled, Granite, Marble, Pre cast concrete flooring, Plastic & PVC tile flooring- Carpet tile & Rubber flooring. **4.5 ROOFS** Definition - Types of roof - Flat roof - RCC roof - Pitched roof - Tile roof - Shell roof - Technical terms - Steel roof truss Types: King post, Raised chord, Howe truss, Fan, fink, north light and Modified north light trusses. **4.6 WEATHERING COURSE** Weathering course – Purpose - Materials Required - Brick Jelly Concrete preparation - Laying procedure- Preparation of mortar with Damp Proof materials for laying pressed clay tiles- Pointing and finishing of clay tiles - Use of Thermal Resistant - Weathering Tiles.	**3** **2** **2**
V	**5.1 POINTING** Objectives - Mortar for pointing - Methods of pointing (As per C.P.W.D. / P.W.D Specifications) - Types of pointing - Flush, recessed, weathered, keyed or grooved pointing. **5.2 PLASTERING** Definitions - Objectives - Cement mortars for Plastering - Requirements of a good plaster - Methods of Plastering - Defects in plastering - Stucco plastering - Acoustic plastering - Granites silicon – plastering – Sand faced Pebble dash - Wall paper finishing - Wall tiling.	**2** **3**

V	**5.3 WHITE WASHING, COLOUR WASHING , DISTEMPERING, PAINTING & VARNISHING** White washing - preparation of surface - Application of white wash - Colour washing - Distempering - Preparation of surfaces - Application of distemper- Painting & Varnishing - Preparation of Surface - Application of Painting & Varnishing. **5.4 ANTI-TERMITE TREATMENT** Definition - objectives and uses - Methods of termite treatment. **5.5 SCAFFOLDING, SHORING AND UNDER PINNING** Scaffolding – Definition - Component parts - Types Single, double & Steel scaffolding, Shoring – Definition - Types Raking, flying and dead shores - Underpinning definition - Purpose - Types - Pit Methods - Pile Method. **5.6 FORM WORK** Definition - Materials used - Requirements of a good form work - Form work for column, RC beams and RC slab.	**3** **1** **3** **2**
	Test & Model Exam	**7 Hrs.**

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

III SEMESTER

SURVEYING

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI-600 025, TAMIL NADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the student admitted from the year 2020-2021 onwards)

Course Name **:** 1010 **:** DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010330

Semester **:** III Semester

Subject Title **: SURVEYING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
SURVEYING	**6 Hrs.**	**96 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Unit	Topics	Hours
I	Introduction to Surveying and Chain Surveying and campass surveying	22
II	Levelling	17
III	Theodolite Surveying	17
IV	Tacheometric Surveying & Contour Surveying	17
V	Total Station and Global Positioning system	16
	Test & Model Exam	7
	TOTAL	**96**

RATIONALE:

The important functions of a diploma civil engineer include the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works. While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like chain surveying, compass surveying and levelling that the Civil Engineering diploma holder will normally be called upon to perform. Each type of Survey like Chain surveying, Compass surveying, Levelling, Theodolite surveying, Tacheometric surveying, Contour surveying, Total station surveying and GPS introduced in this course.

OBJECTIVES:

On completion of the course, the students will posses knowledge about:

- Chain surveying
- Compass surveying
- Theodolite surveying
- Tacheometric Surveying
- Preparation of Contour layouts
- Total Station Surveying
- Global Positioning System

DETAILED SYLLABUS

4010330 - SURVEYING

Contents: Theory

Unit	Name of the Topics	Hours
I	**INTRODUCTION TO SURVEYING AND CHAIN SURVEYING AND CAMPASS SURVEYING** **1.1 SURVEYING** Definition - Objectives and uses of surveying -Classification of Surveying - Principles of surveying. **1.2 CHAIN SURVEYING** Introduction - Instruments used for chaining- Chains and Tapes – Types - Definitions of terms commonly used in chain surveying: Survey stations, base line, check line and tie line - Ranging: Direct and Indirect ranging Offsets: Definition, types, Instruments used - Errors in Chaining, Tape corrections and its necessity. **1.3 COMPASS SURVEYING** Angular measurements-Necessity Instruments used Prismatic compass - Construction details, functions and Temporary adjustment - Types of meridians - Types of bearings - Whole circle and Reduced bearings, Fore and Back bearings- Computation of included angles from bearings - Computation of bearings from included angles - Problems.	**2** **10** **10**
II	**2.1 LEVELLING** Levelling - Definition - Level Parts, Functions, Accessories- Types of levels **:** Dumpy level, Quick setting level, Automatic and Laser level Levelling staff **-** Types Component parts of Levelling instrument - Definitions of terms used **:** Level surface, Horizontal and Vertical surfaces, Datum, Bench marks, Reduced level, Rise, Fall, Line of collimation, Axis of telescope, Axis of bubble tube, Station, Back sight, Fore sight,	**17**

	Intermediate sight, Change point, Height of instrument, Focusing and Parallax - Temporary adjustment of a level - Balancing - Back sight and Foresight- Principle of levelling - Simple levelling -Levelling field book - Reduction of levels - Height of collimation and Rise and Fall method - Comparison of methods - Problems on reduction of levels - Missing entry calculations **:** Problems.	
III	**3.1 THEODOLITE SURVEYING** Introduction - Types of Theodolites: Transit and non- transit Theodolite, Vernier and Micrometer Theodolites, Electronic Theodolite (Principles and description only) - Component parts of a transit Theodolite - Functions - Technical terms used in Theodolite surveying - Temporary adjustments- Measurement of horizontal angle by method of repetition and reiteration- Measurement of vertical angle and deflection angle - Reading bearing of a line- Theodolite traversing - Methods - Field checks in closed traverse - Latitude and departure - Consecutive coordinates - independent coordinates - Problems on computation of area of closed traverse - Omitted measurements - Problems	**17**
IV	**4.1 TACHEOMETRIC SURVEYING** Introduction-Instruments used in tacheometry - Systems of tacheometry: Stadia and Tangential tacheometry - Principles - Fixed hair method of tacheometry - Distance and Elevation formulae - Anallactic lens (No proof) - Advantages and uses - Direct reading tacheometers - Determination of constants of a tacheometer - Problems. **4.2 CONTOUR SURVEYING** Definition - Contour - Contouring - Characteristics of contours - Methods of contouring - Direct and Indirect methods - Tacheometric contouring - Interpolation of contours - Different methods - Contour gradient - Uses of contour plan and map.	**9** **8**

V	**TOTAL STATION AND GLOBAL POSITIONING SYSTEM** **5.1 Total Station** Introduction - Application of total station - Component parts of a Total Station - Accessories used - Summary of total station characteristics - Features of total station - Electronic display and data reading - Field procedure for co-ordinate measurement - Instrument preparation, Setting and Measurement (Distance, Angle, Bearing, Curve etc.). **5.2 GLOBAL POSITIONING SYSTEM (GPS)** Introduction - Maps - Types of Maps - Various Satellites used by GPS - Differential GPS - Fundamentals of GPS - Application of GPS - GPS Receivers - Hand held GPS Receiver - Function Field procedure - Observation and processing applications in Civil Engineering.	**8** **8**
	Test & Model Exam	**7 Hrs.**

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

III SEMESTER

BUILDING PLANNING AND DRAWING

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI-600 025, TAMIL NADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name	**:**	1010 **:** DIPLOMA IN CIVIL ENGINEERING
Subject Code	**:**	4010340
Semester	**:**	III Semester
Subject Title	**:**	**BUILDING PLANNING AND DRAWING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
BUILDING PLANNING AND DRAWING	**4 Hrs.**	**64 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	Introduction	5
II	Planning of Building	5
III	Basic Drawings	9
IV	Building Drawings	38
	Test & Model Exam	7
	TOTAL	**64**

RATIONALE:

Drawing is the language of engineers. Engineering is absolutely incomplete without a thorough knowledge of drawing. A Civil Engineering diploma holder must be capable of sketching detailed constructional drawing of various components of building for the purpose of communication with the craftsman. Planning of small buildings, developing a line plan, dimensioning, key plan, and drainage plan should be a part of curriculum. The diploma engineer must be conversant with reading and interpretation of drawing for execution of work.

OBJECTIVES:

On completion of the course, the students will be able to:

- Study Conventions and Abbreviations;
- Prepare layout of buildings;
- Gain thorough knowledge of the rules, regulations and standards of buildings;
- Read the line sketch and prepare plan, elevations of buildings and gain thorough knowledge of planning various types of buildings**.**

DETAILED SYLLABUS

4010340-BUILDING PLANNING AND DRAWING

Contents: Theory

Unit	Name of the Topics	Hours
I	**INTRODUCTION** **1.1 CONVENTIONS, SYMBOLS :** General – Conventions- Title block- Scales- Line work- Lettering - Symbols - Abbreviations **1.2 BUILDING BYE-LAWS AND SUBMISSION OF DRAWINGS** Objects of bye-laws- Importance of bye-laws- Function of local authority- Set backs- Plot Coverage- Number of floors- Height of building- Built up Area- Floor space index (FSI) - Views and details necessary for the preparation of a civil engineering drawing- Site Plan – Necessity for Approval of plans from local body- Layout plan and key plan- Requirements for submission of drawing for approval- Rules and bye-laws of sanctioning authorities for construction work.	5
II	**PLANNING OF BUILDINGS** **2.1 PLANNING OF RESIDENTIAL BUILDINGS** Types of residential buildings- Usual requirements-Types of Rooms – Minimum Size requirement for each type of rooms - Furniture arrangement in each room- Position of stairs / lifts- Position of Doors/ Windows House drainage and Sanitary fittings – Sump/Water tanks- Plumbing Pipes -Preparation of line drawing for given requirements with dimensions, not to scale. **2.2 PLANNING OF INDUSTRIAL STRUCTURES** Planning aspects - Requirements of industrial units - Sheets for pitched roof coverings – Rolling Shutters - Ramps- Stores- Public Toilets/ Bath rooms- Dining / Resting halls- Ventilation and Lighting - Preparation of line drawing for given requirement with measurements (not to scale).	5

	2.3 PLANNING OF PUBLIC BUILDINGS Types of public buildings - Miscellaneous public buildings - General requirements of Public Buildings -Landscape architecture - Preparation of line plan with dimensions for the given requirements (not to scale).	
III	**BASIC DRAWINGS** Standard symbols used in Civil Engineering Drawing. Draw the elevation of : 1. Fully panelled double leaf door. 2. Fully Panelled single leaf door 3. Flush door 4. Fully Panelled window with grill 5. Partly glazed and partly panelled window 6. Lean- to – roof 7. King post roof truss 8. Steel roof truss 9. Rain water Harvesting– Recharging into the ground a. Shallow well system b. Percolation pit system.	**9**
IV	**BUILDING DRAWINGS** Preparation of plan, section and elevation of buildings with specifications for the given line drawing to suitable Scale: 1. A Reading room with R.C.C flat roof 2. A House with single bed room and attached bathroom with R.C.C. flat roof. 3. A residential building with two bed rooms with R.C.C. flat roof 4. A Two roomed house with RCC slope roof with gable ends 5. A Small workshop with north light steel roof truss (6 to 10m Span) over R.C.C. Columns. 6. A Primary health center for rural area with R.C.C roof. 7. A Village Library building with R.C.C flat roof 8. A small Restaurant building with R.C.C flat roof 9. A Single storied School building with R.C.C flat roof 10. A Bank building with R.C.C flat roof.	**38**
	Test & Model Exam	**7 Hrs.**

Reference Books

1. National Building code of India 2016
2. Tamil Nadu District Municipal building rules and by-laws
3. Civil Engineering Drawing and house planning – by B.P.Verma
4. Elements building drawings and design – by R.S.Deshpande and N.K.Karandikar
5. Design of Houses – by J.S.Yadav
6. A Guide to Civil Engg. Drawing – by V.R.Thothathri Dr
7. Building Planning and Drawing by N. Kumaraswamy and A. Kameswara Rao.
8. Civil Engineering Drawing by S.C.Rangwala
9. Building Planning and Construction Companion", G. Vaidhyanathan, I. Kulasekaran, G. Sathish Kumar"

Scheme of Examination

PART A From unit I and II (2 x 4, Unit III – 1 x 12)	20 marks
PART B From IV	80 marks
TOTAL	**100 Marks ***

Note: *Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N - SCHEME

III SEMESTER

CIVIL ENGINEERING DRAWING AND CAD PRACTICAL- I

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : **1**010 **:** DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010350

Semester : III Semester

Subject Title : **CIVIL ENGINEERING DRAWING AND CAD PRACTICAL - I**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CIVIL ENGINEERING DRAWING AND CAD PRACTICAL - I	4 Hrs.	64 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

Computers play a very vital role in present day life, more so, in all the professional life of engineering. In order to enable the students, use the computers effectively in drafting, this course offers Computer Aided Drafting of various drawings in civil engineering.

OBJECTIVES:

On completion of the course, the students will be able to:

- Know about CAD commands
- Understand building components
- Draw building drawing using CAD software
- Prepare approval drawing for submission to authority

DETAILED SYLLABUS

4010350 - Civil Engineering Drawing and CAD Practical - I

Contents:Practical Total: 64 Hours

LIST OF EXPERIMENTS

Preparation of drawing using CAD Software

Introduction of CAD software for Preparation of Drawings 6 Hours

1. Definition of various commands used in CAD software.
2. Simple Exercises for familiarizing the drawing commands in CAD software.

PART A 14 Hours

Draw the given drawings in Computer and take print out of all drawings in A4 sheet using Inkjet / laser printer or plotter and produced in file forms as record.

3. Section of semicircular Arch
4. Elevation of door, partly panelled and partly glazed
5. Preparation of Plan showing arrangement of furniture / fixtures and other features with standard sizes for the followings (Each roomto be drawn separately - features and furniture may be pasted from the Blocks available in the packages)
   (i) Living (ii) Bed Room (iii) Kitchen (iv) Toilet
6. Steel Structures: Cross section of I, Channel, T, Angle and Tubular section, Compound Beams.
7. Section of Load bearing wall from parapet to foundation showing all the details across the section. (Single storey)

PART B 44 Hours

Draw the building drawing using available CAD software

8. Plan, Section and Elevation of a single bed roomed building (R.C.C. Roof)
9. Plan, Section and Elevation of a Double bed roomed building (R.C.C. Roof)
10. Plan, Section and Elevation of a Primary School Building
11. Plan, Section and Elevation of a Hospital Building
12. Plan, Section and Elevation of a Workshop with steel columns, Steel roof truss and Metal sheet Roofing of about 300 m^2 area.

13. Preparation of approval drawing to be submitted to Corporation or Municipality showing required details in one sheet such as

a) Site Plan (Land boundary, Building boundary, Car Parking, Passage, sanitary layout, septic tank location etc.

b) G.F. Plan, F.F. Plan, Section and Elevation (line diagram is enough)

c) Key Plan

d) Septic tank Plan and section (line diagram)

e) Rain water harvesting pit (with all detail)

f) Typical foundation details (Column foundation or spread footing)

g) Title block showing – joinery details, Specification, Area statement, colour Index, Title of the property, space for owners Signature and Licensed Surveyor's Signature with address.

IN BOARD EXAMINATION, QUESTIONS WILL BE CHOSEN AS FOLLOWS

PART – A	45 marks
PART – B	50 marks
Viva – voce	5 marks
TOTAL	**100 marks**

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of the equipments	Quantity Required
1.	Computers	30 Nos.
2.	Laser printer	3 Nos.
3.	CAD software	30 Users

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N - SCHEME

III SEMESTER

MATERIAL TESTING LABORATORY- I

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020-2021 onwards)

Course Name : 1010**:** DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010360

Semester : III Semester

Subject Title : **MATERIAL TESTING LABORATORY-I**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MATERIAL TESTING LABORATORY- I	3 Hrs.	48 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

The understanding of the structural, physical and mechanical properties and behaviour of engineering materials is at the very core of engineering design. A command of this knowledge is essential for all civil engineers. This laboratory provides a hands-on experience with the testing and evaluation of civil engineering materials, including steel, wood, Cements, Aluminium, Brass and Brick.

OBJECTIVES:

On completion of the course, the students will be able to:

- Study of UTM, Torsion testing machine, Hardness tester, Compression testing machine.
- Determine the Material Properties- test conducted on steel, wood, cement, Aluminium, Brass and Brick.

DETAILED SYLLABUS

4010360 - MATERIAL TESTING LABORATORY - I

Contents: Practical **Total: 48 Hrs.**

Unit	Name of the Topics	Hours
PART A	1. Tension test on mild steel **/** deformed steel bars. 2. Deflection test on Simply Supported Beams of a. wood and b. steel to find Young's modulus 3. Torsion test on mild steel bar to determine the Modulus of Rigidity. 4. Double shear test on M.S. bar. 5. Impact Test on mild steel by performing Izod / Charpytests. 6. Find Brinnel's hardness numbers of the following materials. a. Mild steel b. Brass c. Aluminium. 7. Find Rockwell's hardness numbers of the following materials. a. Mild steel b. Brass c. Aluminium.	**25 Hrs.**
PART B	8. Compression Test on Wooden cube. 9. Compression test on Bricks. 10. Compression test on Solid Blocks 11. Water absorption test on Bricks /pressed tiles. 12. Flexure test on Tiles. 13. Casting of Cement Mortar cubes after determining the normal consistency of cement.. 14. Determining the compressive strength of Cement Mortor cubes.	**23 Hrs.**

4010360 - MATERIAL TESTING LABORATORY - I

DETAILLED ALLOCATION OF MARKS

S.No	Description	Part - A Max. Marks (50)	Part - B Max. Marks (45)
1.	Procedure	5	5
2.	Tabulation and Observation	20	20
3.	Calculations	15	10
4.	Sketch / Graph	5	5
5.	Accuracy of result	5	5
6.	Viva	5	

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of the Equipments	Quantity
1.	UTM	1 no.
2.	Rock well-cum-Brinell Hardness testing machine	1 no.
3.	Torsion testing machine	1 no.
4.	Impact testing machine for Izod and Charpy test	1 no.
5.	Deflection test verification of Maxwell theorem with magnetic stand, deflection gauge, weights and sets of beam (floor type)	1 no.
6.	Weighing balance-digital 10 kg capacity one gram accuracy with battery backup 8 hours/direct electrical connection	1 no.
7.	Compression testing machine 100 tons capacity (electrical operated)	1 no.
8.	Flexural Testing Machine for Tiles	1 no.
9.	Spring testing Apparatus	1 no.
10.	Double shear test apparatus	1 no.
11.	Vicat's Appratus	1 no.

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N - SCHEME

III SEMESTER

SURVEYING PRACTICE- I

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

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DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010**:** DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010370

Semester : III Semester

Subject Title : **SURVEYING PRACTICE - I**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
SURVEYING PRACTICE-I	4 Hrs.	64 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

The important functions of a diploma civil engineer include the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works. Field work should be a selected one so that the student can check his work and have an idea of the results and the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting

OBJECTIVES:

On completion of the course, the students will be able to:

- Handle surveying equipments
- Do practical exercises in Chain surveying, Compass surveying, Levelling and GPS.

DETAILED SYLLABUS

4010370 - SURVEYING PRACTICE-I

Contents : Practical **Total:64 Hrs.**

Unit	Name of the Topics	Hours
PART A	**1. CHAIN AND COMPASS SURVEYING** Study of chain, tape and accessories used for chain survey. Study of Prismatic compass, setting up over a station and observe bearings of lines. Running closed traverse and finding the included angles Use Chain / Tape and Compass. Minimum 5 points. Determination of distance between two points when their base is accessible. Use Chain / Tape and Compass. Determination of distance between two points when their base is inaccessible. Use Chain / Tape and Compass.	**8**
	2. GLOBAL POSITIONING SYSTEM (GPS) Reading of various Maps like Taluk map, District Map and Topo sheets. Study of Hand held GPS. Measurement of Latitude, Longitude and Altitude using hand held GPS. Selection and marking of routings (Way points) using hand held GPS.	**8**
PART B	**3. LEVELLING** Study of a Level - Temporary adjustment, taking readings and booking in a field book. Fly leveling Reduction by Height of Collimation method - Minimum 6 points with two change points (Minimum Two exercises) Fly leveling Reduction by Rise and Fall method - Minimum 6 points with two change points (Minimum Two exercises). Fly levelling covering minimum 6 points with 2 inverted readings (Minimum Two exercises). Check levelling and reduction of levels (Minimum Two exercises)	**48**

4010370 - SURVEYING PRACTICE-I

In Board Examination, questions will be chosen as follows:

PART A By Lot i. Compass Survey - 35 Marks

ii. GPS - 15 Marks

PART B Levelling (Compulsory) - 45 Marks

Viva-Voce - 5 Marks

TOTAL - **100 Marks**

DETAILED ALLOCATION OF MARKS

S.No	Description	Part - A		Part - B
		Max.Marks (35)	Max.Marks (15)	Max. Marks (45)
1.	Procedure, Handling Instruments / Tools	5	3	5
2.	Field works, Observation and Tabulation	15	10	20
3.	Calculations and Check / drawings.	10	0	15
4.	Accuracy of result	5	2	5
5.	Viva-Voce	5		

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of the Equipments	Quantity Required
1.	Chain with (arrows)	6 nos.
2.	Prismatic compass	6 nos.
3.	Dumpy level	10 nos.
4.	Levelling staff	10 nos.
5.	Cross staff	6 nos.
6.	Ranging rod	2 nos.
7.	Hand held GPS	6 nos.

IV SEMESTER

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

IV SEMESTER

THEORY OF STRUCTURES

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the student admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010410

Semester : IV Semester

Subject Title : **THEORY OF STRUCTURES**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
THEORY OF STRUCTURES	6 Hrs.	96 Hrs.	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Slope and Deflection of beams, Propped Cantilever	18
II	Fixed Beams Continuous Beams – Theorem of Three moments method	18
III	Continuous Beams – Moment Distribution method portal frames - moment distribution method	18
IV	Columns and Struts Combined bending and direct stresses	18
V	Masonry Dams Earth pressure and Retaining walls	17
	Test & Model Exam	7
	TOTAL	**96**

RATIONALE:

Study of structural behaviour, analysis and design is a principal part of civil engineering courses and is essential for professional accreditation. This subject enhances the structural analytical ability of the students.

OBJECTIVES:

On completion of the course, the students will be able to:

- Determine the of Slope and Deflection of Determinate beams by area moment method.
- Analyse of Propped cantilevers and Fixed beams by Area-Moment method and draw SFD, BMD.
- Analyse of Continuous beams by Theorem of Three moments and draw SFD, BMD.
- Analyse of Continuous beams, Portal frames and Substitute frames by Moment Distribution Method and draw SFD, BMD.
- Define the different types of Columns and finding critical loads of Columns.
- Analyse of Columns and Chimneys subject to eccentric loading / moment / horizontal loads and find maximum and minimum combined stresses in their sections.
- Calculate the maximum and minimum bearing pressures and check the stability of Masonry Dams
- Calculate the maximum and minimum bearing pressures and check the stability of Retaining walls.

DETAILED SYLLABUS

4010410 THEORY OF STRUCTURES

Contents: Theory

Unit	Name of the Topics	Hours
I	**1.1 SLOPE AND DEFLECTION OF BEAMS** Deflected shapes / Elastic curves of beams with different support conditions –Definition of Slope and Deflection- Flexural rigidity and Stiffness of beams- Mohr's Theorems – Area Moment method for slope and deflection of beams – Derivation of expressions for maximum slope and maximum deflection of standard cases by area moment method for cantilever and simply supported beams subjected to symmetrical UDL & point loads – Numerical problems on determination of slopes and deflections at salient points of Cantilevers and Simply supported beams from first principles and by using formulae. **1.2 PROPPED CANTILEVERS** Statically determinate and indeterminate Structures- Stable and Unstable Structures- Examples- Degree of Indeterminacy- Concept of Analysis of Indeterminate beams - Definition of Prop–Types of Props- Prop reaction from deflection consideration – Drawing SF and BM diagrams by area moment method for UDL throughout the span, central and non-central concentrated loads – Propped cantilever with overhang – Point of Contra flexure.	**10** **8**
II	**2.1 FIXED BEAMS – AREA MOMENT METHOD** Introduction to fixed beam - Advantages –Degree of indeterminacy of fixed beam- Sagging and Hogging bending moments – Determination of fixing end(support) moments(FEM) by Area Moment method – Derivation of Expressions for Standard cases – Fixed beams subjected to symmetrical and unsymmetrical concentrated loads and UDL – Drawing SF and BM diagrams for Fixed beams with supports at the same level (sinking of supports or supports at different levels are not included) – Points of Contra flexure –Problems- Determination of Slope and Deflection of fixed beams subjected to only symmetrical loads by area moment method – Problems.	**9**

II	**2.2 CONTINUOUS BEAMS – THEOREM OF THREE MOMENTS METHOD** Introduction to continuous beams – Degree of indeterminacy of continuous beams with respect to number of spans and types of supports –Simple/Partially fixed / Fixed supports of beams- General methods of analysis of Indeterminate structures – Clapeyron's theorem of three moments – Application of Clapeyron's theorem of three moments for the following cases – Two span beams with both ends simply supported or fixed – Two span beams with one end fixed and the other end simply supported – Two span beams with one end simply supported or fixed and other end overhanging –Determination of Reactions at Supports- Application of Three moment equations to Three span Continuous Beams and Propped cantilevers –Problems- Sketching of SFD and BMD for all the above cases.	**9**
III	**3.1 CONTINUOUS BEAMS – MOMENT DISTRIBUTION METHOD** Introduction to Carry over factor, Stiffness factor and Distribution factor –Stiffness Ratio or Relative Stiffness- Concept of distribution of un balanced moments at joints - Sign conventions – Application of M-D method to Continuous beams of two / three spans and to Propped cantilever (Maximum of three cycles of distribution sufficient) –Finding Support Reactions- Problems - Sketching SFD and BMD for two / three span beams. **3.2 PORTAL FRAMES – MOMENT DISTRIBUTION METHOD** Definition of Frames – Types – Bays and Story - Sketches of Single/Multi Story Frames, Single/Multi Bay Frames- Portal Frame – Sway and Non- sway Frames- Analysis of Non sway (Symmetrical) Portal Frames for Joint moments by Moment Distribution Method and drawing BMD only– Deflected shapes of Portal frames under different loading / support conditions.	**10** **8**

Unit	Name of the Topics	Hours
IV	**4.1 COLUMNS AND STRUTS** Columns and Struts – Definition – Short and Long columns – End conditions – Equivalent length / Effective length– Slenderness ratio – Axially loaded short column - Axially loaded long column – Euler's theory of long columns – Derivation of expression for Critical load of Columns with hinged ends – Expressions for other standard cases of end conditions (separate derivations not required) – Problems – Derivation of Rankine's formula for Crippling load of Columns– Factor of Safety- Safe load on Columns- Simple problems. **4.2 COMBINED BENDING AND DIRECT STRESSES** Direct and Indirect stresses – Combination of stresses – Eccentric loads on Columns – Effects of Eccentric loads / Moments on Short columns – Combined direct and bending stresses – Maximum and Minimum stresses in Sections– Problems – Conditions for no tension – Limit of eccentricity – Middle third rule – Core or Kern for square, rectangular and circular sections – Chimneys subjected to uniform wind pressure –Combined stresses in Chimneys due to Self weight and Wind load- Chimneys of Hollow square and Hollow circular cross sections only – Problem.	**9** **9**
V	**5.1 MASONRY DAMS** Gravity Dams – Derivation of Expression for maximum and minimum stresses at Base – Stress distribution diagrams – Problems – Factors affecting Stability of masonry dams – Factor of safety- Problems on Stability of Dams– Minimum base width and maximum height of dam for no tension at base – Elementary profile of a dam – Minimum base width of elementary profile for no tension - Middle third rule. **5.2 EARTH PRESSURE AND RETAINING WALLS** Definition – Angle of repose /Angle of Internal friction of soil– State of equilibrium of soil – Active and Passive earth pressures – Rankine's theory of earth pressure – Assumptions – Lateral earth pressure with level back fill / level surcharge (Angular Surcharge not required)– Earth pressure due to Submerged soils – (Soil retained on vertical back	**8** **9**

	of wall only) – Maximum and minimum stresses at base of Trapezoidal Gravity walls – Stress distribution diagrams – Problems – Stability of earth retaining walls – Problems to check the stability of walls-Minimum base width for no tension.	
	Test & Model exam	**7 Hrs.**

Reference Books :

1. S. Ramamrutham, “Theory of structures”, Dhanpat Rai Publications, New Delhi
2. B.C. Punmia, Ashok Jain & Arun Jain,” Theory of structures “,Laxmi Publications, 9th Edition, April1992.
3. S.B. Junnarkar, Mechanics of structures (Vol.II) Charator Publishing House Anand, Gujarat.
4. V.N. Vazirani & M.M. Ratwani, “Analysis of structures”, Khanna Publishers, New Delhi.
5. R.L. Jindal , “Elementary Theory of Structures”, S.Chand Pvt., Co. Ltd.New Delhi.
6. Madhan Mohan Dass, “ Structural Analysis” PHI Learning Pvt. Ltd., New Delhi.

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

IV SEMESTER

HYDRAULICS

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name	**:**	1010**:** DIPLOMA IN CIVIL ENGINEERING
Subject Code	**:**	4010420
Semester	**:**	IV Semester
Subject Title	**:**	**HYDRAULICS**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
HYDRAULICS	**6 Hrs.**	**96 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	Introduction of measurement of Pressure Hydrostatic Pressure on Surfaces	20
II	Flow of fluids, Flow through Orifices and Mouthpieces, Flow through Pipes	20
III	Flow through Notches and Flow through weirs	16
IV	Flow through Open channels	15
V	Pumps	18
	Test & Model Exam	7
	Total	**96**

RATIONALE:

Subject of hydraulics is a science subject and helps in solving problems in the field of Aeronautical, Electronics, Electrical, Mechanical, Metallurgical Engineering subject. The subject deals with basic concepts and principles in hydrostatics, hydro- kinematics and hydrodynamics and their application in solving fluid flow problems.

OBJECTIVES:

On completion of the course, the students will be able to:

- Define the properties of fluids and their physical quantities.
- List the different types of pressures and various pressure measuring devices.
- Calculate hydrostatic forces on plane surfaces immersed in water.
- Understand types of forces, energy and application of Bernoulli's theorem.
- Know the different types of Orifices and Mouthpieces and to derive discharge formulae and their practical applications.
- State the different losses of head of flowing liquids in pipes and their equations.
- Know the different types of Notches and Weirs, and deriving the discharge formulas and their Practical applications.
- Study the different types of Channels and their discharge formulas and to determine the condition for maximum discharge.
- Learn the construction details, specifications and efficiencies of Reciprocating Pumps and Centrifugal Pumps.

DETAILED SYLLABUS

4010420 - HYDRAULICS

Contents: Theory

Unit	Name of the Topics	Hours
I	**1.1 INTRODUCTION** Hydraulics – Definition - Properties of fluids - Mass, force, weight, specific volume, specific gravity, specific weight, density, relative density, compressibility, viscosity, cohesion, adhesion, capillarity and surface tension - Dimensions and Units for area, volume, specific volume, velocity, acceleration, density, discharge, force, pressure and power. **1.2 MEASUREMENT OF PRESSURE** Pressure of liquid at a point – Intensity of pressure - Pressure head of liquid – Conversion from intensity of pressure to pressure head and vice-versa - Formula and Simple problems - Types of pressures - Static pressure, Atmospheric pressure, Gauge pressure, Vacuum pressure and Absolute pressure – Simple problems - Measurement of pressure - Simple mercury barometer - Pressure measuring devices- Piezometer tube - Simple U-tube manometer - Differential manometer – Micrometer - Problems. **1.3 HYDROSTATIC PRESSURE ON SURFACES** Pressure on plane surfaces - Horizontal, vertical and inclined surfaces- Total pressure-Centre of pressure - Depth of centre of pressure - Resultant pressure – Problems on Practical application - Sluice gates, Lock gates and Dams- Descriptions.	**6** **9** **5**
II	**2.1 FLOW OF FLUIDS** Types of flow – Laminar and turbulent flow - Steady and unsteady flow – Uniform and Non-uniform flow - Equation for continuity of flow (law of conservation of mass) – Energy possessed by a fluid body - Potential energy and Potential Head – Pressure energy and Pressure Head - Kinetic Energy and Kinetic Head - Total Energy and Total Head – Bernoulli's theorem – (No proof) – Problems on Practical applications of Bernoulli's theorem – Venturimeter - Orificemeter (Derivation not necessary) - Simple problems.	**8**

	2.2 FLOW THROUGH ORIFICES AND MOUTHPIECES Definitions- Types of orifices - Vena contracta and its significance – Hydraulic coefficients Cd, Cv and Cc - Formula - Simple problems - Large orifice – Definition – Discharge formula – Simple problems - Practical applications of orifices – Types of mouthpieces - External and internal mouthpieces - Discharge formula - Simple problems. **2.3 FLOW THROUGH PIPES** Definition of pipe-Losses of head in pipes – Major losses - Minor losses - Sudden enlargement, sudden contraction, obstruction in pipes (no proof) - Simple problems – Energy / Head losses of flowing fluid due to friction - Darcy's equation - Chezy's equation (No derivation) – Problems - Transmission of power through pipes – Efficiency - Pipes in parallel connected to reservoir - Discharge formula - Simple problems.	**6** **6**
III	**3.1 FLOW THROUGH NOTCHES** Definitions- Types of notches – Rectangular, Triangular and Trapezoidal notches – Derivation of equations for discharges - Simple problems - Comparison of V-Notch and Rectangular Notch. **3.2 FLOW THROUGH WEIRS** Definitions - Classification of weirs - Discharge over a rectangular weir and trapezoidal weir – Derivation – Simple problems – End contractions of a weir – Franci's and Bazin's formula – Simple problems - Cippoletti weir – Problems - Narrow crested weir – Sharp crested weir with free over fall - Broad crested weir - Drowned or Submerged weirs - Suppressed weir - Stepped weir – Problems - Definition of terms - Crest of sill, Nappe or Vein, Free discharge - Velocity of approach – Spillways.	**6** **10**
IV	**4.1 FLOW THROUGH OPEN CHANNELS** Definition - Classification - Rectangular and Trapezoidal channels – Discharge – Chezy's formula, Bazin's formula and Manning's formula - Hydraulic mean depth – Problems - Conditions of rectangular/trapezoidal sections - Specific energy, critical depth –Conditions of maximum discharge and maximum velocity - Problems - Flow in a venturiflume –	**15**

	Uniform flow in channels – Flow through a sluice gate – Types of channels – Typical cross- sections of irrigation canals - Methods of measurements of velocities – Channel losses - Lining of canals – Advantages of lining of canals - Types of lining- Cement concrete lining with sketches - Soil cement lining with sketches – LDPE lining.	
V	**5.1 PUMPS** Pumps – Definition – Difference between a pump and a turbine- Classification of pumps - Positive displacement pumps and roto-dynamic pressure pumps - Characteristics of modern pumps - Maximum recommended suction, lift and power consumed- Reciprocating pump - Construction detail and working principle - Types - Single acting and Double acting -Slip -Air vessels- Discharge and Efficiency- Problems - Centrifugal pump Advantages and disadvantages over a reciprocating pump - Layout - Construction details – Priming of centrifugal pump – Working of the pump – Classification – Functions of Foot valve, Delivery valve and Non-return valve – Fundamental equation of centrifugal pump - Characteristics of a centrifugal pump – Discharge, power and efficiency - Problems - Specifications of centrifugal pumps and their sections- Hand pump - Jet pump- Deep well pump - Plunger pumps - Piping system- Computation of power required for pumps, Other types of pumps (not for exam)- Selection and choice of pump.	**18**
	Test & Model Exam	**7 Hrs.**

Reference Books

1. Dr. Jagadish Lal - Hydraulics, Fluid Mechanics and Hydraulic Machines- Metropolitan Book Company- New Delhi
2. P.N. Modi & S.M. Sethi - Fluid Mechanics - Standard Publishers – New Delhi
3. S. Ramamirtham-Hydraulics,Fluid Mechanics and Hydraulics Machines- Dhanpat Rai & Sons, New Delhi
4. K.L.Kumar - Fluid Mechanics – Eurasa Publshing House – New Delhi
5. R.K. Bansal - Fluid Mechanics - Lakshmi Publications
6. Prof. S. Nagarathinam - Fluid Mechanics - Khanna Publishers – New Delhi
7. K.R. Arora - Hydraulics, Fluid Mechanics and Hydraulics Machines –Standard Publishers & Distributors, New Delhi
8. B C S Rao, “Fluid Mechanics and Machinery” Tata-McGraw-Hill Pvt. Ltd., New Delhi

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

IV SEMESTER

TRANSPORTATION ENGINEERING

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020-2021 onwards)

Course Name	**:**	1010**:** DIPLOMA IN CIVIL ENGINEERING
Subject Code	**:**	4010430
Semester	**:**	IV Semester
Subject Title	**:**	**TRANSPORTATION ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
TRANSPORTATION ENGINEERING	**5 Hrs.**	**80 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

*Examination will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Highway Engineering	15
II	Highway Engineering (Contd.)	15
III	Railway Engineering	15
IV	Railway Engineering (Contd.)	14
V	Bridge Engineering	14
	Test & Model Exam	7
	TOTAL	**80**

RATIONALE:

Construction of roads is one of the areas in which diploma holders in Civil Engineering get employment. These diploma holders are responsible for construction and maintenance of highways. Basic concepts of road geo-metrics, surveys and plans, elements of traffic engineering, road materials, construction of rigid and flexible pavements, special features of hill roads, road drainage system and various aspects of maintenance find place in above course.

In addition, this subject will cater the needs of those technicians who would like to find employment in the construction of railway tracks, bridges. The subject aims at providing broad based knowledge regarding various components and construction of railway track, bridges.

OBJECTIVES:

On completion of the course, the students will be able to:

- Study the importance of the roads, development of roads and classification of roads.
- Know about highway pavements, Geometrical design, Traffic controls, Road Arboriculture and Highway Lighting
- Study the highway alignment, road machineries and construction of different types of Roads
- Study the Railway fixtures, Types of stations, Signalling and Control of movement of trains
- Study the Maintenance of Track and Rapid Transport System of Railways
- Know about Bridges, Classifications and its Components

DETAILED SYLLABUS

4010430 - TRANSPORTATION ENGINEERING

Contents: Theory

Unit	Name of the Topic	Hours
I	**HIGHWAY ENGINEERING**	
	1.1 INTRODUCTION	**3**
	General – Development of Roads in India - Modes of transportation - Nagpur Plan - Ribbon development - Advantages of Roads - Importance of roads in India - Requirements of an ideal road - Indian Road Congress - Objects of Highway planning - Classifications of Highways.	
	1.2 HIGHWAY PAVEMENTS	**2**
	Objectives - Types of Pavement - Flexible and Rigid Pavements - Comparative study of Flexible and Rigid pavements - Factors affecting the design of pavements - Other types of pavements (Description not reqd.)	
	1.3 GEOMETRICAL DESIGN OF HIGHWAYS	**3**
	General - Road structure - Right of way - Land width - Width of formation - Road Camber - Super elevation - Sight distances - Road gradient - Road Curves - Horizontal curves - Vertical curves - Types - Widening of pavement on horizontal curves.	
	1.4 TRAFFIC ENGINEERING	**3**
	Objectives - Traffic surveys - Road accidents - Causes of road accidents - Preventive measures - Parking - Methods of parking - Road junctions (Grade intersections and Grade separators) - Traffic signals - Advantages - Types of road signs - Expressways.	

I	**1.5 SUB GRADE SOIL** Significance - Soil mass as a three phase system - Grain size classification - Atterberg limits - Definition and description - I S Classification of soils - Compaction - Definition - Objects of compaction - Standard Proctor Compaction test - Shear strength - Definition - importance - Direct shear test. **1.6 ROAD ARBORICULTURE AND LIGHTING** Objects of Arboriculture - Selection of trees - Location of trees - Highway lighting - Benefits.	**2** **2**
II	**HIGHWAY ENGINEERING (Contd.)** **2.1 HIGHWAY ALIGNMENT AND SURVEYS** Definition - Principles for ideal highway alignment - Factors affecting highway alignment - Surveys - Engineering surveys - Reconnaissance, Preliminary and Location surveys - Project Report and Drawings - Highway Re-alignment projects. **2.2 ROAD MACHINERIES** Excavating equipments - Tractor, Bull dozer, Grader, Scraper, J C B - Compaction equipments - Road roller - Types and description - Equipment for Bituminous road. **2.3 LOW COST ROADS** General - Classifications - Earthen road, Gravel road, Water Bound Macadam roads - Construction with sketches - Advantages and disadvantages - Maintenance - Soil stabilization - Methods. **2.4 BITUMINOUS ROADS** General - Advantages and disadvantages - Bituminous materials used - Types of Bituminous roads - Surface dressing - Types - Bituminous Concrete - Maintenance of Bituminous roads.	 **3** **2** **3** **3**

	2.5 CEMENT CONCRETE ROADS General - Advantages and disadvantages - Methods of construction of cement concrete roads with sketches - Construction procedure for concrete roads.	**2**
	2.6 HILL ROADS Factors considered in alignment - Formation of hill roads - Hair pin bends - Retaining and Breast walls.	**2**
III	**RAILWAY ENGINEERING**	
	3.1 INTRODUCTION Introduction to Railways - Classifications of Indian Railways - Rail Gauges - Types - Uniformity in gauges - Loading gauge - Construction gauge.	**3**
	3.2 RAILS General - Functions of rails - Requirements of an ideal rail - Types of rail sections - Length of rails - Welding of rails - Wear of rails - Coning of wheels - Hogged rails - Bending of rails - Creep of rails - Causes and prevention of creep.	**4**
	3.3 SLEEPERS AND BALLAST Functions of Sleepers - Types of sleepers - Requirements of sleepers - Materials for sleepers - Sleeper density – Ballast- Functions of Ballast - Requirements of ballast - Materials used as ballast.	**4**
	3.4 RAIL FASTENINGS AND PLATE LAYING Rail joints - Types - Rail fastenings - Fish plates - Fish bolts Spikes -Chairs and Keys -Bearing plates - Blocks- Elastic fastenings - Anchors and anti-creepers - Plate laying Methods of plate laying - PQRS method of relaying.	**3**
	3.5 MAINTENANCE OF TRACK Necessity - Maintenance of Track, Bridges and Rolling stock.	**1**

IV	**RAILWAY ENGINEERING (Contd.)**	
	4.1 STATIONS AND YARDS	**3**
	Definition of station - Purpose of railway station - Types of stations - Wayside, Junction and Terminal stations - Platforms - Passenger and Goods platforms - Definition of Yard - Types of yard - Passenger yard, Goods yard, Marshalling yard and Locomotive yards - Level crossings.	
	4.2 STATION EQUIPMENTS	**2**
	General - Engine shed - Ash pits - Examination pits - Drop pits - Water columns - Triangles - Turn table - Traversers - Scotch Block - Buffer stops - Fouling marks - Derailing switch - Sand hump - Weigh bridges.	
	4.3 POINTS AND CROSSINGS	**2**
	Purpose - Some definitions - Turnouts - Right hand and left hand turnouts -Sleepers laid for points and crossings - Types of switches - Crossings - Types of crossings.	
	4.4 SIGNALLING	**3**
	General - Objects of signalling - Types of signalling - Based on function and location - Special signals - Control of movement of trains - Different methods - Following train system - Absolute block system - Automatic signalling - Pilot guard system - Centralized traffic control system.	
	4.5 INTERLOCKING	**2**
	Definition - Principles of interlocking - Methods of interlocking - Tappets and locks system - Key system - Route relay system - - Improvements in interlocking and signalling.	
	4.6 RAPID TRANSPORT SYSTEM	**2**
	General - Underground railways - Advantages - Tube railways - Its features.	

V	**BRIDGE ENGINEERING** **5.1 INTRODUCTION** Bridge: Definition - Components of bridge - IRC loadings - Selection of type of bridge - Scour - Afflux - Economic span - Waterway - Factors governing the ideal site for bridge - Alignment of bridge - Factors to be considered in alignment. **5.2 FOUNDATIONS** Functions of foundation - Types of foundations - Selection of foundations - Control of ground water for foundation - Caisson foundation - Coffer dam – Types. **5.3 CLASSIFICATION OF BRIDGES** Classification according to IRC loadings, Materials, Bridge floor, Type of superstructure - Culverts and Cause ways - Classifications with sketches - Conditions to construct causeways. **5.4 SUBSTRUCTURE** Abutments - Types - Piers - Types - Wing walls - Types. **5.5 SUPERSTRUCTURE** Types - Description - Simple bridge - Types according to bridge floor - Continuous bridge - Cantilever bridge - Balanced cantilever bridge - Arch bridge - Bow-string girder type bridge - Rigid frame bridge - Suspension bridge - Continuous steel bridges - Steel arched bridges. **5.6 BRIDGE BEARINGS** Definition - Purpose - Importance of bearings - Types of bearings – Elastomer bearings - Pot bearings.	**2** **2** **3** **2** **4** **1**
	Test & Model Exam	**7 Hrs.**

Reference Books

1. S.K.Khanna and C.E.G Justo, “Highway Engineering”, Nem Chand and Bros, Roorkee.
2. RANGWALA, “Highway Engineering”, Charotor Publishing House Pvt. Ltd., Edition 2010
3. RANGWALA, “Railway Engineering”, Charotor Publishing House Pvt. Ltd., Edition 2010
4. RANGWALA, “Bridge Engineering”, Charotor Publishing House Pvt. Ltd., Edition 2009
5. S P CHANDOLA, “A Text Book of Transportation Engineering” S Chand & Company Ltd.,
6. G V RAO, “Principles of Transportation & Highway Engineering” Tata McGraw-Hill Publishing Company Ltd.,
7. Madhan Mohan Dass, “Structural Analysis” PHI Learning Pvt. Ltd., New Delhi.

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

IV SEMESTER

HYDRAULICS LABORATORY

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010440

Semester : IV Semester

Subject Title : **HYDRAULICS LABORATORY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
HYDRAULICS LABORATORY	**4 Hrs.**	**64 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

Subject of hydraulics lab is a practical subject which deals with the basic concepts and principles in hydrostatics, hydro-kinematics and hydrodynamics and their applications in solving fluid flow problems.

OBJECTIVES:

On completion of the course, the students will be able to:

- Understand parameters associated with fluid flow and hydrostatic pressure.
- Measure the fluid pressure using manometers
- Determine the co-efficient of discharges of Orifice, mouthpiece, orifice meter, venturimeter, notches etc.,
- Determine pipe friction factor
- Draw the characteristic curves for centrifugal and Reciprocating pumps.

DETAILED SYLLABUS

4010440 - HYDRAULICS LABORATORY

Contents: Practical

List of Experiments

64 Hrs.

Flow of Fluids:

1. Verification of Bernoulli's theorem.
2. Flow through Venturimeter – Determination of Co-efficient of Discharge.
3. Flow through Orificemeter – Determination of Co-efficient of Discharge.

Flow through orifice:

4. Determination of Co-efficient of Discharge by Time fall - Head method
5. Determination of Co-efficient of Discharge by Constant head method.

Flow through external cylindrical mouth piece:

6. Determination of Co-efficient of Discharge by Timing fall in head method
7. Determination of Co-efficient of Discharge by Constant head method

Flow through pipes:

8. Determination of friction factor for the given GI pipe / PVC pipe.

Flow through notch:

9. Determination of Co-efficient of Discharge for Rectangular Notch / V-Notch

Pumps:

10. Reciprocating pump – To draw characteristic curves and determine the efficiency
11. Centrifugal pump – To draw characteristic curves and determine the efficiency
12. Study of working principle of a pelton wheel.

4010440 - Hydraulics Laboratory

DETAILED ALLOCATION OF MARKS

S.No	Description	Marks
1	Procedure	10
2	Tabulation and Observation	35
3	Calculations	30
4	Sketch / Graph	15
5	Accuracy of result	5
6	Viva-Voce	5
	Total	**100**

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of Equipments required	Quantity required
1.	Bernoulli's theorem apparatus (closed circuit)	1 No.
2.	Venturimeter/Orificemeter apparatus (closed circuit) with all accessories	1 No.
3.	Pipe Friction apparatus (closed circuit) with all accessories	1 No.
4.	Orifice/Mouthpiece apparatus (closed circuit) with all accessories	1 No.
5.	Notch apparatus (closed circuit) with accessories	1 No.
6.	Reciprocating Pump test rig with accessories	1 No.
7.	Centrifugal Pump test rig	1 No.
8	Pelton wheel	1 No.

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

IV SEMESTER

MATERIAL TESTING LABORATORY- II

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N -SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name	:	1010: DIPLOMA IN CIVIL ENGINEERING
Subject Code	:	4010450
Semester	:	IV Semester
Subject Title	:	**MATERIAL TESTING LABORATORY- II**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MATERIAL TESTING LABORATORY- II	**3 Hrs**	**48 Hrs**	**25**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

The understanding of the structural, physical and mechanical properties and behaviour of engineering materials is at the very core of engineering design. A command of this knowledge is essential for all civil engineers. This laboratory provides hands-on experience with the testing and evaluation of civil engineering materials, including sand, clay, fine aggregates, course aggregates and water.

OBJECTIVES:

On completion of the course, the students will be able to:

- Test the properties of fine aggregate and coarse aggregate.
- Test the properties of soil.
- Analyse the properties of water/waste water

DETAILED SYLLABUS

4010450 - MATERIAL TESTING LABORATORY- II

Contents: Practical Total : 48 Hrs.

LIST OF EXPERIMENTS

PART A 24 Hours

1. Determination of Voids ratio and porosity of sand.
2. Determination of liquid limit and plastic limit of the given soil.
3. Determination of bulk density and specific gravity of Fine aggregates.
4. Determination of bulk density and specific gravity of Coarse aggregates.
5. Proctor's compaction test on soil.
6. Direct shear test on sand.
7. Field Density of Soil by core cutter method / sand replacement method.

PART B 14 Hours

1. Attrition test on Aggregate.
2. Abrasion test on Aggregate.
3. Aggregate crushing value test.
4. Aggregate impact value test.
5. Determination of Water absorption of coarse aggregate.

PART C 10 Hours

1. Determination of Total solids present in the given sample of water.
2. Determination of Turbidity of water by "Jackson candle turbidity meter."
3. Determination of settleable solids present in the given sample of water/ waste water by "Imhoff cone."
4. Determination of Organic and inorganic matters present in the given sample of water.

4010450 - MATERIAL TESTING LABORATORY- II

SCHEME OF EXAMINATION:

In the examination question has to be given either as a single question from Part A or two questions, one from Part B and another from Part-C.

DETAILED ALLOCATION OF MARKS

S.No	Description	Part - A Max.Marks (95)	Part - B Max.Marks (50)	Part - C Max.Marks (45)
1.	Procedure	10	5	5
2.	Tabulation and Observation	40	25	20
3.	Calculations	30	10	10
4.	Sketch / Graph	10	5	5
5.	Accuracy of result	5	5	5
	TOTAL	95	50	45
	VIVA VOCE	5	5	
	GRAND TOTAL	**100**	**100**	

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of equipments required	Quantity Required
1.	Pycnometer	4 nos.
2.	Liquid limit device with all accessories	2 nos.
3.	Field density of soil apparatus (sand pouring cylinder) with complete set	2 nos.
4.	Proctor compaction mould with all accessories	2 nos.
5.	Direct shear machine with complete accessories	1 no.
6.	Devals attrition testing machine with complete accessories	1 no.
7.	Dorry's abrasion testing machine with complete accessories	1 no.
8.	Aggregate impact testing machine with complete accessories	1 no.
9.	Crushing strength apparatus	1 no.
10.	Jackson Candle Turbidity Meter	1 no.
11.	Imhoff Cone	1 no.

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

IV SEMESTER

CONSTRUCTION PRACTICE LABORATORY

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : ` 4010460

Semester : IV Semester

Subject Title : **CONSTRUCTION PRACTICE LABORATORY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CONSTRUCTION PRACTICE LABORATORY	4 Hrs.	64 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

Diploma holders in Civil Engineering are supposed to supervise construction of buildings. To perform the above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, stair cases, floors etc., and their constructional details. Therefore, the subject of Construction Practice is very important for Civil Engineering diploma holders.

OBJECTIVES:

On completion of the course, the students will be able to:

- Prepare center line plan and foundation plan for a building.
- Set out foundation in the field for spread footing and column footing for a building.
- Determine the Workability of concrete by Compacting factor, slump cone test and Vee - Bee consistometer test.
- Cast Concrete cubes and to test for compressive strength.
- Determine the fineness Modulus of fine and coarse aggregate.
- Perform Shape test on coarse aggregate.
- Determine the bulking characteristics of the given sand.
- Perform Non-Destructive test on hardened concrete

DETAILED SYLLABUS

4010460- CONSTRUCTION PRACTICE LABORATORY

Contents: Practical **Total:64 Hrs.**

List of Experiments

Part A **30 Hrs.**

1. Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10 mm)
2. Identify the available construction materials in the laboratory on the basis of their sources.
3. Identify the grain distribution pattern in given sample of teak wood in the laboratory and draw the various patterns. (along and perpendicular to the grains)
4. Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples.
5. Select first class, second class and third class bricks from the stake of bricks and prepare report on the basis of its properties.
6. Measure dimension of 10 bricks and find average dimension and weight. Perform field tests - dropping, striking and scratching by nail and correlate the results obtained.
7. Apply the relevant termite chemical on given damaged sample of timber.
8. Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of 1m x 1m using suitable brush/ rollers adopting safe practices.
9. Prepare mortar using cement and Sand/ Fly ash or Granite/marble polishing waste in the proportion 1:6 or 1:3.

Part B **34 Hrs.**

10. Prepare and develop a centre line plan, foundation Plan and set out spread footing in the field for the given line sketch of a building.
11. Prepare and develop a centre line plan, foundation Plan and set out the layout of columns and footing in the field for the given line sketch of a building (Framed structure).
12. Arrangement of bricks using English bond for one brick thick wall and one and half brick thick wall for right angled corner junction.
13. Arrangement of bricks using English Bond for one brick thick wall, one and half brick thick wall for Tee junction.
14. Arrangement of bricks using English bond for one brick thick,one and half and two brick thick square pillars.
15. Straightening, cutting, hooking and bending and arrangement of Steel reinforcement bars.

    a. Singly reinforce beam b. Lintel and Sunshade c. Column and footing

SCHEME OF EXAMINATION:

In the examination the students have to be given two experiments one from Part A and another from Part-B.

DETAILED ALLOCATION OF MARKS

S.No	Description	Part – A Max. Marks(35)	Part – B Max.Marks (60)
1.	Procedure	5	5
2.	Tabulation and Observation	20	25
3.	Calculations/Field work		20
4.	Sketch / Graph		5
5.	Accuracy of result/ Report	10	5
	Viva Voce	5	
	Total	**100**	

LIST OF EQUIPMENTS (for a batch of 30 students):

Sl.No.	List of Equipments Required	Quantity Required
1.	Pegs, thread, cranking tools	As required
2.	Consumables like Bricks, aggregate, paints, Fly ash, polish, steel rods	As required

DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

IV SEMESTER

SURVEYING PRACTICE-II

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010470

Semester : IV Semester

Subject Title : **SURVEYING PRACTICE-II**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
SURVEYING PRACTICE-II	4 Hrs.	64 Hrs.	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

The important functions of a civil technician include the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works. While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like Theodolite surveying, Tachometric surveying and surveying using Total station that the Civil Engineering diploma holder will normally be called upon to perform.

OBJECTIVE:

At the end of the course, students will have experiences:

- In handling surveying equipments
- To do practical exercises in Theodolite surveying,
- To do Tachometric surveying
- To do surveying using Total station.

DETAILED SYLLABUS

4010470 - SURVEYING PRACTICE- II

Contents: Practical **Total:64 Hrs.**

LIST OF EXPERIMENTS

PART A: THEODOLITE SURVEYING **20 Hrs.**

1. Study of a Theodolite – Temporary adjustments Reading horizontal angles.
2. Measurement of horizontal angle by:
    i. Reiteration method (not for Exam)
    ii. Repetition method (not for Exam)
3. Determination of distance between two points when their bases are accessible, using Theodolite – Measuring Horizontal angles by repetition method and distances from a Theodolite Station.
4. Determination of distance between two points when their bases are inaccessible, using Theodolite – Measuring Horizontal angles by reiteration method from a baseline.
5. Measurements of vertical angles to different points.
6. Determination of Elevation of an object when the base is accessible.
7. Determination of Elevation of an object when the base is inaccessible by :
    a) Single plane method
    b) Double plane method.
8. Run a closed theodolite traverse for measuring length, included angles and bearing at initial Station and Plot the traverse.

PART B: TACHEOMETRIC SURVEYING **12 Hrs.**

8. Determination of constants of a tacheometer.
9. Determination of distance and elevation of points by Stadia tacheometry.
10. Determination of gradient between two points (with different elevations) by Stadia tacheometry.
11. Determination of distance and elevation of points by Tangential tacheometry.

PART C: TOTAL STATION **11 Hrs**

12. Study of Total Station General commands used – Instrument preparation and setting Reading distances and angles.
13. Measurement of distances and co-ordinates of given points, using Total station.
14. Measurement of altitude of given elevated points, using Total Station.
15. Run closed traverse using Total Station and plotting the traverse.
16. Determination of area of a field / land / College Campus etc. using Total station.

SURVEY CAMP : (Outside/Inside the Campus) **Duration: 4 days**

The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in Survey camp. The camp must involve work on a large area of not less than 10 acres outside/Inside the campus. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plotting. Three working days and one Saturday will be used for the Camp work during the 14^{th} week.

20 marks to be allotted for Survey file in the Board Examination for the works carried out by the students in survey camp:

i. L.S and C.S for a road / canal alignment
ii. Radial Tachometric contouring
iii. Contouring by block levels
iv. Curve setting by deflection angle
v. Theodolite / Tacheometric traverse (Balancing the traverse by Bowditch rule)
vi. Total Station (Closed Traverse) – Plotting & Finding the area of the given field.

4010470 - SURVEYING PRACTICE - II

SCHEME OF EXAMINATION:

In the examination the students have to be given two experiments one from Part A or Part B and another from Part-C.

DETAILED ALLOCATION OF MARKS

S.No	Description	Part – A/ B Max. Marks (45)	Part - C Max. Marks (30)
1.	Procedure	5	5
2.	Tabulation and Observation	20	10
3.	Calculations	10	5
4.	Sketch / Graph	5	5
5.	Accuracy of result	5	5
	Total	45	30
	Survey Camp	20	
	Viva Voce	5	
	GRAND TOTAL	**100**	

LIST OF EQUIPMENTS (for a batch of 30 students):

Sl.No.	List of Equipments Required	Quantity Required
1.	Vernier Theodolite	6 nos.
2.	Total Station	3 nos.

V SEMESTER

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

STRUCTURAL ENGINEERING

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name **:** 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010510

Semester **:** V Semester

Subject Title **:** **STRUCTURAL ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
STRUCTURAL ENGINEERING	**6 Hrs.**	**96 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 Marks and converted to 75 Marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Reinforced cement concrete structures	18
II	Design of T-beams and lintels for flexure by LSM Design of Continuous Beams for flexure and shear by LSM	17
III	Design of one way Slabs and Stair cases by LSM Design of two way Slabs by LSM	20
IV	Design of columns by LSM Design of Column Footings	16
V	Steel Structures	18
	Test & Model Exam	7
	Total	**96**

RATIONALE:

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RCC construction. They may also be required to design simple structural elements, make changes in design depending upon the availability of materials (bars of different diameters). This subject thus deals with elementary design principles as per BIS code of practice BIS: 456 – 2000 by limit state method**.**

OBJECTIVES:

On completion of the course the students should be able to:

- Analyse and design simple RCC elements like singly / doubly reinforced rectangular beams, and singly reinforced T-beams (Cantilevers, Simply supported/ Continuous beams, Lintels etc.) for shear and flexure by limit state method;
- Design One way/ Two way slabs and Staircases by limit state method;
- Design Axially loaded Columns and Footings by limit state method;
- Design simple Steel members like Laterally supported Beams, Tension members, Compression members and Welded connections by limit state method.

DETAILED SYLLABUS

4010510-STRUCTURAL ENGINEERING

Contents: Theory

Unit	Name of the Topics	Hours
I	**REINFORCED CEMENT CONCRETE STRUCTURES** **1.1 INTRODUCTION TO WORKING STRESS AND LIMIT STATE METHOD** Reinforced Cement Concrete- Materials used in R.C.C and their basic requirements – Purpose of providing reinforcement – Different types and grades of cement and steel – Characteristic strength and grades of concrete – Behaviour of R.C members in bending-Modular ratio and Equivalent area of R.C.Sections – Different types of loads on structures as per IS: 875-1987 - Different methods of design. Working Stress Method-Assumptions made in the W.S.M- Singly reinforced rectangular sections – Strain and stress distribution due to bending – Actual and Critical neutral axes – Under / Over reinforced sections- Balanced sections – Lever arm – Moment of resistance of singly reinforced rectangular sections (No problems). Limit State Method - Concept –Advantages- Different limit states- Characteristic strength and design strength of materials – Characteristic loads and design loads - Partial safety factors for loads and material strength - Limit state of collapse in flexure – Assumptions – Stress Strain curves for concrete and steel – Stress block – Maximum strain in concrete – Limiting values of neutral axis of singly reinforced section for different grades of steel -Design stress in tension and compression steel– Moment of resistance of singly and doubly reinforced rectangular sections– Problems. **1.2 DESIGN OF RECTANGULAR BEAMS FOR FLEXURE BY L.S.M** Design requirements-Effective spans of cantilever and simply supported	**8**

	beams – Breadth and depth requirements of beams – Control of deflection – Minimum depth requirement for stiffness – Minimum concrete cover to reinforcement steel for durability and fire resistance – Minimum and maximum areas/ spacing for main reinforcement and side face reinforcement as per IS 456 -2000 - Development Length- Anchorage values of bends and hooks - Curtailment of reinforcements- Design bending moments – Design of singly and doubly reinforced rectangular beams (Cantilevers and Simply supported beams carrying udl only)- Problems- Practice on using Design Aids, SP16 (Description only).	**10**
II	**2.1 DESIGN OF T-BEAMS AND LINTELS FOR FLEXURE BY L.S.M** Cross sections of Tee and L-beams- Effective width of flange- Neutral Axis and M.R of Singly Reinforced T-Sections- Design of singly reinforced T-beams for flexure–Problems on Simply supported T- beams carrying udl only – Loads on Isolated Lintels over openings of masonry walls - Design B.M for isolated lintels carrying rectangular/triangular loads- Design of Lintel- Simple problems **2.2 DESIGN OF CONTINUOUS BEAMS FOR FLEXURE AND SHEAR BY L.S.M** Methods of analysis of continuous beams- Effective Span- Arrangement of Loading for Critical Bending Moments- B.M coefficients specified by IS:456-200-Design of rectangular continuous beams (Singly and Doubly Reinforced) using B.M. coefficients (equal spans & u.d.l only) for sagging and hogging moments. Limit state of collapse in shear – Design shear strength of concrete – Design shear strengths of vertical / inclined stirrups and bent up bars – Principle of shear design **–** Critical sections for shear- S.F Coefficients specified by IS:456- 2000– Nominal shear stress –Minimum shear reinforcement- Design of vertical stirrups for rectangular beams using limit state method –Simple problems- Practice on use of Design Aids (Description only).	**8** **9**

III	**3.1 DESIGN OF ONE WAY SLABS AND STAIRCASES BY L.S.M** Classification of Slabs – Effective spans – Loads (DL and IL) on floor/roof slabs and stairs (IS: 875-1987) – Strength and Stiffness requirements –Minimum and maximum permitted size, spacing and area of main and secondary reinforcements as per IS 456 - 2000- Cover requirement to reinforcements in slabs- Design of cantilever/simply supported one way slabs and sunshades by limit state method – Design of continuous slabs using B.M coefficients- Check for shear and stiffness – Curtailment of tension reinforcement –Anchoring of reinforcement– Practice in designing slabs using design aids (Description only). Types of stairs according to structural behaviour- Requirements of Stairs- Planning a staircase – Effective span of stairs – Effective breadth of flight slab- Distribution of loads on flights – Design of cantilever steps – Design of doglegged stairs spanning parallel to the flight - Planning of open well staircase. **3.2 DESIGN OF TWO WAY SLABS BY L.S.M** Introduction –Effective spans –Thickness of slab for strength and stiffness requirements - Middle and Edge strips – B.M coefficients as per IS:456 – Design B.Ms for Simply supported, Restrained and Continuous slabs – Tension and Torsion reinforcement requirement– Design of two way slabs using B.M. coefficients – Curtailment of reinforcement – Check for stiffness only.	**12** **8**

IV	**4.1 DESIGN OF COLUMNS BY L.S.M** Limit state of collapse in compression – Assumptions - Limiting strength of short axially loaded compression members - Effective length of compression members – Slenderness limits for columns – Classification of columns -Minimum eccentricity for column loads – Longitudinal and Transverse reinforcement requirements as per I S 456-2000 – Cover requirement - Design of axially loaded short columns with lateral ties / helical reinforcement – Practice on use of Design Aids (Description only). **4.2 DESIGN OF COLUMN FOOTINGS** Basic requirements of Footings-Types of R.C footings –Minimum depth below GL- Footings with uniform thickness and varying thickness (sloped footing) – Critical sections for BM, Transverse/Punching Shears – Minimum reinforcement, Distribution of reinforcement, Development length, Anchorage, Cover, Minimum edge thickness requirements as per IS 456- 2000 – Design of Isolated footing (square and rectangular) with uniform/ varying thickness by limit state method- For Examination : Problem either on (i) Designing Size of Footing and Area of tension steel for flexure only for the given Column load and SBC of soil, or on (ii) Checking the footing for Punching shear and Transverse shear only, for the given sizes and other required details of the footing.	**8** **8**
V	**STEEL STRUCTURES** **5.1 DESIGN OF TENSION AND COMPRESSION MEMBERS BY L.S.M** General- Characteristic Actions, Partial Safety Factors for Loads, Design Actions- Ultimate Strength, Partial Safety Factors for Materials, Design Strengths of Materials - Rolled Steel Sections - Different forms of Tension members – Gross area, Net area and Net Effective sectional area of Tension members– Maximum permitted values of Effective Slenderness Ratio –Design Strength of single angle Tension members against Yielding of Gross section and Rupture of Critical section - Block Shear (Description only) - Design of ties using single angles and channel sections.	**9**

	Different forms of Compression members- Classification of Cross sections- Limiting Width to Thickness Ratio- Effective sectional area- End Conditions and Effective length of Compression members – Maximum permitted values of Slenderness ratio – Imperfection factor and Stress reduction factor– Design Strength of Compression members- Problems –– Design of single angle and double angle Struts – Design of steel columns using rolled steel sections (Symmetrical sections only) without cover plates. (Lacing and battens not included). **5.2 DESIGN OF SIMPLE BEAMS AND WELDED CONNECTIONS BY L.S.M** Classification of Steel beams –Effective span- Design principles- Minimum thickness of Web-Design Strength in Bending/ Shear- Limiting deflection of beams - Lateral buckling of beams – Maximum permitted Slenderness Ratio- Plastic Moment of Resistance and Plastic Section Modulus of Sections- Shape Factor –– Design of laterally supported Simple beams using single / double rolled steel sections (symmetrical cross sections only) (Built-up beams not included). Types of welds – Size, Effective area and Effective length of Fillet welds – Requirements of welds-Stresses in Welds –Design strength of fillet/ butt welds -– Lap and butt joints for angles only – Simple Problems - Procedure for design of welded connections for Plates and Angles (Theory only).	**9**
	Test & Model Exam	**7 Hrs.**

Reference Books:

1. S.R.Karve and V.L.Shah," Limit state Theory and Design of Reinforced Concrete",Pune Vidya Griha Prakashan.
2. P C Varghese," Limit state Design of Reinforced Concrete", PHI Learning Pvt. Ltd",2011.
3. Dr.S.Ramachandra,"Limit State Design of Concrete Structures", Scientific publishers, 2004.
4. Mallick and Rangasamy,"Reinforced Cement Concrete" Oxford-IBH.
5. N Krishnaraju, " Reinforced Concrete Design" New Age International Publications, 2012
6. B C Punmia, " Limit State Design of Reinforced Concrete", Laxmi Publications,2007
7. B C Punmia, " R C C Designs", Laxmi Publications, 2006
8. S S Bhavikatti, " Design of R C C and Structural Elements" (RCC Vol I), New Age International Publications, 2011
9. IS 456-2000 ; I S 875-1987; I S 800 -2007.
10. 10. Explanatory hand book SP24, Design Aid SP 16, Detailing of Reinforcement, SP 34
11. M.R.Shiyekar "Limit State Design in Structural Steel", PHI Learning Pvt Ltd, 2011

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

ENVIRONMENTAL ENGINEERING

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students Admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010520

Semester : V Semester

Subject Title : **ENVIRONMENTAL ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ENVIRONMENTAL ENGINEERING	5 Hrs.	80 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topics	Hrs.
I	Water Supply Engineering: Introduction, Quantity of Water, Source of Water, Intakes and conveyance	15
II	Quality of Water, Primary treatment of water, Filtration of water, Disinfection of water and water softening.	15
III	Distribution system and preparation of water supply scheme or project.	15
IV	Sanitary Engineering: Collection and conveyance of sewage, Seaware appurtenances.	14
V	Primary Treatment of water, Secondary treatment of water, solid waste disposal, sludge waste disposal and preparation of sanitary scheme or project.	14
	Test & Model Exam	7
	Total	**80**

RATIONALE:

Diploma holders in Civil Engineering are expected to supervise construction of water supply and waste water treatment works. They are also responsible for waste disposal activities. This subject aims at imparting skills for preparing water supply and waste water engineering drawings to develop competencies for reading the drawings, and their execution in their field.

In addition, Civil Engineering diploma holders must have the knowledge of different types of environmental aspects due to development activities so that they may help in maintaining the ecological balance and control pollution. They should also be aware of the environmental laws for effectively combating environmental pollution.

OBJECTIVES:

On completion of the course, the student will be able to:

- Know the procedure of estimating water requirements for a water supply scheme.
- Select suitable sources of water supply and pipe materials.
- Determine the quality of water, testing procedures and standards for drinking water.
- Understand the methods of purification of water.
- Understand the systems of distribution for a water supply scheme.
- Understand the basic facts of sanitary engineering, the methods of collection and conveyance of sewage.
- Understand the primary and secondary treatment of sewage and disposal.
- Know the methods of disposal of sludge and solid wastes.
- Identify the various types of pollution and their prevention.
- Create awareness about environmental impact assessment.

DETAILED SYLLABUS

4010520-ENVIRONMENTAL ENGINEERING

Contents: Theory

Unit	Name of the Topics	Hours
I	**PART I - WATER SUPPLY ENGINEERING**	
	1.1 INTRODUCTION	**3**
	Water Supply – Salient Features of a Water Supply Scheme – Flow Chart of a Water Supply Scheme- Agencies responsible for protected water supply.	
	1.2 QUANTITY OF WATER	**4**
	Water Supply - Need for Protected Water Supply - Objectives of Public Water Supply System Demand - Types of Demand - Per Capita Demand - Prediction of Population - Problems in Arithmetical Increase Method, Geometrical Increase Method, Incremental Increase Method.	
	1.3 SOURCES OF WATER	**3**
	Sources of Water – Surface Sources – Underground Water Sources – Selection of Source of Water.	
	1.4 INTAKES AND CONVEYANCE	**5**
	Intakes - Types of Intakes - Description of Intakes -Infiltration Galleries and Infiltration Wells in River Beds - Pipes for Conveyance of Water - Cast Iron, Steel, G.I., Cement Concrete, R.C.C., Hume and PVC Pipes - Pipe Joints - Laying and Testing of Pipe Lines.	
II	**2.1 QUALITY OF WATER**	**3**
	Impurities in Water - Testing of Water - Collection of Water Sample - Physical, Chemical, Bacteriological Tests - Standards of Drinking Water - Water Borne Diseases and their Causes.	
	2.2 PRIMARY TREATMENT OF WATER	**5**
	Object of Water Treatment – Flow Diagram of a Treatment Plant – Function of Units – Sedimentation – Purpose of Sedimentation – Types of Sedimentation Tank – Coagulation – Coagulants – Flocculation – Coagulation Process.	

	2.3 FILTRATION OF WATER Theory of Filtration – Classification of Filters – Slow Sand Filter – Rapid Sand Filter – Pressure Filter - Comparison between slow sand filter and rapid sand filter. **2.4 DISINFECTION OF WATER AND WATER SOFTENING** Necessity of Disinfection – Methods of Disinfection – Chlorination –Action of Chlorine – Methods of Chlorine – Forms of Chlorination –Water Softening – Necessity of Water Softening – Hardness – Types of Hardness – Effects of Hardness – Removal of Hardness (names only) - Miscellaneous Water treatment (names only) – Mineral water – requirements – Treatment Process – Reverse of Osmosis (RO).	**3** **4**
III	**3.1 DISTRIBUTION SYSTEM** Distribution System - Methods of Distribution Gravity System, Pumping System, Combined System - Systems of Water Supply - Continuous and Intermittent Supply of Water -Layouts of Distribution - Dead End, Grid Iron, Radial and Circular Systems – Service Reservoirs - Types. **3.2 PREPARATION OF WATER SUPPLY SCHEME OR PROJECT** Reconnaissance of Survey – Demand of Water – Source of Water – Preparation of Topographical Map – Layout Map of the Scheme – Map and Drawing to be Prepared – Office Work – Project Report.	**7** **8**
IV	**PART II – SANITARY ENGINEERING** **4.1 COLLECTION AND CONVEYANCE OF SEWAGE** Sanitation Purpose Terms - Systems of Sanitation - Quantity of Sewage - Variation in Rate of Flow of Sewage -Estimation of strom water - problems - Minimum Size of Sewer – Shapes of Sewer (names only) - Materials used for Sewer - Joints in Sewer Line - Laying and Testing of Sewer Lines – Ventilation of Sewers - Cleaning of Sewers.	**7**

	4.2 SEWER APPURTENANCES Sewer Appurtenances Manhole - Lamp Hole - Catch Basin - Street - Inlet - Grease and Oil Trap - Flushing Tanks Drainage Arrangements in Buildings - Sanitary Fittings - Sewage Pumps Necessity - Types of Sewage Pumps (names only).	**7**
V	**5.1 PRIMARY TREATMENT OF SEWAGE** Introduction – Flow Diagram of Primary Treatment –Screens – Grit Chamber – Skimming Tank – Primary Sedimentation Tank.	**2**
	5.2 SECONDARY TREATMENT OF SEWAGE Introduction – Flow Diagram of Secondary Treatment – Function of the Units of Secondary Treatment - Secondary Sedimentation Tank – Filters – Types - Trickling Filters - Activated Sludge Process – Septic Tanks for isolated buildings – Construction and working of septic tanks – Soak Pits – Dispersion Trenches.	**3**
	5.3 ENVIRONMENTAL POLLUTION AND SOLID WASTE DISPOSAL Environment – definition - water pollution - sources of water pollution - effects of water pollution - control of water pollution - soil pollution - sources of soil pollution - effects of soil pollution - control of soil pollution - noise pollution - sources of noise pollution - effects of noise pollution - control of noise pollution - air pollution - sources of air pollution - effects of air pollution on human beings, plants, animals, materials - air pollution control equipment - control devices for particulate contaminants - environmental degradation - ozone layer depletion . Solid Waste Disposal – Necessity – Method of Solid Waste Disposal - dumping, sanitary landfill, composting - energy from waste.	**6**
	5.4 ENVIRONMENTAL IMPACT ASSESSMENT Environmental impact assessment (EIA) - methodology of EIA - organising the job - performing the assessment - preparation of environmental impact statement (EIS) - review of EIS - environmental risk assessment - limitation of EIA.	**3**
	Test & Model Exam	**7 Hrs.**

Reference Books:

1. S.K. Garg," Water Supply and Sanitary Engineering",PHI Kanna publishers, New Delhi".
2. S.C. Rangwala, Water Supply and Sanitary Engineering, Charotar Publishing House, New Delhi, 2007
3. G.S. Birdie and J.S. Birdie, Water Supply and Sanitary Engineering, Dhanpat Rai Publishers, New Delhi, 2010.
4. N.N. BASAK, Environmental Engineering, Tata McGraw hill publishing Company Ltd., New Delhi, 2010
5. A.Kamala D.l.kanthrao, Environmental Engineering, Tata McGraw hill publishing Company Ltd., New Delhi, 1985
6. Gurcharan Singh, Water supply and Sanitary Engineering vol.I & II, Standard publishers & distributors, New Delhi, 2007.
7. Dr.Suresh K.Dhameja, Environmental Engineering and Management, S.K.Kataria & Sons, New Delhi. 2005.
8. B C Punmia, Environmental Engineering, Laxmi Publications, New Delhi, 2010
9. Dr.Suresh, K.Dhamija, Environmental Studies, S.K.Katarial Sons, Delhi, 2010

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

REMOTE SENSING AND GEOINFORMATICS

(Elective Theory I)

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010 **:** DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010531

Semester : V Semester

Subject Title : **REMOTE SENSING AND GEOINFORMATICS**

(Elective Theory I)

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
REMOTE SENSING AND GEOINFORMATICS	**5 Hrs.**	**80 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Fundamentals of Remote Sensing	15
II	Photogrammetry	15
III	Image Interpretation and Analysis	15
IV	Fundamentals of GIS	14
V	GIS - Data entry, Storage and Analysis	14
	Test & Model Exam	7
	Total	**80**

RATIONALE:

In civil engineering projects, RS and GIS techniques can become potential and indispensable tools. Various civil engineering application areas include regional planning and site investigation, terrain mapping and analysis, water resources engineering, town planning and urban infrastructure development, transportation network analysis, landslide analysis, etc.

OBJECTIVES:

On completion of the course, the students will be able to:

- Understand the basic concepts of remote sensing
- Know the applications of Geographic information systems in Civil Engineering
- Identify the basic remote sensing concepts and its characteristics
- Implement the photogrammetry concepts and fundamentals of Air photo interpretation
- Use various analysis and interpretation of GIS results

DETAILED SYLLABUS

4010531- REMOTE SENSING AND GEOINFORMATICS

(ELECTIVE THEORY I)

Contents: Theory

Unit	Name of the Topics	Hours
I	**FUNDAMENTALS OF REMOTE SENSING** Basics of Remote Sensing: Definitions and its components – Energy Sources and Radiation principles – electromagnetic radiation (EMR) – spectrum – wavelength regions important to remote sensing – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil. characteristic of real remote sensing system, platforms, orbit types, sensors, resolution concept satellite,-Pay load description of important Indian Earth Resources and Meteorological satellites.	15
II	**PHOTOGRAMMETRY** Geometric elements of a vertical photograph – Stereoscopic plotting instruments, Ortho photos, Flight planning	15
III	**IMAGE INTERPRETATION AND ANALYSIS** Fundamentals of Air-photo interpretation - Elements of image-interpretation, concepts of digital image processing image Rectification and Restoration, Image enhancement, Image classification, Application of Remote sensing in Civil Engineering	15
IV	**FUNDAMENTALS OF GIS** Basic Concepts of GIS – Basic spatial concepts –Coordinate Systems: Definitions - History of development of GIS - Components of GIS: Hardware, Software, Data, People and Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data-types of attributes – scales/ levels of measurements -Data Base Management Systems (DBMS).	14

V	**GIS - DATA ENTRY, STORAGE AND ANALYSIS** Data models - Vector and raster data – data compression – data input by digitization and scanning, data storage – attribute data analysis – integrated data analysis- mapping concept - development of map overlay, overlay operation - Errors and quality control. Land Information System (LIS)– Various GIS applications in Civil Engineering-Regional Planning and Site investigations, Hydrology and Water Resources Engineering, Transportation network analysis - Highway Alignments.	**14**
	Test & Model Exam	**7 Hrs.**

Reference Books

- Lo & Yeung (2005), Geographic Information Systems, Prentice of India.
- Anji Reddy.M. (1998), Remote Sensing and Geographical information systems.
- Lillesand, T.M. & Kiefer R.W. (1998), Remote Sensing and image interpretation, John Wiley & Sons, Newyork.
- Burrough P.A. (2000), Principle of Geographical Information Systems for land resources assessment, Clarendon Press, Oxford.
- Clarke Parks & Crane (2005), Geographic Information Systems & Environmental Modelling, Prentice-Hall of India.
- Wolf Paul (1998), Elements of Photogrammetry, McGraw Hill, New Delhi.
- Shahab Fazal,"G I S Basics", New Age International Publications, Chennai.

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

CONCRETE TECHNOLOGY

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the student admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Semester : V SEMESTER

Subject Code : 4010532

Subject Title : **CONCRETE TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CONCRETE TECHNOLOGY	5 Hrs.	80 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Concrete: Introduction, Cement, Aggregates and water	15
II	Admixtures , Mix Design for Concrete	15
III	Special Concrete, Pre-stressed Concrete	15
IV	Light Weight Concrete, Formwork	14
V	Cracks in Concrete Structure and their Prevention, Joints, Repairs and Maintenance of Concrete	14
	Test & Model Exam	7
	Total	**80**

RATIONALE:

Diploma students in Civil Engineering requires to know more about the concrete, which is one of the most important construction materials. This subject aims to improve the knowledge in the mix design and special types of concrete, to have the exposure of cracks in concrete structure and repairing, etc.

OBJECTIVES:

On completion of this course, the students will be able to:

- Materials used
- Admixtures used in concrete
- Mix design method
- Special and prestressed concrete
- Forms works
- Cracks and maintenance of concrete

DETAILED SYLLABUS

4010532 - CONCRETE TECHNOLOGY

Contents: Theory

Unit	Name of the Topics	Hours
I	**1.1 CONCRETE** Introduction of Concrete Technology and Concrete – Ingredients of Concrete. Cement: Composition of Cement – Function of Cement Ingredients – Types of Cements (Names Only) – Uses of Cement. Aggregates: Fine Aggregate – Sand – Types of Sand based on the purpose of use – Types of sand based on the Grain size – Properties of good Sand. Coarse Aggregates – Functions – Properties – Requirements – Classification of Aggregates. Water – Functions – Water for Curing of Concrete. Properties of Concrete – Production of Concrete – Types of Concrete and its uses – Test on Concrete (Names only).	**15**
II	**2.1 ADMIXTURES** Definition – Functions of Admixtures – Classification of Admixtures: Accelerating admixtures – Retarding admixtures – Grouting admixtures – Air entraining admixtures – Pozzolanic or mineral admixtures – Air detraining admixtures – Plasticizers – Super plasicizers. **2.2 Mix Design for Concrete** Mix design – purpose of Mix design – object of Mix design – Factors influencing the choice of Mix design – variables in proportioning – Mix design methods – Mix design procedure I.S. Code method – Mix proportions for weigh batching and volume batching.	**5** **10**

III	**3.1 Special Concrete** Polymer concrete – Fiber reinforced concrete – Light weight concrete – Shot crete or guniting concrete (Applications and Advantages). **3.2 Light Weight Concrete** Classification of light weight concrete – Characteristics of light weight concrete – Applications of light concrete - Advantages of light weight concrete.	**7** **8**
IV	**3.1 Pre-stressed concrete** General principle of stressing – advantages of pre stressed – Concrete – Need for High strength steel and concrete- terminology – tendon – anchorage – pre tensioning-post tensioning – bonded pre stressed concrete – non bonded pre stressed concrete – methods of pre stressing – pretension method – post tension method – system of pre stressing – freyssinet system – Magnet blaton system – Lee-mc - call system – application of pre stressing elements – causes for losses in pre stress and remedial measures. **4.2 Formwork** Requirements of formwork – materials used for formwork –cleaning and treatments of forms - points to be kept in mind before placing concrete in form work.	**10** **4**
V	**5.1 Cracks in Concrete Structure and their Prevention** Cracks in concrete structures – assessment of cracks – types of cracking – preventive measures. **5.2 Joints, Repairs and Maintenance of Concrete** Types of joints – construction joints – contraction joints – expansion joints – isolation joints – methods of repairing concrete works	**6** **8**
	Test & Model Exam	**7 Hrs.**

Reference Books :

1. M.S.Shetty - Concrete Technology (Theory and Practice) - S.Chand & Company Pvt. Ltd. New Delhi.
2. M L GAMBHIR - Concrete Technology - TATA McGraw-Hill Publishing Company Limited, New Delhi
3. Vineet Kumar (Edited)- Concrete Technology - Khanna Publishers, New Delhi.
4. A.R.Santhakumar, Concrete Technology , Oxford University press.
5. A.M.Neville, Concrete Technology, Pearson Education.

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

GEOTECHNICAL ENGINEERING

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010533

Semester : V Semester

Subject Title : **GEOTECHNICAL ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examinations			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examination	Total	
GEOTECHNICAL ENGINEERING	**5 Hrs.**	**80 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	Index properties and Hydraulic Properties of Soil	15
II	Classification and Strength of Soil, Stabilization of Soil and Sub-soil Sampling	15
III	Seepage Analysis and Seepage below Hydraulic Structures, Bearing Capacity and Settlement of foundations	15
IV	Foundations and Foundations in Expansive Soil	14
V	Machine Foundation and Foundations of Transmission Line Towers	14
	Test & Model Exam	7
	Total	**80**

RATIONALE:

Civil Engineering diploma engineers are required to supervise the construction of roads and pavements, dams, embankments, and other Civil Engineering structures. As such, the knowledge of basic soil engineering is a pre-requisite for these engineers for effective discharge of their duties. This necessitates the introduction of Soil Engineering subject in the curriculum for Diploma Course in Civil Engineering. The subject covers only such topics as will enable the diploma engineers to identify and classify the different types of soils, their selection and proper use in the field for various types of engineering structures. The emphasis will be more on teaching practical aspects rather than theoretical concepts.

OBJECTIVES:

On completion of the course, the students will be able to:

- Learn the Properties of Soil, Classification and Strength of soils
- Describe the Sub-soil Sampling
- Understand the Seepage analysis, Bearing Capacity of soil and Settlement of Foundations
- Learn the types of Foundations, Pile foundations and Pile Groups
- Understand the Foundations on Expansive soil and Machine Foundations
- Know about the Foundations of Transmission Line Towers

DETAILED SYLLABUS
4010533 - GEOTECHNICAL ENGINEERING

Contents:Theory

Unit	Name of the Topics	Hours
I	**GEOTECHNICAL ENGINEERING:** **1.1 Soil Mechanics and Index Properties** Introduction - Development of Soil Mechanics - Fields of application of Soil Mechanics - Soil formation - Cohesive and Cohesion less soil - Soil Properties -Three phase system - General, Index and Engineering properties - Detailed description - Atter Berg's limits - Simple problems - Soil map of India. **1.2 Hydraulic Properties of Soil :** Introduction - Permeability - Co-efficient of permeability - Darcy's law - Factors affecting permeability - Permeability tests - Simple problems - Quick sand conditions.	**10** **5**
II	**CLASSIFICATION AND STRENGTH OF SOIL, STABILIZATION OF SOIL AND SUB-SOIL SAMPLING** **2.1 Classification and Strength of Soil** Classification of soil - Introduction - Necessity - Systems of soil classification - Field identification of soil - Shear strength of soil - Introduction - Shear strength - Mohr's stress circle - Mohr- Coulomb failure theory - Shear strength test - Unconfined compression test - Mohr's circle for unconfined compression test - Compaction - Consolidation - Consolidometer - Optimum moisture content - Proctor's Compaction test - Methods of compaction - Degree of compaction - Field density of soil - Tests - Compaction and Consolidation - Comparison. **2.2 Stabilization of Soil and Sub-Soil Sampling :** Stabilization of soil - Introduction - Objects of stabilization - Methods of stabilization - Soil exploration - Introduction - Objects of soil exploration - Methods of soil exploration - Direct , Semi-direct and Indirect methods - Spacing and depth of test borings - Boring log - Sounding and Penetration tests-Standard Penetration Test (SPT)- Geophysical methods - Sub-soil Sampling - Disturbed and Undisturbed samples - Types of samplers - Split spoon sampler - Thin-walled sampler - Chunk sampling.	8 7

III	**SEEPAGE ANALYSIS AND SEEPAGE BELOW HYDRAULIC STRUCTURES, BEARING CAPACITY AND SETTLEMENT OF FOUNDATIONS** **3.1 Seepage Analysis and Seepage Below Hydraulic Structures :** Seepage analysis - Introduction - Head , Gradient and Potential - Hydraulic gradient - Seepage pressure - Upward flow (Quick condition or Quick sand) - Types of flow lines - Types of flow (Definition only) - Two dimensional flow (Laplace equation) - Velocity potential -Properties of flow net - Uses of flow net - Seepage below Hydraulic structures - Introduction - Hydraulic gradient - Piping - Exit gradient - Khosla's theory - Seepage flow nets below hydraulic structures. **3.2 Bearing Capacity and Settlement of Foundations :** Bearing capacity - Introduction - Terminology - Factors affecting bearing capacity of soils - Methods of determining bearing capacity - Types of failure in soil - General , Local and Punching shear failure - Analytical methods - Rankine's analysis - Terzaghi's analysis - Assumption and limitations - Effect of water table - Methods of improving bearing capacity of soil –Bearing capacity of different soil as per IS Settlement of foundation - Introduction - Causes and Effect of settlement – settlement values as per BIS provisions Plate load test - Simple problems.	**7** **8**
IV	**FOUNDATIONS AND FOUNDATIONS IN EXPANSIVE SOIL** **4. 1 Foundations :** Introduction - Definitions - Objectives - Requirements of foundation - Criteria for selection of type of foundation - Types of foundations - Shallow foundation types-isolated, combined ,raft Deep foundations - Types - Foundation at different levels - Foundation on made up grounds - Deep foundation - Introduction - Pile foundation - Uses of piles - Types of piles - Caisson foundation - Types - Selection of piles - Pile Driving - Capacity of piles - Pile load test - Floating foundation - Negative skin friction - Pile groups - Bearing capacity of pile groups - BIS provision for Settlement of pile group – Design of foundation using software (Description only)	**8**

	4.2 Foundations In Expansive Soil : Introduction - Identification of expansive soil - Free Swell Test - Differential free swell test - Indian expansive soil - Swell potential and Swelling pressure - Traditional Indian practice - Methods of foundation in expansive soils - Replacement of soils and "CNS" concept - Under reamed pile foundation - Remedial measures for cracked buildings.	**6**
V	**MACHINE FOUNDATION AND TOWER FOUNDATIONS (TRANSMISSION LINE)** **5.1 Machine Foundation :** Introduction - Soil dynamics - Free vibration and Forced vibration - Definitions -Natural frequency - Barkan's method Pauw's method - Types of machines and machine foundation - General requirements - Design of machine foundations - Reciprocating type - Centrifugal type - Impact type - design steps- Couzen theory - In-situ dynamic investigation of soil - Methods - IS code of practice - Design criteria - Isolation of foundation - Simple problems. **5.2 Foundations of Transmission Line Towers** Introduction - Necessity - Forces on Tower Foundations - General design criteria - Choice and type of foundations - Design procedures - Stability conditions – Description only	**9** **5**
	Test & Model Exam	**7 Hrs.**

Reference Books :

1. Dr.Punmia.B.C.- Soil Mechanics and Foundations - S Laxmi publications(P)Ltd., New Delhi, 2005
2. Dr.K.R.Arora, Soil Mechanics and Foundations Engineering, Standard publications, New Delhi, 2011/6th
3. Gopal Ranjan &Rao ' Basic and applied Soil Mechanics, New Age International, New Delhi, 2000/2nd
4. Terzaghi, Soil Mechanics in Engineering Practice, John Wiley and Sons,New Delhi
5. WAYNE C.TENG, Foundation Design, Prentice Hall of India (P) Ltd, New Delhi.
6. Dr S B SEHGAL, A Text Book of Soil Mechanics, CBS Publishers & Distributors, New Delhi,
7. S. Kaur and R.Singh, Soil Mechanics and Foundation Engineering S.K. Kataria & Sons, New Delhi, 2003

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

CIVIL ENGINEERING DRAWING AND CAD PRACTICAL - II

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name	:	1010: DIPLOMA IN CIVIL ENGINEERING
Subject Code	:	4010540
Semester	:	V Semester
Subject Title	:	**CIVIL ENGINEERING DRAWING AND CAD PRACTICAL - II**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CIVIL ENGINEERING DRAWING AND CAD PRACTICAL - II	**6 Hrs.**	**96 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

***** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

Computers play a very vital role in present day life, more so, in all the professional life of engineering. In order to enable the students to use the computers effectively in drafting, this course offers Computer Aided Drafting of various drawings in Public Health Engineering, Bridge Engineering and Structural Engineering.

OBJECTIVES:

On completion of the course, the students will be able to:

- Prepare Public Health Engineering drawings manually
- Know about RCC and Steel bridge structures and draw manually
- Draw the Structural Engineering drawings using CAD

DETAILED SYLLABUS

4010540 - CIVIL ENGINEERING DRAWING AND CAD PRACTICAL- II

Contents: Practical **Total: 96 Hrs.**

LIST OF EXPERIMENTS

PREPARATION OF DRAWINGS MANUALLY (Part I and II) AND USING CAD SOFTWARE (Part III)

I PUBLIC HEALTH ENGINEERING 24 Hours

Draw plan and sectional views of the following:

1. Rapid Sand Filter
2. Septic Tank with dispersion Trench / Soak pit
3. R.C.C square overhead tank supported by four columns

II BRIDGE DRAWING 14 Hours

Draw plan and sectional views of the following:

4. Steel Foot over bridge across a highway
5. Two span Tee Beam Bridge with square returns

III STRUCTURAL ENGINEERING 58 Hours

Draw plan, cross section and longitudinal section using CAD

6. Continuous one-way slab (with three equal spans)
7. Simply supported two-way slab
8. Restrained two-way slab
9. Singly reinforced rectangular beam
10. Doubly reinforced Continuous beam (Rectangular beam with two spans)
11. Tee Beams supporting continuous slab
12. Lintel and Sunshade
13. Dog-legged staircase
14. R.C.C. Column with square isolated footings

4010540 - CIVIL ENGINEERING DRAWING AND CAD PRACTICAL - II

DETAILED ALLOCATION OF MARKS

PART I & II	Manual Drawing (Plan)	-	20 marks
	Section / Elevation	-	25 marks
PART III Using CAD	Plan/Elevation	-	25 marks
	Plan / Cross section / longitudinal section	-	25 marks
	Viva – voce	-	5 marks
	Total	**-**	**100 marks**

Note:

1. For all the drawings, detailed specifications shall be given. Designs are not to be included in the examinations. The drawings must include Layout plans, full plan, sections, etc., as applicable to each topic.
2. For all the drawings, detailed specifications shall be given and students should draw in the drawing sheet based on the given specifications. The drawings to be drawn using computer and CAD Software.

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of the Equipments	Quantity Required
1.	Drawing table with Board	30 Nos.
2.	Computers	30 Nos.
3.	Laser printer	3 Nos.
4.	CAD software	30 Users

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

ENVIRONMENTAL ENGINEERING LABORATORY

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010550

Semester : V Semester

Subject Title : **ENVIRONMENTAL ENGINEERING LABORATORY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ENVIRONMENTAL ENGINEERING LABORATORY	3 Hrs.	48 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

Diploma holders in Civil Engineering are expected to supervise construction of water supply and waste water treatment works. They are also responsible for waste disposal activities. This subject aims at imparting practical skills for testing of raw water, waste water and to study pollution control equipments to develop competencies for execution in their field.

OBJECTIVES:

On completion of the course, the student will be able to:

- Determine the quality of water, testing procedures and standards for drinking water.
- Understand the Cutting, threading and joining of G.I.Pipes / cutting and pasting of PVC pipes using solvents.
- Make suction and delivery pipe connections to a centrifugal pump (making indents, drawing a neat sketch of the connection with details).

DETAILED SYLLABUS

4010550- ENVIRONMENTAL ENGINEERING LABORATORY

Contents: Practical **Total: 48 Hrs.**

LIST OF EXPERIMENTS

PART A **24 Hours**

1. Collection of water samples from sources and “Estimation of Sulphate content” in water sample.
2. Determination of pH value by Electrometric method using pH meter/ Calorimetric method and comparison by paper method.
3. Determine the optimum dose of coagulant in a given raw water sample by jar test.
4. Determine the dissolved oxygen in the given sample of water .
5. Determination of suspended solids and dissolved solids present in the given sample of water / waste water.
6. Determination of “Temporary and permanent Hardness” present in the given sample of water by EDTA titration method.
7. Estimation of chlorides in the given sample of water by silver Nitrate titration method.
8. Prepare a report of a field visit to water treatment plant.

PART B **24 Hours**

1. Study of pipe fitting used in water supply (with actual models displayed on board).
2. Study of sanitary wares (with actual models displayed on board).
3. Cutting, threading and joining of G.I.Pipes / cutting and pasting of PVC pipes using solvents.
4. Making a bathroom connection from an existing water supply main (making indents, drawing a neat sketch of the connection with details).
5. Making suction and delivery pipe connections to a centrifugal pump (making indents, drawing a neat sketch of the connection with details).
6. Study of air pollution control equipments (Gravity settling chamber, Cyclone filter with models/devices).
7. Prepare a report of a field visit to sewage treatment plant.

SCHEME OF EXAMINATION:

In the examination the students have to be given two experiments one from Part A and another from Part-B.

DETAILED ALLOCATION OF MARKS

S.No	Description	Part - A Max. Marks (50)	Part - B Max. Marks (45)
1.	Procedure	5	5
2.	Tabulation and Observation/ Execution	25	30
3.	Calculations	10	
4.	Sketch / Graph	5	5
5.	Accuracy of result/ Finish	5	5
	Viva Voce	5	
	Total	**100**	

LIST OF EQUIPMENTS (for a batch of 30 students):

S. No	Name of the equipment	Numbers required
1.	pH meter	2 nos
2.	Spectrophotometer	1 no.
3.	Magnetic stirrer	1 no.
4.	Magnetic stirring device	1 set
5.	Turbidimeter	1 no.
6.	Dissolved oxygen meter	1 no.
7.	Drying oven	1 no.
8.	Analytical balance	1 no
9.	Dessicator	1 no.
10.	Dish tongs	1 no.
11.	Evaporating dish	1 no.
12.	Filter membrane	1 no.
13.	Vacuum pump	1 no.
14.	Crucible	1 no.
15.	Whattman filter paper	Required no.
16.	Wash bottle	2 nos.
17.	Pipette, Burette, Funnel, Conical flask, Beaker, Bunsen burner, Stand, Wire gauge, Filter paper	As required

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

ADVANCED SURVEYING AND BASIC GIS PRACTICAL

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010561

Semester : V Semester

Subject Title : **ADVANCED SURVEYING AND BASIC GIS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ADVANCED SURVEYING AND BASIC GIS PRACTICAL	3 Hrs.	48 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

This is an applied subject in Civil Engineering for learning Advanced Surveying and Basic GIS Practical. Diploma holders in Civil Engineering are expected to survey the construction features and this course aims to teach about Surveing using Remote Sensing and GIS applications.

OBJECTIVES:

On the Completion of the course the students will be able to:

- Acquire practical knowledge in the use of Arc GIS and Arc Map.

DETAILED SYLLABUS

4010561- ADVANCED SURVEYING AND BASIC GIS PRACTICAL

Contents: Practical **Total : 48 Hrs.**

	Remote Sensing Exercises:	
1.	Introduction to Remote Sensing and GIS and creating a map using tools.	6
2.	Introduction to ARC GIS Desktop.	6
3.	Geo referencing an image using ARC GIS.	6
4.	Creating and editing Shape files in ARC MAP.	6
5.	Editing in ARC MAP.	6
6.	Adding fields to a Shape file.	6
7.	Querying the data.	4
8.	Buffering and Clipping.	4
9.	Case study of creation of campus map using Arc GIS software	4

Reference Books:

1. Lillesand T.M., and Kiefer,R.W. Remote Sensing and Image interpretation, VI edition of John Wiley & Sons-2015.
2. John R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective,4th Edition, 2015.
3. Paul R.Wolf, Elements of Photogrammetry, McGraw-Hill Science, 2013,ISBN0070713464, 9780070713468
4. Karl Kraus, Photogrammetry, Fundamentals and standard processes, Dümmler, 2000,ISBN 978 3 110190076
5. Mikhail Kasser and Yves Egels, “Digital Photogrammetry”, Taylor and Francis, 2003, ISBN0 748 40944 0
6. Francis h. Moffitt, Edward M. Mikhail, Photogrammetry, TBS The Book Service Ltd, 1980,ISBN 13: 9780700221370
7. Edward M.Mikhail, James S.Bethel, J.Chris McGlone, Introduction on “ModernPhotogrammetry”, John Wiley & Sons, Inc., 2012, ISBN 0-471-30924-9
8. Wilfried Linder, “Digital Photogrammetry”-Theory and Applications, Springer-Verlag BerlinHeidelberg New York, 3rd Edition, 2014, ISBN 3-540-00810-1
9. Digital Photogrammetry – A practical course by Wilfried Linder,3rd edition, Springer, 2009.

4010561- ADVANCED SURVEYING AND BASIC GIS PRACTICAL

SCHEME OF EXAMINATION:

DETAILED ALLOCATION OF MARKS

S.No	Description	Max.Marks (100)
1.	Procedure	10
2.	Tabulation and Observation	40
3.	Calculations	25
4.	Sketch / Graph	10
5.	Accuracy of result	10
	Viva Voce	5
	Total	**100**

LIST OF EQUIPMENTS (for a batch of 30 students):

S. no	Name of the equipment	Numbers required
1.	Arc GIS software	No of users as per requirement
2.	Arc Map Software	No of users as per requirement

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

CONCRETE TECHNOLOGY PRACTICAL

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010562

Semester : V Semester

Subject Title : **CONCRETE TECHNOLOGY PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CONCRETE TECHNOLOGY PRACTICAL	3 Hrs.	48 Hrs.	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

Diploma holders in Civil Engineering are supposed to supervise the construction of buildings. To perform the above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, stair cases, floors etc., and their constructional details. Therefore, the subject of concrete technology practical is very important for Civil Engineering diploma holders.

OBJECTIVES:

On completion of the course, the student will be able to:

- Find the fineness setting time of cement.
- Know the shape tests and fineness for modulus coarse aggregate.
- Determine the bulking characteristics of sand.
- Determine the workability of concrete using slumpcone, compaction factor and Vee Bee consistometer tests.
- Know the arrangement of steel reinforcement for concrete elements
- Study the workability properties of self compacting concrete.

DETAILED SYLLABUS

4010562 - CONCRETE TECHNOLOGY PRACTICAL

Contents: Practical Total: 48 Hrs.

LIST OF EXPERIMENTS

PART A **20 Hours**

1. Determination of the fineness of cement by Blains Permeability Apparatus or by sieve analysis.
2. Determination of Initial setting time of cement by using Vicat's Apparatus.
3. Determination of final setting time of cement by using Vicat's Apparatus.
4. Shape Test for coarse aggregate – Flakiness Index test.
5. Shape Test for coarse aggregate – Elongation Index test.
6. Shape Test for coarse aggregate – Angularity number test.
7. Determine the building characteristics of given sand sample.

PART B **28 Hours**

8. Determination of workability of concrete by slump cone test.
9. Determination of workability of concrete by compaction factor test.
10. Casting of concrete cube and compression test on concrete cube.
11. Determination of Fineness Modulus of fine aggregate sample and plot a particle size distribution curve and also find the effective size and uniformity co-efficient.
12. Determination of Fineness Modulus of coarse aggregate sample by conducting sieve analysis.
13. Vee- Bee Consistometer Test on concrete test.
14. Study of workability of self compacting concrete.

4010562 - CONCRETE TECHNOLOGY PRACTICAL

SCHEME OF EXAMINATION:

DETAILED ALLOCATION OF MARKS

S.No	Description	PART A (35 MARKS)	PART B (60 MARKS)
1.	Procedure	5	10
2.	Tabulation and Observation	15	25
3.	Calculations	5	15
4.	Sketch / Graph	5	5
5.	Accuracy of result	5	5
	Viva Voce	5	
	Total		**100**

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No..	List of the Equipments	Quantity Required
1.	Slump cone apparatus	2 no.
2.	Compaction factor apparatus	1 no.
3.	Concrete cube mould 150*150*150 3sets	3 sets(9 no)
4.	Concrete cube mould 100*100*100 3sets	3 sets (9 no)
5.	Sieve test for fine aggregate made of brace 200mm dia complete set.	2 sets
6.	Sieve test for coarse aggregate made of brass 200mm dia complete set	2 sets
7.	Concrete mixing tray	2 no.
8.	Vee Bee Consistometer	1 no.
9	Weigh balance-digital up to 10kg capacity with 1gm accuracy battery backup with 8 hours	1no.
10.	Apparatus to find Flakiness index, Elongation index and Angularity number for Coarse Aggregate	1 no. each
11	Blaine Permeability apparatus	1 no.
12	Sieve No 9	2 nos.
13	Vicats apparatus	2 sets

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

GEOTECHNICAL ENGINEERING LABORATORY

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010563

Semester : V Semester

Subject Title : **GEOTECHNICAL ENGINEERING LABORATORY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examinations			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examination	Total	
GEOTECHNICAL ENGINEERING LABORATORY	**3 Hrs.**	**48 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

This subject is introduced to know the practical important of Geotechnical Engineering, the students studying this course will gain the knowledge in practical aspects which is directly linked to the construction of structures on different soil.

OBJECTIVES:

After completion of the course the students will be able to:

- Understand and determine physical and index properties of soil.
- Estimate the permeability and shear strength of soil.
- Compute optimum moisture content values for maximum dry density of soil through various tests.
- Know the procedure for performing CBR test.
- Learn various compaction methods for soil stabilization.
- Study the SPT at construction site.

DETAILED SYLLABUS

4010563- GEOTECHNICAL ENGINEERING LABORATORY

Contents: Practical **Total : 48 Hrs.**

LIST OF EXPERIMENTS

1. Identification of rocks from the given specimen.
2. Determine water content of given soil sample by oven drying method as per IS: 2720 (Part-II).
3. Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V).
4. Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part- IV).
5. Use different types of soil to identify and classify soil by conducting field tests-Through Visual inspection, Dry strength test, Dilatancy test and Toughness test.
6. Determine coefficient of permeability by constant head test as per IS 2720 (Part- XVII).
7. Determine coefficient of permeability by falling head test as per IS 2720 (Part- XVII).
8. Determine shear strength of soil by triaxial shear test as per IS 2720 (Part- XIII).
9. Determine shear strength of soil by vane shear test as per IS 2720 (Part-XXX).
10. Determine the consolidation properties of given soil sample.
11. Find the unconfined compressive strength of given clay sample.
12. Study of CBR value on the field as per IS2720 (Part – XVI).
13. Study on Standard Penetration Test to find SBC of soil.

4010563 - GEOTECHNICAL ENGINEERING LABORATORY

SCHEME OF EXAMINATION:

DETAILED ALLOCATION OF MARKS

S.No	Description	Max.Marks (100)
1.	Procedure	10
2.	Tabulation and Observation	40
3.	Calculations	25
4.	Sketch / Graph	10
5.	Accuracy of result	10
	Viva Voce	5
	Total	**100**

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No	Description	Number required
1.	Glass cup, oven, Desiccator, Weighing balance and other accessories	1 set
2.	Hot air oven	1 no.
3.	Shear testing machine	1 no.
4.	Triaxial testing machine	1 no.
5.	Permeameter mould, compacting equipment. Drainage bade, cap, graduated glass jar, stop watch	1 set
6.	Vane shear test apparatus	1 no.
7.	Unconfined compressive strength apparatus	1 no.

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

V SEMESTER

ENTREPRENEURSHIP AND STARTUPS

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010570

Semester : V

Subject Title : **ENTREPRENEURSHIP AND STARTUPS**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENTREPRENEURSHIP AND STARTUPS	**4 Hrs.**	**64 Hrs.**	**25**	**100***	**100**	**3 Hours**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Entrepreneurship – Introduction and Process	10
II	Business Idea and Banking	10
III	Startups, E-cell and Success Stories	10
IV	Human Resource Management, Industrial Legislation and Micro and Small Enterprises	10
V	Preparation of Project Reports	10
	Field visits and preparation of case study report	14
Total		**64**

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and start ups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:

At the end of the course the students will be able to:

- Excite the students about entrepreneurship
- Acquire Entrepreneurial spirit and resourcefulness
- Understand the concept and process of entrepreneurship
- Acquire entrepreneurial quality, competency and motivation
- Learn the process and skills of creation and management of entrepreneurial venture
- Familiarize with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turnover
- Familiarization of various financial and non financial schemes
- Aware the concept of incubation and starts ups

DETAILED SYLLABUS

4010570 - ENTREPRENEURSHIP AND STARTUPS

Contents : Practical

Unit	Name of the Topics	Hours
I	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** • Concept, Functions and Importance • Myths about ntrepreneurship • Pros and Cons of Entrepreneurship • Process of Entrepreneurship • Benefits of Entrepreneur • Competencies and Characteristics • Ethical Entrepreneurship • Entrepreneurial Values and Attitudes • Motivation • Creativity • Innovation • Entrepreneurs - as problem solvers • Mindset of an employee and an entrepreneur • Business Failure – causes and remedies • Role of Networking in entrepreneurship	10
II	**BUSINESS IDEA AND BANKING** • Types of Business: Manufacturing, Trading and Services • Stakeholders: sellers, vendors and consumers and Competitors • E- commerce Business Models • Types of Resources : Human, Capital and Entrepreneurial tools • Goals of Business; Goal Setting • Patent, copyright and Intellectual property rights • Negotiations - Importance and methods • Customer Relations and Vendor Management	10

	• Size and Capital based classification of business enterprises • Role of financial institutions • Role of Government Policy • Entrepreneurial support systems • Incentive schemes for state government • Incentive schemes for Central governments	
III	**STARTUPS, E-cell and SUCCESS STORIES** • Concept of Incubation centre's • Activities of DIC, financial institutions and other relevance institutions • Success stories of Indian and global business legends • Field Visit to MSME's • Various sources of Information • Learn to earn • Startup and its stages • Role of Technology – E-commerce and Social Media • Role of E-Cell • E-Cell to Entrepreneurship	**10**
IV	**4.1 HUMAN RESOURCE MANAGEMENT** • Meaning of Manpower Planning • Recruitment and Selection procedure • Payment of wages, factors determining the wage • Methods of payment of wages – Time rate and Piece rate • Labour Turnover – definition, its causes, impact and remedy • THE BOCW ACT– The Building and Other Construction Workers (Regulation of Employment and Condition of Services) Act, 1996. The Building and Other Construction Workers (Regulation of Employment and Condition of Services) Central Rules, 1998	**4**

	4.2 INDUSTRIAL LEGISLATION: • Need of Industrial legislation • Indian Factories Act – 1948 – Definition of Factory, main provisions regarding health, Safety and Welfare of Workers • Industrial Dispute Act – 1947 – Definition of Industrial dispute, Machineries for settlement of Industrial dispute in India **4.3 MICRO AND SMALL ENTERPRISES** • Definition of Micro & Small enterprises • Meaning and characteristics of Micro and Small enterprise • Scope of SSI with reference to self-employment • Procedure to start SSI – idea generation, SWOT analysis- Selection of site for factories	**3** **3**
V	**PREPARATION OF PROJECT REPORTS FOR:** **5.1 PROJECT IDENTIFICATION AND FORMULATION REPORT:** • **Introduction -** Collection of Data. • Compilation of Data. • Analysis and Assimilation of Data. • Product Selection • Report Finalisation and Report Writing. **5.2 PROJECT PROFILE/PRE-FEASIBILITY REPORT :** • Introduction of the product • Market. • Man Power (Personnel Required). • Manufacturing Process- Plant and Machinery. Means of Finance • Cost of Production • Annual Turnover • Profit - Profit on Investment	**2** **5**

	5.3 TECHNO-ECONOMICAL FEASIBILITY REPORT (TEFR). • Introduction on product • Market Prospects and Marketing • Location • Manufacturing Programme and Annual Turnover • Manufacturing Process • Cost of Project • Means of Finance • Requirement of Raw materials, Consumables, Utilities and Working Capital • Organisational Structure, Management and Man Power • Project Implementation Schedule • Profitability and Cash Flow. **5.4 MARKET SURVEY REPORT FOR CONSTRUCTION PROJECT:** • Data Collection & Processing through Primary & Secondary Sources • Questionnaire - method, e-mail, by post, by phone - • Present Status - Growth of the Industry- Import and Export - Present market Demand • Forecast - Future Prospect/Scope - Market Segmentation.	**3**

Reference Books:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra - 282002
2. Dr. G.K. Varshney, Business Regulatory Framework , Sahitya Bhawan Publications, Agra - 282002
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301
4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
5. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301

6. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
7. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
8. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
9. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers, Rajasthan
10. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
11. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioners guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

Board Examination – Evaluation Pattern Internal Mark Allocation

Assignment (Theory portion)*	-	10
Seminar Presentation	-	10
Attendance	-	5
Total	**-**	**25**

Note:

***** Two assignments should be submitted. The same must be evaluated and Converted to 10 marks.

Each assignment should have five three marks questions and two five marks questions.

Guidelines for assignment:

First assignment – Unit I

Second assignment – Unit II

Guidelines for Seminar Presentation – Unit III

BOARD EXAMINATION

Note:

1. The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.
2. The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Board Practical Examinations.

3. The question paper consists of theory and practical portions. All students should write the answers for theory questions (45 Marks) and practical portions (55 Marks) should be completed for board examinations.
4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do the examination for 3 Hrs.
5. For Written Examination: theory question and answer: 45 Marks

   Ten questions will be asked for 3 marks each. Five questions from each unit 1 & 2. (10 X 3 = 30).

   Three questions will be asked for 5 marks each. One question from each unit 1, 2 & 3. (3 X 5 = 15)
6. For Practical Examination: The business plan/Feasibility report or Report on Unit 4 & 5 should be submitted during the board practical examinations. The same have to be evaluated for the report submission (40 marks).

DETAILED ALLOCATION OF MARKS

S. No	Description	Marks
Part A	Written Examination - Theory Question and answer (10 questions x 3 marks:30 marks & (3 questions x 5 marks: 15 marks)	45
Part B	Practical Examination – Submission on Business Plan/Feasibility Report or Report on Unit 4 & 5	40
Part C	Viva voce	15
	TOTAL	**100**

VI SEMESTER

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

CONSTRUCTION MANAGEMENT

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010610

Semester : VI Semester

Subject Title : **CONSTRUCTION MANAGEMENT**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CONSTRUCTION MANAGEMENT	6 Hrs.	96 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Construction sector in India Feasibility study, planning of Civil Engineering Project and Contract Management	18
II	Construction Organisation and their Superintendence, Departmental procedure and Accounting	18
III	Scheduling and Time Management Resource Management	18
IV	Quality Management and Safety, Construction Disputes and their Settlement, Construction Labour and Legislation Ethics in Engineering	18
V	Entrepreneurship, Information Management and Computers and Financial Management	17
	Test & Model Exam	7
	Total	**96**

RATIONALE:

This is an applied engineering subject. The subject aims at imparting basic knowledge about construction planning and management, site organisation, construction labour, control of work progress, inspection and quality control, accidents and safety and heavy construction equipment.

A good percentage of diploma engineers start working as small contractors. They require the knowledge of contractorship, tendering and preparation of specifications for various types of jobs. Also diploma holders adopt valuers as their profession. To promote entrepreneurship amongst these engineers, knowledge and associated skills in the above field becomes essential. Hence this subject is of great importance to diploma engineers.

OBJECTIVES:

On completion of the course, the students will be able to:

- Describe the Role of government and construction agencies in the field of housing
- Describe the organization set up of PWD
- Mention the construction activity and fixing the construction agency.
- Describe the aspects of inspection and quality control methods
- Describe the banking system.
- Carryout the Feasibility study of a project
- Understand the process of Planning for civil engineering projects.
- Explain the significance of CPM and PERT Techniques.
- Understand the types of contract system
- Study the organization chart of a construction company.
- Understand the concepts and requirement of Entrepreneurship
- Perform the Computation of Net present value.

DETAILED SYLLABUS

4010610 - CONSTRUCTION MANAGEMENT

Contents: Theory

Unit	Name of the Topics	Hours
I	**1.1 CONSTRUCTION SECTOR IN INDIA** Construction Management – Definition- Need – Scope - Objectives and & functions - Role of government and private construction agencies – Types of construction sectors - Public and Private functions of construction management in national development - Construction practice:- the owner, consultant, and contractor - Duties and responsibilities - Various stages of a construction project.	5
	1.2 FEASIBILITY STUDY Study of necessity of project– Technical feasibility, Financial feasibility, Ecological feasibility, Resource feasibility, Recovery from the project, Economical Analysis –Building Economics – Preliminary studies- Analysis – valuation.	4
	1.3 PLANNING OF CIVIL ENGINEERING PROJECT Objectives of planning – Public Project - Preliminary planning – Design factors – Site utilization- – Reconnaissance survey – Preliminary survey – Analysis and plotting of data – Estimate : preliminary and detailed estimate – Project report – Land acquisition – Administrative approval – Technical sanction – Budget provision- Private project – Advantages of planning to client and engineer – limitations -Stages of planning by owner and contractor.	5
	1.4 CONTRACT MANAGEMENT Types of contracts - Contract documents - Contractual obligations - Specifications - Tender notice – Types - Tender documents - Earnest Money Deposit (EMD) and Security Deposits (SD) - Scrutiny and acceptance of a tender - Contract agreement – Contractual changes and termination of contract – Work order – Execution of agreement – Sub contract - Rights and duties of sub-contractor.	4

II	**2.1 CONSTRUCTION ORGANISATIONS AND THEIR SUPERINTENDENCE** Forms of business organizations - sole proprietorship – Partnership - Joint stock company,- Co-operative society,- and State enterprises- Advantages and Disadvantages -delegation of responsibility, personnel requirements and division of works – Decentralization - Construction supervision and Superintendence – Requirements and Responsibilities of Executives of the project – Qualities of Efficient construction Manager - Pay rolls and Records - Purchase and delivery of construction materials and equipments – Percentage completion report - Insurance record - Project office requirement - Organisation chart of a small / medium / large construction company (broad outline only). **2.2 DEPARTMENTAL PROCEDURE AND ACCOUNTING** Organisation of P.W.D. - Responsibilities of officers - Accounting procedure (administrative sanctions, technical sanctions, payment of bills) – Imprest and Temporary accounts – Cash book - Works register - Accounting for consumable materials - Record for tools and plants – Importance of M-book and its entries – Work charged establishment – Nominal Muster Roll (N.M.R) – Daily Labour Reports (D.L.R)	**10** **8**
III	**3.1 SCHEDULING AND TIME MANAGEMENT** Scheduling – Definition – Preparation of Schedule – uses and advantages – Classification of Schedules – Methods of scheduling – Bar chart – Job layout – Work breakdown chart(WBC) – Network for projects management – Activity – Event – Dummies – Basic assumptions in creating a network – Rules for developing networks – Fulckerson's rule for numbering the events - Critical Path Method Critical and Subcritical paths – Critical and Non critical activities/ events – Significance of critical path – Simple Problems - PERT – Time estimate – EST, EFT, LST, LFT - Earliest expected time – Latest allowable occurrence time –Floats - Slack. Standard deviation - Variance – Simple problems.	**10**

	3.2 RESOURCE MANAGEMENT Definition – Need for resource management – Optimum utilization of resources- finance, materials, machinery, human resources - Resource planning – Resource levelling and its objectives – Construction planning – Stages – Operations – Schedule –Crashing – Need for crashing an activity – Methods and tips for crashing – Time Vs Cost optimization curve – Cost slope and its significance in crashing – simple problem on resource levelling (Description only)	**8**
IV	**4.1 QUALITY MANAGEMENT AND SAFETY** Importance of quality – Elements of quality – Quality assurance techniques (inspection, testing, sampling) Importance of safety – Causes of accidents – Role of various parties (designer / employer / worker) in safety management – Benefits – Approaches to improve safety in construction. **4.2 CONSTRUCTION DISPUTES AND THEIR SETTLEMENT** Introduction – Development of disputes – Categories of disputes – Modes of settlements - Arbitration. **4.3 CONSTRUCTION LABOUR AND LEGISTATION** Need for legislation - Payment of wages Act - Factories Act – Contract labour(Regulation and abolition) Act – Employees Provident Fund (EPF) Act. **4.4 ETHICS IN ENGINEERING** Human values - Definition of Ethics - Engineering ethics - Engineering as a profession - Qualities of professional - Professional institutions - Code of ethics - Major ethical issues - Ethical judgement - Engineering and management decision - Value based ethics.	**6** **3** **4** **5**
V	**5.1 ENTREPRENEURSHIP** Definition – Role and Significance – Risks and Rewards – Concepts of Entrepreneurship – Profile and requirement of entrepreneur - Programmes existing in India – SISI, DIC, TANSIDCO – Funding and technical assistance to Entrepreneurship- NIDCO,ICICI,IDBI,IFCI,SFC.	**5**

	5.2 INFORMATION MANAGEMENT AND COMPUTERS Introduction – Definition of MIS – Out lines of MIS – Use of computers in construction industry – Requirements of MIS – A data base approach – Definition – Benefits - A data base approach to contractor's account and its advantage – Basic concepts of estimation – Project management and operations simulation packages – Construction automation and Robotics. **5.3 FINANCIAL MANAGEMENT** Elements of cash flow – Time value of money – Interest rate of capital – Present value computation - NPV method – IRR method – simple problems - Global banking culture - Types of banks –Activities of Banks – Corporate finance – Personal, retail and rural banking – Treasury management.	6 6
	Test & Model Exam	**7 Hrs.**

Reference Books

1. Sanga Reddy. S, "Construction Management",Kumaran Publications, Coimbatore.
2. Sengupta.B, &H.Guha. "Construction Management and Planning ",Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Seetharaman. S, " Construction Engineering & Management ",Umesh Publications, NaiSarak, New Delhi
4. Boyd.C. & Paulson Jr, "Computer Applications in Construction ",Tata McGraw Hill Publishing company Ltd., New Delhi.
5. Rangwala.S.C.,"Construction of Structures and Management of Works" Charotar Publishing House, Anand 388 001, 2000
6. B C Punmia, " Project Planning and control with PERT and CPM", Laxmi Publications.

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

ESTIMATION, COSTING AND VALUATION

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N - SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010620

Semester : VI Semester

Subject Title : **ESTIMATION, COSTING AND VALUATION**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ESTIMATION, COSTING AND VALUATION	**6 Hrs.**	**96 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Introduction, Approximate Estimates, Measurements and Material Requirement and Specifications	15
II	Preparation of Data and Rate Analysis	16
III	Detailed Estimate : Taking of quantities by Trade System	20
IV	Detailed Estimate : Taking of quantities by Group System	20
V	Report Writing, Valuation and Rent Calculation	18
	Test & Model Exam	7
	Total	**96**

RATIONALE:

Diploma holders in Civil Engineering are supposed to prepare material estimates and cost estimates for various Civil Engineering works namely; buildings, irrigation works, public health works and roads etc. In addition, they must have basic knowledge regarding analysis of rates and contracting principles of valuation. Therefore, this subject has great importance for diploma holders in Civil Engineering.

OBJECTIVES:

On completion of the course, the students will be able to:

- Learn the procedure for estimating and costing of Civil Engineering works. To write specifications for various materials and for different items of works.
- Perform rate analysis for various items of works using Standard data and Schedule of Rates.
- Prepare detailed estimate of quantities of various items of works
- Write Technical reports on the proposed projects
- Calculate the value of a building / property; to fix rent for a building adopting suitable method.

DETAILED SYLLABUS

4010620 - ESTIMATION, COSTING AND VALUATION

Contents: Theory

Unit	Name of the Topics	Hours
I	**1.1 INTRODUCTION:** Estimation – Definition of Estimate – Approximate estimate – Detailed estimate - Main estimate - Revised estimate – Supplementary estimate – Sub estimate – Annual maintenance estimate – Repair estimate – Complete estimate.	**3**
	1.2 APPROXIMATE ESTIMATES: Necessity – Types – Plinth area method – Cubical content method – Service unit method – Typical bay method – Simple problems on preliminary estimate of a building project.	**3**
	1.3 MEASUREMENTS & MATERIAL REQUIREMENTS: Units of measurements for works and materials – Degree of accuracy in measurements - Deduction for openings in masonry, plastering and white washing area – Painting co- efficient – out turn of works - working out of materials requirements – cement, sand, bricks, aggregates etc based on thumb rules for different works.	**4**
	1.4 SPECIFICATIONS: Specification – Necessity – Types of specifications – Essential requirements of specifications – Specification for various materials like Cement, Sand, Brick, Timber, Reinforcement Steel, Stone Aggregate, Water - Specifications for various items of works – General Specifications for a building - Culvert - Concrete Roads - Detailed specifications for works such as, earthwork excavation, foundation concrete, Reinforcement cement concrete in column, beam and slab - Weathering course - Steps involved in writing standard specifications.	**5**

II	**2.1 PREPARATION OF DATA** Data – Types – Main and sub data – Observed data – lead statement - Schedule of rates – Standard data book – Sundries – Lump sum provision – Preparation of data using standard data and schedule of rates. **2.2 RATE ANALYSIS:** Brick and stone masonry – Plain cement concrete in foundation – Cement concrete for flooring works - Weathering course – R.C.C works for slab, sunshade, beam and column – Partition wall – Form works for beams and slabs – Road works, WBM and surface dressing – White washing and painting works – A.C. sheet roofing – Apron and revetment works in canals – Wall plastering – Ceiling plastering – Pointing – Plumbing and sanitary works in buildings.	**4** **12**
III	**3.1 TRADE SYSTEM:** Introduction - Taking off Quantities: Systems – Trade system – Group system – Methods – Long wall and Short wall method – Centre line method – Preparation of data – Lump sum provision and contingencies – Quantity surveyor – Duties – Essential Qualities. **3.2 TAKING OFF QUANTITIES USING TRADE SYSTEM:** Prepare detailed estimate using Trade system and Take off quantities for all items of works in the following types of buildings: **i.** A small residential building with two rooms with RCC roof. ii. Industrial buildings with AC/GI sheet roof with steel trusses. iii. Community Hall with R C C columns and T- beams iv. Septic tank with dispersion trench / soak pit v. R.C.C slab culvert vi. Water bound Macadam Road	**2** **18**

IV	**4.1 GROUP SYSTEM:** Advantages of group system – Taking off and Recording Dimensions – Squaring Dimensions – Abstracting or Working up – Billing – Abbreviations. Dimension paper – Timesing, Dimension, Squaring, Descriptive column – Cancellation of Dimensions – Descriptions – Spacing of Dimensions – Order of taking off – Squaring the Dimensions - Method of Squaring – Checking the Squaring – Casting up the dimensions. Function of the Abstract – Order in the Abstract – Preparing the abstract – Casting and reducing the Abstract – Method of writing Bill – Checking the Bill. **4.2 TAKING OFF QUANTITIES USING GROUP SYSTEM:** Prepare detailed estimate using Group system and Take off quantities for all items of works in the following types of buildings: i. A single roomed building using Group system ii. A small residential building with two/three rooms with RCC roof.	**10** **10**
V	**5.1 REPORT WRITING:** Report writing – Points to be considered while writing a report – writing typical reports for works such as i. Buildings – Residential / Hospital / School ii. Laying a village road iii. Construction of a bridge iv. Water supply system for a village **5.2 VALUATION** Purpose of valuation – Types – Book value – Market value – Salvage value – Scrap value – Depreciation – Obsolescence – Sinking fund – Land valuation – Mortage & Lease – Problems on valuation – Annuity – Definition & types only. **5.3 RENT CALCULATION** Fixation of rent – Outgoing – Gross & Net income – Years' Purchase – Capital cost – Standard rent – Market rent – Economical rent – Problems on rent calculation.	**4** **8** **6**
	Test & Model Exam	**7 Hrs.**

Reference Books:

1. Rangawala, “Estimating & Costing” , Charotor Publishing;
2. N.A.Shaw, “Quantity Surveying & Valuation”, Khanna Publishers;
3. L.N.Dutta, “Estimating & Costing”, Dhanpat Rai & Sons
4. Bridie, “Estimating & Costing”
5. Civil Estimating, Casting and Valuation – Kalson Publication, Ludhiana.
6. Vazirani & Chandola,” Estimating and Costing” 2001.
7. IS:1200 - Methods of Measurement of Building and Civil Engineering works.

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

SUSTAINABLE AND GREEN BUILDING TECHNOLOGY

(Elective Theory-II)

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010631

Semester : VI Semester

Subject Title : **SUSTAINABLE AND GREEN BUILDING TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
SUSTAINABLE AND GREEN BUILDING TECHNOLOGY	5 Hrs.	80 Hrs.	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Introduction to Green Building and Design Features	15
II	Energy Audit and Environmental Impact Assessment (EIA)	15
III	Energy and Energy conservation	15
IV	Principles and planning of Green building	14
V	Rating System	14
	Test & Model Exam	7
	Total	**80**

RATIONALE:

On learning Sustainable and Green Building Materials, the students will be able to Identify various requirements for green building, use different steps in environmental impact assessment, relate the construction of green building with prevailing energy conservation policy and regulations, supervise the construction of green building construction using green materials and focus on criteria related to particular rating system for assessment of particular Green building.

OBJECTIVES:

After the completion of this course, the students will be able to:

- Know various aspects of green buildings
- Use different steps involved in measuring environmental impact assessment.
- Relate the construction of green building with prevailing energy conservation policy and regulations.
- Know and identify different green building construction materials.
- Learn different rating systems and their criteria

DETAILED SYLLABUS

4010631 - SUSTAINABLE AND GREEN BUILDING TECHNOLOGY

Contents: Theory

Unit	Name of the Topics	Hours
I	**INTRODUCTION TO GREEN BUILDING AND DESIGN FEATURES** Definition of Green Building, Benefits of Green Building, Components/ features of Green Building, Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality. Site selection strategies, Landscaping, building form, orientation, building envelope and fenestration, material and construction techniques, roofs, walls, fenestration and shaded finishes, advanced passive heating and cooling techniques, waste reduction during construction.	**15**
II	**ENERGY AUDIT AND ENVIRONMENTAL IMPACT ASSESSMENT (EIA)** **2.1 ENERGY AUDIT**: Meaning, Necessity, Procedures, Types, Energy Management Programs. **2.2 ENVIRONMENTAL IMPACT ASSESSMENT (EIA):** Introduction, EIA regulations, Steps in environmental impact assessment process, Benefits of EIA, Limitations of EIA, Environmental clearance for civil engineering projects.	**7** **8**
III	**ENERGY AND ENERGY CONSERVATION** **3.1 ENERGY:** Renewable Energy Resources: Solar Energy, Wind Energy, Ocean Energy, Hydro Energy, Biomass Energy. Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical Sources of Energy, Fuel Cells, Hydrogen, Biofuels. **3.2 ENERGY CONSERVATION** Introduction, Specific objectives, present scenario, Need of energy conservation, LEED India Rating System and Energy Efficiency.	**8** **7**

	Energy-saving houses, Green House, Passive house, Passive house construction, Low-energy house, Zero-energy house, Energy consulting, Energy efficiency:	
IV	**PRINCIPLES AND PLANNING OF GREEN BUILDING** Features: Salient features of Green Building, Environmental design (ED) strategies for building construction. Process: Improvement in environmental quality in civil structure Materials: Green building materials and products- Bamboo, Rice husk ash concrete, plastic bricks, Bagasse particle board, Insulated concrete forms. reuse of waste material-Plastic, rubber, Newspaper wood, Nontoxic paint, Green roofing. Housing modernization and management (building and construction safety, energy efficiency in housing, Property Refurbishment / Upgrade / Modernization / Renovation - Modular kitchens, bathrooms,	**14**
V	**RATING SYSTEM** Introduction to (LEED) criteria, Indian Green Building council (IGBC) Green rating, Green Rating for Integrated Habitat Assessment. (GRIHA) criteria Heating Ventilation Air Conditioning (HVAC) unit in green Building Functions of Government organization working for Energy conservation and Audit(ECA) - National Productivity council(NPC) Ministry of New and Renewable *Energy* (MNRE) Bureau of Energy efficiency (BEE) - BER (Building Energy Rating) - Certificates – Plumbing and Electrical to heating efficiency	**14**
	Test & Model Exam	**7 Hrs.**

Reference Books

1. Kibert, C.J., Sustainable construction: Green Building design and Delivery, John Wiley Hobouken, New Jersey.
2. Chauhan, D S Sreevasthava, S K., Non-conventional Energy Resources, New Age International Publishers, New Delhi.
3. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
4. Jagadeesh, K S, Reddy Venkatta Rama & Nanjunda Rao, K S., Alternative Building Materials and Technologies, New Age International Publishers, Delhi.
5. Sam Kubba., Handbook of Green Building Design and Construction, Butterworth-Heinemann.
6. Means R S, Green Building - Project Planning and Cost Estimating, John Wiley & Sons
7. Sharma K V, Venkataseshaiah P., Energy Management and Conservation, IK International.

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

URBAN PLANNING AND DEVELOPMENT

(Elective Theory-II)

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name **:** 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code **:** 4010632

Semester **:** VI Semester

Subject Title **: URBAN PLANNING AND DEVELOPMENT**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
URBAN PLANNING AND DEVELOPMENT	5 Hrs.	80 Hrs.	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 75 Marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Town planning Principles, Surveys and Zoning	15
II	Housing and Slums	15
III	Public Buildings, Parks, Play Grounds, Master Plan and Re-planning Existing Towns	15
IV	Urban Roads and Traffic Management	14
V	Building Bye-Laws and Miscellaneous Topics	14
	Test & Model Exam	7
	Total	**80**

RATIONALE:

Considerable employment opportunities are available in urban sector. This subject aims at imparting knowledge and skill in the Town Planning and surveys, urban roads and Traffic management, Master plan and Building bye laws which can be promoted for upgrading standards of life in urban areas.

OBJECTIVES:

On completion of the course, the students will be able to:

- Understand the principle of Town Planning and surveys.
- Know the requirements of housing and slum clearance.
- Learn the requirement of Public buildings, parks and play grounds.
- Understand the requirements and types of Urban roads and Traffic management
- Know the Importance of housing and slum clearance programmes
- Prepare Master plan and for Re-planning of existing Towns.
- Learn the Building bye laws and other miscellaneous topics.

DETAILED SYLLABUS

4010632 - URBAN PLANNING AND DEVELOPMENT

Contents: Theory

Unit	Name of the Topics	Hours
I	**1.1 TOWN PLANNING PRINCIPLES** General - Evolution of planning - Objects of town planning – Economic justification for town planning - Principles of Town planning - Necessity of town planning - Origin of towns - Growth of towns – Stages in town development - Personality of town - Distribution of land - Forms of planning - Site for an ideal town - Requirements of new towns - Planning of a modern town - Powers required for enforcement of Town planning scheme - Cost of Town planning - Present position of Town Planning in India. **1.2 SURVEYS** General – Necessity - Collection of Data - Types of surveys for planning a new town - Uses of surveys. **1.3 ZONING** Meaning of the term - Uses of land, objects and Principles of Zoning - Advantages of Zoning - Importance of Zoning - Aspects of Zoning – Transition Zone – Economy of Zoning – Special Economic Zone (SEZ) - Zoning powers - Maps for Zoning.	**7** **3** **5**
II	**2.1 HOUSING** General - Importance of housing - Demand for houses - Building site - Requirements of residential buildings -Classification of residential buildings - Design of residential areas - Rural Housing - Agencies for housing -Investment in housing - HUDCO – CIDCO - Housing problems in India. **2.2 SLUMS** General - Causes of slums - Characteristics of slums - Effects of	**7** **8**

	slums - Slum clearance - Problems in removing slums - Improvement Works - Open plot scheme - Slum clearance and rehousing - Prevention of slum formation - Resources for slum clearance programmes - The Indian slums.	
III	**3.1 PUBLIC BUILDINGS** General – Suitable Location of Public Buildings – Classification of Public Buildings - Principles of design of public buildings - Town centres - Grouping of public buildings – Requirements of Public buildings – Green House– Civic aesthetics. **3.2 PARKS AND PLAY GROUNDS** General – Types of recreation - Necessity of open spaces - Location of urban green spaces - Classification of parks - Park systems - Park design – Finance for parks – Parkways – Playgrounds - Space standards - Landscape architecture. **3.3 MASTER PLAN** General – Objects – Necessity - Factors to be considered - Data to be collected - Drawings to be prepared - Features of master plan - Planning standards – Report – Stages of preparation – Method of Execution - Conclusion. **3.4 RE-PLANNING EXISTING TOWNS** General - Objects of re-planning – Analyzing the defects of existing towns - Data to be collected –difficulties in Master Planning existing towns / cities - Urban renewal projects- merging of suburban areas – Decentralization - Satellite Towns – Smart cities- definition and features- Surface drains – Refuses of Towns – Refuse disposal methods.	**3** **4** **4** **4**
IV	**4.1 URBAN ROADS** General - Objects - Requirements of good city road – Factors to be considered – Classification of urban roads – Types of street systems - Through and By-pass roads – Outer and inner ring roads - Expressways – Freeways – Precincts - Road aesthetics.	**6**

	4.2 TRAFFIC MANAGEMENT General - Object – Traffic survey - Traffic congestion – Traffic control - Traffic diversion - Road junction –Parking - Traffic capacity of road - One way traffic - Road traffic problems – Use of islands and flyovers at crossings – causes of road accidents - Traffic signal – Advantages and disadvantages of Automatic Light signals – Road sign – Road marking - Name boards of streets - Direction boards - Street lighting in a town – Traffic problem of existing towns – Peculiarities of traffic.	**8**
V	**5.1 BUILDING BYE -LAWS** General - Objects of bye-laws - Importance of bye-laws - Function of local authority - Responsibility of owner - Applicability of bye-laws - Set-backs to buildings – Necessity of setbacks - Light plane – Plot coverage - Floor space index- Maximum Height of buildings - Off-street parking – Fire protection - Minimum width of streets and plot sizes – Some other terms - Principles underlying in framing building bye- laws – Building bye-laws for residential area of a typical town planning scheme – Building bye-laws for other types of buildings -Development control rules - General rules of metropolitan Area - CMDA rules. **5.2 MISCELLANEOUS TOPICS** Airports – Location - size - Noise control - Parts of an airports - Betterment and compensation – City blocks –Conurbations - Cul-de-sac streets - Focal point - Green belt - Public utility services - Rapid transit –Remote sensing application – Urban planning using remote sensing – Site suitability analysis Location of Bus Terminus, Whole sale markets, Exhibition Centres etc., – Location for water/sewage treatment plants, location for waste disposal etc.,– Transportation planning.	**8** **6**
	Test & Model Exam	**7 Hrs.**

Reference Books

1. Town Planning - S.C. Rangwala,: Charotar Publisher (2011), Publisher
2. K.S.Rangwala and P.S.Rangwala,. „Town Planning ”,Charotar Publishing House,15th Edition,1999.
3. Michael Hord, R. Remote sensing methods and application, John Wiley and Sons, NewYork, 1986.
4. National Building Code of India- Part-III.(2005).
5. Municipal and Panchayat bye-laws, CMDA Rules and Corporation bye-laws.
6. KA. Ramegowda, Urban and regional planning , University of Mysore
7. Principles and practice of town and country planning Lewis B. Keeble, Estates Gazette, University of Michigan, 2010

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

WATER RESOURCES ENGINEERING

(Elective Theory-II)

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010633

Semester : VI Semester

Subject Title : **WATER RESOURCES ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
WATER RESOURCES MANAGEMENT	**5 Hrs.**	**80 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 75 Marks.

Topics and Allocation of Hours

Unit	Topics	Hours
I	Introduction and Hydrology	15
II	Ground Water and Management of Ground Water	15
III	Rivers and River Training Works, Storage Works	15
IV	Distribution Works and Management of Canal Irrigation	14
V	Water Shed Management and Water Harvesting and Recycling	14
	Test & Model Exam	7
	Total	**80**

RATIONALE:

Diploma holders in civil engineering have to supervise the construction, repair and maintenance of canals, head works, river training works, cross drainage works, regulatory and other works. Some of the diploma holders are also engaged for preventing water logging and irrigation by tubewells. This subject imparts knowledge regarding hydrology, flow irrigation – storage and distribution system, constructional features of head works, river training works, cross drainage works, causes and prevention of water logging and construction of tube wells.

OBJECTIVES:

On completion of the course, the students will be able to:

- Understand water resource potential in India and need for water resource management.
- Understand the components of hydrological cycle and hydrograph.
- Understand the occurrence of ground water and ground water explorationmethods.
- Understand the ground water basin management concept.
- Learn the classification of rivers and river training works.
- Know the different types of storage works and dam structures.
- Understand the distribution system of canals and management of canalirrigation.
- Understand the concept of water shed management including GISapproach.
- Learn the types of detention basins and reclamation of water logged lands.

DETAILED SYLLABUS

4010633 - WATER RESOURCES ENGINEERING

Contents: Theory

Unit	Name of the Topics	Hours
I	**1.1 INTRODUCTION** Water resources – world water inventory - Importance of water resources - Necessity for conservation and development of water resources – water resources of India - water resources management - purpose - factors involved in water resources management.	7
	1.2 HYDROLOGY Introduction – Definition - Application of Hydrology in engineering - Hydrological cycle - Precipitation – forms of Precipitation - measurements of rain fall - Rain gauge - types of rain gauges - rain gauge network – mean rainfall over a drainage basin – methods - Radar and Satellite Measurements of rainfall - runoff - Estimation of runoff - losses – Hydrograph – Unit Hydrograph - uses	8
II	**2.1 GROUND WATER** Ground water resources- zones of Ground water-Aquifer - types-terms used –porosity, permeability, yield, specific yield, specific retention, coefficient of storage, specific capacity – Darcy's law- measurement of yield of well -pumping test- recuperation test- ground water exploration –geo physical methods -Electrical resistivity method – seismic resistivity method- logs.	8
	2.2 MANAGEMENT OF GROUND WATER Concept of basin management - Ground water basin investigations - data collection and field work -mining yield - perennial yield - salt balance - basin management by conjunctive use - artificial recharge of Ground water - recharge methods.	7

III	**3.1 RIVERS AND RIVER TRAINING WORKS** Classification of river - Major rivers in India and Tamil Nadu -Inter linking of rivers in India and its importance – flood - flood forecasting - flood control in India. River training - objectives of river training - classification of river training - methods of river training – levees - guide banks – spurs – types - artificial cut-offs – launching apron - pitching of banks - pitched islands - miscellaneous methods. **3.2 STORAGE WORKS** Surface storage - purpose of surface storage – tanks – types - tank weirs – tank outlet – reservoirs – types - storage capacity of reservoir - methods of determination of storage capacity of reservoir – reservoir losses – dams - classification of dams - selection of dam site - Earth dams – types - methods of construction- causes of failure of earth dam - remedial measures – spillway - types - spillway crest gates- types – sluiceway - types.	**7** **8**
IV	**4.1 DISTRIBUTION WORKS** Irrigation Canal - Typical cross section of canal - components of canal section - classification of canal -alignment of canal - canal head works – types - components of diversion head works - cross drainage works – types - canal losses - lining of canal – necessity - types of lining. **4.2 MANAGEMENT OF CANAL IRRIGATION** Canal irrigation system - Need for canal irrigation management - objectives of canal irrigation management - methods of improvingcanal irrigation management - cropping pattern - need for crop rotation - crop water requirement - water delivery system - irrigation scheduling - frequency of irrigation - optimum use of irrigation water - irrigation efficiencies - conservation of water on the field - farmer's participation - irrigation manager.	**7** **7**

V	**5.1 WATER SHED MANAGEMENT** Water shed - classification of water sheds - integrated approach for water shed management - role of remote sensing and GIS in water shed management - soil and water conservation – Necessity - soil erosion – causes - effects – remedial measures against erosion - contour bunding - strip cropping - bench terracing – check dams - vegetated water way – afforestation - crop residue - land drainage - surface drains - sub surface drains. **5.2 WATER HARVESTING AND RECYCLING** water harvesting - runoff collection - onsite detention basin - ponds - types - Seepage control – methods -evaporation control - Recycling of harvested water - waste water recharge for reuse – methods -water logging-remedial measures-soil reclamation.	**8** **6**
	Test & Model exam	**7 Hrs.**

Reference Books :

1. Santhosh Kumar Garg, Hydrology and Water Resources Engineering, Khanna Publishers, Delhi.
2. G.L.Asawa, Irrigation and Water Resources Engineering, New ageinternational(p) Ltd., Publishers, New Delhi.
3. David Keith Todd., Ground water Hydrology,John wiley &sons,Singapore.
4. Dilip Kumar Majumdar, Irrigation Water Management - Principles and Practice, PHI Pvt.Ltd. NewDelhi-1.
5. Madan Mohan Das & Mimi Das Saikia, Irrigation and water power Engineering,PHI learning pvt. Ltd., NewDelhi-1
6. K.Subramanya, Engineering hydrology, Tata McGraw-Hill publishing company ltd., New Delhi.

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

COMPUTER APPLICATIONS IN CIVIL ENGINEERING PRACTICE

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010 **:** DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010640

Semester : VI Semester

Subject Title : **COMPUTER APPLICATIONS IN CIVIL ENGINEERING PRACTICE**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hour / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
COMPUTER APPLICATIONS IN CIVIL ENGINEERING PRACTICE	**5 Hrs.**	**80 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

Computers play a very vital role in present day life, more so, in all the professional life of engineering. In order to enable the students use the computers effectively in problem solving, this course offers various engineering applications of computers in civil engineering.

OBJECTIVES:

After completing this course, students will be able to:

- Prepare the estimate and abstract estimate using Electronics Spread sheet software.
- Know the RCC detailihng using software.
- Analyse the simple frame structure using software.
- Use the Construction Project Management Software to develop the CPM/PERT network.
- Practice the Aerial Map using GIS software.

DETAILED SYLLABUS

4010640 - COMPUTER APPLICATIONS IN CIVIL ENGINEERING PRACTICE

Contents: Practical **Total: 80 Hrs.**

PART - A

LIST OF EXPERIMENTS

I ELECTRONIC SPREAD SHEET USING SOFTWARE **20 Hours**

Solving problems involving estimation, analysis and design using any one of the available packages mentioned below or any other suitable packages for the following exercises.

1. Prepare the Estimate sheet with given data (provide all the measurement details) and calculate the quantity using formula bar.
2. Prepare the Abstract sheet for the given data and calculate Amount and Total Amount using Formula bar (Use separate column for rates and units)
3. Design and Analysis problems
4. Calculate Area and Elongation using Formula bar
5. Calculate Effective depth'd' and Area of Steel 'A_{st} 'using Formula Bar for given singly reinforced section.
6. For given dimension of Masonry/R.C.C Dam ie. top width, bottom width, height of Dam , height of water, Specific weight of masonry/R.C.C. , Sp.wt of Water etc,. Find the base pressure and check the stability of the dam.
7. Finding centre of gravity; I_{xx} and I_{YY} of I, L, T and channel sections.

Note : In addition to the above, similar exercises may be given for practice

Commercial Software	Similar Open source	Download Link
Microsoft Office	Open office	http://download.openoffice.org/
	LibreOffice	http://www.libreoffice.org/

PART B

II RCC DETAILING USING SOFTWARE 20 Hours

Generation of detailed drawings for the given specification and Preparation of Bar Bending schedule using any one of the software packages for the following exercises.

Cross section and longitudinal section of:

1. Continuous one way slab (with three equal spans)
2. Simply supported two-way slab
3. Restrained two - way slab
4. Singly reinforced rectangular beam
5. Doubly reinforced continuous rectangular beam with two equal span
6. Dog-legged staircase
7. R.C.C Column with square Isolated footing

III RCC STRUCTURES - ANALYSIS USING SOFTWARE 20 Hours

1. Carry out the analysis and design of simple RCC structures using any one of the available packages like STAADPRO, ETAB, CADS3D or any other suitable packages.

IV. CONSTRUCTION PROJECT MANAGEMENT USING SOFTWARE 12 Hours

1. Develop the CPM / PERT Network for the proposed simple building project using any one of the available packages mentioned below or any other suitable packages.

Commercial Software	Similar Open source	Download Link
Microsoft Project	GANTT PROJECT	http://www.ganttproject.biz/

V. DRAWING MAPS USING GIS SOFTWARE 8 Hours

(Demonstration and Practice only)

1. Develop Aerial map of given area using **any one** of the available packages mentioned below or any other suitable packages.

Commercial Software	Similar Open source	Download Link
ARCGIS	QGIS	http://www.qgis.org/en/site/
	GRASS GIS	http://grass.osgeo.org/

SCHEME OF EXAMINATION:

In the examination the students have to be given two experiments one from Part A and another from Part-B.

DETAILED ALLOCATION OF MARKS

S.No	Description	Part - A Max.Marks (40)	Part - B Max.Marks (55)
1.	Procedure	5	5
2	Tabulation and Observation	15	25
3	Calculations	10	15
4	Sketch / Graph	5	5
5	Accuracy of result	5	5
	Viva Voce	5	
	Total	**100**	

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of the Equipments	Quantity Required
1.	Computers	30 Nos.
2.	Suitable Software for Electronic Spread Sheet	30 Users
3.	Suitable RCC Detailing Software	30 Users
4.	Suitable Structural Analysis Software	30 Users
5.	Suitable Project Management Software	30 Users
6.	Suitable GIS Software	30 Users

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

ESTIMATION AND COSTING LABORATORY

(Elective Practical -II)

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name **:** 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code **:** 4010651

Semester : VI Semester

Subject Title **:** **ESTIMATION AND COSTING LABORATORY**

TEACHING AND SCHEME OF EXAMINATION:

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ESTIMATION AND COSTING LABORATORY	**4 Hrs.**	**64 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

EstimatIon and Costing Lab deals with the procedure for estimating and costing of Civil Engineering works and to perform rate analysis for different items associated with construction projects.

OBJECTIVES:

After completing this course, students will be able to:

- Select modes of measurements for different items of works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques

DETAILED SYLLABUS

4010651 - ESTIMATION AND COSTING LABORATORY

Contents: Practical Total: 64 Hrs.

List of Experiments

1. Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2. Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.
3. Recording in Measurement Book (MB) for any four items
4. Prepare bill of quantities of given item from actual measurements. (any four items).
5. Prepare approximate estimate for the given engineering works.
6. Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from (1BHK Building with staircase).
7. Prepare detailed estimate from the given set of drawings using “standard measurement and abstract format” for RCC framed structure using description of item (G+1 Building)
8. Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m x 4m with bar bending schedule.
9. Prepare detailed estimate of bitumen road of one kilometre length from the given drawing.
10. Prepare detailed estimate of small Septic tank from the given set of drawings.
11. Prepare bar bending schedule for the given singly reinforced and doubly reinforced beams
12. Prepare bar bending schedule for the given continuous beam
13. Prepare bar bending schedule for the given one way slab
14. Prepare bar bending schedule for the given two way slab
15. Prepare bar bending schedule for the given square column and square footing

Reference Books:

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors
2. Rangwala,S.C., Estimating and Costing, Charotar Publishing House, Anand.
3. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. Delhi.
4. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.. Monojit Chakraborti, Kolkata.
5. PWD Schedule of Rates.

4010651 - ESTIMATION AND COSTING LABORATORY

DETAILED ALLOCATION OF MARKS

S.No	Description	Marks
1.	Tabulation and Observation	50
2.	Calculations	35
3.	Accuracy of result	10
4.	Viva-Voce	5
	Total	**100**

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

HIGHWAY ENGINEERING LABORATORY

(Elective Practical -II)

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010652

Semester : VI Semester

Subject Title : **HIGHWAY ENGINEERING LABORATORY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hour/ Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
HIGHWAY ENGINEERING LABORATORY	4 Hrs.	64 Hrs.	25	100 *	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

In this course, the students learn about testing of aggregates, bitumen and preparing a report about roadworks.

OBJECTIVES:

After the completion of this course, the students will be able to:

- Identify the types of roads as per IRC recommendations.
- Understand the geometrical design features of different highways.
- Perform different tests on road materials.

DETAILED SYLLABUS

4010652 - HIGHWAY ENGINEERING LABORATORY

Contents: Practical Total:**64 Hours**

LIST OF EXPERIMENTS

Exercises:

1. Draw the sketches showing standard cross sections of Expressways, Freeways, NH/SH, MDR/ODR
2. Flakiness and Elongation Index of aggregates.
3. Angularity Number of aggregates.
4. Los Angeles Abrasion test
5. Softening point test of bitumen.
6. Penetration test of bitumen.
7. Ductility test of Bitumen.
8. Study of dense Bituminous macadam design
9. Visit the constructed road for visual inspection to identify defects and suggest remedial measures.
10. Prepare the photographic report containing details for exercise No.9
11. Visit the hill road constructed site to understand its components.
12. Prepare the photographic report containing details for exercise No.11
13. Visit the road of any one type (flexible or rigid) to know the drainage condition.

Reference Books:

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN:978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers,Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

4010652 - HIGHWAY ENGINEERING LABORATORY

DETAILED ALLOCATION OF MARKS

S.No	Description	Marks
1.	Procedure	15
2.	Tabulation and Observation	40
3.	Calculations	30
4.	Accuracy of result	10
5.	Viva-Voce	5
	Total	**100**

LIST OF EQUIPMENTS (for a batch of 30 students):

S. NO.	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1.	Sieve test for coarse aggregate made of brace 200mm dia complete set	2 sets
2.	Length gauge and Thickness gauge	2 Nos.
3.	Los Angeles Abrasion testing equipment	1 no.
4.	Viscometer	1 no.
5.	Ductility testing machine, briquette mould, water bath	1 No.
6.	Flash and Fire point apparatus	1 set
7.	Bitumen Penetro meter	1 No.
8.	Weigh balance-digital upto 10kg capacity with 1gm accuracy battery backup	1No

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

WATER RESOURCES ENGINEERING LABORATORY

(Elective Practical -II)

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010**:** DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010653

Semester : VI Semester

Subject Title : **WATER RESOURCES ENGINEERING LABORATORY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hour/ Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
WATER RESOURCES ENGINEERING LABORATORY	**4 Hrs.**	**64 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

Diploma holders in civil engineering have to supervise the construction, repair and maintenance of canals, head works, river training works, cross drainage works, regulatory and other works. Some of the diploma holders are also engaged for preventing water logging and irrigation by tubewells. This subject imparts knowledge regarding hydrology, flow irrigation – storage and distribution system, constructional features of head works, river training works, cross drainage works, causes and prevention of water logging and construction of tube wells.

OBJECTIVES:

The following are the objectives of this course:

- To learn estimation of hydrological parameters.
- To understand water demand of crops and provisions to meet the same.
- To know planning of reservoirs and dams.
- To design irrigation projects, canals and other diversion works.

DETAILED SYLLABUS

4010653 - WATER RESOURCES ENGINEERING LABORATORY

Contents: Practical **Total : 64 Hrs.**

LIST OF EXPERIMENTS

EXERCISES

1. Calculate average rainfall for the given area using arithmetic mean method.
2. Calculate average rainfall for the given area using isohyetal, Theissen polygon method.
3. Delineation of contributory area for the given outlet from the given topo-sheet.
4. Estimate crop water requirement for the given data.
5. Estimate capacity of the canal for the given data.
6. Calculate reservoir capacity from the given data.
7. Calculate control levels for the given data for a given reservoir.
8. Draw a labeled sketch of the given masonry/earthen dam section.
9. Draw the theoretical and practical profile of the given gravity dam section.
10. Prepare a presentation on the technical details of any one micro or minor irrigation scheme.
11. Prepare a model of any irrigation structure using suitable material.
12. Prepare a maintenance report for any major/minor irrigation project site in the vicinity of your area, based on field visit.
13. Prepare summary of the technical details of any existing water resource project in the vicinity of your area.
14. Draw a labeled sketch of the given diversion head works and Cross Drainage works.
15. Design a canal section for the given conditions with estimation of the quantity of material required for lining.

Reference Books

1. Punmia, B.C., Pande, B, Lal, Irrigation and water power engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand and Company
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education India Pvt. Ltd.
6. Asawa, G.L., Irrigation and water resource Engineering, New Age International(P)
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

DETAILED ALLOCATION OF MARKS

S.No	Description	Marks
1.	Tabulation and Observation/ Procedure	35
2.	Calculations	45
3.	Accuracy of result	15
4.	Viva-Voce	5
	Total	**100**

DIPLOMA IN CIVIL ENGINEERING

III YEAR

N-SCHEME

VI SEMESTER

PROJECT WORK AND INTERNSHIP

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION
CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010660

Semester : VI Semester

Subject Title : **PROJECT WORK AND INTERNSHIP**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
PROJECT WORK AND INTERNSHIP	6 Hrs.	96 Hrs.	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.
Minimum marks for Pass is 50 out of which minimum 50 marks should be obtained out of 100 marks in the Board Examination alone.

RATIONALE:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise.

As far as possible, the students should be given live project problems with a view to:

i) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.

ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.

iii) Develop first and experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems of the world of work.

iv) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values

OBJECTIVES:

The objective of the project work is to enable the students to work in convenient groups of not more than six members in a group on a project involving theoretical and experimental studies related to Civil Engineering. Every Project Work shall have a Guide who is a member of the faculty of Civil Engineering of the college. The hours allotted for this course shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis or field work and also to present in periodical seminars the progress made in the project. Each student shall finally produce a comprehensive report covering background information, literature Survey, problem statement, Project work details and conclusions.

This experience of project work shall help the student in expanding his / her knowledge base and also provide opportunity to utilise the creative ability and inference capability.

- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment
- Get exposure on industrial environment and its work ethics.
- Understand what entrepreneurship is and how to become an entrepreneur.
- Learn and understand the gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions, as well as to prepare collaborative edition of the final project report.

WORKS INVOLVED IN PROJECT WORK:

Collection of Data from various Journals and Civil Engineering Magazines about the list of Projects given below- Select a suitable project based on the data collected and available resources in your locality -Surveyed Site Plan – Site particulars – Preparation of Architectural Drawings – soil type in the location – Specification for materials & construction procedure - Structural design – Preparation of Detailed Estimate, Data as per Current schedule of Rates - Abstract Estimate – Structural Drawings – Preparation of Report about the project.

IMPORTANT DOCUMENTS TO BE REFERRED FOR THE ABOVE ACTIVITIES:

S.No	Activity	Reference
1.	Preparation of Architectural Drawings	1. Building Regulations of Locality 2. National Building Code of India, etc
2.	Structural design, Concrete Reinforcement, Steel etc.	1. Relevant IS code for Masonry, Structures 2. IS 456 for Reinforced Cement Concrete 3. Hand book on Concrete Reinforcement and Detailing (SP-34)
3.	Specification of material and work procedure as per State Govt. Highways, Central Govt. Railways, etc	1. Construction procedure by organization, viz. PWD 2. Construction procedure by organization viz. CPWD 3. Specification by Architect etc.,

The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.

a) INTERNAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student peridocially as follows:

Details of assessment	**Period of assessment**	**Max.Marks**
First Review	6th Week	10
Second Review	12th week	10
Attendance	Entire semester	5
Total		**25**

b) Allocation of Marks for Project Work and Intership in Board Examinations:

Details of Mark allocation	Max. Marks
Demostration/Presentation	25
Report	25
Viva Voce	30
Internship report	20
Total	**100***

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year “Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Board examination.

LIST OF SUGGESTED PROJECTS

- **COMPARATIVE STUDY**

  Conventional and Composite concrete mixtures Light weight construction materials

  Prefabricated and R.C.C. Structures

  Cost and construction procedures for steel and R.C.C. Structures

  Cost and Construction procedures for Prestressed and R.C.C. Structures

- **ADMIXTURES**

  Economy of using flyash in concete

- **MIX DESIGN**

  Comparative study of mix design by different methods

- **STUDY OF SPECIAL TYPES OF CONCRETE IN CONSTRUCTION BY EXPERIMENTS**
  - Bamboo as a reinforcing material
  - Baggase ash concrete
  - Flyash concrete
  - Concrete with Natural vegetative materials
  - Concrete using Plastic waste
  - Concrete using Steel slag
  - Concrete using factory wastes
  - Self Compacting concrete, Fibre reinforced concrete, Ferro cement products,

- **PAPER PROJECTS**

- Residential Houses, Primary Health center, School Buildings, Guest House
- Panchayat Union Office Building, Bank Building
- Post Office Building, College Building, Hospital Building, Hotel Building, Hostel Building, Factory Building, Auditorium, Shopping Centre, Community Hall, Theatre
- Market Building, Multistoried Car park, Rural Bus Stand , Stadium
- Swimming Pool
- Over head tank for a village, New village road with culvert, Small Bridge
- Plate girder bridge
- Septic Tank for a Colony
- Other Civil Engineering related structures

- **ENVIRONMENTAL MANAGEMENT PROJECTS**
  - Treatment of Wastewater and recirculation for a Colony.
  - Solid waste management in a Colony.
  - Hydrological data Collection for a river basin/water shed Industrial effluent Collection and analysis .
- **MISCELLANEOUS**
  - Rain water Harvesting system for buildings
  - Rain water Harvesting system for a small colony
  - Low cost Housing techniques
  - Rehabilitation of structures

FORMAT FOR PREPARATION OF PROJECT REPORT

1. ARRANGEMENT OF CONTENTS:

The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page
2. Bonafide Certificate
3. Abstract
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

The table and figures shall be introduced in the appropriate places.

2. PAGE DIMENSION AND BINDING SPECIFICATIONS:

The dimension of the project report should be in A4 size. The project report should be bound using flexible cover of the thick white art paper. The cover should be **printed in black letters** and the text for printing should be identical.

3. PREPARATION OF FORMAT:

3.1 Cover Page & Title Page – A specimen copy of the Cover page & Title page of the project report are given in **Appendix 1.**

3.2 Bonafide Certificate – The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14, as per the format in **Appendix 2.**

The certificate shall carry the guide‟s signature and shall be followed by the guide‟s name, academic designation (not any other responsibilities of administrative nature), department and full address of the institution where the supervisor has guided the student. The term **‘GUIDE’** must be typed in capital letters between the guide‟s name and academic designation.

3.3 Abstract – Abstract should be one page synopsis of the project report typed double line spacing, Font Style Times New Roman and Font Size 14.

3.4 Table of Contents – The table of contents should list all material following it as well as any material which precedes it. The title page and Bonafide

Certificate will not find a place among the items listed in the Table of Contents but the page numbers of which are in lower case Roman letters. One and a half spacing should be adopted for typing the matter under this head. A specimen copy of the Table of Contents of the project report is given in **Appendix 3.**

3.5 List of Tables – The list should use exactly the same captions as they appear above the tables in the text. One and a half spacing should be adopted for typing the matter under this head.

3.6 List of Figures – The list should use exactly the same captions as they appear below the figures in the text. One and a half spacing should be adopted for typing the matter under this head.

3.7 List of Symbols, Abbreviations and Nomenclature – One and a half spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.

3.8 Chapters – The chapters may be broadly divided into 3 parts

(i) Introductory chapter,

(ii) Chapters developing the main theme of the project work such as

1. Objectives
2. Collection of data and required survey work
3. Management and construction procedure
4. Resources scheduling and networking
5. Design details
6. Required drawing set
7. Utility to society if any and Conclusion

The main text will be divided into several chapters and each chapter may be further divided into several divisions and sub-divisions.

- Each chapter should be given an appropriate title.
- Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.
- Footnotes should be used sparingly. They should be typed single space and placed directly underneath in the very same page, which refers to the material they annotate.

3.9 Appendices – Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme.

- Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc.
- Appendices, Tables and References appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.
- Appendices shall carry the title of the work reported and the same title shall be made in the contents page also.

3.10 List of References –The listing of references should be typed 4 spaces below the heading “REFERENCES” in alphabetical order in single spacing left – justified. The reference material should be listed in the alphabetical order of the first author. The name of the author/authors should be immediately followed by the year and other details.

A typical illustrative list given below relates to the citation example quoted above.

Reference:

1. Code of practice for plain and reinforced concrete (fourth edition), IS456:2000, Bureau of India Standard, New Delhi
2. Neville, A. M., Concrete Technology, Fourth edition, Pearson Education, New Delhi.
3. Handbook on concrete mixes (based on Indian Standards), SP: 23- 1988, Bureau of Indian Standards, New Delhi, India

3.10.1 Table and figures - By the word Table, is meant tabulated numerical data in the body of the project report as well as in the appendices. All other non- verbal materials used in the body of the project work and appendices such as charts, graphs, maps, photographs and diagrams may be designated as figures.

4.0 Typing Instructions:

The impression on the typed copies should be black in colour.

One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style 'Times New Roman' and Font size 12.

****

APPENDIX 1
(A typical Specimen of Cover Page & Title Page)
<Font Style Times New Roman – Bold>

TITLE OF PROJECT REPORT

<Font Size 18><1.5 line spacing>

A PROJECT REPORT
<Font Size 14>

Submitted by
<Font Size 14><Italic>

NAME OF THE CANDIDATE(S)
<Font Size 16>

Submitted for partial fulfillment of requirement for the award of the diploma

in

<Font Size 14><1.5 line spacing><Italic>

BRANCH OF STUDY
<Font Size 14>

NAME OF THE POLYTECHNIC COLLEGE
<Font Size 14>

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI 600 025

<Font Size 16><1.5 line spacing>

MONTH & YEAR
<Font Size 14>

SPECIMEN

PLANNING ANALYSIS AND DESIGNING OF MULTI- LEVEL CAR PARKING

A PROJECT REPORT

Submitted by

SANDHYA. A 10200382
GAYATHRI. R 10293990
MUTHUSAMY. G 10293991
RAJA. D 10289898

in partial fulfillment of requirement for the award of the diploma

in

CIVIL ENGINEERING

XXXXX POLYTECHNIC COLLEGE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI 600 025

APRIL 20….

APPENDIX 2

(A typical specimen of Bonafide Certificate)

<Font Style Times New Roman>

DIRECTORATE OF TECHNICAL EDUCATION
CHENNAI 600 025

<Font Style Times New Roman – size -18>

BONAFIDE CERTIFICATE

<Font Style Times New Roman – size -16>

<Font Style Times New Roman – size -14>

Certified that this project report entitled **"…….TITLE OF THE PROJECT……..."**is the bonafide work done by " .....**NAME OF THE CANDIDATE(S).……"** with his/her batch-mates, in partial fulfillment of the requirement for the award of Diploma in Civil Engineering under my guidance.

Signature of the Head of the Department>>
SIGNATURE

<<Name>>
HEAD OF THE DEPARTMENT

<<Department>>
<<Full address of the Dept & College >>
the Dept & College >>

<<Signature of the Guide>>
SIGNATURE

<<Name>>
GUIDE
<<Academic Designation>>
<<Department>>
<<Full address of

Submitted for Board Examination held on_____at …..XXXXX… Polytechnic College.

INTERNAL EXAMINER EXTERNAL EXAMINER

APPENDIX 3
(A typical specimen of table of contents)
<Font Style Times New Roman>

TABLE OF CONTENTS

SANDWICH DIPLOMA COURSE-INDUSTRIAL TRAINING

4010491 - Industrial Training I (Report writing & Viva Voce)

4010492 - Industrial Training II (Report writing & Viva Voce)

1. Introduction

The main objective of the sandwich Diploma course is to mould a well rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 Semesters of 3 ½ years duration, the subjects of 3 years-Full Time Diploma Course being regrouped for academic convenience.

While in the 4th semester students under Industrial Training for 6 months(December through May). They also do course work in the institution for one day in a week, While in the 7th semester they undergo another spell of 6 months (June through November) Industrial training.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.

I SEM	II SEM	III SEM	IV SEM	V SEM	VI SEM	VII SEM

2. Attendance Certification

Every month students have to get their attendance certified by industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

3. Training Reports

The students have to prepare two types of reports:

- Weekly report in the form of diary to be submitted to the concerned staff in- charge of the institution. This will be reviewed while awarding Internal Assessment marks.
- Comprehensive report at the end of each spell which will be used for Board Examination.

3.1 Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc). The concern Industrial supervisor is to check periodically these progress reports.

3.2 Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant/product/process/construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc should be incorporated with the consent of the Organisation.

Scheme of Evaluation:

1.1 Internal Assessment Marks

First Review (during Third month)	:	10 marks
Second Review (during Fifth month)	:	10 marks
Attendance *	:	05 marks (Awarded same as in Theory)
Total	:	**25 marks**

*** For awarding marks to attendance, the Industrial Training attendance has to be considered.**

1.2 Board Examination :

DETAILED ALLOCATION OF MARKS

S.No	Description	Marks
1.	Presentation about Industrial Training	30
2.	Comprehensive Training Report	40
3.	Viva-voce	30
	Total	**100***

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

****

DIPLOMA IN ENGINEERING AND TECHNOLOGY

1020 - 2020 - 3020

DEPARTMENT OF MECHANICAL ENGINEERING

(FULL TIME – PART TIME – SANDWICH)

SEMESTER PATTERN

N – SCHEME

IMPLEMENTED FROM 2020 - 2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI-600 025, TAMIL NADU

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STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N SCHEME

(To be implemented for the students admitted from the 2020 -2021 onwards)

Chairperson

TMT. G.LAXMI PRIYA, I.A.S
Director
Directorate of Technical Education, Guindy, Chennai.

Co-ordinator

Thiru R.Kanagaraj
Principal
Government Polytechnic College, Purasawalkam, Chennai.

1020 - 2020 - 3020
DIPLOMA IN MECHANICAL ENGINEERING
(FULL TIME – PART TIME – SANDWICH)

Convener

Thiru R.Kanagaraj M.E.,
Principal
Government Polytechnic College, Purasawalkam, Chennai.

Members

Thiru M.Sugumaran, M.E.,
Principal I/c
Ramakrishna Mission Polytechnic College
Mylapore, Chennai – 4.

Dr. N.Thangavelu, M.E., Ph. D.,
HOD- Mechanical Engineering
Sakthi Polytechnic College
Sakthinagar,

Dr. V.Prabhu Raja, M.E., Ph. D.,
Professor (CAS)
Department of Mechanical Engineering
PSG College of Technology,
Peelamedu

Thiru K.Subaramani, M.E.,
HOD – Mechanical Engineering
NPA Centenary Polytechnic College
Kotagiri

Thiru T.E.Kuppuswamy
Asst.General Manager- Tool Room
Mudhra Fine Blanc(p) Ltd.
Chennai

Dr. V.V.Senthil Kumar M.E., Ph.D.,
Principal
TVS Polytechnic College
Chennai.

Thiru M.Saravanan B.Tech
Manager HR training
Delphi TVS Technologies Ltd.
Uragadam, Chennai

Dr. N.Rajamanickam M.E., Ph.D.,
Programmer CDC
Directorate of technical Education
Chennai

Thiru R.Karthikeyan M.E.,
HOD Mechanical Engineering
PACR Polytechnic College
Rajapalayam.

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DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2020 - 2021)

N – SCHEME

R E G U L A T I O N S*

******Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology.*

1. Description of the Course:

a. Full Time (3 years)

The Course for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Sandwich Diploma in Engineering shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4^{th} and/or during 7^{th}semester the students undergo industrial training for six months/ one year. Industrial training examination will be conducted after completion of every 6 months of industrial training.

c. Part Time (4 years)

The course for the Part Time Diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3 year full time diploma courses being regrouped for academic convenience.

***** ***Each Semester will have 16 weeks duration of study with 35 hrs. / Week for Regular Diploma Course and 18 hrs. / Week for Part-Time Diploma Course.***

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2020 – 2021 academic year onwards.

2. Condition for Admission:

Condition for admission to the Diploma courses shall be required to have passed in The S.S.L.C Examination of the Board of Secondary Education, Tamil Nadu.(Or)

The Anglo Indian High School Examination with eligibility for Higher Secondary Course in Tamil Nadu.(Or)

The Matriculation Examination of Tamil Nadu.(Or)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamil Nadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board with eligibility for university Courses of study or equivalent examination &Should have studied the following subjects.

A pass in 2 Years ITI with appropriate Trade or Equivalent examination.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational		Industrial Training Institutes Courses
		Subjects Studied	Subjects Studied		
			Related subjects	Vocational subjects	
1.	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Maths / Physics / Chemistry	Related Vocational Subjects Theory& Practical	2 years course to be passed with appropriate Trade
2.	Diploma Course in Commercial Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretaryship	

- For the Diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practicals may also be taken for arriving the eligibility.
- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.
- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Commercial Practice Diploma courses the candidates studied the related subjects will be given first preference.
- *Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.*

4. Age Limit: No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, Tamil Nadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses are as given below:

Diploma Course	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
Full Time (Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

This will come into effect from N Scheme onwards i.e. from the academic year 2020-2021.

7. Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical subjects.

The curriculum outline is given in Annexure – I.

8. Examinations:

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment. Board Examinations are conducted for 100 marks and reduced to 75.

The total marks for result are 75 + 25 = 100 Marks.

9. Continuous Internal Assessment:

A. For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

i) Subject Attendance **5 Marks**

(Award of marks for subject attendance to each subject Theory/Practical will be as per the range given below)

80%	-	83%	1 Mark
84%	-	87%	2 Marks
88%	-	91%	3 Marks
92%	-	95%	4 Marks
96%	-	100%	5 Marks

ii) Test **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Average of the these two test marks will be taken and the marks to be reduced to:	05 Marks
The Test – III is to be the Model Examination covering all the five units and the marks obtained will be reduced to:	05 Marks

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	**Model Examination:** Covering all the 5 Units. (Board Examinations-question paper-pattern).	End of 16th week	100	3 Hrs

From the Academic Year 2020 – 2021 onwards.

Question Paper Pattern for the Test - I and Test – II is as follows. The tests should be conducted by proper schedule. Retest marks should not be considered for internal assessment.

Without Choice:

Part A Type questions:	6 Questions × 1 mark	06 marks
Part B Type questions:	7 Questions × 2 marks	14 marks
Part C Type questions:	2 Questions × 15 marks	30 marks
	Total	**50 marks**

iii) Assignment **5 Marks**

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 5 marks.

iv) Seminar Presentation **5 Marks**

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second Year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar

individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2 ½ marks for the material submitted in writing and 2 ½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks.

All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of Board Exam results and produced to the flying squad and the inspection team at the time of inspection/verification.

B. <u>For Practical Subjects:</u>

The Internal Assessment mark for a total of 25 marks which are to be distributed as follows:-

a) Attendance : **5 Marks**

(Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/
Other Practical related Work : **10 Marks**

c) Record writing : **10 Marks**

TOTAL : **25 Marks**

- *All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examinations.*
- The observation note book / manual should be maintained for 10 marks. The observation note book / manual with sketches, circuits, programme, reading and calculation written by the students manually depends upon the practical subject during practical classes should be evaluated properly during the practical class hours with date.
- The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 10 marks for each exercise as per the above allocation.
- At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks (including Observation and Record writing) and the marks

awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)

- Only regular students, appearing first time have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Log Book of the staff, who is handling the theory subject.

The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Log Book of the staff, who is handling the practical subject.

10. Communication Skill Practical, Computer Application Practical and Physical Education:

The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase the Communication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physical education is introduced to encourage students to remain healthy and fit by including physical activities and sports.

11. Project Work and Internship:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work & Internship:

Project Review I	…	**10 marks**
Project Review II	…	**10 marks**
Attendance	…	**05 marks** (Award of marks same as theory subject pattern)
Total	…	**25 marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work & Internship in Board Examinations:

Demonstration/Presentation	25 marks
Report	25 marks
Viva Voce	30 marks
Internship Report	20 marks
Total	**100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Board examination.

12. Scheme of Examinations:

The Scheme of examinations for subjects is given in Annexure - II.

13.Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.
2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than *40% in theory subjects* and *50% in practical subjects* out of the total prescribed maximum marks including both the Internal Assessment and the Board Examinations marks put together, subject to the condition that he/she secures at least a minimum of 4*0 marks out of 100 marks in the Board Theory Examinations and a minimum of 50 marks out of 100 marks in the Board Practical Examinations.*

14. **Classification of successful candidates:**

Classification of candidates who will pass out the final examinations from April 2023 onwards (Joined first year in 2020 -2021) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full Time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

Second Class:

All other successful candidates will be declared to have passed in **Second Class.**

The above classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2023 /April 2024 onwards (both joined First Year in 2020 -2021)

15. Duration of a period in the Class Time Table:

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

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STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

ANNEXURE – I

CURRICULUM OUTLINE

1020 DIPLOMA IN MECHANICAL ENGINEERING (FULL TIME)

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020310	Strength of Materials	5	-	-	5
4020320	Manufacturing Technology - I	5	-	-	5
4020330	Measurements and Metrology	5	-	-	5
4020340	Thermal Engineering – I	5	-	-	5
4020350	Machine Drawing and CAD Practical	-	2	2	4
4020360	Manufacturing Technology – I Practical	-	-	4	4
4020370	Measurements and Metrology Practical	-	-	4	4
		20	2	10	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

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IV Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020410	Fluid Mechanics and Fluid Power	5	-	-	5
4020420	Manufacturing Technology II	5	-	-	5
4020430	Electrical Drives and Controls	5	-	-	5
4020440	Production and Quality Management	5	-	-	5
4020450	Strength of Materials and Fluid Mechanics Practical	-	-	4	4
4020460	Manufacturing Technology II Practical	-	-	4	4
4020470	Electrical Drives and Control Practical	-	-	4	4
		20		12	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

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V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020510	Design of Machine Elements	6	-	-	6
4020520	Thermal Engineering – II	5	-	-	5
Elective I Theory					
4020531	Computer Integrated Manufacturing	5	-	-	5
4020532	Green Energy and Energy Conservation	5	-	-	
4020533	Mechatronics	5	-	-	
4020540	Process Automation Practical	-	-	4	4
4020550	Thermal Engineering Practical			4	4
Elective I Practical					
4020561	Computer Integrated Manufacturing Practical	-	-	4	4
4020562	Green Energy and Energy Conservation Practical	-	-	4	
4020563	Mechatronics Practical	-	-	4	
4020570	Entrepreneurship& Startup			4	4
		16	-	16	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

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VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020610	Industrial Engineering and Management	6	-	-	6
4020620	E Vehicle Technology & Policy	4	-	-	4
Elective II Theory					
4020631	Industrial Robotics and 3D Printing	5	-	-	5
4020632	Refrigeration and Air Conditioning	5	-	-	
4020633	Automobile Technology	5	-	-	
4020640	Solid Modelling Practical	-	-	6	6
Elective II Practical					
4020651	Industrial Robotics and 3D Printing Practical	-	-	5	5
4020652	Refrigeration and Air Conditioning Practical	-	-	5	
4020653	Automobile Technology Practical	-	-	5	
4020660	Project Work and Internship	-	-	6	6
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

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ANNEXURE-II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

SCHEME OF EXAMINATION

1020 DIPLOMA IN MECHANICAL ENGINEERING (FULL TIME)

III Semester

Subject Code	SUBJECT	Marks			Minimum marks for pass	Duration of ExamHours
		Internal Assessment	* Board Examination	Total		
4020310	Strength of Materials	25	100	100	40	3
4020320	Manufacturing Technology - I	25	100	100	40	3
4020330	Measurements and Metrology	25	100	100	40	3
4020340	Thermal Engineering – I	25	100	100	40	3
4020350	Machine Drawing and CAD Practical	25	100	100	50	3
4020360	Manufacturing Technology – I Practical	25	100	100	50	3
4020370	Measurements and Metrology Practical	25	100	100	50	3

* Examinations will be conducted for 100 Marks and will be converted 75 Marks.

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IV Semester

Subject Code	SUBJECT	Marks			Minimum marks for pass	Duration of ExamHours
		Internal Assessment	* Board Examination	Total		
4020410	Fluid Mechanics and Fluid Power	25	100	100	40	3
4020420	Manufacturing Technology II	25	100	100	40	3
4020430	Electrical Drives and Controls	25	100	100	40	3
4020440	Production and Quality Management	25	100	100	40	3
4020450	Strength of Materials and Fluid Mechanics Practical	25	100	100	50	3
4020460	Manufacturing Technology II Practical	25	100	100	50	3
4020470	Electrical Drives and Control Practical	25	100	100	50	3

* Examinations will be conducted for 100 Marks and will be converted 75 Marks.

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V Semester

Subject Code	SUBJECT	Marks			Minimum marks for pass	Duration of ExamHours
		Internal Assessment	* Board Examination	Total		
4020510	Design of Machine Elements	25	100	100	40	3
4020520	Thermal Engineering – II	25	100	100	40	3
ELECTIVE – I THEORY						
4020531	Computer Integrated Manufacturing	25	100	100	40	3
4020532	Green Energy and Energy Conservation	25	100	100		
4020533	Mechatronics	25	100	100		
4020540	Process Automation Practical	25	100	100	50	3
4020550	Thermal Engineering Practical	25	100	100	50	3
ELECTIVE – I PRACTICAL						
4020561	Computer Integrated Manufacturing Practical	25	100	100	50	3
4020562	Green Energy and Energy Conservation Practical	25	100	100		
4020563	Mechatronics Practical	25	100	100		
4020570	Entrepreneurship & Startup #	25	100	100	50	3

* Examinations will be conducted for 100 Marks and will be converted 75 Marks.

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VI Semester

Subject Code	SUBJECT	Marks			Minimum marks for pass	Duration of ExamHours
		Internal Assessment	* Board Examination	Total		
4020610	Industrial Engineering and Management	25	100	100	40	3
4020620	E Vehicle Technology & Policy #	25	100	100	40	3
ELECTIVE – II THEORY						
4020631	Industrial Robotics and 3D Printing	25	100	100	40	3
4020632	Refrigeration and Air Conditioning	25	100	100		
4020633	Automobile Technology	25	100	100		
4020640	Solid Modelling Practical	25	100	100	50	3
ELECTIVE – II PRACTICAL						
4020651	Industrial Robotics and 3D Printing Practical	25	100	100	50	3
4020652	Refrigeration and Air Conditioning Practical	25	100	100		
4020653	Automobile Technology Practical	25	100	100		
4020660	Project Work and Internship	25	100	100	50	3

* Examinations will be conducted for 100 Marks and will be converted 75 Marks.

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STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

ANNEXURE – I

CURRICULUM OUTLINE

3020: DIPLOMAIN MECHANICAL ENGINEERING (PART TIME)

THIRD SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4020310	Strength of Materials	4	-	-	4
4020330	Measurements and Metrology	4	-	-	4
40015	Engineering Graphics - I	-	4	-	4
40001	Communication Skill Practical	-	-	3	3
4020370	Measurements and Metrology Practical	-	-	3	3
TOTAL		**8**	**4**	**6**	**18**

FOURTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial / Drawing	Practical	Total
4020320	Manufacturing Technology - I	4	-	-	4
4020340	Thermal Engineering - I	4	-	-	4
40025	Engineering Graphics - II	-	4	-	4
4020360	Manufacturing Technology – I Practical	-	-	3	3
40002	Computer Application Practical	-	-	3	3
TOTAL		**8**	**4**	**6**	**18**

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FIFTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4020410	Fluid Mechanics and Fluid Power	4	-	-	4
4020510	Design of Machine Elements	4	-	-	4
4020620	E Vehicle Technology & Policy	3	-	-	3
4020350	Machine Drawing and CAD Practical	-	2	2	4
4020450	Strength of Materials and Fluid Mechanics Practical	-	-	3	3
TOTAL		**11**	**2**	**5**	**18**

SIXTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial / Drawing	Practical	Total
4020420	Manufacturing Technology II	4	-	-	4
4020430	Electrical Drives and Controls	4	-	-	4
4020610	Industrial Engineering and Management	4	-	-	4
4020460	Manufacturing Technology II Practical	-	-	3	3
4020470	Electrical Drives and Control Practical	-	-	3	3
TOTAL		**12**	**-**	**6**	**18**

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SEVENTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4020520	Thermal Engineering - II	4	-	-	4
Elective-I Theory					
4020531	Computer Integrated Manufacturing	3	-	-	3
4020532	Green Energy and Energy Conservation				
4020533	Mechatronics				
4020540	Process Automation Practical	-	-	3	3
4020550	Thermal Engineering Practical	-	-	3	3
Elective-I Practical					
4020561	Computer Integrated Manufacturing Practical	-	-	3	3
4020562	Green Energy and Energy Conservation Practical				
4020563	Mechatronics Practical				
4020570	Entrepreneurship & Startups	-	-	2	2
TOTAL		**7**	**-**	**11**	**18**

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EIGHTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial / Drawing	Practical	Total
4020440	Production and Quality Management	4	-	-	4
Elective-II Theory		4	-	-	-
4020631	Industrial Robotics and 3D Printing				
4020632	Refrigeration and Air Conditioning				
4020633	Automobile Technology				
4020640	Solid Modelling Practical	-	-	4	4
Elective-II Practical		-	-	3	3
4020651	Industrial Robotics and 3D Printing Practical				
4020652	Refrigeration and Air Conditioning Practical				
4020653	Automobile Technology Practical				
4020660	Project Work and Internship	-	-	3	3
TOTAL		**8**	**-**	**10**	**18**

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STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

ANNEXURE – I

CURRICULUM OUTLINE

2020 DIPLOMA IN MECHANICAL ENGINEERING (SANDWICH)

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020310	Strength of Materials	5	-	-	5
4020320	Manufacturing Technology - I	5	-	-	5
4020330	Measurements and Metrology	5	-	-	5
4020340	Thermal Engineering – I	5	-	-	5
4020350	Machine Drawing and CAD Practical	-	2	2	4
4020360	Manufacturing Technology – I Practical	-	-	4	4
4020370	Measurements and Metrology Practical	-	-	4	4
		20	2	10	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

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IV Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020420	Manufacturing Technology II	4	-	-	4
4020460	Manufacturing Technology II Practical	-	-	3	3
4020480	Industrial Training I	-	-	-	-
		4	-	3	7
Extra / Co-Curricular activities					
Library		-	-	-	-
Physical Education		-	-	-	-
TOTAL					**-**

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V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020410	Fluid Mechanics and Fluid Power	5	-	-	5
4020430	Electrical Drives and Controls	5	-	-	5
4020520	Thermal Engineering – II	5	-	-	5
Elective I Theory					
4020531	Computer Integrated Manufacturing	5	-	-	5
4020532	Green Energy and Energy Conservation	5	-	-	
4020533	Mechatronics	5	-	-	
4020450	Strength of Materials and Fluid Mechanics Practical	-	-	3	3
4020470	Electrical Drives and Control Practical	-	-	3	3
4020550	Thermal Engineering Practical	-	-	3	3
Elective I Practical					
4020561	Computer Integrated Manufacturing Practical	-	-	3	3
4020562	Green Energy and Energy Conservation Practical	-	-	3	
4020563	Mechatronics Practical	-	-	3	
		20	-	12	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

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VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020620	E Vehicle Technology & Policy #	4	-	-	4
4020440	Production and Quality Management	5			5
4020510	Design of Machine Elements	6	-	-	6
4020610	Industrial Engineering and Management	4	-	-	4
Elective II Theory					
4020631	Industrial Robotics and 3D Printing	4	-	-	4
4020632	Refrigeration and Air Conditioning	4	-	-	
4020633	Automobile Technology	4	-	-	
4020540	Process Automation Practical	-	-	3	3
4020640	Solid Modelling Practical	-	-	3	3
Elective II Practical					
4020651	Industrial Robotics and 3D Printing Practical	-	-	3	3
4020652	Refrigeration and Air Conditioning Practical	-	-	3	
4020653	Automobile Technology Practical	-	-	3	
		23	-	9	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

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VII Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020570	Entrepreneurship & Startups	-	-	3	3
4020710	Project Work	-	-	4	4
4020720	Industrial Training II	-	-	-	-
		-	-	-	-
Extra / Co-Curricular activities					
Library		-	-	-	-
Physical Education		-	-	-	-
TOTAL					**-**

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1020 Diploma in MechanicalEngineering

List of Equivalent Subjects for M- Scheme to N– Scheme

THIRD SEMESTER

M-SCHEME		N-SCHEME	
Subject code	**Name ofthe Subject**	**Subject code**	**Name ofSubject**
32031	Strength of Materials	4020310	Strength of Materials
32032	Manufacturing Processes	4020320	Manufacturing Technology – I
32033	Machine Drawing		No Equivalent
32034	Computer Applications and CAD Practical		No Equivalent
32035	Foundry and Welding Practical		No Equivalent
32036	Lathe and Drilling Practical		No Equivalent
32037	Metrology and Metallography Practical		No Equivalent

FOURTH SEMESTER

M-SCHEME		N-SCHEME	
Subject code	**Name ofthe Subject**	**Subject code**	**Name ofSubject**
32041	Heat Power Engineering	4020340	Thermal Engineering – I
32042	Special Machines	4020420	Manufacturing Technology II
32043	Fluid Mechanics and Fluid Power	4020410	Fluid Mechanics and Fluid Power
32044	Electrical Drives & Control	4020430	Electrical Drives and Controls
32045	Strength of Materials and Fluid Mechanics Practical	4020450	Strength of Materials and Fluid Mechanics Practical
32046	Special Machines Practice	4020460	Manufacturing Technology II Practical
32047	Electrical Drives & Control Practical	4020470	Electrical Drives and Control Practical

FIFTH SEMESTER

M-SCHEME		N-SCHEME	
Subject code	**Name ofthe Subject**	**Subject code**	**Name ofSubject**
32051	Design of Machine Elements	4020510	Design of Machine Elements
32052	Thermal and Automobile Engineering		No Equivalent
32053	Process Planning and Cost Estimation		No Equivalent
Elective- I Theory			
32071	Total Quality Management		No Equivalent
32072	Press Tools		No Equivalent
32073	Renewable Energy Sources and Energy Conservation	4020532	Green Energy and Energy Conservation
32055	Process Automation Practical	4020540	Process Automation Practical
32056	Thermaland Automobile Engineering Practical		No Equivalent
30002	Life and Employability Skills Practical		40001 Communication Skill Practical

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SIXTH SEMESTER

M-SCHEME		N-SCHEME	
Subject code	**Name ofthe Subject**	**Subject code**	**Name ofSubject**
32061	Industrial Engineering and Management	4020610	Industrial Engineering and Management
32062	Computer Aided Design and Manufacturing	4020531	Computer Integrated Manufacturing
Elective-II Theory			
32081	Mechanical Instrumentation		No Equivalent
32082	Robotics		No Equivalent
32083	Refrigeration and Air-conditioning	4020632	Refrigeration and Air Conditioning
32064	Computer Aided Design and Manufacturing Practical	4020561	Computer Integrated Manufacturing Practical
32065	Machine Tool Testing and Maintenance Practical		No Equivalent
Elective- II Practical			
32084	Mechanical Instrumentation Practical		No Equivalent
32085	Robotics Practical		No Equivalent
32086	Refrigeration and Air-conditioning Practical	4020652	Refrigeration and Air Conditioning Practical
32067	Project Work		No Equivalent

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020310

Semester : III

Subject Title : Strength of Materials

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
4020310 Strength of Materials	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Engineering Materials	15
II	Deformation of Metals	15
III	Geometrical Properties of Sections and Thin Shells	15
IV	Theory of Torsion and Springs	14
V	SF and BM Diagrams of Beams and Theory of Bending	14
Test and Model Exam		7
Total		**80**

RATIONALE:

Day by day, engineering and technology experience tremendous growth. Design plays a major role in developing engineering and technology. Strength of material is backbone for design. The strength of material deals generally with the behaviour of objects, when they are subject to actions of forces. Evaluations derived from these basic fields provide the tools for investigation of mechanical structure.

OBJECTIVES

- Acquire knowledge about materials properties.
- Calculate the deformation of materials, which are subjected to axial load and shear.
- Determine the moment of Inertia of various sections used in industries.
- Estimate the stresses induced in thin shells.
- Draw the shear force and bending moment diagram of the beam for different load.

4020310 STRENGTH OF MATERIALS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ENGINEERING MATERIALS** **Chapter: 1.1: Engineering materials:** Classification - definition of Mechanical properties - ferrous metals - cast iron - uses - advantages - types of cast iron - properties and applications - effect of impurities on cast iron. steel - classification - alloying elements - purpose of alloying - effect of alloying elements on steel - uses of steels - properties of mild steel - defects in steel - applications - properties of hard steel - market forms of steels – nonferrous metals - properties and uses. **Chapter: 1.2: Mechanical testing of materials:** Compression test - bend test - hardness test - Brinell hardness test, Vickers hardness test, Rockwell hardness test - impact test - fatigue test - creep test. Tensile test of mild steel in UTM - stress strain diagram -	7 6

	limit of proportionality - elastic limit - yield stress - breaking stress - ultimate stress - percentage of an elongation and percentage reduction in area - problems. **Chapter: 1.3: Friction** Introduction - definition - force of friction - limiting friction - static friction - dynamic friction - angle of friction - coefficient of friction - laws of static and dynamic friction. Description only.	2
II	**DEFORMATION OF METALS** **Chapter: 2.1: Simple stresses and strains** Definition - load, stress and strain - classification of force systems: tensile, compressive and shear force systems. Hooke's law - definition Young's modulus - working stress, factor of safety, load factor, shear stress and shear strain - modulus of rigidity. Linear strain - deformation due to tension and compressive forces - simple problems in tension, compression and shear forces. **Chapter: 2.2: Elastic constants** Definition - lateral strain – poison's ratio - volumetric strain - bulk modulus - volumetric strain of rectangular and circular bars - problems connecting linear, lateral and volumetric deformations - elastic constants and their relationship - problems on elastic constants. Composite bar - definition - problems in composite bars subjected to tension and compression. Temperature stresses and strains - simple problems. **Chapter: 2.3 Strain Energy** Definition – proof resilience – modulus of resilience – the expression for strain energy stored in a bar due to axial load – instatntaneous stresses due to gradual, sudden, impact and shock loads – problems computing instantaneous stress and deformation in gradual, sudden, impact and shock loadings.	4 7 4
III	**GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS** **Chapter: 3.1: Properties of sections** Definition – center of gravity and centroid - position of centroids of plane geometrical figures such as rectangle, triangle, circle and trapezium-problems to determine the centroid of angle, channel, T and I sections	8

	only – Definition - centroidal axis - Axis of symmetry. Moment of Inertia – parallel axis theorem and perpendicular axis theorem (statement only). Moment of Inertia of lamina of rectangle, circle, triangle, I and channel sections – Definition - Polar moment of Inertia - radius of gyration – Problems computing moment of inertia and radius of gyration for angle, T, Channel and I sections. **Chapter: 3.2: Thin Shells** Definition – Thin and thick cylindrical shell – Failure of thin cylindrical shell subjected to internal pressure – Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure – simple problems – change in dimensions of a thin cylindrical shell subjected to internal pressure – problems – Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure – simple problems – change in diameter and volume of a thin spherical shell due to internal pressure – problems.	7
IV	**THEORY OF TORSION AND SPRINGS** **Chapter: 4.1: Theory of Torsion** Assumptions – torsion equation $\frac{T}{J}=\frac{f_s}{R}=\frac{C\theta}{l}$ - Strength of solid and hollow shafts – power transmitted – Definition – Polar modulus – Torsional rigidity – strength and stiffness of shafts – comparison of hollow and solid shafts in weight and strength considerations – Advantages of hollow shafts over solid shafts – Problems. **Chapter: 4.2: Springs** Types of springs – Laminated and coiled springs and applications –– Difference between open and closely coiled helical springs – closely coiled helical spring subjected to an axial load – problems to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs.	7 7
V	**SF AND BM DIAGRAMS OF BEAMS AND THEORY OF BENDING** **Chapter: 5.1: SF and BM diagrams** Classification of beams – Definition – shear force and Bending moment – sign conventions for shear force and bending moment – types of	7

	loadings – Relationship between load, force and bending moment at a section – shear force diagram and bending moment diagram of cantilever and simply supported beam subjected to point load and uniformly distributed load (UDL) – Determination of Maximum bending moment in cantilever beam and simply supported beam when they are subjected to point load and uniformly distributed load. **Chapter: 5.2: Theory of bending** Theory of simple bending – Assumptions – Neutral axis – bending stress distribution – moment of resistance – bending equation – M/I=f/y=E/R – Definition – section modulus - rectangular and circular sections – strength of beam – simple problems involving flexural formula for cantilever and simply supported beam.	7

Reference Books:

1. Strength of Materials, R. S. Khurmi, S.Chand & Co., Ram Nagar, New Delhi.
2. Strength of Materials, S. Ramamrutham, 15th Edition 2004, DhanpatRai Pub. Co., New Delhi.
3. Strength of Materials, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 3rd Edition, 2010.
4. Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2008, ISBN 9780070668959,
5. Strength of Materials, B K Sarkar, I Edition, 2003Tata Mcgraw hill, New Delhi.
6. Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 2nd Edition, 2007.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020320

Semester : III

Subject Title : Manufacturing Technology - I

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020320 Manufacturing Technology - I	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Casting Processes	15
II	Joinng Processes	15
III	Bulk Deformation Processes and Heat Treatment	15
IV	Manufacturing of Plastic Componenets and Powder Metalurgy	15
V	Centre Lathe and Special Purpose Lathe	13
Test and Model Exam		7
Total		**80**

RATIONALE:

Manufacturing, the major and the most important aspect in industries needs utmost care and attention. Knowledge about various processes and allied areas will be of great use to the personnel involved in production. This will provide the students an opportunity to skill themselves for the industrial scenario.

OBJECTIVES:

- Acquire Knowledge about types of pattern, casting, and moulding.
- Describe the various casting processes.
- Knowledge about various welding process and its working principle.
- Appreciate the safety practices used in welding.
- Acquire knowledge about various forming technologies.
- Knowledge about the lathe and its working parts.
- Describe the functioning of semi-automatic lathes.

4020320 MANUFACTURING TECHNOLOGY - I

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**CASTING PROCESSES** **Chapter: 1.1: Patterns** Definition – pattern materials – factors for selecting pattern materials – Types of Pattern - solid piece, split patterns, loose piece, match plate, sweep, skeleton, segmental, shell – pattern allowances – core prints. **Chapter: 1.2: Moulding** Definition – moulding boxes, moulding sand – ingredients – silica – clay – moisture and miscellaneous materials – properties of moulding sand – sand additives – moulding sand preparation - moulding tools – mixing – tempering and conditioning – types of moulding – green sand – dry sand – machine moulding –Top and bottom squeezer machines – Jolting machines – sand slinger- core – CO_2 core making – types of core – core boxes.	 3 6

	Chapter: 1.3: Casting Definition – sand casting using green sand and dry sand – gravity die casting – pressure die casting – hot and cold chamber processes – centrifugal casting – continuous casting – chilled casting – malleable casting – melting of cast iron – cupola furnace – melting of nonferrous metals – crucible furnace melting of steel - arc furnaces – induction furnaces – instrument for measuring temperature – optical pyrometer – thermo electric pyrometer – cleaning of casting – tumbling, trimming, sand and shot blasting – defects in casting – causes and remedies – safety practices in foundry.	6
II	**JOINING PROCESSES** **Chapter: 2.1: Arc Welding** Definition – arc welding equipment – arc welding methods – carbon arc, metal arc, Metal Inert gas (MIG), Tungsten inert gas (TIG), Atomic hydrogen, Plasma arc, Submerged arc and Electro slag welding. **Chapter: 2.2: Gas welding** Definition Gas Welding Equipment– Oxy and acetylene welding - Three types of flame– resistance welding – classification of resistance welding – butt – spot – seam – projection welding – welding related processes – oxy and acetylene cutting – arc cutting – hard facing bronze welding – soldering and brazing special welding processes – cast iron welding – thermit welding – solid slate welding, ultrasonic, diffusion and explosive welding – explosive cladding – modern welding, electron beam and laser beam welding – types of welded joints – merits and demerits of welded joints – inspection and testing of welded joints – destructive and nondestructive types of tests – magnetic particle test – radiographic and ultrasonic test defects in welding – causes and remedies – safety practices in welding .	5 10
III	**BULK DEFORMATION PROCESSES AND HEAT TREATMENT** **Chapter: 3.1: Forming** Hot working, cold working – advantages of hot working and cold working– hot working operations – rolling, forging, smith forging, drop	7

	forging, upset forging, press forging – roll forging Press working : Types of presses – Mechanical and Hydraulic presses – press tool and accessories – press working operations – bending operations – angle bending – chemical bending – curling – drawing – shearing operations – blanking, piercing, trimming – notching – lancing. **Chapter: 3.2: Heat treatment** Heat treatment processes – purpose – procedures – applications of various heat treatment processes – Iron – carbon equilibrium diagram – full annealing – process annealing stress relief annealing - spherodising annealing – isothermal annealing – normalizing – hardening – tempering – quenching medium – different types and their relative merits – case hardening – pack carburizing – cyaniding – nitriding – induction hardening and flame hardening.	8
IV	**MANUFACTURING OF PLASTIC COMPONENTS AND POWDER METALLURGY** **Chapter: 4.1: Plastic Components** Types of plastics-Engineering plastics – thermosets – composite - structural foam, elastomers - polymer alloys and liquid crystal polymers. **Chapter: 4.2: Processing of Plastics** Extrusion-general features of single screw extrusion - twin screw extruders and types-Injection moulding types : Plunger type.- Reciprocating screw injection - details of injection mould - structural foam injection mould - sandwich moulding - gas injection moulding – injection moulding of thermosetting materials calendaring and rotational moulding. Design consideration for plastic components. **Chapter: 4.3: Powder Metallurgy** Methods of manufacturing metal powders – atomization, reduction and electrolysis deposition – compacting – sintering – sizing – infiltration – mechanical properties of parts made by powder metallurgy – design rules for the power metallurgy process.	3 6 6
V	**CENTRE LATHE AND SPECIAL PURPOSE LATHES** **Chapter: 5.1: Centre Lathe** Centre lathe: specifications – simple sketch with principal parts. Head	5

	stock: back geared type – all geared type - description only. Working principale of tumbler gear mechanism, quick change gear box, apron mechanism, carriage cross slide. Feed mechanism: automatic feed, longitudinal feed and cross feed. Construction and working of tail stock. work holding device: face plate – three jaw chuck – four jaw chuck – catch plate and carrier – center. Operations: straight turning – step turning - taper turning – knurling-Thread cutting - Facing – Boring – chamfering. Cutting speed – feed - depth of cut. **Chapter: 5.2: Semi-Automatic Lathes** Types of semi-automatic lathes – capstan and turret lathes – difference between turret and capstan. **Chapter: 5.3: Automatic Lathes** Automatic lathe – Construction and working principle of single spindle automatic lathe – automatic screw cutting machines – multi spindle automatic lathes.	4 4

Reference Books:

1. Elements of workshop Technology Volume I & II – Hajra Chowdry & Bhattacharaya - IIth Edition - Media Promoters & Publishers Pvt. Ltd., Seewai Building `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2. Introduction of basic manufacturing processes and workshop technology – Rajendersingh – New age International (P) Ltd. Publishers, 4835/24, Ansari Road, Daryaganj, New Delhi – 110002.
3. Manufacturing process – Begeman - 5th Edition -McGraw Hill, New Delhi 1981.
4. Workshop Technology- WAJ Chapman - Volume I, II, & III – Vima Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
5. Workshop Technology – Raghuwanshi - Khanna Publishers. Jain & Gupta,
6. Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi 110 006 - 2006
7. Production Technology - P. C. SHARMA - Edn. X - S.Chand & Co. Ltd., Ram Nagar, New Delhi 110 055 - 2006
8. Production Technology – HMT - Edn. 18 - published by Tata McGraw Hill publishing Co. Ltd., 7 West Patel nagar, New Delhi 110 008. – 2001.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020330

Semester : III

Subject Title : Measurements and Metrology

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020330 Measurements and Metrology	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Basic Concepts of Measurements	15
II	Linear and Angular Measurements	15
III	Form Measurement	15
IV	Advances in Metrology	14
V	Measurement of Mechanical Parameters	14
Test and Model Exam		7
Total		**80**

RATIONALE:

Measurements and metrology are the basic and prominent tools in all the industries in the present scenario. The students should be trained not only in manufacturing also they should have knowledge about the various measuring instruments which is used in industries. This will provide the students an opportunity to skill themselves for how to handle the various metrological equipment available to measure the dimensions of the components.

OBJECTIVES

- Study about the basic concepts of measurements.
- Acquire knowledge about precision and accuracy.
- Describe about the various linear and angular measurements.
- Acquire knowledge about the measurement of screw threads and gears.
- Study about the laser metrology and computer in metrology.
- Describe the measurement of mechanical parameters force, power and flow.

4020330 MEASUREMENTS AND METROLOGY

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**BASIC CONCEPTS OF MEASUREMENTS** **Chapter: 1.1: Introduction** Basic units - system concepts used in measuring technology - measuring instruments - length, angles and surface - scope of Metrology - standardization - international standardization, the bureau of Indian standards - legal Metrology - definition - applications - important elements of measurements - methods of measurements - needs for inspection - need for measurement - important terminology. **Chapter: 1.2: Precision and accuracy** Precision - definition - accuracy - definition - difference between precision and accuracy - factors affecting the accuracy of the measuring system - general rules for accurate measurements -	7 8

	precautions for use of instruments so as to avoid in accuracy in measurements - reliability - definition - error - definition - sources of errors - classification of error - compare systematic error and random error - selection of measuring instruments - symbols for metallurgical terms (ASME and ISO).	
II	**LINEAR AND ANGULAR MEASUREMENTS** **Chapter: 2.1: Linear measurements** Classification of linear measurement instrument - construction and the principles only - Steel rule - callipers - outside calliper, inside calliper, Jenny caliper - combination set - feeler gauge - pitch screw gauge - Vernier caliper - digital caliper - Vernier height gauge- micrometer - inside micrometer - thread micrometer - optical micrometer - light wave micrometer - possible sources of errors in micrometers - slip gauges - requirements - Indian standard - care and use. **Chapter: 2.2: Angular measurements** Introduction - vernier bevel protractor - universal bevel protractor - optical bevel protractor. Sine bar - types - uses and limitations - working principle of clinometer, autocollimator, angle dekkor. Comparators - uses - application - classification of comparator - mechanical comparator, optical comparator, electrical comparator, pneumatic comparator - principles - advantages and disadvantages - compare comparator with measuring instruments - compare electrical and mechanical comparators.	7 8
III	**FORM MEASUREMENT** **Chapter: 3.1: Measurement of screw threads** Screw thread terminology - error in thread - measurement of various elements of thread (description only) - thread gauges - classification - plug screw gauges, ring screw gauges, caliper gauges - adjustable thread gauge - gauging of taps - function of various types of gauges - floating carriage micrometer. **Chapter: 3.2: Measurement of gears** Introduction - types of gear - gear terminology - gear errors - spur	5 10

	gear measurement - run out, tooth measurement, profile measurement, lead checking , backlash checking, tooth thickness measurement - vernier gear tooth caliper - David brown tangent comparator - constant chord method - measurement of concentricity, alignment checking - Parkinson gear tester - Rolling gear testing machine - radius measurement - radius of circle - surface finish measurement - classification of geometrical irregularities - elements of surface texture - methods of measuring surface finish - measuring surface roughness - tracer type profilogram - double microscope.	
IV	**ADVANCES IN METROLOGY** **Chapter: 4.1: Laser Metrology** Basic concepts of lasers - types of lasers - uses, advantages and applications - laser telemetric system - laser and LED based distance measuring instruments - scanning laser gauge - photodiode array imaging - diffraction pattern technique - laser triangulation sensors - two frequency laser interferometer - gauging wire diameter from the diffraction pattern formed in laser - interferometry - use of laser in interferometry - interferometer - standard interferometer, single beam interferometer, AC interferometer, Michelson interferometer, dual frequency laser interferometer - Twyman green interferometer - applications. **Chapter: 4.2: Computer in Metrology** Coordinating measuring machine - introduction - types of measuring machines - types of CMM - futures of CMM - causes of errors in CMM - 3 co-ordinate measuring machine - performance of CMM - applications - advantages disadvantages - computer controlled coordinating measuring machine - mechanical system of computer controlled CMMs - trigger type probe system, measuring type prop system, features of CNC and CMM - features of CMM software - factors affecting CMM - digital devices - Computer based inspection - Computer aided inspection using robots.	 7 7

V	**MEASUREMENT OF MECHANICAL PARAMETERS** **Chapter: 5.1: Force** Measurement of force - Direct methods - equal arm balance, unequal arm balance, multiple lever system, pendulum scale - indirect methods - electromagnetic balance - load cells - hydraulic load cell, pneumatic load cell, strain gauge load cell, shear type load cell, electronic weighing system. Torque measurement - torque measurement using strain gauge - laser optical torque measurement - stroboscope for torque measurement. **Chapter: 5.2: Measurement of power** Mechanical dynamometer - DC dynamometer - inductor dynamometer - hydraulic dynamometer - diaphragm pressure sensor - deform cage with LVDT - diaphragm gauge with strain gauges - piezoelectric sensors. **Chapter: 5.3: Measurement of flow** Types of flow metres - rotameter, electromagnetic flow metre, hot wire anemometer, ultrasonic flow metre, laser Doppler anemometer (LDA) - reference beam mode, interference French mode.	6 4 4

Reference Books:

1. Mechanical Measurements and Instrumentation, Rajput R K, S.K.Kataria and Sons.
2. Mechanical Measurement and Control, Jalgaonkar R.V, Everest Publishing House.
3. Mechanical and Industrial Measurements, Jain R K, Khanna Publications.
4. Instrumentation Devices and Systems, Narang C S, Tata McGraw Hill Publications.
5. Instrumentation, Measurement and Analysis, Nakra B.C, Chaudhary K.K, Tata McGraw Hill Publications.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020340

Semester : III

Subject Title : Thermal Engineering - I

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020340 Thermal Engineering - I	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Basics of Thermodynamics and Thermodynamic processes of Perfect Gases	15
II	Thermodynamic Air Cycles and Heat Transfer	15
III	Internal Combustion Engines	15
IV	Fuels & Combustion of Fuels and Performance of IC Engines	15
V	Refrigeration and Air Conditioning	13
Test and Model Exam		7
Total		**80**

RATIONALE:

The growth of industries in the areas of Automobile and thermal power generation is the contemporary need of the present day. For these industries Knowledge on the concept of Thermodynamics, Thermodynamic Processes, Steady flow energy equation and study of fuels, IC Engines and performance of IC Engines are vital.

OBJECTIVES:

- Explain the basics of systems and laws of thermodynamic and
- Thermodynamic processes.
- Explain different type of fuels and their combustion phenomenon.
- Explain the types, functions and the performance tests of IC engines.
- Explain vapour compression refrigeration system.
- Explain vapour absorption refrigeration system.
- Compare the properties and applications of various refrigerants.
- Describe the equipment used for air conditioning.

4020340 THERMAL ENGINEERING - I

DETAILED SYLLABUS

Contents: Theory

Unit	Name Of The Topic	Hours
I	**BASICS OF THERMODYNAMICS AND THERMODYNAMIC PROCESSES OF PERFECT GASES** Introduction – definitions and units of mass, weight, volume, density, work –power- energy – types- specific weight, specific gravity and specific volume – pressure – units of pressure –temperature - absolute temperature – S.T.P and N.T.P conditions – heat -specific heat capacity at constant volume and at constant pressure – law of conservation of energy – thermodynamic system– types – thermodynamic equilibrium - properties of systems – intensive and extensive properties –State of System- process – cycle – point and path functions - zeroth, first and second laws of thermodynamics. Description of basic concepts only.	5

	Perfect gases – laws of perfect gases – Boyle's, Charles', Joule's, Regnault's and Avogadro's laws –General Gas Equation-characteristic gas equation – relation between specific heats and gas constant – universal gas constant –Thermodynamic Processes-Change in Internal Energy- enthalpy –change in enthalpy – entropy – change in entropy – general equations for change in entropy. Description only. Constant volume, constant pressure, isothermal, isentropic (reversible adiabatic) – Description and problems. Polytropic (derivation only), hyperbolic (derivation only) – P-V and T-S diagrams, work done, change in internal energy, heat transfer, change in enthalpy, change in entropy for various processes - Free expansion and throttling processes.	5 5
II	**THERMODYNAMIC AIR CYCLES AND HEAT TRANSFER** Air cycles – air standard efficiency – reversible and irreversible processes –assumptions in deriving air standard efficiency – Carnot cycle – Otto cycle –Joule cycle – Diesel cycle – comparison of Otto cycle and Diesel cycle -Comparison of ideal and actual p-V diagrams of Otto and Diesel cycles –problems . Modes of heat transfer – heat transfer by conduction – Fourier's Law- – heat transfer by convection –heat exchanger – Parallel flow and Counter flow– heat transfer by radiation – Description only. Steady flow system – control volume – steady flow energy equation – assumptions –Engineering applications of steady flow energy equation – non flow energy equation. Description only.	5 5 5
III	**INTERNAL COMBUSTION ENGINES** Internal combustion engines. Classifications of I.C Engines – components of I.C Engines and functions material and method of manufacturing - four stroke cycle petrol and diesel engines – two stroke cycle petrol and diesel engines - comparison of four stroke and two stroke engines – Comparison of petrol and diesel engines - valve timing diagram for four stroke petrol and diesel engines – port timing diagram for two stroke petrol and diesel engines. Layout of fuel	10

	supply system in petrol engines - A.C. mechanical fuel pump – simple carburetor – layout of fuel supply system in diesel engine- single acting fuel feed pump – CAV fuel injection pump – fuel injectors – types of nozzles -fuel filters. Ignition systems – battery coil ignition systems – magneto ignition system - MPFI and CRDI System. Governing of I.C. engines - quantity and quality governing – cooling systems – air cooling – water cooling. Lubrication system – properties of lubricants –types of lubrication systems – high pressure Lubrication system - oil pump (Gear & Rotor Pumps) and oil filters.	5
IV	**FUELS &COMBUSTION OF FUELS AND PERFORMANCE OF I.C ENGINES** Classifications of fuels - merits and demerits – requirements of a good fuel –combustion equations – stoichiometric air required for complete combustion of fuels – excess air – products of combustion – analysis of exhaust gases - Exhaust gas analyser - calorific value of fuels – higher and lower calorific values – Dulong's formula – determination of calorific value – Bomb and Junker's calorimeter. Description only. Testing - thermodynamic and commercial tests – indicated power – brake power – friction power – efficiencies of I.C. engines – indicated thermal ,brake thermal, mechanical and relative efficiencies – Specific fuel consumption – problems - Morse test – heat balance sheet – procedure and problems**.**	15
V	**REFRIGERATION AND AIR CONDITIONING** Refrigeration – refrigerators and heat pumps – types and applications of refrigeration Systems – refrigerating effect – unit of Refrigeration – C.O.P. – actual C.O.P. Air Refrigeration System – reversed Carnot cycle – C.O.P of refrigerator, heat pump & Heat Engines. Bell-coleman cycle – Vapour compression refrigeration system - vapour absorption system – Comparision - refrigerants – properties. Description only. Psychrometry - psychometric properties – dry air – moist air – water vapour – saturated air – dry bulb temperature – wet bulb temperature – wet bulbdepression – dew point temperature – dew point	10 5

	depression – humidity – specific and relative humidity – psychrometric chart – psychrometric processes – sensible heating and cooling - By-pass Factor - humidification – dehumidification –Mixing of Air Stream. Air conditioning – classification and applications of air conditioning system – room air conditioning – central air conditioning – comparison – comfort and industrial air conditioning – factors to be considered in air conditioning – loads encountered in air conditioning systems. Description only.	

Reference Books:

1. Thermal Engg, R.K.Rajput, 8th Edition, Laxmi publications Pvt Ltd , New Delhi.
2. Applied Thermodynamics, P.K. Nag, 2nd Edition, TATA Mcgraw – Hill Publishing Company, New Delhi .
3. Thermal Engineering, R.S. Khurmi and J.K. Gupta, 18th Edition, S. Chand & Co, New Delhi.
4. Thermal Engineering, P.L Ballaney , 24th Edition Khanna Publishers, New Delhi.
5. Thermal Engineering, B.K. Sarkar , 3rd Edition , Dhanpat Rai & Sons New Delhi .
6. Applied Thermodynamics, Domkundwar and C.P Kothandaraman, 2nd Edition Khanna publishers, New Delhi.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020350

Semester : III

Subject Title : Machine Drawing and CAD Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020350 Machine Drawing and CAD Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

RATIONALE:

Mechanical Engineering Diploma Engineer is expected to possess a thorough understanding of drawing, which includes clear visualization and proficiency in reading and interpreting a wide variety of production drawing. Manufacturing of various parts start from the basic drawing of components. The assembly of components is also carried out from the drawing. So drawing is an important subject to be studied by the students to carry and complete the production and assembly process successfully.

OBJECTIVES:

- To learn the parts and assembly of the machine components.
- To appreciate the need for sectional view and types of sections.
- To draw sectional views.
- To practice manual drawing

- To use Computer Aided Drafting.
- To prepare geometrical model of various machine elements.
- To draw the different views of machine elements.
- To interpret the drawing in engineering field and illustrate three dimensional objects.

4020350 MACHINE DRAWING AND CAD PRACTICAL

DETAILED SYLLABUS

Contents: Practical

PART–A: MANUAL DRAWING PRACTICE

Sectioning - sectional views – representation of sectional plane – hatching – inclination – spacing – hatching large areas – hatching adjacent parts - full section – half section – types of half sections – conventional representation of materials in section – Dimensioning.

Detailed drawings of the machine parts are given to students to assemble and draw any two views of the machine elements in the Drawing Sheet with dimensions. Front View /Full Section / Half SectionFront Viewand Top View / Left Side View / Right Side View.

PART–B: COMPUTER AIDED DRAFTING (CAD)

CAD applications – Hardware requirement – Software requirement – CAD screen interface – menus – Toolbars – types of co-ordinate system – Creating 2D objects – Using draw commands – Creating text – Drawing with precision – Osnap options – drafting settings – drawing aids – Fill, Snap, Grid, Ortho lines – Function keys – Editing and modify commands – Object selection methods – Erasing object – Oops – Cancelling and undoing a command – Copy – Move – Array – Offset – Scale – Rotate – Mirror – Break – Trim – Extend – Explode. Divide – Measure – stretch – Lengthen – Changing properties – Color – line types – LTscale – Matching properties – Editing with grips – Pedit – Ddedit – Mledit - Basic dimensioning – Editing dimensions – Dimension styles – Dimension system variables. Machine drawing with CAD. Creation of blocks – Wblock – inserting a block – Block attributes – Hatching – Pattern types – Boundary hatch – working with layers – Controlling the drawing display – Blipmode – View group commands – Zoom, redraw, regen,

regenauto, pan, viewers – Realtime zoom. Inquiry groups – calculating area – Distance – Time – Status ofdrawing – Using calculator. Plot

Detailed drawings of the machine parts are given to students to assemble and create two views of the machine elements in the CAD package with dimensions. Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View.

EXERCISE:

Draw the Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View for the following given part drawing of the components after assemble in the drawing sheet and CAD package.

1. Sleeve & Cotter joint
2. Screw jack
3. Plummer Block
4. Simple Eccentric
5. Machine Vice
6. Protected type flanged coupling

Reference Books:

1. A Textbook of Machine Drawing, Pritam Singh Gill, S.K.Kataria & Sons.
2. Machine Drawing, N.D.Bhatt, V.M.Panchal, Charoter Publishing House.
3. Introducing Autocad 2010 and Autocad LT 2010, George Omura, Wiley India Pvt. Ltd.
4. A Textbook of Engineering Drawing, R.B.Gupta, Satya Prakasan, Technical India Publications.
5. Engineering Drawing, D.N. Ghose, Dhanpat Rai &Sons, Delhi

Internal Mark Allocation

Note:

All the students should maintain the observation cum record note book / manual as per the regulation. The printout of the actual CAD output created by the student during practice should be pasted for every exercise in the observation cum record note work.

For every exercise, manual drawing sheet (Two views) should be submitted and evaluated for 50 Marks. (Front view – 30 Marks and Top view/Side view – 20 Marks). The average of the six exercises should be converted to 10 Marks.

Drawing Sheet (Six Exercise Average)	-	10 Mark
Observation and Record work	-	10 Mark
Attendance	-	05 Marks
Total	**-**	**25 Marks**

BOARD EXAMINATION

Note: All the exercises should be completed by Manual and CAD. All the exercise should be given for examination, the students are permitted to select by lot or the question paper from DOTE should be followed. Observation cum Record note book should be submitted during examination along with the drawing file. Part A and Part B should be completed for the examination.

PART A: Manual Drawing in the Drawing sheet

Draw the assemble Front View / Sectional Front View (Full Section / Half Section) for the given part drawing of the components in the drawing sheet.

PART B: Computer Aided Drafting in the CAD package

Create the assemble Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View for the given part drawing of the components in any one of the CAD package.

DETAILLED ALLOCATION OF MARKS

Manual Drawing in Drawing sheet		**: 30 marks**
Assemble Front view	30	
Computer Aided Drafting		**: 60 marks**
Drafting	20	
Assembly	20	
Dimensioning	20	
Viva-voce		**: 10 marks**
Total		**: 100 marks**

LISTOF EQUIPMENT (For 30 students)

1. Personal computer – 30 Nos.
2. Printer – 1 No.
3. Required Software's: CAD Package – Sufficient to the strength.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020360

Semester : III

Subject Title : Manufacturing Technology - I Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020360 Manufacturing Technology - I Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Identify the parts of a center lathe
- Identify the work holding devices
- Set the tools for various operations
- Operate the lathe and Machine a component using lathe
- Identify the tools used in foundry.
- Identify the tools and equipments used in welding
- Prepare sand moulds for different patterns.
- Perform welding operation to make different types of joints.
- Identify the different welding defects.
- Appropriate the safety practices used in welding

4020360 MANUFACTURING TECHNOLOGY - I PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Lathe: Study of Lathe parts and its fuctions – Operations - Plain Turning , Step Turning, Taper turning, Knurling, Thread cutting, Bushing, Ecentric Turning

Foundry: Study of foundry - green sand – properties – patterns – Types - Solid Pattern - Stepped pulley, Bearing top, Gear wheel. Split Pattern - T Pipe, Bent Pipes, Dumbles - Loose Piece pattern – Dovetail – Core – Cores sand - Cylindrical core making

Welding Exercises

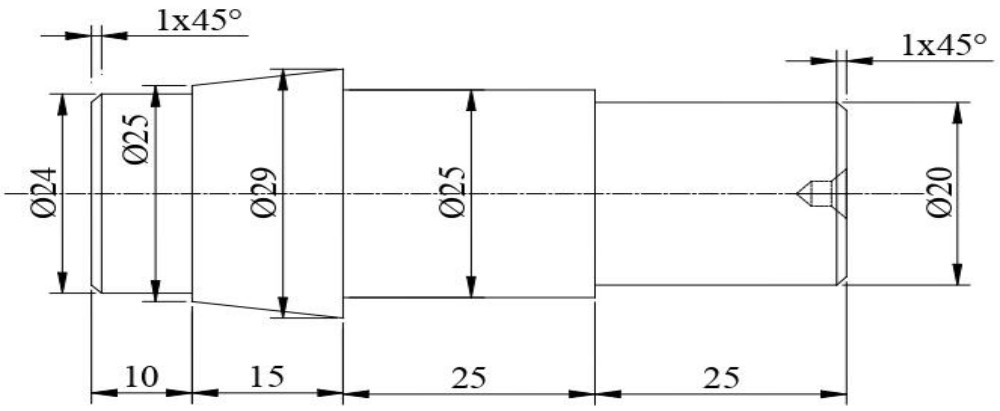
Arc welding principles and components - Arc Welding - Lap Joint - Butt Joint, T Joint, Corner joint. Gas welding equipments – components - Gas welding - Lap Joint, Butt Joint, T Joint, Corner Joint. Gas cutting - Spot Welding

Exercises

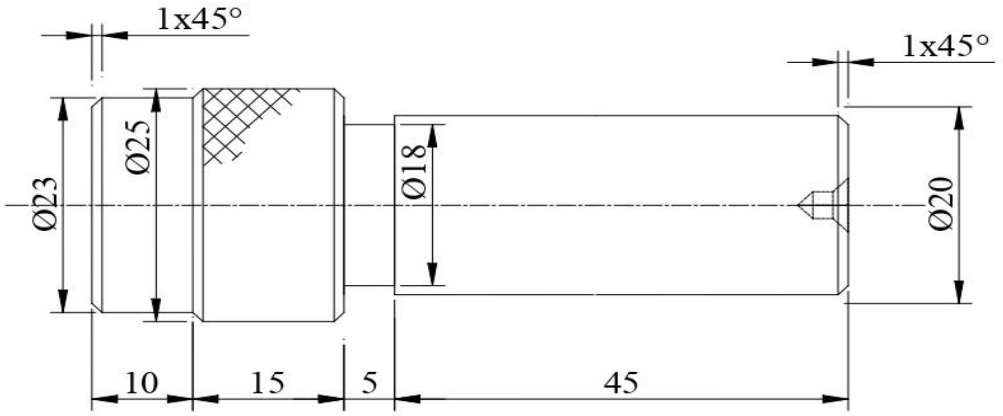
PART A – Lathe Exercises

Note**:** All Dimensions are in mm. All linear dimensions in ± 0.5mm tolerance. All cylindrical dimensions in ± 0.2mm tolerance.Estimate the cost of the job for following exercises for M.S. round rod with suitable raw material for the final size. Final job of the raw material should be retained for verification. (student wise or batch wise).

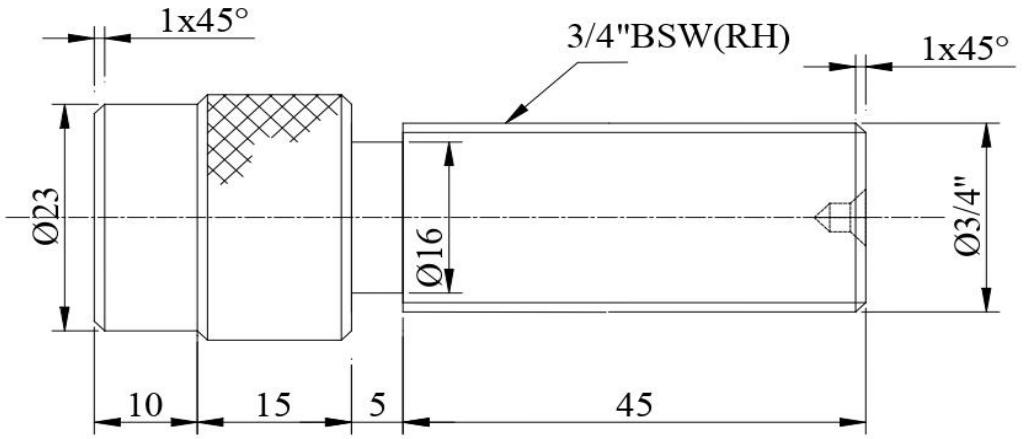
1. Prepare the specimen and make the Step turning & Taper turning as shown in figure using the Lathe.



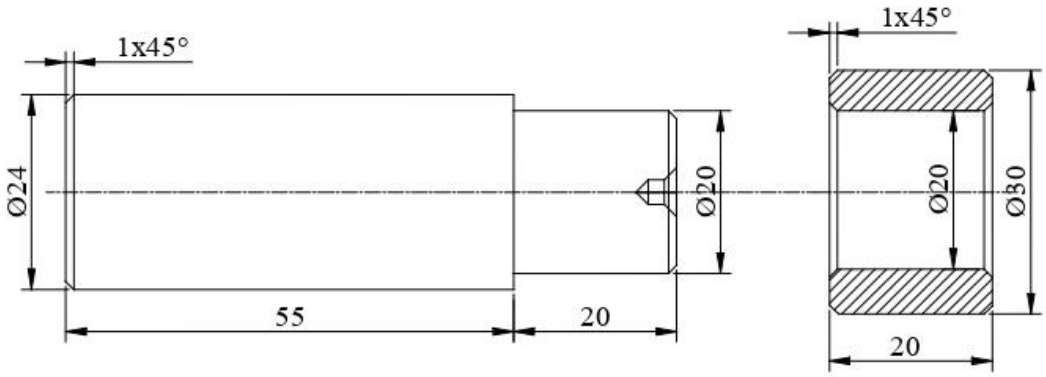
2. Prepare the specimen and make the Step turning & Knurling as shown in figure using the Lathe.



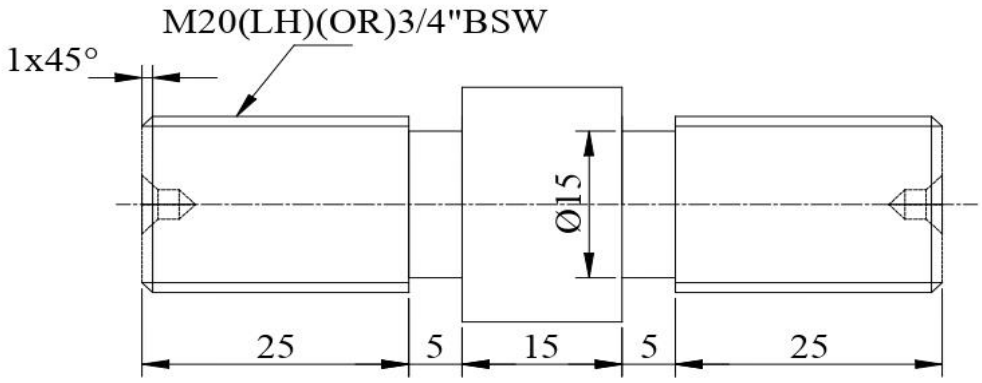
3. Prepare the specimen and make the Step turning &BSW Thread cutting as shown in figure using the Lathe.



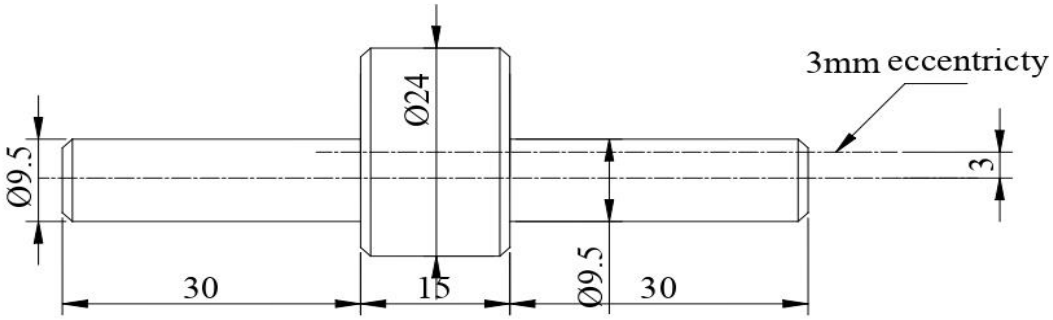
4. Prepare the specimen and make the Shaft and Bush as shown in figure using the Lathe.



5. Prepare the specimen and make the Step turning & BSW and Metric Thread cutting as shown in figure using the Lathe.



6. Prepare the specimen and make the Eccentric turning as shown in figure using the Lathe.



PART B – Exercises

1. Prepare the green sand moulding using any one Solid Pattern in the foundry.
2. Prepare the green sand moulding using any one Split Pattern in the foundry.
3. Prepare the green sand moulding using any one Loose Piece pattern in the foundry.
4. Prepare the specimen and make the Lab joint by the Arc Welding (Both side welded). (Raw material 25mm X 6mm MS flat)
5. Prepare the specimen and make the corner joint by the Gas Welding. (Raw material 25mm X 3mm MS sheet)
6. Prepare the specimen and make the Butt joint by the Spot welding. (Raw material 25mm X 3mm GI sheet)

BOARD EXAMINATION

Note:

- All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the exercises should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Part - A	**:**	**55 marks**
Procedure / Preparation	10	
Machining / Dimensions	35	
Finishing	10	
Part - B	**:**	**40 marks**
Procedure / Preparation	10	
Machining / Dimensions	25	
Finishing	5	
Viva voce	**:**	**05 marks**
Total	**:**	**100Marks**

LIST OF EQUIPMENT (For 30 students)

1. Center Lathe 4 ½ ‘ Bed length – 10 No’s
2. 4 Jaw / 3 Jaw Chucks – required Numbers
3. Chuck key (10 mm x 10 mm size) – 10 No’s
4. Box spanner – 1 No’s
5. Cutting Tool H.S.S ¼ ‘’ X ¼ ‘’ X 4 ‘’ long – 10 No’s
6. Pitch gauge – 5 Nos
7. Vernier Caliper (0-25 and 25-50) – 5 Nos each
8. Micrometer, Inside and Outside(0-25 and 25-50) - 5 each
9. Vernier Height Gauge(300mm) - 1 no
10. Snap gauge – 1 set
11. Gear tooth Vernier - 1 No
12. Parallel Block - 2 Nos
13. Steel Rule (0-150) – 10 Nos.
14. Outside and Inside Calipers - 10 Nos. each
15. Thread gauge – 5 Nos.
16. Bevel Protractor – 1 No
17. Jenny Caliper – 5 Nos.
18. Dial Gauge with Magnetic Stand – 5 Nos.
19. Marking Gauge – 10 Nos.
20. Safety Glass – 10 Nos.
21. Arc welding booth – 2 No’s
    with oil /air cooledwelding transformer withaccessories
22. Gas welding unit (Oxygen and acetylene cylinder) – 1 Set
23. Flux – 500 g
24. Electrode 10 SWG – 200 No’s
25. Face shield – 3 No’s
26. Gas welding goggles – 2 No’s
27. Leather Glows 18’’ – 4 Set
28. Flux chipping hammer – 4 No’s
29. Spot welding machine - 1 No
30. Crucible furnace - 1 No
31. Tilting furnace - 1 No
32. Shovel - 10 Nos

33. Rammer set - 10 Nos
34. Slick - 10 Nos
35. Strike-off bar - 10 Nos
36. Riddle - 10 Nos
37. Trowl - 10 Nos
38. Lifter - 10 Nos
39. Sprue pin - 20 Nos
40. Brush - 10 Nos
41. Vent rod - 10 Nos
42. Draw spike - 10 Nos
43. Gate cutter - 10 Nos
44. Cope box - 10 Nos
45. Drag box - 10 Nos
46. Core box - 10 Nos
47. Runner & riser - 20 Nos
48. Moulding board - 10 Nos
49. Patterns - 5 Nos each

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering
Subject Code : 4020370
Semester : III
Subject Title : Measurements and Metrology Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020370 Measurements and Metrology Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Familiarize about measuring techniques of Metrology instruments.
- Select the range of measuring tools. Study of accuracy of instruments and calibration of instruments.
- Obtain accurate measurements.
- Determine the least count of measuring instruments.
- Acquire knowledge about linear measurement.
- Acquire knowledge about angular measurement.
- Acquire knowledge about geometric measurements.
- Study of Linear Measuring Instruments: Vernier Caliper, Micrometer, Inside Micrometer, Vernier Height gauge and Slip Gauge.
- Study of Angular Measuring Instruments–Universal Bevel Protractor, Sine Bar.

- Study of Geometric measurement - Gear tooth Vernier, Thread Vernier.

Exercises

PART A:

1. Measure the dimensions of ground MS flat / cylindrical bush using VernierCaliper compare with Digital / Dial Vernier Caliper.
2. Measure the diameter of a wire using micrometer and compare the result with digital micrometer
3. Measure the thickness of ground MS plates using slip gauges
4. Measure the inside diameter of the bore of a bush cylindrical component using inside micrometer compare the result with digital micro meter.
5. Measure the height of gauge blocks or parallel bars using vernier height gauge.
6. Detect of cracks of the given two specimens using liquid penetrant test and magnetic particle test.
7.

PART B:

1. Measure the angle of a V-block / Taper Shank of Drill / Dovetail using universal bevel protractor.
2. Measure the angle of the machined surface using sine bar with slip gauges.
3. Measure the geometrical dimensions of V-Thread using thread micrometer.
4. Measure the geometrical dimensions of spur gear.
5. Find out the measurement of given component and compare with a standard component using mechanical comparator and slip gauge .
6. Prepare a specimen to examine and find the grain structure using the Metallurgical Microscope.

BOARD EXAMINATION

Note:

- All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the exercises should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Part-A	**:**	**45 marks**
Procedure / Preparation	10	
Observation / Dimensions	25	
Finishing	10	
Part-B	**:**	**45 marks**
Procedure / Preparation	10	
Observation / Dimensions	25	
Finishing	10	
Viva-voce	**:**	**10 marks**
Total	**:**	**100Marks**

LIST OF EQUIPMENTS (For 30 students)

1. Vernier Caliper - 2 Nos.
2. Digital / Dial Vernier Caliper. - 2 Nos.
3. Outside micrometer - 2 Nos.
4. Inside Micrometer - 2 Nos
5. Digital Micrometer - 2 Nos.
6. Slip gauges - 2 Nos.
7. Universal bevel protractor. - 2 Nos.
8. Sine bar - 2 Nos.
9. Digital inside micrometer - 2 Nos.
10. Surface plate - 2 Nos.
11. Vernier height gauge - 1No.
12. Thread Vernier - 1 No.
13. Thread micrometer – 1 No.
14. Gear tooth Vernier - 2 Nos.
15. Mechanical comparator - 2 Nos.
16. Dial indicator (0-10) - 2 Nos.
17. Abrasive grinder – 1 No.
18. Polishing Machine – 1 No.
19. Mounting machine – 1 No.
20. Metallurgical microscope – 2 Nos
21. Magnetic yoke - 1 No.
22. Liquid penetrant test kit – 1 set.
23. Consumable - Sufficient quantity

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020410

Semester : IV

Subject Title : Fluid Mechanics and Fluid Power

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020410 Fluid Mechanics and Fluid Power	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Properties of Fluids & Fluid Pressure	12
II	Fluid Flow, Flow Through Pipes & Impact of Jet	17
III	Hydraulic Turbines, Centrifugal Pumps & Reciprocating Pumps	16
IV	Hydraulic Systems	16
V	Pneumatic Systems	12
Test and Model Exam		7
Total		**80**

RATIONALE:

The purpose of this subject is to teach the students the fundamentals of engineering fluid mechanics in a very general manner so that they can understand the way that forces are produced and transmitted by fluids that are, first, essentially at rest and, second, in motion. This will allow them to apply the physical principles behind some of the most common applications of fluid mechanics in engineering.

OBJECTIVES:

- To study the basic fluid properties and types of flow;
- To understand the transmission of pressure in liquids and its application to hydraulics;
- To calculate hydrostatic forces on plane and curved submerged surfaces;
- To employ the concept of continuity of flow and use Bernoulli's equation to measure flow rate and velocity;
- To apply the momentum principle to liquids in jets and pipes.
- To understand the working of hydraulic machines like, turbines, pumps.
- To identify the various components of a Hydraulic & Pneumatic systems and select them for design of hydraulic and pneumatic circuits for Engineering applications.

4020410 FLUID MECHANICS AND FLUID POWER
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**PROPERTIES OF FLUIDS & FLUID PRESSURE**	
	Chapter: 1.1: Properties of Fluids	4
	Fluid – definition-classification. Properties – density, specific gravity, specific weight, specific volume, dynamic viscosity, kinematic viscosity, surface tension, capillarity, vapour pressure and compressibility – Problems	
	Chapter: 1.2: Fluid Pressure & Its Measurement	8
	Fluid Pressure – Hydrostatic law - Pressure head, Pascal's Law – proof -	

	applications - Hydraulic press- Hydraulic jack. Concepts of absolute, vacuum, gauge and atmospheric pressures. Pressure measurements – Simple U tube manometers and differential manometers and their types – Problems - Bourdon tube pressure gauge. Pressure sensor technologies - classification only. Total Pressure, Centre of pressure on immersed bodies (flat vertical., flat vertical) – Problems.	
II	**FLUID FLOW, FLOW THROUGH PIPES & IMPACT OF JET** **Chapter: 2.1: Fluid Flow** Types of Fluid flow - Laminar, turbulent, steady, unsteady, uniform, non-uniform, rotational, irrotational. Continuity equation, Bernoulli's theorem - assumptions- derivation - applications and limitations - Problems. Venturimeter – Construction - working principle, coefficient of discharge - derivation for discharge. Orificemeter - Construction working principle, coefficient of discharge- derivation for discharge. Problems. Pitots Tube – Construction and working principle only. **Chapter: 2.2: Flow through Pipes** Laws of fluid friction for Laminar and turbulent flow- Darcy's equation and Chezy's equation for frictional losses – Problems. Minor Losses - description. Hydraulic gradient line and Total energy line. Hydraulic Power transmission through pipes – problems. **Chapter: 2.3: Impact of Jet** Impact of jet on fixed vertical plate - Impact of jet on moving vertical flat plates in the direction of jet - Impact of jet on a series of moving plates or vanes - Problems on work done and efficiency.	6 6 5
III	**HYDRAULIC TURBINES, CENTRIFUGAL PUMPS & RECIPROCATING PUMPS** **Chapter: 3.1: Hydraulic Turbines** Classification of hydraulic turbines and their applications. Construction and working principle of Pelton wheel, Francis and Kaplan turbine. Draft tubes – types and construction, Concept of cavitation in turbines, Surge tank and its need.	4

	Chapter: 3.2: Centrifugal Pumps Construction - Principle of working. Types of casings and impellers. Concepts of multistage. Priming and its methods. Manometric head, work done, manometric, mechanical and overall efficiencies - problems **Chapter: 3.3: Reciprocating Pumps** Construction, working principle and applications of single and double acting reciprocating pumps. Discharge - Theoretical power required coefficient of discharge – Problems Concepts of slip – negative slip. Cavitation and separation. Use of air vessel. Indicator diagram with effect of acceleration head and friction head.	6 6
IV	**HYDRAULIC SYSTEMS** **Chapter: 4.1: Introduction to Fluid power systems** Fluid power systems - general layout - components of hydraulic & Pneumatic systems. Practical applications of Fluid power systems. Comparison - Advantages and limitations. **Chapter: 4.2: Components of Hydraulic systems** Types, construction, working Principle and symbol of the following components. Pump – vane, gear and piston pumps. Valves: Pressure Control valves – pressure relief . valve, pressure reducing valve, pressure unloading valve. Direction control valve – poppet valve, spool valve, 3/2, 4/2 & 4/3 DC valves, sequencing valve.Flow control valve – pressure compensated – non pressure compensated.Actuators – Linear actuactors – single acting & double acting – rotory actuators – hydraulic motors. Accessories – Intensifiers and Accumulators. **Chapter: 4.3: Hydraulic Circuits** Double acting cylinder with Meter in, Meter out circuits, Pump unloading cut, Bleed off circuit, sequencing circuit. Hydraulic circuits for milling machine, shaping machine. Motion synchronisation circuit.	 4 8 4
V	**PNEUMATIC SYSTEMS** **Chapter: 5.1: Components of pneumatic systems** Types, construction, working Principle and symbol of the following components. Compressor – Reciprocating & Rotary Compressors.	 8

	Valves. Pressure Control valves – pressure relief valve, pressure regulating valves.Direction control valves – 3/2, 5/2 & 5/3 DC valves, sequencing valve.Flow control valve – throttle valves – shuttle valves-quick exhaust valves. Actuators – Linear actuactors – single acting & double acting – rotary actuators – air motors.Accessories.- FRL unit. **Chapter: 5.2: Pneumatic Circuits** Double acting cylinder with Meter in, Meter out circuits, speed control circuit and sequencing circuit	4

Reference Books:

1. A Textbook of Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publications (P).,Ltd, New Delhi, 2010
2. Hydraulics and Fluid Mechanics, Modi P.N. and Seth, S.M. Standard Book House, New Delhi, 2013.
3. Fluid Power with Applications, Anthony Esposito,, Pearson Education 2005.
4. A Textbook of Fluid Mechanics, R. K Rajput, S.Chand & Co, New Delhi, 2019
5. Engineering Fluid Mechanics, Kumar K. L., Eurasia Publishing House (P) Ltd., New Delhi, 2016.
6. Oil Hydraulics Systems- Principles and Maintenance", Majumdar S.R., Tata McGraw- Hill, 2001.
7. Hydraulic and Pneumatic Controls, Shanmugasundaram.K, Chand & Co, 2006

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020420

Semester : IV

Subject Title : Manufacturing Technology - II

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020420 Manufacturing Technology - II	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Theory of Metal Cutting, Drilling Machine & Abrasive Process	15
II	Reciprocating Machines and Broaching	15
III	Milling Machines and Gear Generating	14
IV	Unconventional Machining Processes	14
V	CNC Machine and CNC Programming	15
Test and Model Exam		7
Total		**80**

RATIONALE:

In the process of manufacturing we should possess adequate and through knowledge about the working of conventional as well as non-conventional machines. The topics included aim to inculcate in the students the skills of metal cutting, milling, grinding, CNC machines and other machining processes which are very much essential.

OBJECTIVES:

- Study the working of various machine tools: Planer, Shaper, Drilling and Slotter.
- Study the various work holding devices
- Study various types of milling cutter.
- Study the different types of grinders and grinding wheels.
- Study the broaching operation and their applications.
- Study the milling procedure for spur, helical and bevel gears.
- Study the various types of gear generating processes
- Study the use of non-conventional machining processes.
- Study the CNC machines working principle and its components.

4020420 MANUFACTURING TECHNOLOGY – II

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**THEORY OF METAL CUTTING, DRILLING MACHINE & ABRASIVE PROCESS**	
	Chapter: 1.1: Theory of metal cutting Introduction – orthogonal cutting – oblique cutting – single point cutting tool – nomenclature – types of chips – chip breakers – cutting tool materials – properties – tool wears – factors affecting tool life – cutting fluids – functions – properties of cutting fluid.	4
	Chapter: 1.2: Drilling machines Drills – flat drills – twist drills – nomenclature of twist drill – types of	4

	drilling machines – bench type – floor type – radial type – gang drill – multi spindle type – principle of operation in drilling – methods of holding drill bit – drill chucks – socket and sleeve – drilling operation – reaming, counter sinking, counter boring, spot facing, tapping and deep hole drilling. **Chapter: 1.3: Abrasive process** Types and classification – specifications – rough grinding – pedestal grinders - portable grinders – belt grinders. Precision grinding – cylindrical grinder – centerless grinders - surface grinder – tool and cutter grinder – planetary grinders – principles of operations – grinding wheels – abrasives – natural and artificial diamond wheels – types of bonds – grit, grade and structure of wheels – wheel shapes and sizes – standard marking systems of grinding wheels – selection of grinding wheel – mounting of grinding wheels – dressing and truing of wheels – balancing of grinding wheels.	7
II	**RECIPROCATING MACHINES** **Chapter: 2.1: Planer** Introduction – description of double housing planner – specifications – principles of operation – drives – quick return mechanism – feed mechanism - operations. **Chapter: 2.2: Shaper** Introduction – specifications – principles of operations – standard shaper – quick return mechanism – crank and slotted link – hydraulic shaper – feed mechanism – operations. **Chapter: 2.3: Slotter** Introduction - specifications – method of operation – whitworth quick return mechanism - feed mechanism – types of tools. **Chapter: 2.4: Broaching** Types of broaching machine – horizontal, vertical and continuous broaching – principles of operation – types of broaches – classification – broach tool nomenclature – broaching operations.	4 4 3 4

III	**MILLING MACHINES AND GEAR GENERATING PROCESSES** **Chapter: 3.1: Milling machines** Types – column and knee type, plain, vertical and universal milling machines – principles of operation – specification of milling machines – work holding devices – tool holding devices – arbor – stub arbor – spring collet – adaptor. Milling cutters – cylindrical milling cutter - slitting cutter – side milling cutter – angle milling cutter – T slot milling cutter – woodruff milling cutter – fly cutter – nomenclature of cylindrical milling cutter. Milling operations – straddle milling - gang milling – vertical milling attachment. Indexing plate – differential indexing – simple indexing and compound indexing – simple problems. **Chapter: 3.2: Generating processes** Gear shaper – gear hobbing – principle of operations only. Gear finishing processes – burnishing – shaving – grinding and lapping – gear materials.	10 4
IV	**UNCONVENTIONAL MACHINING PROCESSES** **Chapter: 4.1: Mechanical energy based process** Introduction – classification – process selection – advantages – limitations – demerits of conventional processes. Mechanical energy based process**:** Introduction – abrasive jet machining – metal removal rate process parameters – water jet machining – hydrodynamic jet machining – ultrasonic machining process – advantages – disadvantages – applications – compare ultrasonic machining with traditional abrasive machining. **Chapter: 4.2: Electrical energy based processes** Introduction – electrical discharge machine (EDM) – flushing system in EDM – tool (electrode) materials - tool wear – metal removal rate and surface finish - factors affecting the metal removal rate – advantages – disadvantages – applications – wire cut EDM , features of wire cut EDM – difference between EDM and wire cut EDM. **Chapter: 4.3: Thermal energy based processes** Introduction – electron beam machining – laser beam machining – lasing materials – machining applications of laser – plasma arc machining –	5 5 4

	gases used in plasma arc machining – types of plasma arc torches – advantages – disadvantages – applications.	
V	**CNC MACHINE AND ITS COMPONENTS** **Chapter: 5.1: CNC machines** Numerical control – definition – working principle of a CNC system – features of CNC machines – advantages of CNC machines – difference between NC and CNC – construction and working principle of turning centre – construction and working principle of machining centre - machine axes conventions turning centre and machining centre – co-ordinate measuring machine – construction and working principle. **Chapter: 5.2: Components of CNC machine** Slide ways – requirement – types – friction slide ways and anti-friction slide ways – linear motion bearing – recirculation ball screw – ATC – tool magazine – feedback devices – linear and rotary transducers – encoders – in process probing – tool material – tool inserts. **Chapter: 5.3: CNC Programming** Introduction – Cartesian coordinate system – Polar coordinate system – Absolute and incremental positioning – Purpose of G and M codes. Basic codes – basic CNC program. CNC turning program using linear interpolation and circular interpolation. Machine control panel – Homing position – Offset setting – Auto. CNC milling program using linear interpolation and circular interpolation. Compensation – Machine control panel – Home position – Work offset setting procedure – Tool offset .	5 4 6

Reference Book:

1. Elements of Workshop Technology- Vol. I & II, Hajra Choudry & Battacharya, Edn. 11, published by Media Promoters and Publishers Pvt. Ltd., Seervai Buildings `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2. Production Technology, Jain & Gupta, Khanna Publishers, 2-B, North Market, Naisarak, New Delhi – 110 006 – 2006.
3. Production Technology, HMT, Edn. 18, published by Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.

4. Manufacturing process, Myro N Begman, , Edn. 5, Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
5. Workshop Tech Vol I,II, III, WAJ. Chapman, published by Viva Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
6. Production processes, NITTTR, published by 5, Tata McGraw Hill Publishing Co. Ltd., West Patel Nagar, New Delhi 110 008.
7. Principles of the manufacturing of Composite materials – Suong V Hoa, DES tech publication. Inc, 439, North Duke street, Lancaster, Pennsylvania – 17602 U.S.A.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020430

Semester : IV

Subject Title : Electrical Drives and Control

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020430 Electrical Drives and Control	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Dc Circuits and Dc Machines	15
II	Ac Circuits and Ac Machines	15
III	Special Machines & Drives	15
IV	Power Supplies, Control Elements and Electrical Safety	14
V	Display Devices, Logic Gates and PLC	14
Test and Model Exam		7
Total		**80**

RATIONALE:

The automation is being the order of the day to improve the production with high quality consciousness. Such automation involves electrically operated switches, sensors controlled through electrically driven motors and actuators. The subject aims in introducing the basic electrical DC and AC circuits and motors and also focuses on the various special control devices like stepper, servo drives and its controlling elements.

OBJECTIVES:

- Explore fundamental electric circuit laws.
- Explain the working principle of DC and AC Electrical machines.
- Identify the effective uses of drives of Electrical machines.
- Analyze the various power supply circuits.
- Select the field controlled elements.
- Explain the construction and working of Transformer.
- Compare the different types of Logic gates.
- Appreciate the safety practices followed in Electrical system.
- Compare the use of servo motors and stepper motors in electrical driving system
- Identify PLC Input outputs.
- Identify the use of Control elements.

4020430 ELECTRICAL DRIVES AND CONTROL
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DC CIRCUITS AND DC MACHINES** **Chapter: 1.1:** Definition- Electric Current, Voltage and Resistance -Ohm's law and Kirchoff's law. Resistance in series, parallel and series parallel – simple problems - Electromagnetism (definitions only) – Magnetic flux, Fluxdensity, Magnetic field intensity, MMF, Permeability,	7

	Reluctance,Faraday's law of Electromagnetic induction, Electrical and Mechanical units. **Chapter: 1.2:** DC Generators – Construction, Principle of operation and Applications. DC Motors: - Construction, Principle of operation and Applications. Necessity of starters: Three point, four point starters.	8
II	**AC CIRCUITS AND AC MACHINES** **Chapter: 2.1:** Fundamentals of AC voltage, and current – Peak, Average, RMS value of sine wave, frequency, time period, amplitude, power and power factor (definition only). Transformer: Principle of operation and construction – EMF equation - Losses in Transformer – Efficiency – Applications. Alternator construction – Principle of operation and Applications. **Chapter: 2.2:** AC machine: AC Motors- Principle of operation of Single Phase, Capacitor Start induction motor - universal motor - Applications- Three Phase Induction Motors – Squirrel Cage and Slip ring Induction motors (Construction and Working Principle only) - Applications – Speed control of 3Φ Induction Motor - DOL and star/delta starter.	7 8
III	**SPECIAL MACHINES & DRIVES** **Chapter: 3.1:** PMDC Motor, Stepper motor- Construction and Working Principle and Applications - Servo motor – types. Permanent Magnet Servo motor Construction and Applications. Brushless Servo motor - Construction and Applications. **Chapter: 3.2:** Industrial drives- types, Group drive, Individual drive, Multi motor drive. Block diagram of Variable Frequency Drive (VFD). Stepper motor Drive: Single stepping and Half stepping Servo drives. DC Servo drive, AC Servo drive and BLDC Servo drive.	7 8

IV	**POWER SUPPLIES, CONTROL ELEMENTS AND ELECTRICAL SAFETY** **Chapter: 4.1:** Rectifiers – Half wave, Full wave and Bridge rectifiers – Necessityof Filters- Regulated Power Supplies: IC Voltage Regulators.Batteries - Working, Constructions, Maintenances and Trouble shooting. **Chapter: 4.2:** Fuses – Selection of Fuse – Necessity of Fuse- Fuse switch units. Sensors: Photo electric sensor, Inductive Proximity sensors, Temperature sensors. Contactors - usage – Necessity of Contactor- Solenoid type Contactor. **Chapter: 4.3:** Circuit breakers – Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB). Electrical Safety: - Importance of Earthing - Electric shock: First aid, Precautions - Causes of Accident and their Preventive measures.	5 5 4
V	**DISPLAY DEVICES, LOGIC GATES AND PLC** **Chapter: 5.1:** Display devices – LED, 7 segments LED, LCD, applications. **Chapter: 5.2:** Logic gates: Positive and Negative Logic, Definition, Symbol and truth table.Boolean expression for OR, AND, NOT, NOR, NAND, EXOR AND EXNOR gates. Universal Logic Gates: NAND, and NOR. **Chapter: 5.3:** Features of PLC - PLC Block diagram - PLC scan. Fixed and Modular PLC. Ladder logic - NO, NC contacts - Coils - AND logic, OR logic.	4 5 5

Reference Books

1. Fundamentals of physics, Brijlal and Subramaniam.
2. Fundamentals of Electricity, D.N. Vasudeva, S. Chand & co.
3. Electric motors and drives, Austin Hughes
4. A text bookof Electrical Technology, Volume II, B.L.Theraja, S. Chand & co.
5. Programmable Logic Controllers – John R Hackworth Frederick D.Hackworth Jr., Pearson Education.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020440

Semester : IV

Subject Title : Production and Quality Management

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020440 Production and Quality Management	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Process Planning and Selection	15
II	Basic concepts of Total Quality Management	14
III	TQM Tools	14
IV	Statistical Fundamentals & Charts	15
V	Lean Manufacturing Concepts	15
Test and Model Exam		07
Total		**80**

RATIONALE:

In the product manufacturing the process selection and planning are important. Quality and customer satisfaction in every product and every activity is the order of the day. As there is a shift from quality control to quality management in all activities, the concept Total Quality Management and the pillars of TQM are to be given to Engineers, who are designing products and production systems.

OBJECTIVES:

- Understand the process planning.
- Study the process selection.
- Define quality and appreciate its signature.
- Explain the concept of TQM.
- Appreciate the use of principles of TQM to meet customer satisfaction.
- Solve problem using the Quality control tools.
- Apply Brainstorming and quality circle to solve problems.
- Use PDCA cycle for continuous improvement.
- Appreciate the benefits of implementing 5S concepts.
- Collect, classify and present the data.
- Determine the process capability of a manufacturing process.
- Practice on management planning tools.
- Use Bench Mark and JIT concepts.

4020440 PRODUCTION AND QUALITY MANAGEMENT

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Process Planning And Selection** **Chapter: 1.1:** **Production:** Types of Production – Mass production, batch production and job order production **Chapter: 1.2:** **Process Planning:** Introduction – concept – Information required to do processplanning – factors affecting process planning – process	 3 6

	planningprocedure – Make (or) Buy decision using Break Even Analysis – simple problems. Manual process planning – Introduction ofAutomated process planning and generator process planning –Advantage of computer aided process planning – Principle of linebalancing – need for line balancing – Value Engineering –Definition – cost control Vs cost reduction – value analysis when todo – steps information needed – selection of product. **Chapter: 1.3:** **Process Selection:** Process selection – technological choice – specific componentchoice – Process flow choice – Factors affecting process selection– machine capacity – analysis of machine capacity – process andequipment selection procedure – Determination of man, machineand material requirements – simple problems – selection ofmaterial – jigs – fixtures etc. – Factors influencing choice of machinery – selection of machinery – simple problems – Preparation of operation planning sheet for simple components.	6
II	**Chapter: 2.1: Basic Concepts Of Total Quality Management** Quality-Definitions – Dimensions of quality – Brainstorming and itsobjectives – Introduction to TQM - Characteristics – Basic concepts – Elements - Pillars – Principles – Obstacles to TQMimplementation - Potential benefits of TQM - Quality council – duties – Responsibilities - Quality statements – Vision – Mission – Quality policy statements – Strategic planning – Seven steps tostrategic planning – Deming philosophy – Customer – Input / Output process model – Juran Trilogy - PDCA (Deming Wheel) cycle.	14
III	**TQM Tools** **Chapter: 3.1:** **Seven tools of quality control (Q 7 tools):** Check sheet – Types of check sheet – Histogram – Cause and effect diagram – Pareto diagram – Stratification Analysis – Scatter diagram-Graph/run charts – Control charts – Construction of above diagrams.Quality circle – concept of quality circle – Organisation of Qualitycircle and objectives of Quality circle. Zero Defect Concepts.	14

	Chapter: 3.2: **Management Planning Tools (M 7 Tools)** Affinity diagram – Radar Diagram – Inter Relationship diagram (Inter Relationship diagram) – Tree diagram – Prioritization matrix – Matrix diagram – Decision tree – Arrow diagram – Matrix data analysis diagram – Construction of above diagrams.	
IV	**Statistical Fundamentals And Control Charts** **Chapter: 4.1:** Types of Data – Collection of Data – Classification of Data – Tabular presentation of Data - Graphical representation of a frequency distribution – Comparison of Frequency distribution – Mean - Median – Mode – Comparison of measures of central tendency - Introduction to measures of dispersion – Sample – sampling – Normal curve – Sigma – Concept of six sigma – Principles – Process - Problems. **Chapter: 4.2: Control Charts** Control chart – Types of control charts – Control chart for variables – Construction of X bar and R charts – control limits Vs specification limits – Process capability – Method of doing process capability Analysis – Measures of process capability – Problems. Attributes – Control charts - P chart – np chart – c chart – u chart – Construction of above diagrams – Problems – Comparison between variable chart and Attribute chart.	7 8
V	**Capter 5.1: Lean Manufacturing Concepts** 5S Concepts (SEIRI, SEITON, SEISO, SEIKETSU and SHITSUKE) – needs and objectives – effective implementation of 5S concepts in an organisation – Housekeeping – Kaizen – Kanban System.Bench marking - Objectives of bench marking – Types – Benchmarking process – Benefits of Bench marking – Pit falls of Benchmarking-Just In Time(JIT) concepts and its objectives – TotalProductive Maintenance(TPM) – Introduction, Objectives of TPM –steps in implementing TPM. – Overall Equipment Effectiveness(OEE)–Lean Six Sigma – Value Stream Mapping – DMAIC(Define, Measure, Analyse, Improve, Control) – DMADV (Define , Measure, Analyse, Design, Verify)	15

Reference Books:

1. Industrial Engineering & Management – O.P Khanna
2. Industrial Engineering & Production Management – Martand Telsang
3. Total Quality Management, Date H.Besterfiled, Pearson Education Asia.
4. Total Quality Management, V.Jayakumar, Lakshmi Publications.(reprint 2005)
5. Training manual on ISO 9001 : 2000 & TQM, Girdhar J.Gyani, Raj PublishingHouse, Second Edition 2001
6. Quality Management, Howard Cuitlow, Tata Mc Graw Hill, 1998
7. Production Engineering – P.C.Sharma.
8. Production and Costing – GBS Narang and V.Kumar
9. Mechanical Estimating and Costing – Banga & Sharma.
10. Total Quality Management, Oakiand.J.S. Butterworth Heinemann Ltd. Oxford1989.
11. Quality Management – Concepts and Tasks- Narayana.V and
12. Sreenivasan.N.S., New Age International 1996.
13. Total Quality Management for engineers, Zeiri. Wood Head Publishers. 1991.
14. Quality Planning and Analysis, Juran J.M and Frank M.Gryna Jr., TMH. India.1982
15. ISO 9001, Brain Rethry, Productivity and Quality Publications.
16. ISO 9001, Brain Rethry, Productivity and Quality Publishing Pvt. Ltd. 1993.
17. Quality Auditing D.Mills, Chapman and Hall, 1993.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020450

Semester : IV

Subject Title : Strength of Materials and Fluid Mechanics Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020450 Strength of Materials and Fluid Mechanics Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Acquire skills on different types of testing methods of metals.
- Conduct material testing on elasticity, hardness, shear strength
- Determine modulus of rigidity of open coil spring and closed coil springs.
- Determine the co-efficient of discharge of venturimeter and mouth piece
- Determine the co-efficient of friction in pipes.
- Conduct performance test on reciprocating pump.
- Conduct performance test on impulse turbine.

4020450 STRENGTH OF MATERIALS AND FLUID MECHANICS PRACTICAL
DETAILED SYLLABUS

Experiments:

PART A : Strength of Materials Laboratory

1. **Test on Ductile Materials:**
   Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.
2. **Hardness Test:**
   Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminium.
3. **Torsion test:**
   Torsion test on mild steel – relation between torque and angle of twist- determination of shear modulus and shear stress.
4. **Impact test:**
   Finding the resistance of materials to impact loads by Izod test and Charpy test.
5. **Tests on springs of circular section:**
   Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open or Closed coil spring)
6. **Shear test:**
   Single or double shear test on M.S. bar to finding the resistance of material to shear load.

PART B: Fluid Mechanics Laboratory

1. Verify the Bernoulli's Theorem.
2. Determination of co-efficient of discharge of a mouth piece by variable head method.
3. Determination of co-efficient of discharge of a venturimeter.
4. Determination of the friction factor in a pipe.
5. Performance test on reciprocating pump and to draw the characteristics curves.
6. Performance test on impulse turbine and to find out the Efficiency.

BOARD EXAMINATION

Note:

- All the experiments in both sections have to be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Part-A	**:**	**45 marks**
Procedure / Observation	10	
Tabulation / Calculations	25	
Result / Graph	10	
Part-B	**:**	**45 marks**
Procedure / Observation	10	
Tabulation / Calculations	25	
Result / Graph	10	
Viva-voce	**:**	**10 marks**
Total	**:**	**100 Marks**

LIST OF EQUIPMENTS: (For 30 students)

1.	UTM.	01
2.	Rockwell's Hardness Testing Machine.	01
3.	Torsion testing machine.	01
4.	Impact testing machine.	01
5.	Spring testing arrangements.	01
6.	Shear testing machine.	01
7.	Vernier calliper.	02
8.	The Bernoulli's Apparatus.	01
9.	An open tank fitted with an external mouth piece and a collecting tank with Piezometer.	01
10.	An arrangement to find friction factor of pipe.	01
11 .	A reciprocating pump with an arrangement for collecting data to find out the efficiency and plot the characteristics curves.	01
12.	A impulse turbine with an arrangement for calculating data to find out the efficiency.	01
13.	An arrangement of Venturimeter fitted in horizontal water pipe line to find coefficient of discharge.	01

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020460

Semester : IV

Subject Title : Manufacturing Technology - II Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020460 Manufacturing Technology - II Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

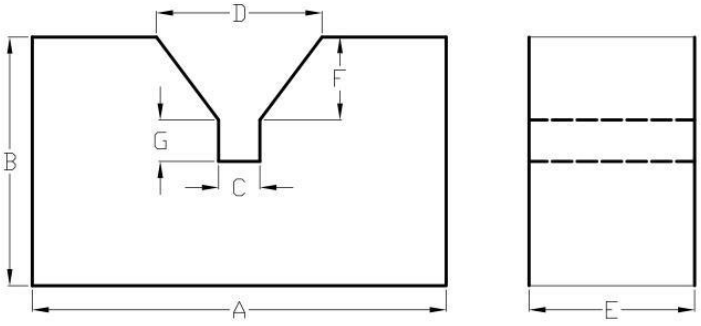
OBJECTIVES:

- Identify a milling machine and its parts
- Identify a cylindrical grinder, surface grinder and tool and cutter grinder
- Identify shaper, Slotter and its parts
- Identify the tools and instruments used in milling.
- Study the components of the CNC machine and setting.
- Handle the different types of work holding devices
- Machine a component using different machine tools.
- Calculate the indexing for a work
- Machine a gear using milling machine.
- Machine a cutting tool using Tool and Cutter grinder.
- Machine a plug gauge using Cylindrical grinding machine.
- Machine components by shaping machine
- Machine components by slotting machine.
- Machine components by the CNC machines.

4020460 MANUFACTURING TECHNOLOGY - II PRACTICAL
DETAILED SYLLABUS

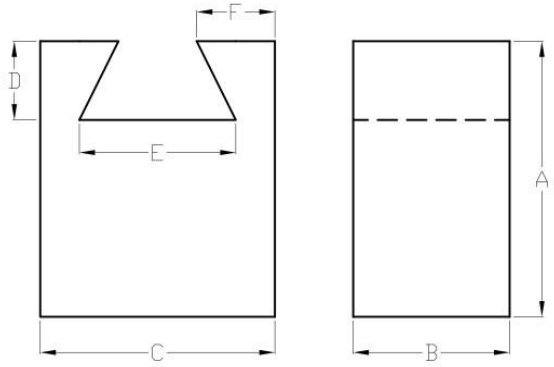
EXERCISES: **Raw Material: M.S. / C.I**

1. Make ‘V’ Block using shaping machine



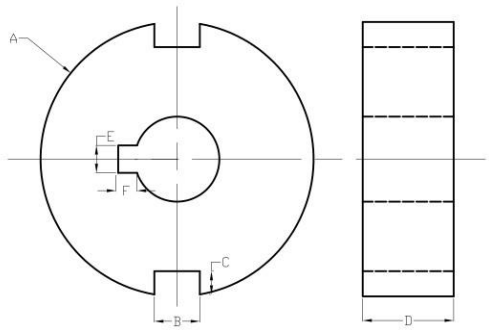
Dimensions			
Sl.No	Part Name	Actual	Obtained

2. Make dovetail using shaping machine



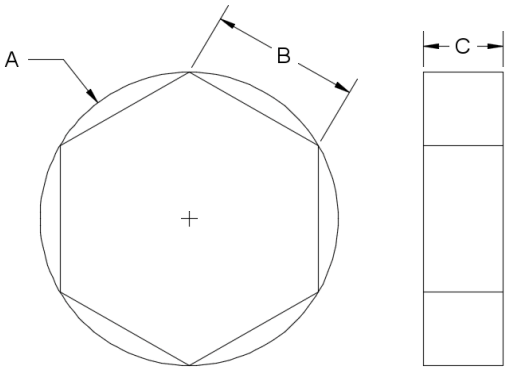
Dimensions			
Sl.No	Part Name	Actual	Obtained

3. Make groove cut using slotting machine



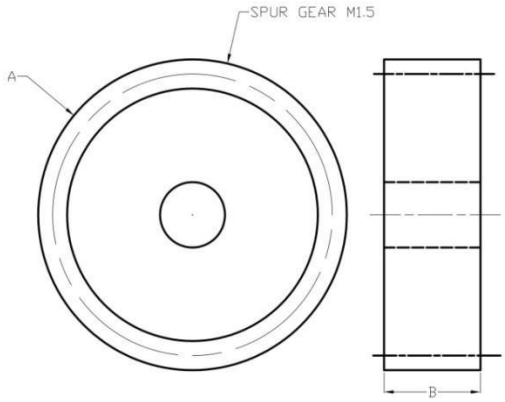
Dimensions			
Sl.No	Part Name	Actual	Obtained

4. Make round to hexagon in milling machine.



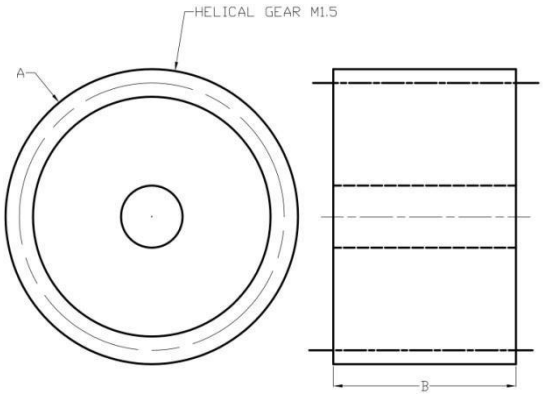
Dimensions			
Sl.No	Part Name	Actual	Obtained

5. Make Spur Gear using milling machine.



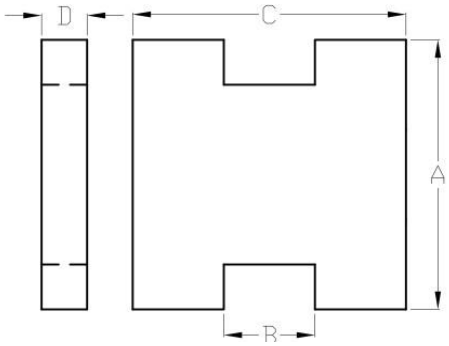
Dimensions			
Sl.No	Part Name	Actual	Obtained

6. Make Helical Gear using milling machine.



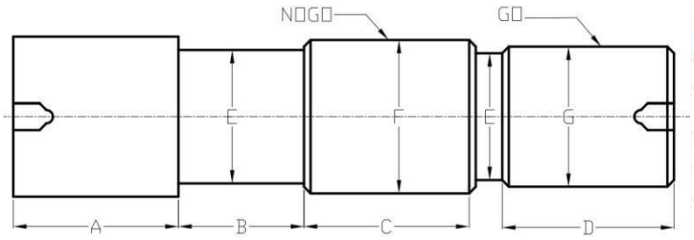
Dimensions			
Sl.No	Part Name	Actual	Obtained

7. Make slot cut using milling machine.



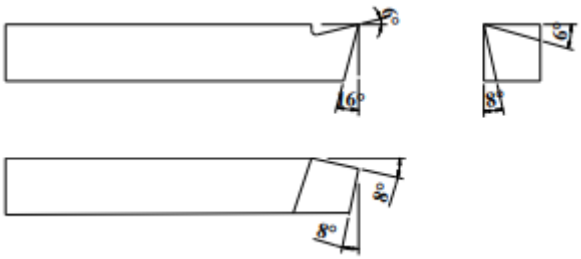
Dimensions			
Sl.No	Part Name	Actual	Obtained

8. Make Progressive type Plug gauge using Cylindrical Grinding machine



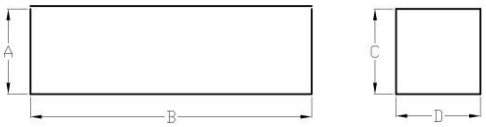
Dimensions			
Sl.No	Part Name	Actual	Obtained

9. Make a turning tool using Tool and Cutter Grinder



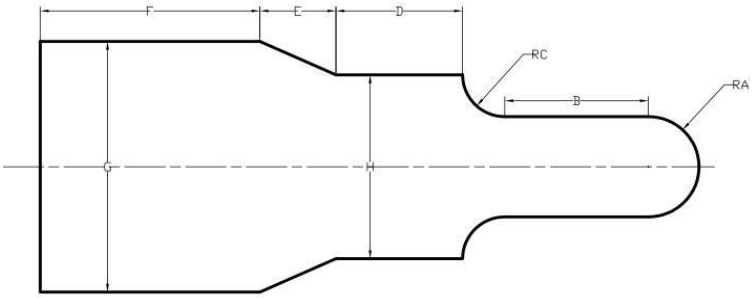
Dimensions			
Sl.No	Part Name	Actual	Obtained

10. Make plain surfaces (four surfaces)using surface Grinder

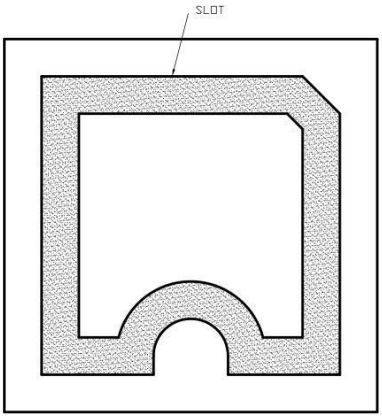


Dimensions			
Sl.No	Part Name	Actual	Obtained

11. Make the component in the CNC Turing Centre.



12. Make the component in the CNC Milling Centre.



BOARD EXAMINATION

Note:

- All the exercises should be completed. Any one exercise will be given for examination.
- All the exercises should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Description	Marks
Procedure	10
Preparation of the Specimen	15
Setting and Machining	30
Dimensions	25
Finishing	10
Viva-voce	10
Total	**100**

LIST OF EQUIPMENTS (For 30 students)

1	Vertical milling machine / Vertical attachment	-	2 Nos.
2.	Universal Milling Machine	-	2 Nos.
3.	Surface Grinding Machine	-	1 No.
4.	Cylindrical Grinding Machine	-	1 No.
5.	Tool and Cutter Grinder	-	1 No.
6.	Shaping Machine	-	2 Nos.
7.	Slotting Machine	-	1 No.
8.	CNC Turning centre	-	1 No.
9.	CNC Milling Centre	-	1 No.
10	Tools and Measuring instruments	-	Sufficient quantity.
11	Consumables	-	Sufficient quantity.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020470

Semester : IV

Subject Title : Electrical Drives and Control Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
4020460 Electrical Drives and Control Practical	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Identify starters for different motors.
- Study and prepare earthing
- Test the characteristics of DC and AC machines.
- Identify and select controlling elements.
- Explore the performance of ELCB, MCB.
- Design regulated power supplies.
- Identify display devices–LED, 7 segment LED, LCD.
- Identify the drive circuit for special motors.Test the speed control circuit of the special motors.

4020460 ELECTRICAL DRIVES AND CONTROL PRACTICAL

EXPERIMENTS:

Part A:

1. Verification of Ohm's Law
2. Load test on DC shunt motor
3. Load teston single phase induction motor
4. Load test on three phase squirrel cage motor
5. Testing of relays, contactors, push buttons and limit switch
6. Connection and Testing of MCB, ELCB

Part B

1. Construction and testing of Halfwave and Fullwave rectifier.
2. Construction and testing of IC voltage regulator using IC 7805.
3. Verification of truth tables for logic gates.
4. Verification of universal gates.
5. Identification and testing of display devices - LED, 7segment LED, Laser diode.
6. Testing of Stepper motor drive.
7. Testing of Servomotor drive.

BOARD EXAMINATION

Note:

- All the experiments in both sections have to be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All the students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILLED ALLOCATION OF MARKS

Part A:		**45**
Circuit diagram	10	
Connections & Readings	20	
Calculations & Graph	15	
Part B:		**45**
Circuit diagram	10	
Connections & Readings	20	
Execution	15	
Viva Voce		**10**
Total		**100**

LISTOF EQUIPMENTS (For 30 students)

Electrical Lab

1. DC ammeter 0-5A - 1 no
2. DC ammeter 0-25A - 1 no
3. DC voltmeter 0-30V - 1 no
4. DC voltmeter 0-300V - 1 no
5. Rheostat 10.8 ,8.5A - 1 no
6. AC ammeter 0-5A - 1 no
7. AC ammeter 0-10A - 2 nos.
8. AC voltmeter 0-50V - 3 nos
9. ACwattmeter 5A-10A - 3 nos
   (0-750W,0-600V)
10. Loading rheostat 5A,230V - 1 no
11. Tachometer 0-1000rpm - 1 no
    (Analog type)
12. Variac 20A,250V - 2 nos
    (Auto transformer)
13. Over load relay1 to 2.5A - 1 no
14. Air breakcontactors 20A,220V - 4 nos

15. Push button 2A ,220V - 2 nos
16. Limit switch 20A,220V - 1 no
17. MCB 20A single pole - 1 no
18. MCB 20A double pole - 1 no
19. ELCB 2pole 20A,100mA - 1 no
20. ELCB 4POLE 20A,100mA - 1 no

Electronics Lab

1. Transformer 230 / 9-0-9V, 1A - 4 nos.
2. Resistor 1 Kδ/ ½W - 3 nos.
3. Capacitor 1000 μF/25V - 4 nos.
4. IC 7805 - 1 no.
5. Logic Gates IC
   7400, 7408, 7432, 7404,7402, 7486- 1 each
6. Stepper Motor Drive kit - 1no.
7. Servo Motor Drive Kit - 1no
8. Digital Multimeter - 1no.
9 LED, 7 Segment LED, Laser Diode - 1 each

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020510

Semester : V

Subject Title : Design of Machine Elements

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020510 Design of Machine Elements	6	96	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Engineering Materials and Joints	18
II	Design Of Shafts, keys and Couplings	18
III	Design of Flat Belts and V-Belts	18
IV	Design of Bearings & Spur Gears	18
V	Computer Aided Design (CAD) and Geometrical Modelling	17
Test and Model Exam		7
Total		**96**

RATIONALE:

The main objective of Machine Design is to create new and better machine components to improve the existing one. A mechanical engineer should have thorough knowledge of design of machine elements to avoid the failure of machines or components.

OBJECTIVES:

- Design sleeve and cotter joint, knuckle joint and Welded joints
- Design shafts, keys and couplings required for power transmission.
- Compare the different types of couplings.
- Design flat and V-belt for power transmission.
- Study the various types of bearings and their applications.
- Design journal bearings.
- Design Spur gear.
- Role of CAD in design and analysis.

4020510 DESIGN OF MACHINE ELEMENTS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Engineering Materials and Joints** **Chapter: 1.1:** General Considerations in Machine Design. Engineering materials - Factors affecting selection of material – BIS designation of Ferrous materials – Preferred number - Factor of safety and allowable stress – Stresses: Tension, Compression, Shear, Bearing pressure Intensity, Crushing, bending and torsion - problem. Creep strain and Creep Curve- Fatigue, S-N curve, Endurance Limit - Stress Concentration – Causes & Remedies. Theories of Elastic Failures – Principal normal stress theory, Maximum shear stress theory & maximum distortion energy theory. **Chapter: 1.2:**	10 8

	Joints: Design of sleeve and cotter joint, knuckle joint and welded joint.	
II	**Design Of Shafts, Keys and Couplings** **Chapter: 2.1:** **Shafts:** Design of shafts subjected to – twisting moment – bending moment – combined twisting and bending moments – fluctuating loads – design of shafts based on rigidity. **Chapter: 2.2:** **Keys:** Types of keys - design of sunk keys only - Effect of keyways on shaft - problems. **Couplings:** Requirements of good couplings – types - design of - rigid protected type flange couplings - marine couplings – pin type flexible coupling (Description only).	9 9
III	**Design of Flat Belts and V-Belts:** **Chapter: 3.1:** **Flat Belts:** Types of belts - materials for belt -– types of belt drives – Speed ratio – effect of slip - length of flat belts –Tension Ratio $T1/T2=e^{\mu\theta}$ – centrifugal tension - power transmitted – condition for maximum power - transmission – Initial Tension - problems - design procedure of flat belts - design of flat belt based on manufacturer's data only – problems. **Chapter: 3.2:** V-belt drive - comparison with flat belt drive - designation of V-belts – length of belt - power transmitted – Design of V-belt using manufacturer's data only – Problem.	9 9
IV	**Design of Bearings & Spur Gears** **Chapter: 4.1:** **Bearings:** Classifications of bearings – sliding contact and rolling contact bearings - radial and thrust bearings - roller bearing – types - Designation of ball bearings - materials used for bearings - journal bearings - heat generated - heat dissipated - cooling oil requirement – problems - design of journal bearings – Problems. (Design based on approved data books only.).	10

	Chapter: 4.2: **Spur Gears:** Gear drives - Types of gears - applications - materials - spur gear terminology - design of spur gear based on Lewis and Buckingham equation (design procedure only) - speed reducer – types.	8
V	**Computer Aided Design (CAD) and Geometric Modelling** **Chapter: 5.1:** CAD – Roles of CAD in design – Development and uses - Applications – Advantages – Product cycle – Design process: Shigley Model - Pahl and Beitz Model – Sequential Engineering – Concurrent Engineering – 2D and 3D Transformation. **Chapter: 5.2:** Geometric Modelling: Solid modelling – entities – advantages and disadvantages – Boolean operations - Boundary representation – Constructive Solid Geometry – Comparison – Finite Element analysis – Steps.	9 8

Reference Book:

- Machine Design, Pandya & Shah, Edn. 1995, Charotar Publishing House.
- Machine Design, T. V. Sundararajamoorthy & N. Shanmugam, Revised Edition June-2003–Anuradha Publications.
- Design Data Book – by PSG College of Technology, DPV Printers.
- A text book of Machine Design, R.S. Khurmi & J.K.Gupta, Edn. 18,Eurosia Publishing House Pvt. Limited.
- Machine Design, Bandari,
- Theory and Problems of Machine Design, Holowenko, Laughlin, Schaum's outline series.
- R.Radhakrishnan, and S.Subramanian, "CAD/CAM/CIM", New Age International Pvt Limited.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020520

Semester : V

Subject Title : Thermal Engineering - II

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020520 Thermal Engineering - II	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Formation and Properties of Steam & Thermodynamic Processes of Vapour	15
II	Steam Boilers and Performance Of Boiler	15
III	Thermal Power Plant and Steam Turbines and Condensers	15
IV	Conventional Sources of Energy and Nuclear Power Plant	13
V	Air Compressors and Gas Turbines	15
Test and Model Exam		7
Total		**80**

RATIONALE:

This subject is one of the core subjects. Diploma engineers have to work with various power producing and power absorbing devices. This subject will enable students to establish foundation required to operate and maintain the devices. This subject emphasizes on steam boilers and allied components that are used in industrial sectors. Thermal power plants are still contributing major share in electricity production in India.

OBJECTIVES:

- Define various types of steam.
- Explain the working of Boiler.
- Compare various types of Boilers.
- Familiarize boiler mounting and accessories.
- Describe various circuits used in the thermal power plant.
- Explain working of steam turbine and condensers.
- Compare conventional energy sources with Non-Conventional Sources of energy.
- Explain working of nuclear power plant.

4020520 THERMAL ENGINEERING - II

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Formation and Properties of Steam & Thermodynamic Processes of Vapour** Steam - Properties – formation of steam– saturation temperature – enthalpy of water – enthalpy of evaporation – conditions of steam – wet, dry and superheated steam - dryness fraction – enthalpy of wet, dry and superheated steam - advantages of superheated steam – Property diagrams – p-v diagram - T-H	10

	diagram – T-V diagram – T-S diagram - phase diagram-H-S diagram – P-H diagram – critical conditions of water – specific volume of water and steam – density of steam – external work done during evaporation – internal latent heat – internal energy of steam – entropy of water and steam – steam tables - Mollier chart – Description only. Determination of dryness fraction of steam – bucket calorimeter - combined separating and throttling calorimeters - problems. Expansion processes of steam - constant volume, constant pressure, constant temperature, hyperbolic, polytrophic, isentropic and throttling processes – problems.	5
II	**Steam Boilers And Performance Of Boilers** Introduction -Classification of boilers – comparison of fire tube and water tube boilers– high pressure boilers – advantages of high pressure boilers - BHEL high pressure boilers – boiler mountings and function- construction and working – boiler accessories and function - construction and working – comparison of mountings and accessories – feed water treatment – internal and external treatments - starting boiler from cold condition – safety precautions in boiler operation – clauses of Indian boiler act. Evaporation rate - actual, equivalent and factor of evaporation – boiler efficiency – factors influencing boiler efficiency - boiler power - problems – boiler plant - efficiency of economizer and super heater - problems – boiler trial – heat losses in a boiler- heat balance sheet – problems.	10 5

III	**Thermal Power Plant And Steam Turbines and condensers** Selection of site for thermal power plant -Layout of thermal power plant – fuel and ash circuit – water and steam circuit – air and flue gas circuit – cooling water circuit – merits and demerits of thermal power plant –– air pollution by thermal power plants – pollutants, effects and control – cyclone separator – wet scrubber – electrostatic precipitator – control of No_2 and SO_2.fiudised bed combustion- thermal and noise pollution. Basic steam power cycles – Carnot, Rankine and modified Rankine cycles. Classification of steam turbine-Impulse and reaction turbines- Difference - necessity of compounding – Methods of compounding – special turbines. Steam condensers – elements of condensing plant – classification of condensers – jet condenser – surface condensers – Comparison of jet and surface condensers – sources of air in condenser – condenser vacuum – vacuum efficiency – condenser efficiency - mass of cooling water required – mass of air present – number of tubes – simple problems.	5 5 5
IV	**Conventional Sources Of Energy And Nuclear Power Plant** Conventional sources of energy – layout of hydel and diesel power plants – merits and demerits. Nuclear fuels –fissile and fertile fuels – Nuclear fission and fusion – chain reaction – radio activity – layout of nuclear power plant – merits and demerits – Nuclear reactors -Components–Reactor Core -moderators – control rods – coolant – reflectors – biological shield-Reactor Vessels-Classification of Reactor- pressurized water reactor – boiling water reactor – Candu type reactor – fast breeder reactor –– effect of nuclear radiation – Fuel Cycle –Site selection – Safety-Floating Nuclear Power Plants-Uranium Enrichment – Methods-disposal of nuclear wastes- comparison of nuclear power plants with thermal power plants- Nuclear Power Plant in India.	3 12

V	**Air Compressors And Gas Turbines** Air Compressors-uses of compressed air – classifications of Air compressor – reciprocating compressor - single stage reciprocating compressor – compression processes – power required to drive the compressor (Neglecting clearance Volume) – clearance volume and its effects – volumetric efficiency –power required to drive the compressor with clearance volume – problems – multi stage compression – merits and demerits - work input – ratio of cylinder diameters for minimum work input. Rotary compressors – Roots blower - vane blowers – centrifugal and axial flow air compressors. Gas turbines – uses - classifications – merits and demerits of gas turbines -constant pressure combustion gas turbine – gas turbine with – intercooler –reheater - regenerator -effects – closed cycle gas turbines - merits and demerits of open and closed cycle gas turbines Jet propulsion -turbojet engines– merits and demerits – turbo propeller engines – merits and demerits – ramjet – merits and demerits – Rocket engines – solid propellant rocket -applications of rockets.	6 5 4

Reference Books:

1. Thermal Engg, R.K . Rajput , ,8th Edition, Laxmi publications Pvt Ltd , New Delhi.
2. Applied Thermodynamics, P.K. Nag, ,2nd Edition, TATA Mcgraw – Hill Publishing Company, New Delhi .
3. Thermal Engineering, R.S. Khurmi and J.K. Gupta, 18th Edition,S.Chand & Co,NewDelhi
4. Thermal Engineering ,P.L Ballaney , 24th Edition ,Khanna Publishers,New Delhi.
5. Thermal Engineering ,B.K. Sarkar , 3rd Edition , Dhanpat Rai & Sons New Delhi .
6. Applied Thermodynamics, Domkundwar and C.PKothandaraman, 2ndEdition Khanna publishers, New Delhi.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020531

Semester : V

Subject Title : Computer Integrated Manufacturing

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020531 Computer Integrated Manufacturing	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Computer Aided Design	15
II	Computer Aided Manufacturing	14
III	CNC programming	16
IV	FMS, AGV, AS/RS, Robotics	14
V	Advanced concepts of CIM	14
Test and Model Exam		7
Total		**80**

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of Computer Aided Design and Manufacturing. They are able to operate CNC machines and write part program. They are able to understand the advanced concepts adopted in automated industries.

OBJECTIVES:

- Acquire knowledge in the field of Computer aided Design
- Explain the various concepts of Computer Aided manufacturing
- Write part program for manufacturing components in CNC machines
- Explain the concepts of automatic material handling and storage systems and robotics
- Explain the advanced concepts of CIM

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Computer Aided Design** Computer Aided Design: Introduction – definition – Shigley's design process – CAD activities – benefits of CAD - CAD software packages – point plotting, drawing of lines, Bresenham's circle algorithm, Transformations: 2D & 3D transformations – translation, scaling, rotation and concatenation. Geometric modelling: Techniques - Wire frame modelling – applications – advantages and disadvantages. Surface modelling – types of surfaces – applications – advantages and disadvantages – Solid modelling – entities – advantages and disadvantages – Boolean operations - Boundary representation – Constructive Solid Geometry – Comparison. Graphics standard: Definition – Need - GKS –IGES – DXF. Finite Element Analysis: Introduction – Development - Basic steps – Advantages.	**6** **6** **3**
II	**Computer Aided Manufacturing** CAM – Definition - functions of CAM – benefits of CAM. Introduction of CIM – concept of CIM - evolution of CIM – CIM wheel – Benefits – integrated CAD/CAM.	**3**

	Group technology: Part families - Parts classification and coding - coding structure – Opitz system, MICLASS system and CODE System. Process Planning: Introduction – Computer Assisted Process Planning (CAPP) – Types of CAPP - Variant type, Generative type – advantages of CAPP. Production Planning and Control (PPC): Definition – objectives - Computer Integrated Production management system – Master Production Schedule (MPS) – Capacity Planning – Materials Requirement Planning (MRP) – Manufacturing Resources Planning (MRP-II) – Shop Floor Control system (SFC) - Just In Time manufacturing philosophy (JIT) - Introduction to Enterprise Resources Planning (ERP).	**6** **5**
III	**CNC Programming** NC in CAM, tooling for CNC – ISO designation for tooling – CNC operating system. Programming for CNC machining – part program - Manual part programming - coordinate system – Datum points: machine zero, work zero, tool zero - reference points - NC dimensioning – G codes and M codes – linear interpolation and circular interpolation - CNC program procedure - sub-program – canned cycles - stock removal – thread cutting – mirroring – drilling cycle – pocketing. Rapid prototyping: Classification – subtractive – additive – advantages and applications – materials – Virtual machining.	**16**
IV	**FMS, AGV, AS/RS, Robotics** FMS: Introduction – FMS components – FMS layouts – Types of FMS: Flexible Manufacturing Cell (FMC) – Flexible Turning Cell (FTC) – Flexible Transfer Line (FTL) – Flexible Machining System (FMS) – benefits of FMS - introduction to intelligent manufacturing system. Material handling in CIM environment: Types – AGV: Introduction – AGV - working principle – types – benefits. AS/RS – working principle –types – benefits. Robotics: Definition – robot configurations – basic robot motion – robot programming method – robotic sensors – end effectors – mechanical grippers – vacuum grippers – robot programming concepts - Industrial applications of Robot: Characteristics - material transfer and loading – welding - spray coating - assembly and inspection.	**5** **3** **6**

V	**Advanced Concepts Of CIM** Concurrent Engineering: Definition – Sequential Vs Concurrent engineering – need of CE – benefits of CE. Quality Function Deployment (QFD): Definition – House of Quality (HOQ) – advantages – disadvantages. Steps in Failure Modes and Effects Analysis (FMEA) – Value Engineering (VE) – types of values – identification of poor value areas – techniques – benefits. Guide lines of Design for Manufacture and Assembly (DFMA). Product Development Cycle: Product Life Cycle - New product development processes. Augmented Reality (AR) – Introduction - concept – Applications.	**14**

REFERENCES BOOKS:

1. R.Radhakrishnan, and S.Subramanian, “CAD/CAM/CIM”, New Age International Pvt. Ltd.
2. Mikell P.Groover, and Emory Zimmers, “CAD/CAM”, Jr.Prentice Hall of India Pvt., Ltd.
3. Dr.P.N.Rao, “CAD/CAM Principles and Applications,”, Tata Mc Graw Hill Publishing Company Ltd.
4. Ibrahim Zeid, “Mastering CAD/CAM”, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
5. Mikell P. Groover, “Automation, Production Systems, and Computer-Integrated Manufacturing”, Pearson Education Asia.
6. Yoram Koren, “Computer control of manufacturing systems,”, McGraw Hill Book.
7. Chris Mcmahon and Jimmie Browne, “CAD/CAM – Principle Practice and Manufacturing Management”, Addision Wesley England, Second Edition,2000.
8. Dr.Sadhu Singh, “Computer Aided Design and Manufacturing,”, Khanna Publishers, NewDelhi, Second Edition,2000.
9. S.Kant Vajpayee, “Principles of Computer Integrated Manufacturing,”, Prentice Hall of India, 1999.
10. David Bed worth, “Computer Integrated Design and Manufacturing,”, TMH, 1998.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020532

Semester : V

Subject Title : Green Energy and Energy Conservation

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020532 Green Energy and Energy Conservation	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Fundamentals of Energy, Geothermal energy, Wind energy	15
II	Bio mass energy, Solar Energy	15
III	Photovotaic (PV)	15
IV	PV Technologies, Applications	14
V	Energy conservation	14
Test and Model Exam		7
Total		**80**

RATIONALE:

There is an ever increasing demand for energy in spite of the rising prices of oil & other fossil fuel / depletion of fossil fuels. Energy demand, in particular electricity production has resulted in creation of fossil fuel based power plants that let out substantial greenhouse gas / carbon emission into the atmosphere causing climate change and global warming. We have various forms of renewable energy sources viz., Wind, Solar, Biomass, Biogas, etc. Municipal and Industrial wastes could also be useful sources of energy while ensuring safe disposal. This subject is introduced to learn about the major renewable energy sources and more focus on the PV module solar energy. The government act and guidelines are discussed for the benefit of the Diploma Engineers.

OBJECTIVES:

1. Study about the fundamentals of Energy.
2. Study of construction and principle of Wind energy, Solar energy, Geo thermal and Bio energy.
3. Understand the solar energy.
4. Understand the PV design and its components.
5. Study the energy conservation process.
6. Understand the Government Policies and Acts.
7. Study the TEDA projects in Tamil Nadu.

4020532 GREEN ENERGY AND ENERGY CONSERVATION

DETAILED SYLLABUS

Contents: Theory

UNIT	Name of the Topics	Hrs.
I	**Fundamentals of Energy, Geothermal energy, Wind energy** **Energy:** Introduction – Energy need and trends - Forms of Energy – First Law of Thermodynamics - Second Law of Thermodynamics – energy requirement and supply – Fossil fuels and climate changes – need of renewable energy sources – Current renewable energy uses – Renewable energy policies in India. **Geothermal energy:** Introduction – Essential characteristic –	5 4

	Sources – Power Plants – Single flash power plant – double flash power plant – Flow diagram and principle only. **Wind energy:** Introduction – energy conversion – site selection considerations – Components of wind energy conversion system – Classification. Wind mill: Horizontal axis machines - Vertical axis machines – working principle, advantages and disadvantages. Schemes for electric generation.	6
II	**Bio mass energy, Solar Energy** **Bio mass energy:** Introduction – conversion technologies: Wet processes – dry processes. Bio gas generation – factors affecting the bio gas generation – classification of bio gas plants – Bio gas plant – construction - advantages and disadvantages. Materials used for bio gas generation – factors to be considered for the selection of site. **Solar Energy:** Introduction – Sun's energy: advantages – conversion challenges– The Sun-Earth movement - Solar radiation - Different angles - optimal angle for fixed collector, in summer and winter. Sun tracking - measuring instruments of solar radiation – methods to estimate solar radiation.	7 8
III	**Photovotaic (PV)** Photovotaic (PV): Semiconductors as solar cell – types of unit cells - electronic arrangement of silicon atom – intrinsic semiconductor – extrinsic semiconductor – Description only. P-N junction diode - forward bias - reverse bias. Solar cell - characteristics - description of short circuit current, open circuit voltage, fill factor and efficiency - losses in solar cells. Growth of solar PV and silicon (Si) requirement – production of metallurgical grade (MGS) – production of electronic grade (EGS) – Production of Si wafers: ingot making - monocrystalline - multicrystalline – wafer dicing. Si sheets. Solar grade silicon (SoG) – refining processes – Si usage in Solar PV. Process flow of commercial Si cell technology – Description of saw damage removal and surface texturing, diffusion process, thin-film layers for	6 9

	anti reflection coating and surface passivation, metal contacts and their deposition.	
IV	**PV Technologies, Applications** PV Technologies: Thin film Technologies – materials for thin film technologies – Thin film deposition techniques: Physical vapour deposition – Evaporation – Sputtering. Chemical vapour deposition – Low pressure – plasma enhanced. Advantages of thin film Si solar cell technologies. Solar cell structures – substrate arrangement – superstrate arrangement. Solar PV module: series and parallel connections of cells – mismatch in cell / module- Design and structure of PV module. Batteries for PV systems – factors affecting battery performance – DC to DC converters – Charge controllers – DC to AC converter (inverter) (Description only). Applications: Flat plate collector - concentrating solar collectors – solar pond – solar water heating – space heating and cooling – solar pumping – solar cooking – solar green house. principle and applications only.	6 3 5
V	**Energy conservation** Energy conservation act 2001 - Power of state government to facilitate and enforce efficient use of energy and its conservation - Finance, Accounts and Audit of bureau - Penalties and Adjudication - Appellate tribunal for energy conservation – Energy Conservation Guidelines for Industries by BEE, Govt of India - Guide lines – heating, cooling and heat transfer – waste recovery and usage – conversion of heat to electricity – Prevention of energy loss due to heat radiation and electric resistance – Industry energy management system. Net-metering policies – Tamil Nadu Energy Development Agencies – Projects in Tami Nadu: Solar energy, Bio energy and Wind energy – Tamil Nadu Solar policy 2019.	14

Reference Books

1. Non Conventional Energy Sources, G.D.Rai, Khanna Publishers.
2. Non Conventional Energy Sources and Utilisation, R.K.Rajput, S.Chand & Company Ltd.
3. Renewable Energy, Stephen Peake, Oxford press
4. Non Conventional Energy Resources, B.H.Khan, Tata Mc Graw Hill.
5. Industrial energyconservation- D. A. Ray- Pergaman Press
6. Energy resource management, Kirpal Singh Jogi, Sarup and sons.
7. Solar Photovltaics, Chetan Singh Solanki, PHI Learning Pvt. Ltd.
8. Renewable Energy Engineering and Technology, V V N Kishore, TERI.
9. Principles of Solar Engineering, D.Yogi Goswami, Frank Kreith, Jan F.Kreider, Taylor & Francis.
10. Energy conservation act 2001, Government of India.
11. Energy Conservation Guidelines for Industries, Bureau of energy Efficiency, Ministry of Power, Government of India.
12. Tamil Nadu Solar policy 2019

13) https://teda.in/achievements/solar-energy-4/

14) https://teda.in/achievements/bio-energy-2/

15) https://teda.in/achievements/wind-energy-2/

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020533

Semester : V

Subject Title : Mechatronics

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020533 Mechatronics	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Introduction, Sensors & Transducers	15
II	Actuation systems	14
III	Basic system models, Input / Output systems	14
IV	Programmable Logic Controller	14
V	Design examples & advanced applications In Mechatronics	16
Test and Model Exam		7
Total		**80**

RATIONALE:

As per the latest requirements in the automation industries this enables to learn the various concepts of automation components. They are able to write program, and operate PLCs. They are able to select the electronic components for various industry applications.

OBJECTIVES:

- Explain the working of sensors and transducers
- Acquire knowledge about actuation systems
- Explain the system models and I/O systems
- Write program and operate PLCs
- Explain the applications of mechatronics

4020533 MECHATRONICS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Introduction, Sensors & Transducers** Introduction – Systems – Measurement Systems – Control Systems – Microprocessor Based Controllers. Examples – Mechatronics approach. Measurement System terminology – Displacement, Position & Proximity Sensors – Velocity and Motion Sensors – Force Sensors – Fluid Pressure Sensors – Flow Sensors – Liquid Level Sensors – Temperature Sensors – Light Sensors – Selection of Sensors – Calibration of sensors.	**15**
II	**Actuation Systems** Mechanical Actuation Systems – Types of motion – Freedom and constraints – Loading – Gear Trains – Pawl & Ratchet – Belt & Chain drive – Bearing – Selection – Ball & Roller bearings – Mechanical aspects of motor selection. Electrical Actuation Systems – Switches & Relays – Solenoids – D.C Motors – A.C. Motors – Stepper Motors – Specification and control of	**7** **7**

	stepper motors – Servomotors: D.C Servomotor and A.C Servomotor. Pneumatic & Hydraulic Systems – Power supplies – DCV – PCV – Cylinders – Rotary actuators.	
III	**Basic System Models, Input/Output Systems** Mathematical Model – Introduction to mathematical model – Mechanical System building blocks – Electrical System building blocks – Fluid System building blocks – Thermal System building blocks. System Model – Engineering Systems – Rotational – Translational Systems – Electro-Mechanical System – Hydro- Mechanical System. Interfacing – Input/Output ports – Interface requirements: Buffers, Handshaking, Polling and interrupts, Serial interfacing – Introduction to PIA – Serial communications interface – Example of interfacing of a seven-segment display with a decoder.	**14**
IV	**Programmable Logic Controller** Definition – Basic block diagram and structure of PLC – Input/Output processing – PLC Programming: Ladder diagram, logic functions, latching and sequencing – PLC mnemonics – Timers, internal relays and counters – Shift registers – Master and jump controls – Data handling – Analog input/output – Selection of PLC – sample ladder programs.	**14**
V	**Design Examples & Advanced Applications In Mechatronics** Design process stages – Traditional Vs Mechatronics designs – Possible design solutions: Timed switch, Wind- screen wiper motion, Bath room scale – Case studies of mechatronics systems: A pick-and-place robot, Car park barrier, Car engine management system, Automatic Camera and Automatic Washing Machine. Sensors for condition monitoring systems of production systems – Examples of monitoring methods: Vibration monitoring, Temperature monitoring, Wear behavior monitoring – Mechatronics control in automated manufacturing: Monitoring of manufacturing processes, On-line quality monitoring, Model-based systems, Hardware-in-the-loop simulation, Supervisory control in manufacturing inspection, Integration of heterogeneous systems.	**16**

REFERENCES BOOKS:

1. W.Bolton, “Mechatronics”, 2nd Edition 2001, Pearson Education, New Delhi.
2. R.K.Rajput, A Text Book of Mechatronics, 1st Edition 2007, S.Chand & Co. Ltd., New Delhi.
3. HMT, “Mechatronics”, 1st Edition 1998, Tata McGraw Hill, New Delhi.
4. Devdas Shetty & Kolk, “Mechatronics System Design”, 1st Reprint, 2001, PWS Publishing Co., Boston.
5. James H.Harter, “Electromechanics”, 1st Edition 2003, Prentice-Hall of India, New Delhi.
6. M.D.Singh & J.G.Joshi, “Mechatronics”, 1st Edition 2006, Prentice-Hall of India, New Delhi.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020540

Semester : V

Subject Title : Process Automation Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020540 Process Automation Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Design and operate pneumatic circuits.
- Design and operate fluid power circuits
- Use PLC system and its elements for process control
- Familiarize the working of function blocks in PLC
- Use ON-Delay timer to control a motor
- Use OFF-Delay timer to control a motor
- Use counter function block (Up counter and Down counter)
- Control the automatic operation of pneumatic cylinder using PLC
- Record of work to be prepared.

Exercises

PART A

Pneumatics Lab.

1. Direct operation of single and double acting cylinder.
2. Operation of double acting cylinder with quick exhaust valve.
3. Speed control of double acting cylinder using metering-in and metering-out circuits.
4. Automatic operation of double acting cylinder in single cycle - using limit switch.

Hydraulics Lab.

5. Direct operation of double acting cylinder.
6. Direct operation of hydraulic motor.
7. Speed control of double acting cylinder metering-in and metering-out control.

PART B

PLC Lab.

1. Direct operation of a motor using latching circuit.
2. Operation of a motor using ‘AND’ logic control.
3. Operation of a motor using ‘OR’ ‘control.
4. On-Delay control of a motor and Off –Delay control of a motor.
5. Automatic operation of a Double acting cylinder-single cycle - forward, time delay, return.
6. Automatic operation of Double acting cylinder-Multi cycle.
7. Sequential operation of double acting cylinder and a motor.

BOARD EXAMINATION

Note:

- All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Detailled Allocation of Marks

Part A:		**45**
Procedure / Circuit diagram	10	
Identification of Components	15	
Connection and execution	20	
Part B:		**45**
Procedure / Circuit diagram	10	
Ladder diagram / Programming	25	
Execution	10	
Viva Voce		**10**
Total		**100**

LIST OF EQUIPMENTS (For 30 Students)

1. Pneumatic Trainer Kit – 3 Nos
   (All Cylinders, Control Valves, Limit switches and other accessories)
2. Hydraulics Trainer Kit – 2 No.
   (All Cylinders, Control Valves, Limit switches and other accessories)
3. PLC kit – 3 Nos.
4. Computer with software – 10 Nos.

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DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020550

Semester : V

Subject Title : Thermal Engineering Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020550 Thermal Engineering Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Determine the flash and fire point and viscosity of oil.
- Draw the valve timing diagram of petrol and diesel engines.
- Draw the port timing diagram of petrol and diesel engines.
- Conduct performance test on petrol and diesel engines.
- Prepare heat balance sheet for an IC engine.
- Conduct of C.O.P of Refrigerators.
- Determine the volumetric efficiency of the Air Compressor.

Experiments:

PART - A

1. Determine flash and fire point of the given oil using open cup and closed cup apparatus.
2. Determine the absolute viscosity of the given lubricating oil using Redwood viscometer.
3. Determine the absolute viscosity of the given lubricating oil using Say bolt viscometer.
4. Port timing diagram of two stroke petrol Engine
5. Valve time diagram for four stroke petrol Engine.
6. Valve time diagram for four stroke diesel engines.

PART - B

1. Load test (Performance test) on Four Stroke Petrol Engine.
2. Load test (Performance test) on Four Stroke diesel Engine.
3. Morse test on Multi-cylinder petrol engine.
4. Heat balance test on Four Stroke Diesel / Petrol Engine.
5. Volumetric efficiency of Air Compressor.
6. Determination of COP of Refrigeration System.

BOARD EXAMINATION

Note:

- All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Detailled Allocation of Marks

Part A:		**35**
Observation and Tabular Column	5	
Calculations	20	
Result / Graph	10	
Part B:		**55**
Observation and Tabular Column	10	
Formulae, Calculations	30	
Result / Graph	15	
Viva Voce		**10**
Total		**100**

LIST OF EQUIPMENTS (For 30 students)

1. Open cup apparatus - 2 Nos.
2. Close cup apparatus - 2 Nos.
3. Redwood viscometer - 2 Nos.
4. Say bolt viscometer - 2 Nos.
5. Four stroke petrol engine Model - 2 Nos.
6. Four stroke diesel engine Model - 2 Nos.
7. Two stroke petrol engine Model - 2 Nos.
8. Four stroke Petrol Engine Test rig - 1 No.
9. Four stroke Diesel engine Test rig - 1 No.
10. Multi -cylinder petrol engine test rig - 1 No.
11. Air compressor test rig – 1 No.
12. Refrigeration Test rig – 1 No.
13. Measuring instruments - Required quantity
14. Consumables - Required quantity

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020561

Semester : V

Subject Title : Computer Integrated Manufacturing Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020561 Computer Integrated Manufacturing Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of Computer Integrated Manufacturing. They are able to write part program and able operate CNC lathe and Milling machines. They are able to understand the advanced concepts adopted in CIM.

OBJECTIVES:

- Acquire knowledge in the field of Computer Integrated Manufacturing
- Create 3D Solid models of machine components using modelling software
- Execute and perform machining operations in CNC Lathe and CNC Milling machines.

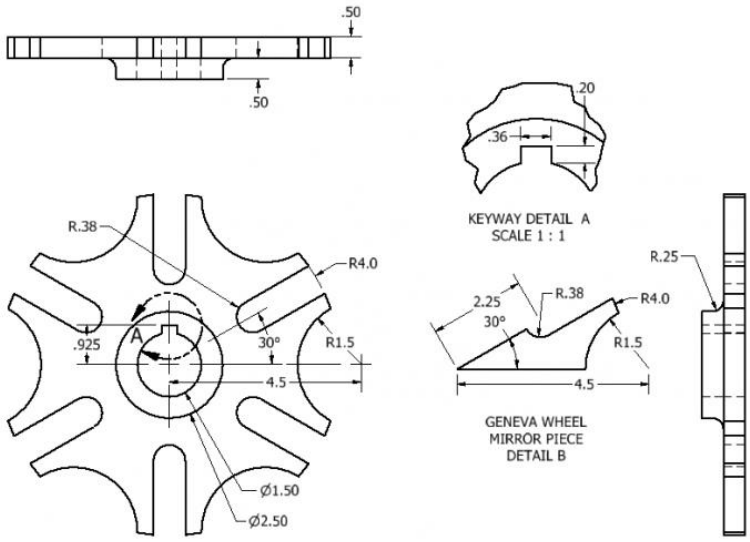
DETAILED SYLLABUS

Contents: Practical

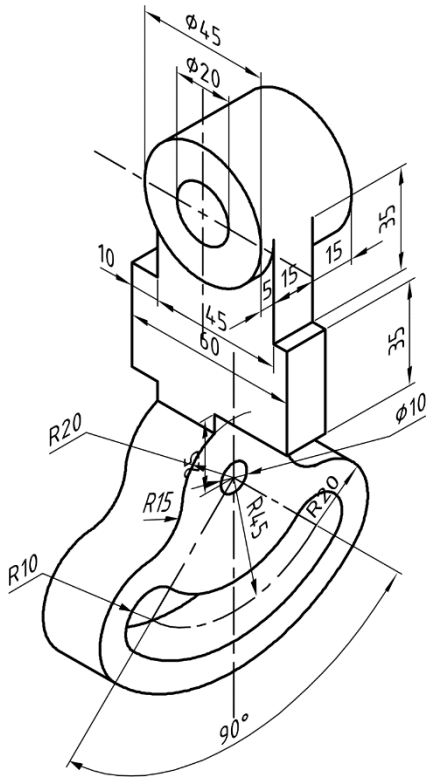
PART A: SOLID MODELLING

Introduction to Part modelling - Datum Plane – constraint – sketch – dimensioning – extrude – revolve – sweep – blend – protrusion – extrusion – rib – shell – hole – round – chamfer – copy – mirror – assembly – align – orient – drawing and detailing –creating assembly views

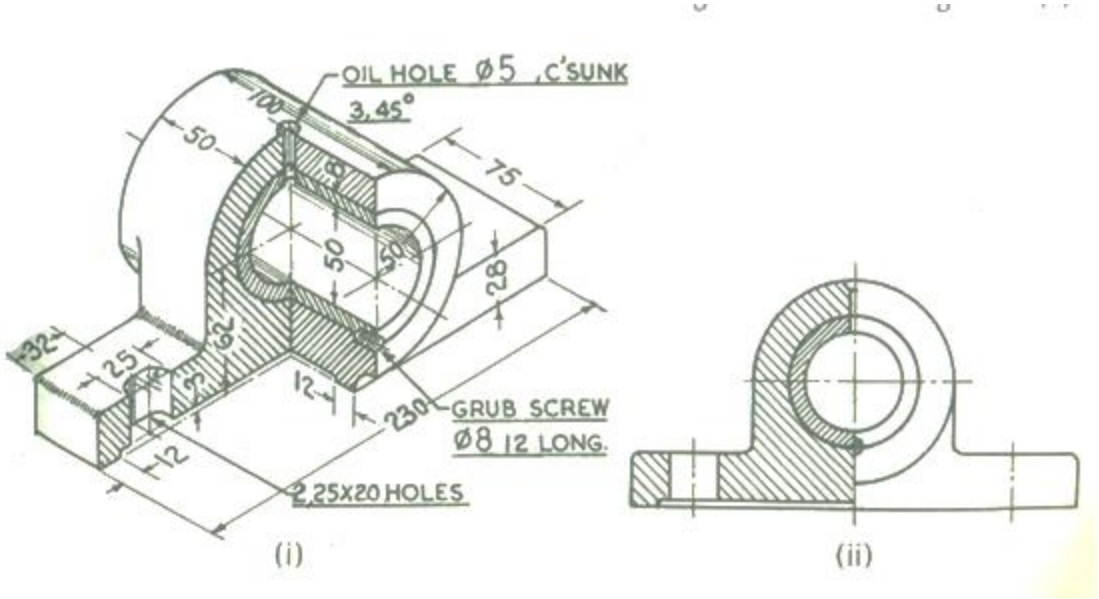
Exercise No. 1. Geneva Wheel



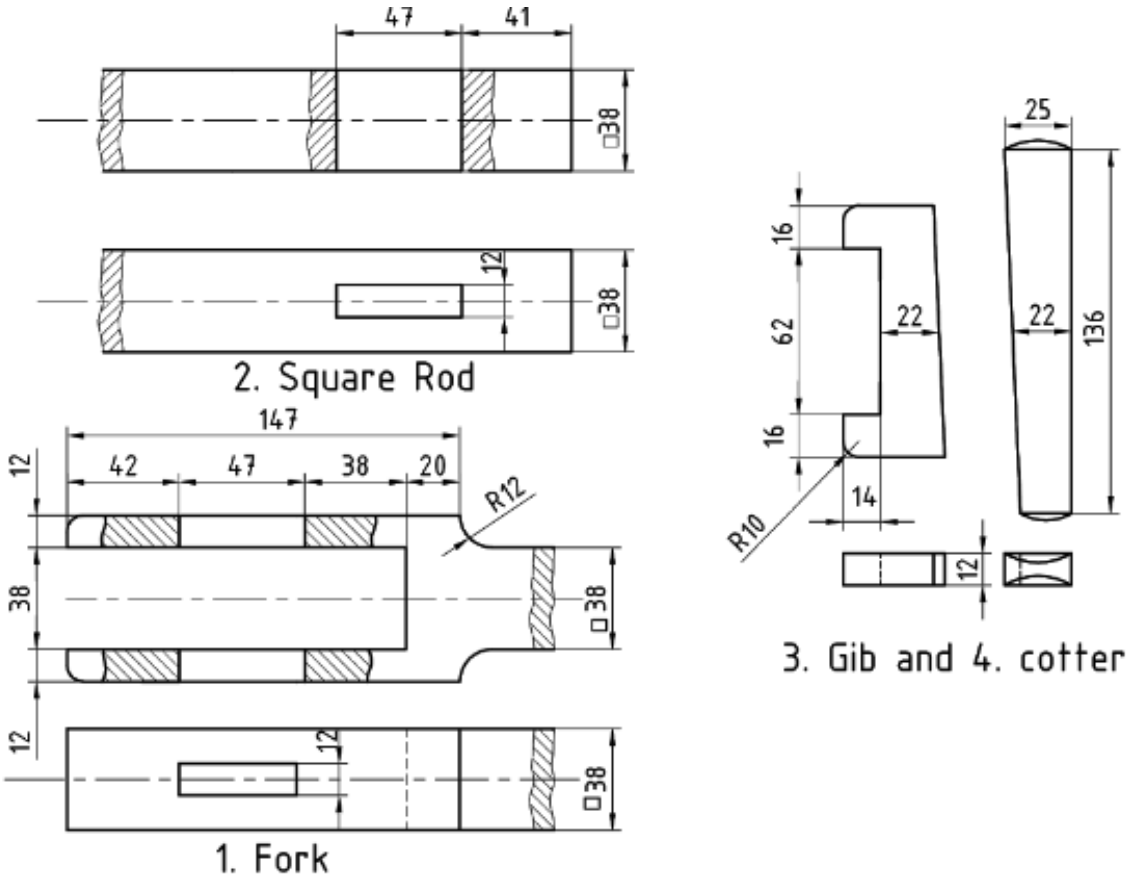
Exercise No. 2. Bearing Block



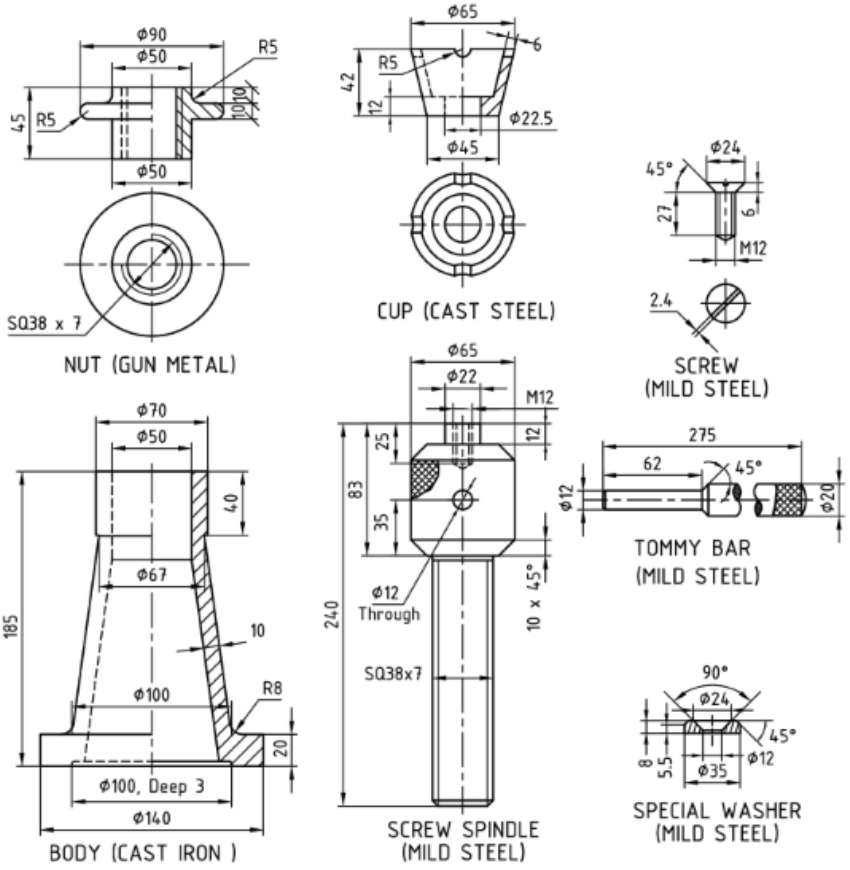
Exercise No. 3. Bushed bearing



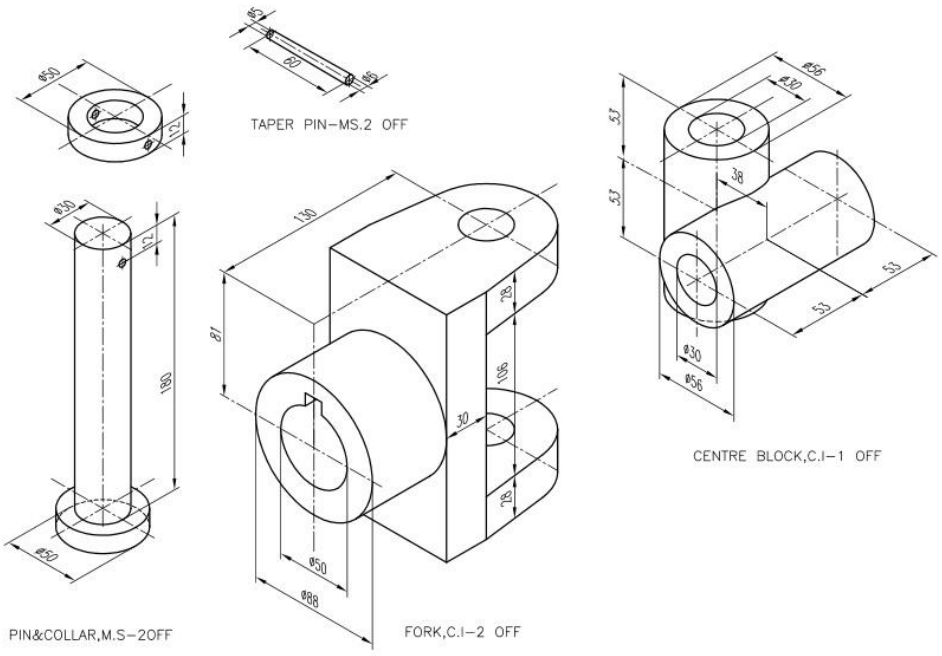
Exercise No. 4. Gib and Cotter joint



Exercise No. 5. Screw Jack



Exercise No. 6. Universal Coupling



Note: Print the orthographic view and sectional view from the above assembled 3D drawing.

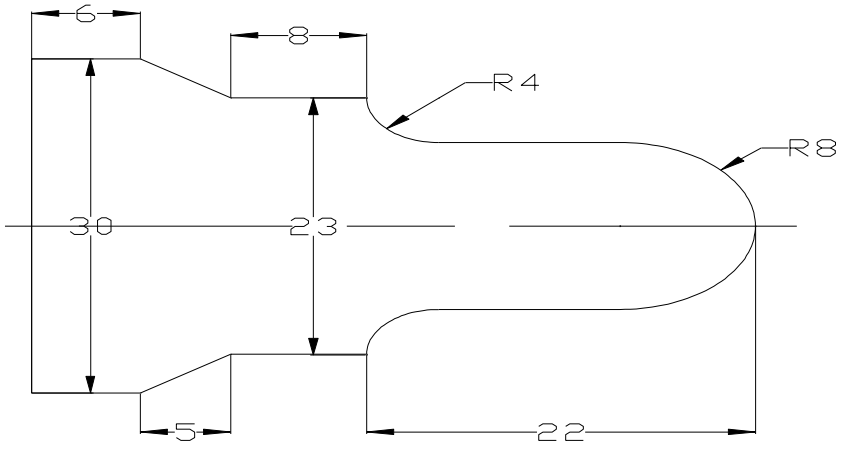
PART B: CNC Programming and Machining

Introduction: 1. Study of CNC lathe, milling. 2. Study of international standard codes: G-Codes and M-Codes 3. Format – Dimensioning methods. 4. Program writing – Turning simulator – Milling simulator, IS practice – commands menus. 5. Editing the program in the CNC machines. 6. Set the machine and execute the program in the CNC machines.

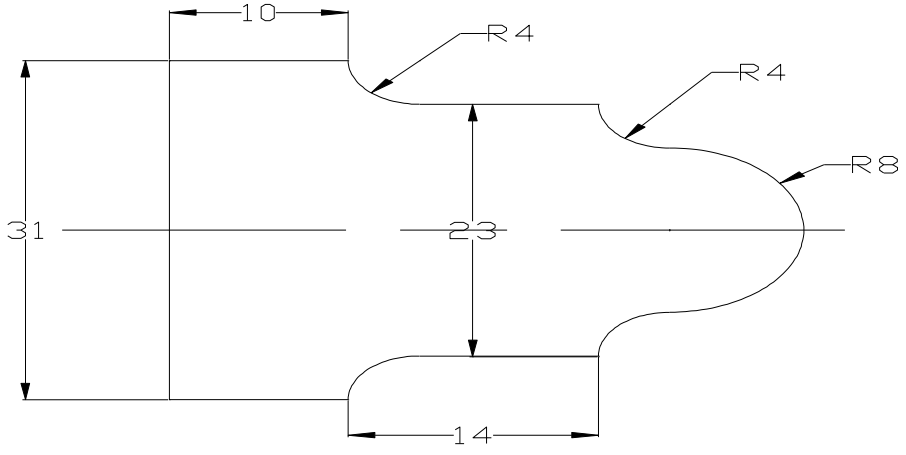
Note: Create and edit the part program in the simulation software for verification of the part program. Enter / tranfer the program to make the component in the CNC machine.

CNC Turning Machine Material: M.S / Aluminium / Acrylic fibre / Plastic

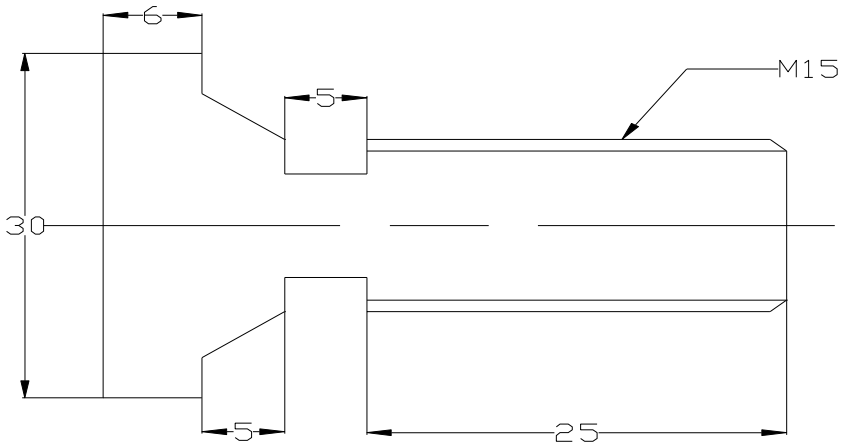
1. Using Linear and Circular interpolation - Create a part program and produce component in the Machine.



2. Using Stock removal cycle – Create a part program for multiple turning operations and produce component in the Machine.



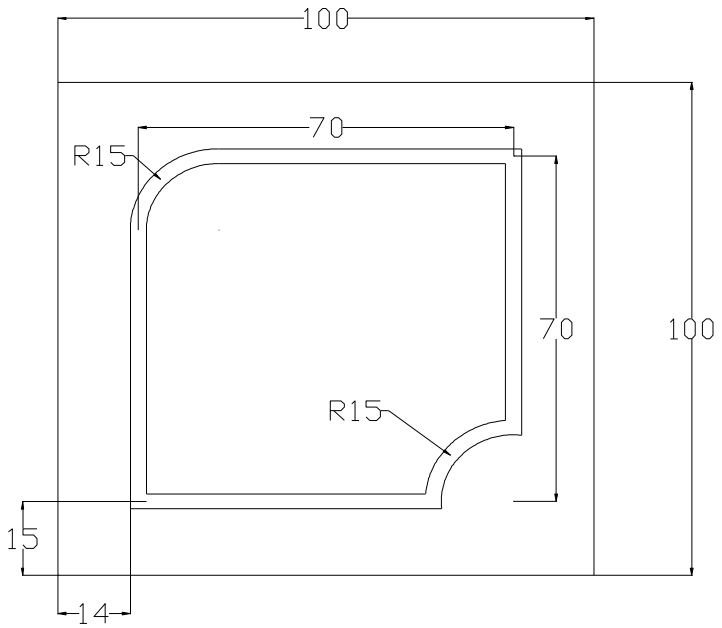
3. Using canned cycle - Create a part program for thread cutting, grooving and



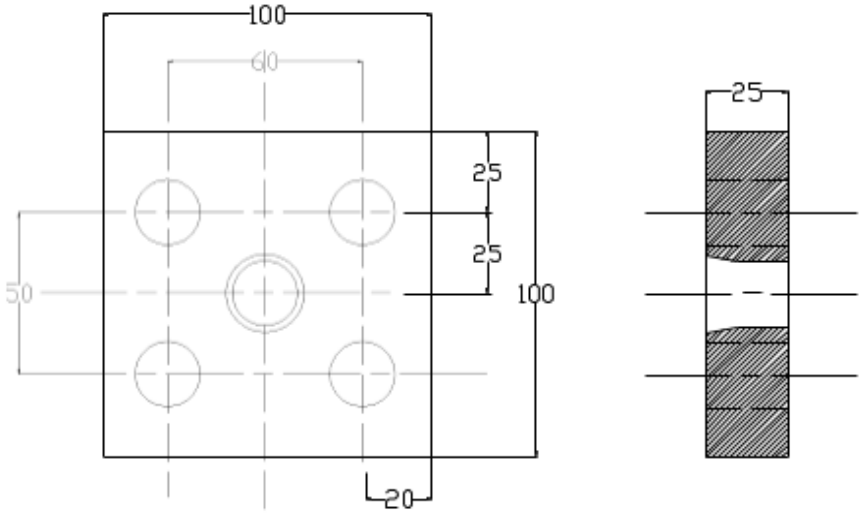
produce component in the Machine.

CNC Milling Machine Material: M.S / Aluminum / acrylic fibre / plastic

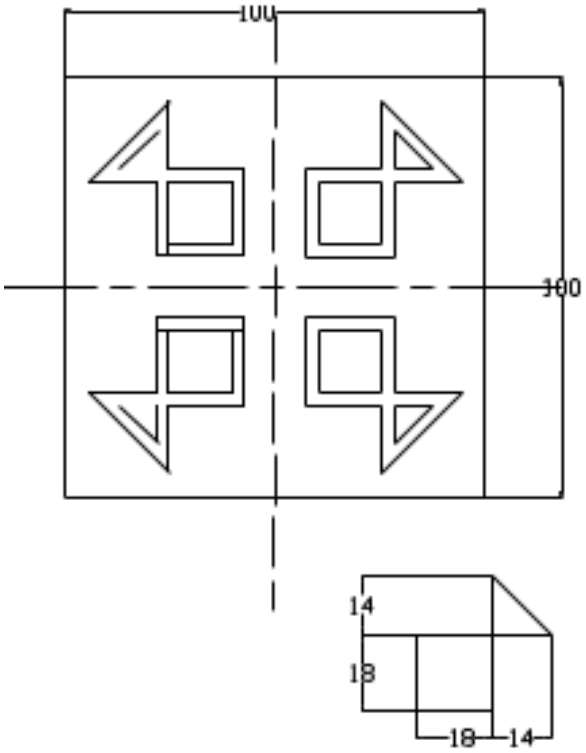
4. Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine.



5. Using canned cycle - Create a part program for drilling, tapping, counter sinking and produce component in the Machine.



6. Using subprogram - Create a part program and produce component in the Machine.



BOARD EXAMINATION

Note:

- All the exercises in both sections should be completed. Two exercises will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the exercises should be given in the question paper and students are allowed to select by a lot or question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Note: Part A: The given component drawing should be created and solid modelling after assembly should be printed and submitted along with the answer paper for evaluation by the external examiner.

Part B: The program for the given component should be written in the answer paper. The program should be entered in the CNC machine and the component should be submitted for evaluation by the external examiner. The machined component should be kept under the custody of examiner.

Allocation of marks for Board Examination

PART A: Solid Modelling

Creation of sketch	: 15
Modelling	: 25
Accuracy	: 5

PART B: CNC Programming

Program writing	: 15
Setting	: 10
Editing and Machining	: 20
Viva voce	: 10

Total Marks : 100

LIST OF EQUIPMENTS (For 30 students)

1. Personal computer - 30 Nos.
2. 3D Solid Modelling and Simulation software - Sufficient to the strength
3. CNC Lathe –2 Nos.
4. CNC Mill –2 Nos.
5. Consumables - Sufficient quantity
6. Laser / Inkjet Printer – 1 No.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020562

Semester : V

Subject Title : Green Energy and Energy Conservation Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020562 Green Energy and Energy Conservation Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Objectives:

- To demonstrate the I-V and P-V Characteristics of PV module .
- To show the effect of variation in tilt angle on PV module power.
- To study the characteristics of battery.
- To understand how a solar PV standalone system works
- To workout power flow calculations of standalone PV system AC load DC load with battery.
- To understand how to use various electrical measuring equipments.
- To study the different electrical parameters of a monocrystalline and polycrystalline silicon solar panel
- To study the effect of shading on the output of solar panel.
- To understand and determine the power flow in a solar DC system.

4020562 GREEN ENERGY AND ENERGY CONSERVATION PRACTICAL

DETAILED SYLLABUS

Experiments

PART A

1. Study and demonstrate the I-V and P-V Characteristics of PV module with varying radiation and temperature level.
2. Study and demonstrate the I-V and P-V characteristics of series and parallel combination of PV modules.
3. Study and demonstrate the effect of shading on module output power.
4. Do a shading analysis on the site where solar PV system needs to be setup.
5. Study the wind power generation status in Tamilnadu.
6. Study the biogas generation status in Tamilnadu.

PART B

1. Conduct experiment to show the effect of variation in tilt angle on PV module power.
2. Conduct the experiment to demonstrate the working of diode as Bypass diode and blocking diode.
3. Conduct the experiment to draw the charging and discharging characteristics of battery.
4. Conduct the experiment for the power flow calculations of standalone PV system of AC load with battery.
5. Conduct the experiment for the power flow calculations of standalone PV system of DC load with battery.
6. Conduct the experiment to determine the different electrical parameters of a monocrystalline and polycrystalline silicon solar panel.

BOARD EXAMINATION

Note:

- All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

ALLOCATION OF MARKS

Part - A			
Study explanation		**:**	**30**
Part - B		**:**	**60**
Procedure	15		
Observation / Reading / calculation	35		
Result	10		
Viva-voce		**:**	**10**
Total		**:**	**100**

Equipment / Tools Required (For 30 students)

S.No.	Description	Qty.
1	150 /160 Wp Polycrystalline Solar PV Modules	2 Nos.
2	340/350 Wp Mono crystalline Solar PV Modules	2 Nos.
3	80 / 90 Wp Thin film Solar PV Modules	2 Nos.
4	1000W/1500W Off-grid Grid Inverter with MPPT Charge Controller	1 No.
5	Solar Structure	1 No.
6	Wall mountable ACDB Box	1 No.
7	Earthing kit	3 No.
8	DC Wire , AC Wire, PVC items	1 No.
9	Accessories like MC4 connectors, Lugs, Screws etc	Sufficient quantity
10	Solar System Analyser	1 No.
11	Solar Power Meter	1 No.
12	Solar Module Analyser	1 No.
13	Thermal Imaging Camera	1 No.
14	Drill m/c, Multimeters, Clamp meters, Tools & Tackles, Safety gear	1 Set
15	Electrical Measuring Instruments	Sufficient Quantity
16	Shop Floor Tools	Sufficient Quantity

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DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020563

Semester : V

Subject Title : Mechatronics Practical

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
4020563 Mechatronics Practical	4	64	25	100*	100	3Hrs.

*Examinations will be conducted for 100 marks and it will be reduced for 75 marks for result

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of industrial automation. They are able to write ladder logic program and able operate PLCs. They are able to understand the advanced concepts adopted in industrial automation.

OBJECTIVES:

- Acquire knowledge in the field of mechatronics
- Explain the various components of electro pneumatics and electro hydraulics
- Handle PLC, HMI, SCADA and DCS components

4020563 MECHATRONICS PRACTICAL

DETAILED SYLLABUS

ELECTRO PNEUMATICS: Introduction to Electro Pneumatics -Applications of pneumatics - Pneumatic and electro pneumatic controllers - Components and assemblies in the electrical signal control section: Power supply unit - Push button and control switches - Sensors for measuring displacement and pressure - Relays and contactors. Electrically actuated directional control valves - Construction and mode of operation - Functions - Electrical connection of solenoid coils. Procedure for developing a control system.

ELECTRO HYDRAULICS: Basic principles of electro hydraulics - Function and use of electrohydraulic components - Production and interpretation of standard hydraulic and electrical circuit diagrams

PROCESS CONTROL INSTRUMENTATION: Process control - Types of processes – Structure of control system – Controllers - Digital controllers – Types of process control – ON/OFF Control – Analog control – Digital control. Data Acquisition System - Objectives of DAS - Types of DAS: Single channel DAS – Multichannel DAS – Computer based DAS. Data Loggers - Block diagram of Data Loggers – Control facilities in Data Logger – Uses of Data Logger - Different stages of Direct Digital Control.

SCADA - Fundamental principles of modern SCADA systems - SCADA hardware - SCADA software - Landlines for SCADA - SCADA and local area networks - Modem used in SCADA systems - Remote terminal units. Human Machine Interface – components of HMI.

Distributed Control System - Parts of DCS – Layered structure of DCS – Communication options in DCS.Variable Frequency Drives - Construction, Working, Operation, Applications and Specifications

Experiments

PART A

(ELECTRO PNEUMATICS)

1. Direct control of a 3/2 NC Single solenoid valve and a 3/2 NO Single solenoid valve
2. Direct control of a 5/2 single solenoid valve and a 5/2 double solenoid valve
3. Simple circuit using OR Logic and AND Logic
4. Limit switch and proximity switch application circuits

(ELECTRO HYDRAULICS)

1. Sorting device using double acting cylinder, directly actuated, manually
2. Component selection on conveyor belt using double acting cylinder and directly actuated, manually
3. Lifting station using single acting cylinder and directly actuated, manually
4. Door control using double acting cylinder and interlocking

PART B

PROCESS CONTROL INSTRUMENTATION

1. Wiring practice of HMI
2. Design of HMI screen
3. HMI Configuration and Interfacing with PLC and PC
4. Configuring Alarms in SCADA
5. Real time project development and interfacing with PLC
6. Monitoring & Control of Pneumatic System using HMI

BOARD EXAMINATION

Note:

1. All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.
2. All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.

3. All regular students appearing for first attempt should submit record notebook for the examination.
4. The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
5. The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

ALLOCATION OF MARKS

PART A: Electro Pneumatic circuit / Electro Hydraulic circuit (by lot):

Circuit diagram	:	15
Components connections & execution	:	20
Output	:	10

PART B: Process Control Instrumentation

Circuit diagram	:	15
Execution &Programming	:	20
Output	:	10
Vivavoce	:	10
Total Marks	:	100

List of Equipment (For 30 students)

Electro Pneumatics:

1. Basic Pneumatic Trainer Kit with FRL Unit, Compressor and Accessories – 2 Nos
   - 3/2 NC Single Solenoid Valve - 2Nos
   - 3/2 NO Single Solenoid Valve - 2Nos
   - 5/2 Single Solenoid Valve - 2Nos
   - 5/2 Double Solenoid Valve - 2Nos
   - Limit Switch – 6 Nos
   - Proximity Sensor (Inductive, Capacitive & Optical) – Each 2 Nos
   - Single Acting Pneumatic Cylinder – 4 Nos
   - Double Acting Pneumatic Cylinder – 2 Nos
   - Power Supply Unit, Connecting Leads and Hoses – As per Requirements

Electro Hydraulics:

1. Basic Hydraulics Trainer Kit with Hydraulic Pump, Regulator and Hoses Accessories – 2 Nos
    - Double Acting Cylinder – 2 Nos
    - Single Acting Cylinder – 2 No
    - Manual Actuator Switch – 4 Nos
    - Material Sorting assembly set up – 1 No
    - Conveyor Assembly set up – 1 No
    - Lifting Station Assembly Set up – 1 No
    - Limit Switch - 4 Nos

Process Control Instrumentation:

- Programmable Logic Controller (PLC) with Software – 3 Nos
- Human Machine Interface (HMI) with Software - 3 Nos
- SCADA Software – 1 No or Integrated Software for PLC, HMI and SCADA)
- Personnel Computer – 3 Nos
- Water Tank Assembly set up with Level Sensor and Flow Controller (Actuator) to interface with PLC and HMI – 1 No

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(implemented from the Academic year 2020-2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020570

Semester : V

Subject Title : Entrepreneurship & Startups

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
4020570 Entrepreneurship & Startups	4	64	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced for 75 marks for result

Topics and Allocation of Hours

UNIT	Topic	Hours
1	Entrepreneurship – Introduction and Process	10
2	Business Idea and Banking	10
3	Start ups, E-cell and Success Stories	10
4	Pricing and Cost Analysis	10
5	Business Plan Preparation	10
Field visit and Preparation of case study report		14
Total		64

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and start ups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:

At the end of the study of 5th semester the students will be able to

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spirit and resourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture
- Familiarization with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turnover
- Familiarization of various financial and non financial schemes
- Aware the concept of incubation and starts ups

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
1	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** • Concept, Functions and Importance • Myths about Entrepreneurship • Pros and Cons of Entrepreneurship • Process of Entrepreneurship • Benefits of Entrepreneur • Competencies and Characteristics • Ethical Entrepreneurship • Entrepreneurial Values and Attitudes • Motivation • Creativity • Innovation • Entrepreneurs - as problem solvers • Mindset of an employee and an entrepreneur • Business Failure – causes and remedies • Role of Networking in entrepreneurship	10
2	**BUSINESS IDEA AND BANKING** • Types of Business: Manufacturing, Trading and Services • Stakeholders: Sellers, Vendors and Consumers • E- Commerce Business Models • Types of Resources - Human, Capital and Entrepreneurial tools • Goals of Business and Goal Setting • Patent, copyright and Intellectual Property Rights • Negotiations - Importance and methods • Customer Relations and Vendor Management • Size and Capital based classification of business enterprises • Role of Financial Institutions • Role of Government policy	10

	• Entrepreneurial support systems • Incentive schemes for State Government • Incentive schemes for Central Government	
3	**STARTUPS, E-CELL AND SUCCESS STORIES** • Concept of Incubation centre's • Activities of DIC, financial institutions and other relevance institutions • Success stories of Indian and global business legends • Field Visit to MSME's • Various sources of Information • Learn to earn • Startup and its stages • Role of Technology – E-commerce and Social Media • Role of E-Cell • E-Cell to Entrepreneurship	**10**
4	**PRICING AND COST ANALYSIS** • Calculation of Unit of Sale, Unit Price and Unit Cost • Types of Costs - Variable and Fixed, Operational Costs • Break Even Analysis • Understand the meaning and concept of the term Cash Inflow and Cash Outflow • Prepare a Cash Flow Projection • Pricing and Factors affecting pricing • Understand the importance and preparation of Income Statement • Launch Strategies after pricing and proof of concept • Branding - Business name, logo, tag line • Promotion strategy	**10**
5	**BUSINESS PLAN PREPARATION** • Generation of Ideas, • Business Ideas vs. Business Opportunities	**10**

	• Selecting the Right Opportunity • Product selection • New product development and analysis • Feasibility Study Report – Technical analysis, financial analysis and commercial analysis • Market Research - Concept, Importance and Process • Marketing and Sales strategy • Digital marketing • Social Entrepreneurship • Risk Taking-Concept • Types of business risks	

REFERNCE BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra - 282002
2. Dr. G.K. Varshney, Business Regulatory Framework , Sahitya Bhawan Publications, Agra - 282002
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301
4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
5. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
6. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
7. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
8. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
9. I. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers, Rajasthan
10. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018

11. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioners guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

Board Examination – Evaluation Pattern

Internal Mark Allocation

Assignment (Theory portion)*	-	10
Seminar Presentation	-	10
Attendance	-	5
Total	**-**	**25**

Note: * Two assignments should be submitted. The same must be evaluated and converted to 10 marks.

Guidelines for assignment:

First assignment – Unit I

Second assignment – Unit II

Guidelines for Seminar Presentation - Unit III

Each assignment should have five three marks questions and two five marks questions.

BOARD EXAMINATION

Note

1. The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.
2. The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Board Practical Examinations.
3. The question paper consists of theory and practical portions. All students should write the answers for theory questions (45 Marks)

and practical portions (55 Marks) should be completed for board examinations.

4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do the examination for 3Hrs.
5. For Written Examination: theory question and answer: 45 Marks

   Ten questions will be asked for 3 marks each. Five questions from each unit 1 & 2. (10 X 3 = 30).

   Three questions will be asked for 5 marks each. One question from each unit 1, 2 & 3. (3 X 5 = 15)
6. For Practical Examination: The business plan/Feasibility report or Report on Unit 4 & 5 should be submitted during the board practical examinations. The same have to be evaluated for the report submission (40 marks).

DETAILED ALLOCATION OF MARKS

Sl. No	Description	Marks
Part A	Written Examination - Theory Question and answer 10 questions x 3 marks = 30 marks 3 questions x 5 marks = 15 marks	45
Part B	Practical Examination – Submission on Business Plan/Feasibility Report or Report on Unit 4 & 5	40
Part C	Viva voce	15
	Total	100

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020610

Semester : VI

Subject Title : Industrial Engineering and Management

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020610 Industrial Engineering and Management	6	96	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Plant Engineering and Plant Safety	18
II	Work Study, Method Study and WorkMeasurement	18
III	Principles, Personnel Management and Organizatioal Behavior:	19
IV	Financial and Material Management	18
V	Engineering Ethics and Human Values	16
Test and Model Exam		07
Total		**96**

RATIONALE:

In the Indian Economy, Industries and Enterprises always find prominent place. After globalization, the students should be trained not only in manufacturing process but also in managing activities of industries. The knowledge about plant, safety, work study techniques, personnel management, financial management and engineering ethics and human values will definitely help the students as managers to suit the industries.

OBJECTIVES:

- To study the different types of layout.
- To study the safety aspects and its impacts on an organization.
- To study different work measurement techniques.
- To study engineering ethics and human values.
- To study the staff selection procedure and training of them.
- To study capital and resources of capital.
- To study inventory control system.
- To study about organization and it's behavior.

4020610 INDUSTRIAL ENGINEERING AND MANAGEMENT
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Time
I	**Plant Engineering and Plant Safety**	
	Chapter: 1.1: Plant Engineering : Plant – Selection of site of industry – Plant layout – Principles of a good layout – types – process, product and fixed position – techniques to improve layout – Principles of material handling equipment – Plantmaintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance.	**9**
	Chapter: 1.2: Plant Safety: Importance – accident - causes and cost of an accident - accident proneness - prevention of accidents - Industrial disputes - settlement of Industrial disputes - Collective bargaining, conciliation, Mediation, arbitration - Indian Factories Act 1948 and its provisions related to health, welfare and safety.	**9**

II	**Work Study, Method Study and Work Measurement** **Chapter: 2.1: Work Study:** Productivity – Standard of living – method of improving productivity – Objectives – Importance of good working conditions. **Chapter: 2.2: Method Study:** Definition – Objectives – Selection of a job for method study – Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart, Man Machine chart, String diagram and flow diagram. **Chapter: 2.3: Work Measurement:** Definition – Basic procedure in making a time study – Employees rating factor – Application of time allowances – Rest, Personal, Process, Special and Policy allowances – Calculation of standard time – Problems – Basic concept of production study – Techniques of work measurement - Ratio delay study, Synthesis from standard data, analytical estimating and Pre determined Motion Time System (PMTS).	**4** **6** **8**
III	**Principles, Personnel Management and Organizational Behavior:** **Chapter: 3.1: Principles of Management:** Definition of management – Administration - Organization – F.W. Taylor's and Henry Fayol's Principles of Management – Functions of Manager – Directing – Leadership –Types of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation - Modern management techniques- Management Information Systems – Strategic management – SWOT Analysis - Business Process Re-engineering (BPR) – Enterprises Resource Planning (ERP) – Activity Based Management (ABM) – Global Perspective – Principles and brief description. **Chapter: 3.2: Personnel Management:** Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school training – Job evaluation and merit rating – objectives and importance – wages and salary administration – Components of wages – Wage fixation – Type of wage payment – Halsey's 50% plan,	**7** **7**

	Rowan's plan and Emerson's efficiency plan – Problems. **Chapter: 3.3: Organizational behavior:** Definition – organization - Types of Organization – Line, Staff, Taylor's Pure functional types – Line and staff and committee type – Organizational Approaches, individual behavior - causes - Environmental effect - Behavior and Performance, Perception - organizational implications.	**5**
IV	**Financial and Material Management** **Chapter: 4.1: Financial Management:**Fixed and working capital – Resources of capital – shares preference and equity shares – debentures – Type of debentures – Public deposits, Factory costing – direct cost – indirect cost – Factory overhead – Selling price of a product – Profit – Problems. Depreciation – Causes – Methods - Straight line, sinking fund and percentage on diminishing value method – Problems. **Chapter: 4.2: Material Management:** Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Minimum Stock, Lead Time, Reorder Level - Economic order quantity - problems – supply chain management - Introduction – Purchasing procedure – Store keeping – Bin card.	**9** **9**
V	**Engineering Ethics and Human Values** **Chapter: 5.1: Engineering Ethics**: Definition - engineering ethics - personal and business ethics - duties and rights - engineering as a profession - core qualities of professional practitioners - environment and their impact - code of ethics - procedure for solving ethical conflicts - ethical judgement - Kohiberg's stages of moral development - value based ethics - engineers as managers, consultants and leaders - environmental ethics - computer ethics - Intellectual Property Rights (IPRs). **Chapter: 5.2: Human values :** Morals – values – integrity - service learning - civic virtue - respect for others - living peacefully - caring – sharing – honesty - courage - valuing time cooperation - commitments – empathy - selfconfidence – character - stress management.	**9** **7**

Reference Books :

1. Industrial Engineering and Management, O.P. Khanna, Revised Edition Publications (P) Ltd – 2004, 67/4 Madras House, Daryaganj, New Delhi–110002.
2. Engineering Economics and Management, T.R. Banga& S.C. Sharma, McGraw Hill Editiion. 2 – 2001, New Delhi.
3. Herald Koontz and Heinz Weihrich, Essentials of Management, McGraw Hill Publishing Company, Singapore International Edition. Latest
4. Govindarajan .M, Natarajan. S, Senthilkumar V.V, Engineering ethics, prentice hall of India New Delhi, 2004.
5. Management, Aglobal perspective, Heinz Weihrich, Harold Koontz, 10th Edition, McGraw Hill International Edition. Latest.
6. Essentials of Management,4th Edition, Joseph L. Massie, Prentice - Hall of India, New Delhi 2004.
7. S.Chandran, Organizational Behaviours, Vikas Publishing House Pvt. Ltd. Latest
8. M.Govindarajan and S.Natarajan, Principles of Management, Prentce Hall of India Pvt.Ltd. New Delhi. Latest.
9. Charles B. Fledderman, Engineering ethics, pearson prentice hall, New Jersey, 2004.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020620

Semester : VI

Subject Title : E Vehicle Technology & Policy

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
4020620 E Vehicle Technology & Policy	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Environmental impact and history, Types of Electric vehicles	12
II	Electric vehicle, Electrical Propulsion System	12
III	Energy Storages, Charging System, Effects and Impacts	11
IV	Electric Mobility Policy Frame Work	11
V	Tamilnadu E-Vehicle Policy 2019	11
Test and Model Exam		7
Total		**64**

RATIONALE:

The world is transitioning to cleaner mobility options with the aim at improving air quality and reducing dependency on fossil fuels. Electric Vehicles (EVs) have emerged a popular clean mobility choice to reduce emissions. EVs are powered fully or partially by batteries, they can help to reduce dependence on fossil fuels also air quality. Tamil Nadu is one of the most advanced states in India. Tamil Nadu has a highly developed industrial eco-system and is very strong in sectors like automobiles and auto-components. Many globally renowned companies have setup their manufacturing facilities in Tamil Nadu. Due the rapid depletion of fossil fuel and increase in fuel cost, environmental pollution, the shift to clean transport is necessary. This subject introduced by keeping all the above factors.

OBJECTIVES:

- To learn the environmental impact and history of Electric Vehicles.
- To understand the concept of Electric Vehicle and its types.
- To study the configurations of Electric Vehicles
- To acquire knowledge about Energy Storages, Charging System, Effects and Impacts
- To appreciate the Electric Mobility Policy Frame work India and EV Policy Tamil Nadu 2019.

4020620 E Vehicle Technology & Policy

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Environmental impact and history:** Environmental impact of conventional vehicle **-** Air pollution – Petroleum resources – History of Electric vehicles & Hybrid Electric Vehicles - Conventional drive train system – Rear Wheel, Front Wheel and All wheel - Parts of Drive train system	6
	Types of Electric Vehicles: Introduction to Battery Electric Vehicle (BEV) – Definition BEV – Necessity BEV – Different between BEV and Conventional Vehicle -	6

	Advantages of BEV - Block diagram of BEV – Hybrid electric Vehicle (HEV) - Plug-in Hybrid Electric Vehicle (PHEV) – Fuel Cell Electric Vehicle (FCEV) – Description.	
II	**Electric Vehicles:** Configurations of Electric Vehicle – Performance of Electric Vehicles – Tractive Effort in Normal Driving – energy consumption. Hybrid Electric Vehicles: Concept of Hybrid electric drive trains – Architecture of Hybrid Electric Drive trains – Series, Parallel and Series & Parallel **Electric Propulsion Systems:** Types of EV motors - DC motor drives– Permanent Magnetic Brush Less DC Motor Drives (BLDC) – Principles, Construction and Working – Hub motor Drive system – Merits and Demerits of DC motor drive, BLDC motor drive	6 6
III	**Energy Storages:** Electrochemical Batteries – Battery Technologies – Construction and working of Lead Acid Batteries, Nickel Based Batteries and Lithium Based Batteries - Role of Battery Management System (BMS)– Battery pack development Technology– Cell Series and Parallel connection to develop battery pack. **Charging:** Battery Charging techniques - Constant current and Constant voltage, Trickle charging – Battery Swapping Techniques – DC charging – Wireless charging **–** Maintenance of Battery pack – Latest development in battery chemistry. **Effects and Impacts:** Effects of EV – Impacts on Power grid – Impacts on Environment – Impacts on Economy.	5 4 1
IV	**Electric Mobility Policy Frame Work** Government of India Electric Mobility Policy Frame work – Global Scenario of EV adoption – Electric mobility in India – National Electric Mobility Mission Plan 2020 – Action led by Original Equipment Manufacturers – Need of EV Policy – Advantage of EV Eco system –	11

	Scope and Applicability of EV Policy – ARAI Standards for Electric Vehicle – AIS 038, AIS 039 &AIS 123 - Key Performance Indicator - Global impact – Trends and Future Developments	
V	**Tamil Nadu E-Vehicle Policy 2019** Tamil Nadu E-vehicle Policy 2019: Vehicle Population in Tamil Nadu – Objectives of EV Policy – Policy Measures – Demand side incentives – Supply side incentives to promote EV manufacturing – Revision of Transport Regulation of EV – City building codes – Capacity Building and Skilling – Charging structure – implementing agencies – Reasearch &Development and Business Incubation – Recycling Ecosystem – Battery and EVs	11

Reference Books

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York.
2. Comparison of Electric and Conventional Vehicles in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Vehicle (IJSR), Akshat Bansal, Akriti Agarwal
3. A Comprehensive Study of Key Electric Vehicle (EV) Components, Technologies, Challenges, Impacts, and Future Direction of Development (MDPI), Fuad Un-Noor, Sanjeevikumar Padmanaban, Lucian Mihet-Popa, Mohammad Nurunnabi Mollah and Eklas Hossain.
4. Electric Vehicles: A future Projection CII October 2020 report.
5. Design and analysis of aluminum/air battery system for electric vehicles, Shaohua Yang, Harold Knickle, Elsevier.
6. Propelling Electric Vehicles in India, Technical study of Electric Vehicles and Charging Infrastructure
7. ZERO EMISSION VEHICLES (ZEVs): TOWARDS A POLICY FRAMEWORK – NTI Aayog.
8. FASTER ADOPTION OF ELECTRIC VEHICLES IN INDIA: PERSPECTIVE OF CONSUMERS AND INDUSTRY, The Energy and Resources Institute, New Delhi.
9. India EV Story: Emerging Opportunities by Innovation Norway.
10. Automotive Industry Standards – AIS 038, AIS 039 & AIS 123 – Manual

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020631

Semester : VI

Subject Title : Industrial Robotics and 3D Printing

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020631 Industrial Robotics and 3D Printing	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Fundamentals of Robot Technology	12
II	Drive Systems, End Effecters, Sensors and Machine Vision System	12
III	Robot Programming, Robot Applications in Maufacturing	12
IV	Introduction and Design for Additive Manufacturing	18
V	Additive Manufacturing Processes	19
Test and Model Exam		07
Total		**80**

RATIONALE:

Rapid industrialization and globalization needs industries to be more competitive and deliver cost effective quality products. This needs industries to implement flexible manufacturing systems where Robotic technology plays major role. Hence study of robotic technology is very essential.

3D printing is often utilized when manufacturers need to create a product accurately, quickly and at a low quantity. This has lead to 3D printers being brought in to prototype industrial robots, helping to aid the development of better, more efficient robots in the industrial sector.

OBJECTIVES:

- Understand fundamentals of robotics
- Acquire knowledge structure and elements of robot
- Gain knowledge on controller and various drives used in robotics
- Develop knowledge on role of sensors and vision system
- Acquire skill to program and control robot
- Understand to adopt robot to various industrial applications.
- To acquire the knowledge on 3D Printing and design principles for additive manufacturing
- To understand the principles of latest manufacturing processes in Additive manufacturing

4020631 Industrial Robotics and 3D Printing
DETAILED SYLLABUS

Contents: Theory

Unit	Name Of The Topic	Hours
I	**Fundamentals of Robot Technology** Introduction – History of robot– Definitions– Basic configuration of Robotics – Robot Components – Manipulator, End effecter, Driving system, Controller and Sensors – Degrees of freedom – Links and joints – Types of joints – Joint notation scheme – Pitch, Yaw, Roll – Classification of robots – Work envelope and Work Volume – Effect of structure on Control ,Work envelop and Work volume- Introduction to PUMA robot- Robot controller –	12

	Configuration - Four types of controls – Open loop and closed loop controls – Speed of response and stability – Precision of movements: Spatial resolutions, accuracy and repeatability.	
II	**Drive Systems, End Effecters, Sensors and Machine Vision System** Pneumatic drives – Hydraulic drives – Mechanical drives – Electrical drives – Stepper motors, DC Servo motors and AC Servo motors– Applications and Comparisons of Drives. End effecters – Grippers – Mechanical Grippers, Magnetic Grippers, Vacuum Grippers- Selection and design considerations in robot gripper- Requirements of Sensors – Position sensors: LVDT, Resolvers, Optical encoders- Proximity sensors: Inductive, Capacitive, Ultrasonic and Optical proximity sensors- Touch Sensors – Range Sensors- Machine Vision System: Sensing & Digitizing Image Data – Image Processing and Analysis - Application	12
III	**Robot Programming, Robot Applications In Manufacturing** Forward kinematics, Inverse kinematics and differences – Forward kinematics and Reverse kinematics of manipulators with Two and Three degrees of freedom – Derivations. Robot programming –Lead through programming, Textual programming – Teach Pendant for Robot system– Robot programming languages – Motion commands, Sensor commands, End effecter commands. Robot applications – Material handling-Spot welding – Arc welding – Spray painting – Assembling – Finishing-AGV-RGV.	12
IV	**Introduction and Design for Additive Manufacturing** **Introduction to Additive Manufacturing** Additive Manufacturing – 3D Printing – Rapid prototyping – Overview – Need – Additive manufacturing Vs CNC Machining - Development of Additive Manufacturing Technology – Principle of AM Process – Generalised Additive Manufacturing Process Chain - Classification - Benefits – Direct and Indirect process, Prototyping, Manufacturing and Tooling	9

	Design for Additive Manufacturing Design tools: Data processing - CAD model preparation – STL file - Part orientation and support structure generation - Model slicing - Tool path generation. Design for Additive Manufacturing: Concepts and objectives - AM unique capabilities - DFAM for part quality improvement – strategies – Design Rules – Quality aspects – Software for AM – MIMICS, etc.	9
V	**Additive Manufacturing Processes** **Photo polymerization and Powder Bed Fusion Processes** Photo polymerization: SLA - Photo curable materials - Process - reaction rates – scan patterns - Advantages and Applications. Powder Bed Fusion: SLS - Process description - powder fusion mechanism – material feed system - Process Parameters - Materials and Applications. Electron Beam Melting **Extrusion Based And Sheet Lamination Processes** Extrusion Based System: FDM – Introduction - Basic Principle – plotting and path control - Materials - Applications and Limitations - Bio-extrusion. Sheet Lamination Process: LOM – Materials - Gluing or Adhesive bonding - Thermal bonding – Ultrasonic AM. **Printing Processes And Beam Deposition Processes** Droplet formation technologies - Continuous mode - Drop on Demand mode - Three Dimensional Printing – Advantages – Bio-plotter - Beam Deposition Process: LENS- Process description - Material delivery - Process parameters – Materials – Benefits.Applications of AM technologies in Automotive, Manufacturing, Architectural, Healthcare, and Consumer products.	7 5 7

Reference Books:

1. Industrial Robotics – Technology, Programming and Applications, P.Groover, MCGraw Hill, 2001
2. Chua C.K., Leong K.F., and Lim C.S., **"**Rapid prototyping: Principles and applications**"**, Third edition, World Scientific Publishers, 2010.

3. Ian Gibson, David W. Rosen, Brent Stucker **"**Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing**"** Springer, 2010.
4. Robotics Control, Sensing, Vision and Intelligence, Fu.K.S.Gonzalz.R.C., and Lee C.S.G, McGraw-Hill Book Co., 1987
5. Robotics for Engineers, Yoram Koren, McGraw-Hill Book Co., 1992
6. Robotics and Image Processing, Janakiraman.P.A, Tata McGraw-Hill, 1995
7. Andreas Gebhardt **"**Understanding Additive Manufacturing: Rapid Prototyping, Rapid Manufacturing**"** Hanser Gardner Publication 2011.
8. Kamrani A.K. and Nasr E.A., **"**Rapid Prototyping: Theory and practice**"**, Springer, 2006.
9. Liou L.W. and Liou F.W., **"**Rapid Prototyping and Engineering applications: A tool box for prototype development**"**, CRC Press, 2007.
10. Tom Page, **"**Design for Additive Manufacturing**"** LAP Lambert Academic Publishing, 2012.
11. Amit Bandyopadhyay, and Susmita Bose, "Additive Manufacturing", CRC Press.
12. John O Milewski., "Additive Manufacturing of Metals: From Fundamental Technology to Rocket Nozzles, Medical Implants, and Custom Jewellery", Springer Series in Materials Science
13. Sabrie Soloman. "Additive Manufacturing: Advanced Manufacturing Technology in 3d Print Deposit"
14. David Ian Wimpenny and Pulak M Pandey, "Advances in 3D Printing and Additive Manufacturing Technologies"
15. Andreas Gebhardt, Hanser, "Understanding Additive Manufacturing"

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020632

Semester : VI

Subject Title : Refrigeration and Air-Conditioning

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020632 Refrigeration and Air-Conditioning	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Refrigeration System And Refrigeration Equipments	15
II	Vapour Compression Refrigeration System And Vapour Absorption Refrigeration System	15
III	Refrigerant Flow Controls, Refrigerants And Lubricants, Applications Of Refrigeration	15
IV	Psychrometry And Comfort Air Conditioning	14
V	Air Conditioning Systems And Cooling Load Calculations	14
	Test and Model Exam	7
	TOTAL	80

RATIONALE:

Requirement of human comfort, maintenance of machines and preserving Perishables through air conditioning is very essential. Hence learning the study of refrigeration principles, refrigeration system, Concept of air-conditioning and methods of facilitates quality design of air conditioners are essential.

OBJECTIVES:

- Explain the working of open and closed air system of refrigeration.
- Describe the working and construction of compressors used for air-conditioning
- Explain the vapour compression refrigeration system.
- Explain the vapour absorption refrigeration system.
- Compare the properties and applications of various refrigerants.
- Define the parameters used for air conditioning.
- To Use the psychometric chart.
- Estimate the cooling load for the given requirement.
- Explain the industrial application of refrigeration.

4020632 REFRIGERATION AND AIR-CONDITIONING
DETAILLED SYLLABUS

Unit	Name Of The Topic	Hours
I	REFRIGERATION SYSTEM Thermodynamic state of a pure substances - modes of heat transfer – laws of heat transfer – mechanisms of production of cold – unit of refrigeration – types of refrigeration – reversed Carnot cycle-C.O.P of heat engine–heat pump– refrigerating machine – principle of working of open and closed air system of refrigeration – Advantages and disadvantages – problems. REFRIGERATION EQUIPMENTS Compressor – principle of working and constructional details of reciprocating and rotary compressors, hermetically and semihermetically sealed compressors – condensers – principle of working and constructional details of air cooled and water cooled	15

	Condensers, evaporative condensers - advantages and disadvantages - natural and forced draught cooling towers. Evaporators – natural circulation and forced circulation type - principle of working constructional details.	
II	VAPOUR COMPRESSION REFRIGERATION SYSTEM Principle of working of vapour compression system – analysis of vapour compression cycle using T-s diagram and p-H diagram- refrigerating effect - compression work – C.O.P – effect ofsuperheating and under cooling – problems – effect of evaporative pressure – condenser pressure – liquid – vapour refrigeration heatexchangers – advantages and disadvantages of superheating and Under cooling – use of flash chamber and accumulator. VAPOUR ABSORPTION REFRIGERATION SYSTEM Simple absorption system – Electrolux system – Solar absorption system - absorption system comparison with Mechanical (Compression) refrigeration system.	15
III	REFRIGERANT FLOW CONTROLS, REFRIGERANTS AND LUBRICANTS AND APPLICATION OF REFRIGERATION Capillary tube - automatic expansion valve – thermostatic expansion valve - solenoid valve - evaporator pressure regulator – suction pressure regulator - selection of a refrigerant - properties and Applications of following refrigerants SO2, CH4, F11, F12, F22, and NH3 – lubricants used in refrigeration and their applications, Cryogenics. APPLICATIONS OF REFRIGERATION Slow freezing – quick freezing – cold storage – frozen storage freeze drying – dairy refrigeration – ice cream cabinets – ice making – Water cooler, milk cooler, bottle cooler – frost free refrigeration.	15
IV	PSYCHROMETRY AND COMFORT AIR CONDITIONING Definitions of dry air, moist air, water vapour, Avogadro's law, Dalton's law of partial pressure – dry and wet bulb temperature -	14

	dew point – humidity – specific and absolute – relative humidity - degree of saturation – enthalpy of moist air - adiabatic saturation of air by evaporation of water – psychometric chart and its uses – psychometric processes – sensible heating and cooling – humidifying and heating – dehumidifying and cooling – adiabatic cooling with humidification – total heating or cooling processes – sensible heat factor – by pass factor with simple problems – Governing optimum effective temperature – comfort chart - design consideration.	
V	AIR CONDITIONING SYSTEMS Equipment for air conditioning and insulation factors – airpurification – temperature control – humidity control – dry and wet filters - centrifugal dust collector – air washer humidifier – dehumidifier – fans and blowers – grills and registers – summerand winter air conditioning, window type air conditioner – split type air conditioner system – properties of ideal insulator, types of insulating materials – air distribution and duct systems – tools and Installation, servicing and maintenance of R & AC systems. COOLING LOAD CALCULATIONS Different heat sources – conduction heat load – radiationLoad of sun – occupants load – equipment load – infiltration air load– miscellaneous heat sources – fresh air load – simple problems.	14

Reference books:

1. Refrigeration and air conditioning, P.L. Ballaney, Khanna Publishers, 2B,North Market, Naisarak, New Delhi 110 006.
2. Refrigeration and air conditioning, V.K. Jain,
3. Industrial Refrigeration Hand Book, Wilbert F. Steocker
4. A course in refrigeration and air conditioning, Domkundwar,
5. Principles of refrigeration, Dossat ,
6. Home refrigeration and air conditioning, Audels, Theo.Audel & Co. publisher,199 Edn.49, West 23rd Street, New York. – 1998
7. Refrigeration and air conditioning, C.P Arora,
8. Cryogenic systems Randell Fd Barron.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020633

Semester : VI

Subject Title : Automobile Technology

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020633 Automobile Technology	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Automobile Engines	14
II	Fuel Feed Systems and Alternativefuels	14
III	Transmission and Power Trains	15
IV	Automobile Chassis	15
V	Electrical Equipment & Hybrid Electric Vehicles	15
Test and Model Exam		07
Total		**80**

RATIONALE:

Automobile is one of the key areas of development in India facilitated by Multinational Companies. As Automobile is the Major sources of employing man power a thorough knowledge on Automobile Engine construction and its functioning is required with due consideration on pollution control.

OBJECTIVES:

- Explain about the constructional details of an Automobile engine including cooling and lubrication system.
- Describe fuel feed systems for petrol and diesel engines with all devicesinvolved in it.
- Explain the construction and functional features of the power transmission systems and various parts involved in it.
- Explain the functions of different types of steering, suspension and brake systems.
- Describe the different types of chassis and their functions.
- Familiarize electrical and electronic equipments used in automobile.
- To understand the emerging trends of electric vehicles, hybrid electric vehicles and solar vehicles.
- To know the automobile emissions and its effects on environment.

4020633 AUTOMOBILE TECHNOLOGY
DETAILED SYLLABUS

Contents: Theory

Unit	Name Of The Topic	Hours
I	**Automobile Engines** Basic Engine Components – Functions , types , materials and construction of –Cylinder block – Crankcase – oil pan - Cylinder head – Gaskets – cylinder liners– Comparison of liners – Piston – piston rings – types of compression rings and oil control rings – piston pin – Connecting rod - methods of connecting piston and Connecting rod – Crankshaft – flywheel – Cam shaft – Valve and Valve mechanism – L-I-F-T.Cooling systems – purpose – types –	14

	air and water cooling systems – merits and demerits –pump assisted water cooling systems –components – water pump, fan - thermostat – types - radiator –types –pressure cap - troubles in cooling system. Lubrication systems – purpose – types of lubricants – additives – Service rating of oil – types of lubricating systems - Full pressure system – techniques of cylinder and piston lubrication – oil filters – full flow and bypass filter systems - Troubles in lubrication system.	
II	**Fuel Feed Systems And Alternative fuels** Requirements of good fuel-Types of fuel feed systems- S.U. Electrical fuel pump – fuel filter – Air cleaners – types- petrol injection –merits and demerits – DTSI – VTI – CCVTI – PGMFI – MPFI system. Layout of diesel and petrol fuel feed system – single acting fuel feed pump – fuel injection pumps – Construction and working of distributor type pump – CRDI system - fuel injectors – types – Single & Multi hole – pintle and pintaux - fuel filters – primary and secondary filters. Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits - Engine Modifications	12 3
III	**Transmission And Power Trains** General arrangement of power transmission system – Arrangement of front engine rear drive – rear engine rear drive – front engine front drive - four wheel drive – applications – clutch – function – Components – Types - Single plate ,multi plate and diaphragm spring clutch – fluid coupling – Clutch troubles and their causes. Gear box – purpose – various resistance to motion – types of gear boxes –constant mesh and synchromesh-gear box troubles and their causes. Drive line – propeller shaft – Universal joint – Cross type only – slip joint – final drive – function – types of gear arrangement – straight & spiral Bevel , Hypoid ,Worm and Worm Wheel – merits , demerits	5 3 7

	and application – Hotch kiss drive –Torque tube drive – radius rod. Differential – purpose – Construction and operation – Self locking and non slip differential – Differential troubles and their Causes – Semi floating, three quarter floating and full floating rear axles.	
IV	**Automobile Chassis** Front axle – Types – Stub axle – Types – Steering system – Ackermann Principle of Steering – Wheel alignment – Factors – Camber , Caster , King pin inclination , Toe in and Toe out on turns - Steering linkages – Steering gears –Cam and double roller ,recirculating ball type , Rack and Pinion – Steering troubles and causes – power steering – Necessity – types – Layout of any one type – Collapsible Steering system. Suspension system – Functions – Type of springs – Leaf , coil and Torsion bar– Front suspension systems – independent front suspension –merits and demerits – types – rear end suspension – Air suspension - shock absorber –purpose – telescopic type – construction and working. Brake system – functions – classification of brakes – drum brakes – leading shoe and trailing shoe – Self energizing action – hydraulic brake – brake bleeding - Air assisted hydraulic brakes – Air brake – layout , functions of each component and application only – disc brakes – construction and working – comparison of disc and drum type – brake troubles and their causes – anti lock Brake system. Wheels – types of wheels – brief description and applications – tyres – function– construction of tyres – cross and radial ply tyres – comparison.	7 3 3 2

V	**Electrical Equipment & Hybrid Electric Vehicles** Battery – lead acid battery – Nickel alkaline battery – construction – battery rating – charging - testing – starting circuit - construction and operation of starter motor – starting motor drives – over running clutch and Bendix drive – construction and operation – solenoid switch - Charging circuit – alternator construction and operation – regulators – Dynamo. Ignition system – Types – High tension magneto – electronic ignition – Ignition system troubles and remedies. Lighting system – circuit – Head light – Aiming and adjustment – sealed beam head lights – directional signal circuits – fluorescent lamp - Horn circuits – Wind screen wiper. Introduction: Concept and environmental importance of EVs, HEVs and solar vehicles. Electric vehicles: Layout, construction and working. Hybrid electric vehicles: Types, layout, hybridization factor, plug in hybrid electric vehicles, fuel efficiency analysis. Challenges and future scope of EVs and HEVs. EMISSION STANDARDS: Euro I, II, III and IV norms, Bharat Stage II, III, IV norms. Motor Vehicle Act.	6 5 4

Reference Books:

1. Automobile Engineering, G.B.S.Narang, Khanna Publishers, NewDelhi.
2. AutomotiveMechanics,William H.crouse and Donald .L. Anglin, Tata McGraw– Hill Publishing CompanyLtd, NewDelhi.
3. The Automobile, Harbans Singh Reyat, S.Chand &Co Ltd, NewDelhi
4. Vehicle and Engine technology. Vol. I,HeinzHeisler, , ELBS
5. Automotive Mechanics,Joseph Heitner, East–west Press (P) Ltd, NewDelhi
6. Internal Combustion engines, M.L.Mathur &R.P.Sharma, Dhanpat Rai & Sons,
7. Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York
8. Electric & hybrid Vehicle, A.K.babu, Khanna Publications, New delhi.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020640

Semester : VI

Subject Title : Solid Modelling Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020640 Solid Modelling Practical	6	96	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

RATIONALE:

A Mechanical Engineering Diploma Engineer is expected to possess a thorough understanding of drawing, which includes clear visualization and proficiency in reading and interpreting a wide variety of production drawing. The market driven economy demands frequent changes in product design to suit the customer requirements. The introduction of this subject is to provide hands on experience in sketching and modeling of the industrial components using any one of the Computer Aided Design and Modelling packages. The aim of this subject is to help the student to attain the industry identified competency through practice in CAD software.

OBJECTIVES:

- Prepare 2D Drawing using sketcher or part modelling of any parametric CAD software.
- Generate 3D Solid models from 2D sketch or part modelling of any parametric CAD software.
- Prepare assembly of part models using assembly of any parametric CAD software.
- Generate orthographic views of 3D solid models/assemblies using drafting of any parametric software.
- Plot a drawing for given part model/assembly.

DETAILED SYLLABUS

Contents: Practical

Introduction

Parametric CAD software – sketch – elements – entities: line – circle – arc – ellipse – polygon – text – dimensions – sketch tools – fillet – chamfer – offset – trim – extend – mirror – rotate – block. Partmodelling– reference planes – reference point – reference axes – co-ordinate system – extrude – revolve – swept – helix and spiral – lofts – dome – shell – draft – rib – wrap – intersect – holes – patterns. Assembly – approaches – mate – coincident – sub assembly –rebuild – isolate. Drawing views – Save – Plot – model view – exploded view – projected view – section view – import – export – Appearance – rendering.

Exercises

PART A: Draw the given 3D drawing using 3D modelling commands.

1. Model 1
2. Model 2
3. Model 3
4. Model 4
5. Model 5
6. Model 6

PART B: Draw the part models and assemble the components using 3D modelling.

1. Revolving Centre

2. Tail stock
3. Machine Vice
4. Crane hook
5. Petrol Engine Connecting Rod
6. Pipe Vice

Board Examination

Note: All the exercises should be completed All the exercises should be given for examination, the students are permitted to select by lot or the question paper from DOTE should be followed. Record note book should be submitted during examination.

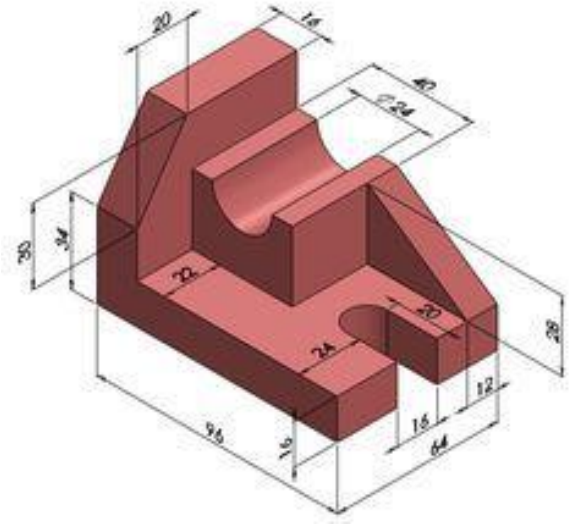
Two exercises will be given for examination by selecting one exercise in each PART. The printout of exercises of the student work should be submitted with answer paper and the same have to be evaluated as per the allocation.

DETAILLED ALLOCATION OF MARKS

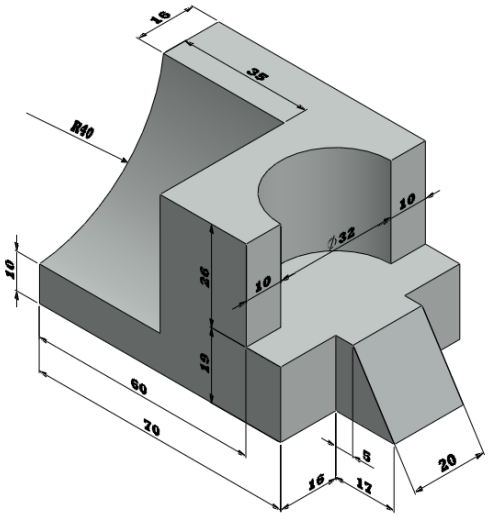
Sl. No.	Performance Indicator	Marks
Part A – 3D Component Modelling		
1	Sketching	15
2	3D Modelling	15
Part B – Assemble Drawing Modelling		
3	Sketching / Part modelling	20
4	Assembly	30
5	Solid Model / Views	10
6	Viva voce	10
Total		100

Exercises

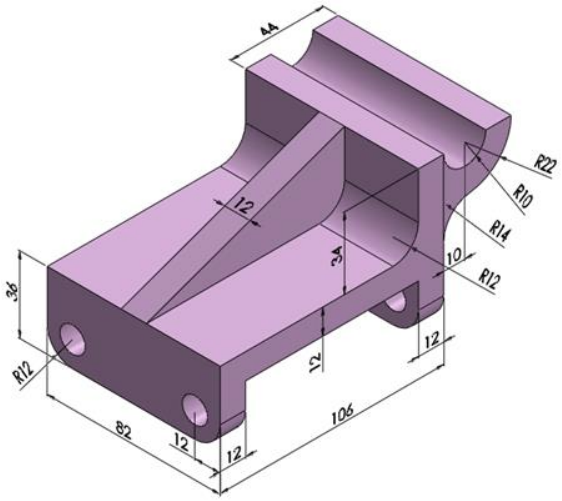
PART A: Draw the given 3D drawing using 3D modelling commands.



Model 1



Model 2



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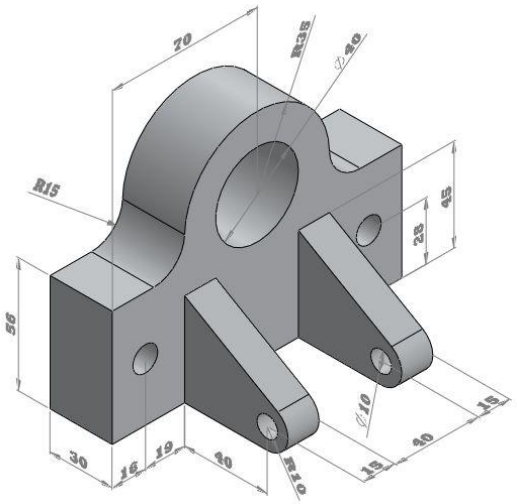

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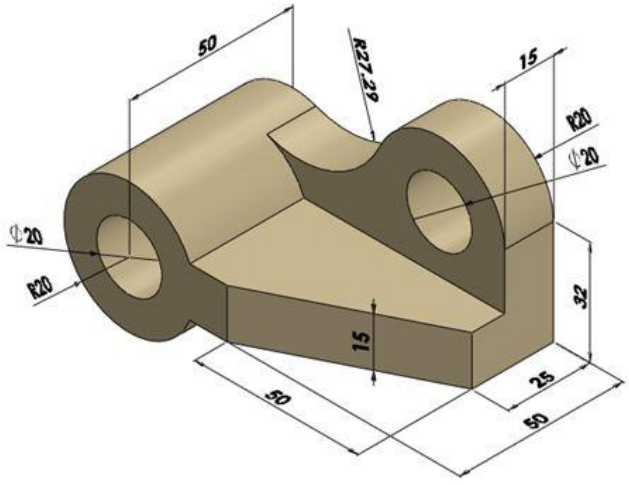

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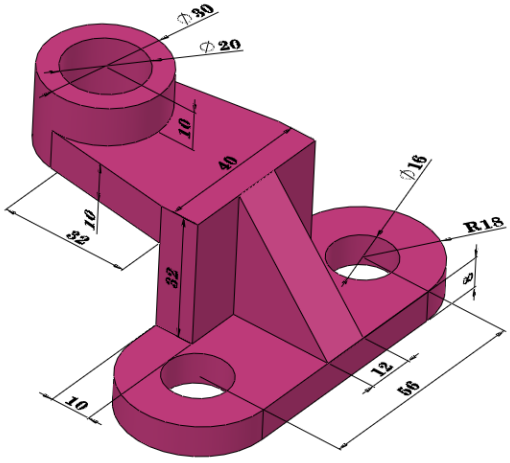

Model 6

LIST OF EQUIPMENTS

- Personal computer : 30 Nos.
- Laser Printer : 1 No.
- Software : GUI System Software
  : Modelling package – Sufficient to the strength.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020651

Semester : VI

Subject Title : Industrial Robotics and 3D Printing Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020651 Industrial Robotics and 3D Printing Practical	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Objectives

- Study of Robot / Study of robot simulation software
- To study the components required.
- To study the techniques of programming for various industrial manufacturing applications.
- Prepare a record of work done.
- Acquire knowledge in the field of Additive Manufacturing
- Explain the various concepts of Solid Modelling
- Create STL files to manufacture components using 3D Printer

4020651 INDUSTRIAL ROBOTICS AND 3D PRINTING PRACTICAL
DETAILED SYLLABUS

Contents:

3D Printing : Getting to know the User Interface of the Modelling software – Home Screen – Navigating the main Screen – Options Bar – Application Menu & Quick Access Toolbar – Describe the function of a sketch - Describe the various types of sketches. Create sketches of 3D models. Basic Modelling Considerations – Describe part creation within the design process. Add placed features to existing parts. Create complex shapes by sweeping or lofting profiles. Assemblies - Managing the assemblies - Assemble a mechanical piece of equipment using constraints. STL files – introduction – conversion of parts from other file formats to STL file – Additive Manufacturing – types of 3D Printers – orientation and positioning of parts - producing 3D working models using 3D Printers.

Exercises

PART A - Robot Programming

1. Position recording using Cartesian co-ordinate system - (No. of positions - 9)
2. Position recording using Polar co-ordinate system - (No. of positions - 9)
3. Pick and place the objects - No. of objects - 6)
4. Pick and stack the objects - (No. of objects - 6)
5. Spray painting practice - (Area - 300mm x 300mm)
6. Spot welding practice - (No. of spots - 9)
7. Arc welding practice – (Length of weld 50 mm)
8. Assembling practice - (Minimum 3 Components)
9. Profile cutting practice - (Complicated profile – combination of lines and arcs)

PART B - 3D Printing

1. Create the model and produce the Gear Train in 3D printing.
2. Create the model and produce the Geneva Gear & Ratchet mechanism.

3. Create the model and produce the Slide-crank mechanism.

Note: Every student is asked to design and produce only one component of an assembly. After the completion of the product, individual parts are checked for its precision and matting in the assembly. Hence group exercises can be given. The models can be scaled according to the print area of the 3D Printer.

Board Examination

Note: All the exercises should be completed All the exercises should be given for examination, the students are permitted to select by lot or the question paper from DOTE should be followed. Record note book should be submitted during examination.

Two exercises will be given for examination by selecting one exercise in each PART.

DETAILLED ALLOCATION OF MARKS

Sl. No.	Performance Indicator	Marks
Part A – Robot Programming		
1	Robot Program	20
2	Simulate / Execution	30
3	Result	10
Part B – 3D Prinitng		
4	CAD - Modelling	15
5	3D Printing	15
6	Viva voce	10
Total		100

LIST OF EQUIPMENTS (For 30 students)

Personal computer	:	10 Nos.
6 Axis Robot	:	1 No.
3D Printer	:	1 No.
Software	:	GUI System Software
	:	Modelling package / 3D Printer
		Sufficient to the strength.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020652

Semester : VI

Subject Title : Refrigeration and Air-Conditioning Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020652 Refrigeration and Air-Conditioning Practical	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Identify the various tools used in R & AC
- Demonstrate the construction and working of window air conditioner
- Demonstrate the construction and working of split type air conditioner
- Set parameters for comfortable operation of an air conditioner.
- Determine the C.O.P of air conditioner.
- Determine the capacity of window air conditioner.
- Describe the wiring of refrigerator and coolers.
- Perform servicing on air conditioner.

Experiments:

PART A

1. Determine the refrigerating effect, C.O.P and the compressor capacity of a open type system with any one expansion device. (Thermostatic expansion valve / Capillary tube / Automatic Expansion Valve)
2. Determine the C.O.P of sealed system by using electrical measurements.
3. Determine the capacity of a window air conditioner.
4. Determine the efficiency of a cooling tower.
5. Conduct Leak tests in a split air conditioning system, detect the failures and suggest the remedies. Conduct the Refrigerant Charge Test.
6. Conduct the flush test to remove the contaminants of refrigeration system and recharge.

PART- B

1. Study the various sizes of copper and steel tubing. To study the various tools used for operations.
2. Study and carry out the various operations on copper and steel tubing– Flaring, Swaging and Soldering methods used in R& A.C.
3. Study the methods to set and adjust the following a) Thermostats, b) Low pressure and high pressure cut-outs c) Thermostatic expansion valve d) Automatic Expansion Valve.
4. Conduct the service to change refrigerant into service cylinder from storage cylinder.
5. Conduct the service to pump down the system and to purge air from the system.
6. Conduct the service to check the oil level in the compressor and trace the common faults in R & A.C units and their remedies.

BOARD EXAMINATION

Note:

1. All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.
2. All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
3. All regular students appearing for first attempt should submit record notebook for the examination.
4. The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
5. The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Detailled Allocation of Marks

PART A		
Procedure	-	10
Formulae / Observation	-	20
Calculation / Result	-	20
PART B		
Description / Procedure	-	15
Tool handling	-	15
Conclusion / Report	-	10
Viva voce	-	10
TOTAL	-	100

LIST OF EQUIPMENTS (For 30 students)

WORKING MODELS OF THE FOLLOWING WITH ARRANGEMENTS FOR CONDUCTING TESTS

1. Refrigerator with test rig
2. Water cooler
3. Window A/C with test rig
4. Split A/C
5. Cooling tower

WORKING MODEL OF THE FOLLOWING TO CONDUCT EXPERIMENTS

1. Thermostat units
2. Cut off units
3. Thermostatic expansion valve unit
4. Automatic expansion valve unit
5. Sealed compressor with experimental setup

TOOLS:

1. Mechanics tool set
2. Tube cutter
3. Tube bender type
4. Tube bender spring
5. Swaging tool
6. Flaring block
7. Flaring nut
8. Pinching tool
9. Capillary tube testing gauge
10. Blow Lamp

SERVICE TOOLS:

1. Gas cylinder with receiver valve and key
2. Charging System
3. Blow lamp
4. Stem key
5. Spring remover
6. Service valve
7. ‘t’ connector
8. High pressure gauge
9. Compound gauge
10. Leak detector
11. Soldering and Brazing kit.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020653

Semester : VI

Subject Title : Automobile Technology Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020653 Automobile Technology Practical	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Identify the various tools and their applications used in Automobile.
- Dismantle and assemble parts of petrol engine.
- Dismantle and assemble parts of diesel engine.
- Service AC fuel pump, oil pump and water pump.
- Dismantle and assemble fuel injection pump..
- Dismantle and assemble steering gear box.
- Testing and charging of batteries.
- Overhauling of starter motor, alternator.
- Troubleshoot the electrical circuits in automobile.

Exercises

PART-A

1. Dismantling and assembling of four stroke petrol engine and identification of parts.
2. Removing camshaft, replacing timing gears, removing valves, lapping and adjusting valve clearance.
3. Removing, servicing and replacing of fuel pump, oil pump & water pump.
4. Removing, servicing & replacing MPFI system.
5. Dismantling and assembling of inline fuel injection pump / CRDI system.
6. Test a battery with specific gravity test and charge the battery with constant amperage / voltage method.

PART-B

1. Removing and replacing of pressure plate and clutch plate, fingers adjustment
2. Dismantling, inspecting and assembling of constant mesh gear box and find out the gear ratios.
3. Dismantling, assembling and adjusting of steering gear box.
4. Dismantling, overhauling and assembling of starter motor / alternator
5. Trace the automobile electrical system with respect to battery coil ignition system
6. Trace the automobile electrical system with respect to (i) horn relay circuit, (ii) Wiper circuit & explain with neat circuit diagram.

BOARD EXAMINATION

Note:

1. All the exercises in both sections should be completed. Two expercises will be given for examination by selecting one from PART A and one from PART B.
2. All the exercises should be given in the question paper and students are allowed to select by a lot or question paper issued from the DOTE should be followed.
3. All regular students appearing for first attempt should submit record notebook for the examination.
4. The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
5. The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Detailled Allocation of Marks

PART A		
Dismantling Procedure	-	20
Tools handling methods	-	15
Assembly / Report	-	10
PART B		
Dismantling Procedure	-	20
Tools handling methods	-	15
Assembly / Report	-	10
Viva voce	-	10
TOTAL	-	100

LIST OF EQUIPMENTS (Sufficient for 30 students)

1. Automobile Mechanic’s tools-Complete Set
2. Internal circlip plier, bearing puller
3. Feeler gauge to check valve clearance, hammer and accessories
4. Compressor to supply high pressure air to clean oil and water filters.
5. 4 stroke petrol engine - with all accessories
6. 4 stroke Diesel engine - with all accessories
7. Engine cylinder with liner and cylinder bore dial gauge
8. Oil pump and water pump.
9. MPFI.
10. Inline Fuel Injection Pump
11. CRDI
12. Injectors.
13. Clutch set arrangement with tools
14. Complete gear box with tools
15. Complete steering arrangement
16. Battery and charging set up.
17. Measuring instruments
18. Consumables

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020660

Semester : VI

Subject Title : Project Work and Internship

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020660 Project Work and Internship	6	96	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

RATIONALE: This subject ‘Project Work and Internship” is the continuation of the previuos semester subjects. The students are to implement the detailed project plan, which they have prepared. This project are generally an integration of the various types of skills acquired during their course of study. Hence it is essential that students are given opportunity to develop and integrate the highly esssential industry oriented competencies and skills. This subject build up greater confidence to face in the world of work.

OBJECTIVES:

- Implement the theoreticaland practical knowledge gained through the curriculuminto an application suitable for a real practicalworking environment preferablyin an industrialenvironment.
- Implement the planned activity as a team.
- Take appropriate decisions on collected information.

- Carryout cooperativelearning through synchronousguided discussionswithin theclassinkey dates,asynchronousdocumentsharinganddiscussions,as well as to prepare collaborative edition ofthefinalproject report.

Project Work and Internship:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work and Internship:

Project Review I	…	**10 marks**
Project Review II	…	**10 marks**
Attendance	…	**05 marks** (Award of marks same as theory subject pattern)
Total	…	**25 marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work and Internship in Board Examinations:

Demonstration/Presentation	25 marks
Report	25 marks
Viva Voce	30 marks
Internship Report	20 marks
Total	**100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year “Project Work & Internship” for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work and Internship Board examination.

SANDWICH DIPLOMA COURSE - INDUSTRIAL TRAINING

4020480 Industrial Training I

4020720 Industrial Training II

1. Introduction

The main objective of the sandwich Diploma course is to mould a well-rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 Semesters of 3 ½ years duration, the subjects of 3years-Full Time Diploma Course being regrouped for academic convenience.

While in the 4th semester students under Industrial Training for 6 months (December through May). They also do course work in the institution for one day in a week, While in the 7th semester they undergo another spell of 6 months (June through November) Industrial training.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.

I SEM	II SEM	III SEM	IV SEM	V SEM	VI SEM	VII SEM

Institutional Training

Industrial Training

2. Attendance Certification

Every month students have to get their attendance certified by industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

3. Training Reports

The students have to prepare two types of reports:

- Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Internal Assessment marks.
- Comprehensive report at the end of each spell which will be used for Board Examination.

3.1 Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc.). The concern Industrial supervisor is to check periodically these progress reports.

3.2 Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant/product/process/construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc. should be incorporated with the consent of the Organisation.

a. Scheme of Evaluation

1.1 Internal Assessment Marks

First Review (during 3rd month)	: 10 marks
Second Review (during 5th month)	: 10 marks
Attendance *	: 05 marks
	(Awarded same as in Theory)
Total	: 25 marks

1.2 Board Examination

Presentation about Industrial Training	: 20 marks
Comprehensive Training Report	: 30 marks
Viva-voce	: 25 marks
Total	: 75 marks

*** For awarding marks to attendance, the Industrial Training attendance has to be considered.**

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 2020 Diploma in Mechanical Engineering (Sandwitch)

Subject Code : 4020710

Semester : VII

Subject Title : Project Work

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020710 Project Work	6	96	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

RATIONALE:

This subject ‘Project Work” is the continuation of the previuos semester subjects. The students are to implement the detailed project plan, which they have prepared. This project are generally an integration of the various types of skills acquired during their course of study. Hence it is essential that students are given opportunity to develop and integrate the highly esssential industry oriented competencies and skills. This subject build up greater confidence to face in the world of work.

OBJECTIVES:

- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment.
- Implement the planned activity as a team.
- Take appropriate decisions on collected information.

- Carryout cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions,as well as to prepare collaborative edition of the final project report.

Project Work:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work:

Project Review I	…	**10 marks**
Project Review II	…	**10 marks**
Attendance	…	**05 marks** (Award of marks same as theory subject pattern)
Total	…	**25 marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work and Internship in Board Examinations:

Demonstration/Presentation	40 marks
Project Report	30 marks
Viva Voce	30 marks
Total	**100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work Board examination.

DIPLOMA IN ENGINEERING AND TECHNOLOGY

(1030,2030,3030)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER PATTERN

N – SCHEME

IMPLEMENTED FROM 2020 - 2021

CURRICULAM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICALEDUCATION, CHENNAI – 600025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS (II / III YEAR)

Chairperson

N Scheme

(Implemented from Academic Year 2020-21 onwards)

Tmt. G. LAXMI PRIYA, I.A.S

Director, Directorate of Technical Education, Chennai 600 025.

Co-Ordinator

Tmt. J. Rama,

Principal, Government Polytechnic College,
R.K.Nagar, Chennai-81. Mobile number: 9444748513.

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(1030,2030,3030)</td></tr>
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DIPLOMA COURSES IN ENGINEERING / TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2020 - 2021)

N – SCHEME

R E G U L A T I O N S*

***Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology.*

1. Description of the Course:

a. Full Time (3 years)

The Course for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Sandwich Diploma in Engineering shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4thand/or during 7thsemester the students undergo industrial training for six months/ one year. Industrial training examination will be conducted after completion of every 6 months of industrial training.

c. Part Time (4 years)

The course for the Part Time Diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3-year full time diploma courses being regrouped for academic convenience.

**** Each Semester will have 16 weeks duration of study with 35 hrs. / Week for Regular Diploma Course and 18 hrs. / Week for Part-Time Diploma Course.***

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2020 — 2021 academic years onwards.

2. Condition for Admission:

Condition for admission to the Diploma courses shall be required to have passed inthe S.S.L.C Examination of the Board of Secondary Education, Tamil Nadu.

(OR)

The Anglo-Indian High School Examination with eligibility for Higher Secondary Course in Tamil Nadu.

(OR)

The Matriculation Examination of Tamil Nadu.

(OR)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamil Nadu.

Note: In addition, at the time of admission the candidate will have to satisfy certainminimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board with eligibility for university Courses of study or equivalent examination& should have studied the following subjects.

A pass in 2 Years ITI with appropriate Trade or Equivalent examination.

Sl. No	**Courses**	**H.SC Academic**	**H.SC Vocational**		**Industrial Training Institutes Courses**
		Subjects Studied	**Subjects Studied**		
			Related subjects	**Vocational subjects**	
1.	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Mathematics / Physics / Chemistry	Related Vocational Subjects Theory& Practical	2 years course to be passed with appropriate Trade

2.	Diploma Course in Modern Office Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles& Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing &Salesmanship, Insurance& Material Management, Office Secretary ship.	

- For the Diploma Courses related with Engineering/Technology, the related / equivalentsubjects prescribed along with Practicals may also be taken for arriving the eligibility.
- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.
- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Modern Office Practice Diploma courses the candidates studied the related subjects will be given first preference.
- *Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.*

4. Age Limit : No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, Tamil Nadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses is as givenbelow:

Diploma Course	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
Full Time (Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

This will come into effect from N Scheme onwards i.e., from the academic year 2020-2021.

7. Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time totime, both in theory and practical subjects.

The curriculum outline is given in Annexure– I.

8. Examinations:

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment. Board Examinations are conducted for 100 marks and reduced to 75.

The total marks for result are 75 + 25 = 100 Marks

9. Continuous Internal Assessment:

For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to be distributed asfollows:

i) Subject Attendance 5 Marks

(Award of marks for subject attendance to each subject Theory/Practical will be as perthe range given below)

80%	-	83%	1 Mark
84%	-	87%	2 Marks
88%	-	91%	3 Marks
92%	-	95%	4 Marks
96%	-	100%	5 Marks

ii) **Test Marks** **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks areto be conducted. Average of these two test marks will be taken and the marks to be reduced to: **05 Marks**

The Test – III is to be the Model Examination covering all the five unitsand the marks obtained will be reduced to: **05 Marks**

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hours
Test II	Unit – III & IV	End of 12th week	50	2 Hours
Test III	**Model Examination:** Covering all the5 Units. (Board Examinations-question paper-pattern).	End of 16th week	100	3 Hours

From the Academic Year 2020 – 2021 onwards.

Question Paper Pattern for the Test -I and Test–II is as follows. The tests should be conducted by proper schedule. Retest marks should not be considered for internal assessment.

Without Choice:

Part A Type questions:	6 Questions ×1 mark	06 marks
Part B Type questions:	7Questions ×2marks	14 marks
Part C Type questions:	2 Questions ×15 marks	30 marks
	Total	**50 marks**

iii) Assignment **5 Marks**

For each subject Three Assignments are to be given each for 20 marks and theaverage marks scored should be reduced for 5 marks.

iv) Seminar Presentation **5 Marks**

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second Year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2½ marks for the material submitted in writing and 2 ½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks.

All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of Board Exam results and produced to the flying squad and the inspection team at the time of inspection/verification.

A. <u>For Practical Subjects:</u>

The Internal Assessment mark for a total of 25 marks which are to be distributed as follows:

a) Attendance :**5Marks**

(Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/

Other Practical related Work : **10Marks**

c) Record writing : **10Marks**

TOTAL : **25Marks**

- ***** All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examinations.
- ***** The observation notebook / manual should be maintained for 10 marks. The observation notebook / manual with sketches, circuits, program, reading and calculation written by the students manually depends upon the practical subject during practical classes should be evaluated properly during the practical class hours with date.
- ***** The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 10 marks for each exercise as per the above allocation.
- ***** At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks (including Observation and Record writing) and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)

- ***** Only regular students, appearing first time must submit the duly signed bonafied record notebook/file during the Practical Board Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Logbook of the staff, who is handling the theory subject.

The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Logbook of the staff, who is handling the practical subject.

10. Communication Skill Practical, Computer Application Practical and Physical Education:

The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase theCommunication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physicaleducation is introduced to encourage students to remain healthy and fit by including physical activities and sports.

11. Project Work and Internship:

The students of all the Diploma Courses must do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. To encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e., institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work &Internship:

Project Review I	. . .	**10 marks**
Project Review II	. . .	**10 marks**
Attendance	. . .	**05 marks** (Award of marks same as theory subject pattern)
Total	. . .	**25 marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work &Internship in Board Examinations:

Demonstration/Presentation	25 marks
Report	25 marks
Viva Voce	30 marks
Internship Report	20 marks
Total	**100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centers / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format must be submitted by individual student during the Project Work &Internship Board examination.

12. Scheme of Examinations:

The Scheme of examinations for subjects is given in Annexure - II.

13. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than 40% in theory subjects and 50% in practical subjects out of the total prescribed maximum marks including both the Internal Assessment and the Board Examinations marks put together, subject to the condition that he/she secures at least

3. a minimum of 40 marks out of 100 marks in the Board Theory Examinations and a minimum of 50 marks out of 100 marks in the Board Practical Examinations.

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2023onwards (Joined first year in 2020 -2021) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects withinthe stipulated period of study 2 / 3/ 3½/ 4 years [Full time (lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3/ 3½/ 4 years [Full time (lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 2 / 3/ 3½/ 4 years [Full time (lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

Second Class:

All other successful candidates will be declared to have passed in **Second Class.**

The above classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2023 /April 2024 onwards (both joined First Year in 2020 -2021)

15. Duration of a period in the Class Timetable:

The duration of each period of instruction is1 hour and the total period of instruction hours excluding interval and lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

ANNEXURE – I

CURRICULUM OUTLINE

1030 DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING (FULL TIME)

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4040310	Electronic Devices and Circuits	5	-	-	5
4030320	Electrical Circuit Theory	6	-	-	6
4030330	Electrical Machines -1	5	-	-	5
4040340	Electronic Devices and Circuits Practical	-	-	4	4
4030350	Electrical Circuits and Machines Practical	-	-	4	4
4030360	Electrical Workshop Practical	-	-	4	4
4030370	Wiring & Winding Practical	-	-	4	4
		16	-	16	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

IV Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030410	Electrical Machines -II	5	-	-	5
4030420	Measurements, Instruments and Transducers	5	-	-	5
4040430	Analog and Digital Electronics	4	-	-	4
4020440	E-Vehicle Technology and Policy	4	-	-	4
4030450	Electrical Machines and Instrumentation Practical	-	-	5	5
4040460	Analog and Digital Electronics Practical	-	-	5	5
4030470	Electrical Circuits and Simulation Practical	-	-	4	4
		18	-	14	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030510	Generation Transmission and Switchgear	5	-	-	5
4040520	Micro Controller and its Applications	5	-	-	5
Elective I Theory					
4030511	Control of Electrical Machines	5	-	-	5
4030512	Programmable Logic Controllers	5	-	-	
4030513	Renewable Energy Sources	5	-	-	
Elective I Practical					
4030514	Control of Electrical Machines Practical	-	-	5	5
4030515	Programmable Logic Controller Practical	-	-	5	
4030516	Renewable Energy Sources Practical	-	-	5	
4030540	Computer Aided Electrical Drawing Practical	-	-	4	4
4040550	Microcontroller and its Applications Practical	-	-	4	4
4040570	Entrepreneurship and Startups	-	-	4	4
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

Common to all Departments

VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030610	Distribution and Utilization	6	-	-	6
4030630	Energy Conservation and Audit	4	-	-	4
Elective II Theory					
4030621	Power Electronics	5	-	-	5
4030622	Bio-Medical Instrumentation	5	-	-	
4030623	Computer Hardware and Networks	5	-	-	
4030640	Electrical Estimation and Costing Practical	-	-	5	5
Elective II Practical					
4030624	Power Electronics Practical	-	-	6	6
4030625	Bio-Medical Instrumentation Practical	-	-	6	
4030626	Computer Hardware and Networks Practical	-	-	6	
4020660	Project Work and Internship	-	-	6	6
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

ANNEXURE-II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

SCHEME OF EXAMINATION

1030 DIPLOMA IN ELETRICAL AND ELETRONICS ENGINEERING (FULL TIME)

THIRD SEMESTER

Subject Code	SUBJECT	EXAMINATION MARKS			Min. Marks for PASS	Exam Hours
		Internal Assessment Marks	Board Exam Marks	Total Marks		
4040310	Electronic Devices and Circuits	25	75	100	40	3
4030320	Electrical Circuit Theory	25	75	100	40	3
4030330	Electrical Machines - I	25	75	100	40	3
4040340	Electronic Devices and Circuits Practical	25	75	100	50	3
4030350	Electrical Circuits and Machines Practical	25	75	100	50	3
4030360	Electrical Workshop Practical	25	75	100	50	3
4030370	Wiring & Winding Practical	25	75	100	50	3

1030 DIPLOMA IN ELETRICAL AND ELETRONICS ENGINEERING (FULL TIME)

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4040310	Electronic Devices and Circuits	5	-	-	5
4030320	Electrical Circuit Theory	6	-	-	6
4030330	Electrical Machines -1	5	-	-	5
4040340	Electronic Devices and Circuits Practical	-	-	4	4
4030350	Electrical Circuits and Machines Practical	-	-	4	4
4030360	Electrical Workshop Practical	-	-	4	4
4030370	Wiring & Winding Practical	-	-	4	4
		16	-	16	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

IV Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030410	Electrical Machines -II	5	-	-	5
4030420	Measurements, Instruments and Transducers	5	-	-	5
4040430	Analog and Digital Electronics	4	-	-	4
4020440	E-Vehicle Technology and Policy	4	-	-	4
4030450	Electrical Machines and Instrumentation Practical	-	-	5	5
4040460	Analog and Digital Electronics Practical	-	-	5	5
4030470	Electrical Circuits and Simulation Practical	-	-	4	4
		18	-	14	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030510	Generation Transmission and Switchgear	5	-	-	5
4040520	Micro Controller and its Applications	5	-	-	5
Elective I Theory					
4030511	Control of Electrical Machines	5	-	-	5
4030512	Programmable Logic Controllers	5	-	-	
4030513	Renewable Energy Sources	5	-	-	
Elective I Practical					
4030514	Control of Electrical Machines Practical	-	-	5	5
4030515	Programmable Logic Controller Practical	-	-	5	
4030516	Renewable Energy Sources Practical	-	-	5	
4030540	Computer Aided Electrical Drawing Practical	-	-	4	4
4040550	Microcontroller Practical	-	-	4	4
4040570	Entrepreneurship and Startups	-	-	4	4
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

Common to all Departments

VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030610	Distribution and Utilization	6	-	-	6
4030630	Energy Conservation and Audit	4	-	-	4
Elective II Theory					
4030621	Power Electronics	5	-	-	5
4030622	Bio-Medical Instrumentation	5	-	-	
4030623	Computer Hardware and Networks	5	-	-	
4030640	Electrical Estimation and Costing Practical	-	-	5	5
Elective II Practical					
4030624	Power Electronics Practical	-	-	6	6
4030625	Bio-Medical Instrumentation Practical	-	-	6	
4030626	Computer Hardware and Networks Practical	-	-	6	
4020660	Project Work and Internship	-	-	6	6
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

DEPARTMENT OF ELETRICAL AND ELETRONICS ENGINEERING

LIST OF ELECTIVE SUBJECTS

Note: Select the Elective Theory and Related Practical subjects.

V Semester

Elective I Theory					
4030511	Control of Electrical Machines	5	-	-	5
4030512	Programmable Logic Controllers	5	-	-	
4030513	Renewable Energy Sources	5	-	-	
Elective I Practical					
4030514	Control of Electrical Machines Practical	-	-	5	5
4030515	Programmable Logic Controller Practical	-	-	5	
4030516	Renewable Energy Sources Practical	-	-	5	

VI Semester

Elective II Theory					
4030621	Power Electronics	5	-	-	5
4030622	Bio-Medical Instrumentation	5	-	-	
4030623	Computer Hardware and Networks	5	-	-	
Elective II Practical					
4030624	Power Electronics Practical	-	-	6	6
4030625	Bio-Medical Instrumentation Practical	-	-	6	
4030626	Computer Hardware and Networks Practical	-	-	6	

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

ANNEXURE – I

CURRICULUM OUTLINE

3030: DIPLOMA IN ELETRICAL AND ELETRONICS ENGINEERING (PART TIME)

THIRD SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4040310	Electronic Devices and Circuits	4	-	-	4
4030320	Electrical Circuit Theory	4	-	-	4
40015	Engineering Graphics - I	-	4	-	4
40001	Communication Skill Practical	-	-	3	3
4040340	Electronic Devices and Circuits Practical	-	-	3	3
TOTAL		**8**	**4**	**6**	**18**

FOURTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4030330	Electrical Machines -1	4	-	-	4
4030350	Electrical Circuits and Machines Practical	4	-	-	4
40025	Engineering Graphics - II	-	4	-	4
40002	Computer Application Practical	-	-	3	3
4030360	Electrical Workshop Practical	-	-	3	3
TOTAL		**8**	**4**	**6**	**18**

FIFTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4030410	Electrical Machines -II	4	-	-	4
4030420	Measurements, Instruments and Transducers	3	-	-	3
4030510	Generation Transmission and Switchgear	4	-	-	4
4030450	Electrical Machines and Instrumentation Practical	-	-	4	4
4030370	Wiring & Winding Practical	-	-	3	3
TOTAL		**11**	**-**	**7**	**18**

SIXTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4040430	Analog and Digital Electronics	4	-	-	4
4030610	Distribution and Utilization	4	-	-	4
4030630	Energy Conservation and Audit	4	-	-	4
4040460	Analog and Digital Electronics Practical	-	-	3	3
4030470	Electrical Circuits and Simulation Practical	-		3	3
TOTAL		**12**	**-**	**6**	**18**

SEVENTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4040520	Micro Controller and its Applications	4	-	-	4
Elective-I Theory					
4030511	Control of Electrical Machines	3			3
4030512	Programmable Logic Controllers				
4030513	Renewable Energy Sources				
4030540	Computer Aided Electrical Drawing Practical	-	-	3	3
4040550	Microcontroller Practical	-	-	3	3
Elective-I Practical					
4030514	Control of Electrical Machines Practical			3	3
4030515	Programmable Logic Controller Practical				
4030516	Renewable Energy Sources Practical				
4040570	Entrepreneurship & Startups	-	-	2	2
TOTAL		**7**	**-**	**11**	**18**

EIGHTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4020440	E-Vehicle Technology and Policy	4			4
Elective-II Theory		4			4
4030621	Power Electronics				
4030622	Bio-Medical Instrumentation				
4030623	Computer Hardware and Networks				
4030640	Electrical Estimation and Costing Practical			4	4
Elective-II Practical				3	3
4030624	Power Electronics Practical				
4030625	Bio-Medical Instrumentation Practical				
4030626	Computer Hardware and Networks Practical				
4020660	Project Work and Internship			3	3
TOTAL		**8**	**-**	**10**	**18**

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

ANNEXURE – I

CURRICULUM OUTLINE

2020 DIPLOMA IN MECHANICAL ENGINEERING (SANDWICH)

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4040310	Electronic Devices and Circuits	5	-	-	5
4030320	Electrical Circuit Theory	6	-	-	6
4030330	Electrical Machines -1	5	-	-	5
4040340	Electronic Devices and Circuits Practical	-	-	4	4
4030350	Electrical Circuits and Machines Practical	-	-	4	4
4030360	Electrical Workshop Practical	-	-	4	4
4030370	Wiring & Winding Practical	-	-	4	4
		16	-	16	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

IV Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030410	Electrical Machines -II	4	-	-	4
4030450	Electrical Machines and Instrumentation Practical	-	-	3	3
4020491	Industrial Training - I	-	-	-	NA
		4		3	7
Extra / Co-Curricular activities					
	Library	-	-	-	-
	TOTAL				7

V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030420	Measurements, Instruments and Transducers	4			4
4040430	Analog and Digital Electronics	4			4
4020440	E Vehicle Technology and Policy	4			4
4030510	Generation Transmission and Switchgear	4			4
	Elective Theory I	4			4
4030450	Electrical Machines and Instrumentation Practical			3	3
4040460	Analog and Digital Electronics Practical			3	3
4030470	Electrical Circuits and Simulation Practical			3	3
	Elective Practical I			3	3
		20		12	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education*		-	-	-	2*
TOTAL					**35**

- Physical Education hour will be allocated after regular working hour.

VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030440	Energy Conservation and Audit	4			4
4040520	Micro Controller and its Applications	5			5
4030610	Distribution and Utilization	5			5
	Elective Theory II	4			4
4030540	Computer Aided Electrical Drawing Practical			3	3
4040550	Microcontroller Practical			3	3
	Elective Practical II			4	4
4040570	Entrepreneurship and startups			4	4
		18		14	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education*		-	-	-	2*
TOTAL					**35**

- Physical education hour will be allocated after regular working hour.

VII Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020660	Project Work and Internship			6	6
4020791	Industrial Training II				NA
Extra / Co-Curricular activities					
Library		-	-	-	1
TOTAL					**7**

DEPARTMENT OF ELECTRICAL AND ELCTRONICS ENGINEERING

LIST OF ELECTIVE SUBJECTS

Note: Select the Elective Theory and Related Practical subjects.

V Semester

Elective I Theory					
4030511	Control of Electrical Machines	4	-	-	4
4030512	Programmable Logic Controllers	4	-	-	
4030513	Renewable Energy Sources	4	-	-	
Elective I Practical					
4030514	Control of Electrical Machines Practical	-	-	3	3
4030515	Programmable Logic Controller Practical	-	-	3	
4030516	Renewable Energy Sources Practical	-	-	3	

VI Semester

Elective II Theory					
4030621	Power Electronics	4	-	-	4
4030622	Bio-Medical Instrumentation	4	-	-	
4030623	Computer Hardware and Networks	4	-	-	
Elective II Practical					
4030624	Power Electronics Practical	-	-	4	4
4030625	Bio-Medical Instrumentation Practical	-	-	4	
4030626	Computer Hardware and Networks Practical	-	-	4	

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implemented for the Students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040310

Semester : III Semester

Subject title : ELECTRONIC DEVICES AND CIRCUITS

TEACHING AND SCHEME OF EXAMINATION

No of weeks/ semester: 16weeks

Subject	Instruction		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ELECTRONIC DEVICES AND CIRCUITS	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	Hrs
I	Filters, Zener diode and Opto-electronic devices	14
II	Bipolar Junction Transistor, Field Effect Transistor and UJT	16
III	Feedback, Amplifiers and Oscillators	16
IV	Special Semiconducting Devices (SCR, DIAC AND TRIAC)	14
V	Wave shaping Circuits	13
	Tests and Model Exam	7
Total		80

RATIONALE:

Every Electronics Engineer should have sound knowledge about the components used in Electronics Industry. This is vital in R&D Department for chip level troubleshooting. To meet the industrial needs, diploma holders must be taught about the most fundamental subject, Electronic Devices and Circuits. By studying this subject, they will be skilled in handling all types of electronic devices and able to apply the skill in electronics system.

OBJECTIVES:

On completion of the following units of syllabus contents, the students must be able to:

- Know the importance of Filters
- Know the construction, working principle and applications of Zener diode
- Know the construction, working principle and applications of Optoelectronic devices
- Know the biasing methods of Transistors and their applications
- Study the performance of special devices like UJT, FET
- Study the Concept of Feedback, different types of Negative feedback connections
- Know the Types of Transistor amplifiers, Transistor oscillators and their applications
- Study the performance of Special semiconducting devices like SCR, DIAC, and TRIAC
- Explain the concept of wave shaping circuits, Bistable Multivibrator and Schmitt trigger
- Study the working principle of Clippers, Clampers, Voltage Multipliers and their applications

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**FILTERS, ZENER DIODES AND OPTO-ELECTRONIC DEVICES** **1.1: FILTERS** Definition - Types - Capacitor filter - Inductor filter - L section filter - Pi section and RC filter - Comparison and Applications of Filters **1.2: ZENER DIODE** Construction, Working principle and Characteristics of Zener Diodes- Zener Breakdown-Avalanche breakdown- Zener diode as a Voltage regulator.	**5** **5**
II	**BIPOLAR JUNCTION TRANSISTOR (BJT), FIELD EFFECT TRANSISTOR (FET) AND UNI JUNCTION TRANSISTOR (UJT)** **2.1: BIPOLAR JUNCTION TRANSISTOR** Transistor biasing: Need for biasing - Types- Fixed bias, Collector to base bias and Self bias (Operation only, no derivation of circuit elements and parameters)– Define: Stability factor - Operation of Common Emitter Transistor as an Amplifier and as a switch. **2.2**: **FIELD EFFECT TRANSISTOR (FET)** Construction – Working principle–Classification - Drain and Transfer Characteristics -Applications–Comparison between FET and BJT - FET amplifier (common source amplifier). **2.3: UNIJUNCTION TRANSISTOR (UJT)** Construction- Equivalent Circuit-Operation-Characteristics- UJT as a relaxation oscillator.	**7** **5** **4**
III	**FEEDBACK, AMPLIFIERS AND OSCILLATORS** **3.1: FEEDBACK** Concept - effects of negative feedback-Types of negative feedback connections - Applications **3.2: AMPLIFIERS** Transistor amplifiers - Types - RC coupled amplifier - Working and Frequency response characteristics –Working of Common Collector Amplifier (Emitter follower) **3.3: OSCILLATORS** **Transistor oscillators**–Conditions for oscillation (Barkhausen criterion)-	**6** **6** **4**

	Classifications– Hartley Oscillator– Colpitts Oscillator – RC Phase shift oscillator.	
IV	**SPECIAL SEMICONDUCTING DEVICES (SCR, DIAC AND TRIAC)** **4.1:SCR (SILICON CONTROLLED RECTIFIER)** Symbol – Layered Structure – Transistor analogy - Working–VI characteristics– Applications - Comparison between SCR and Transistor **4.2: DIAC (Diode for Alternating Current)** Symbol – Layered structure - Working – VI characteristics- Applications **4.3: TRIAC (Triode for Alternating Current)** Symbol – Layered structure - Working – VI characteristics- Applications	**5** **5** **4**
V	**WAVE SHAPING CIRCUITS** **5.1: CLIPPERSAND CLAMPERS** Construction and working of Positive, Negative and biased Clippers - Construction and working of Positive and Negative Clamper **5.2: Voltage Multipliers** Construction and working of Voltage Doubler and Tripler. **5.3: Multivibrator and Schmitt Trigger** Construction – Working – Waveform of Astable and Monostable Multivibrator using Transistors and Schmitt Trigger using Transistors.	**5** **3** **5**

TEXT BOOKS:

1. Electronics Devices & Circuits by Salivahanan S,N.Suresh Kumar, A.Vallavaraj Tata McGraw Publication 3rdEdition 2016
2. Electronics Devices & Circuits by Jacob Millman and Halkias 3rd Edition, 2010, Tata McGraw– Hill publication

REFERENCE BOOKS:

1. Electronics Devices & Circuits by Salivahanan S,N.Suresh Kumar, A.Vallavaraj Tata McGraw Publication 3rdEdition 2016
2. Electronics Devices and circuit theory by Boyestad & Nashelsky, PHI, New Delhi 2009
3. Electronic Principles by Malvino, -Tata McGraw Hill Publication 2010.
4. Optical Fiber Communication by Gerd Keiser 5th Edition, Tata McGraw– Hill.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030320

Semester : III

Subject Title : ELECTRICAL CIRCUIT THEORY

TEACHING AND SCHEME OF EXAMINATION

No of weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL CIRCUIT THEORY	**6**	**96**	**25**	**100***	**100**	**3 Hrs.**

*** Examinations will be conducted for 100 Marks, and it will be reduced to 75 Marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	DC Circuits	18
II	Circuit Theorems	18
III	Single Phase Circuits	18
IV	Three phase Circuits	18
V	Storage Batteries	17
Test & Model Exam		7
Total		96

RATIONALE:

- Electric circuit analysis is the process of finding the voltages across, and the currents through the components in the network. Many Techniques are available for calculating these values.
- Part of the course is deal with basics of Network Analysis, introduction to network elements and explains methods for finding voltage and current across any network Component with DC Source, Single Phase AC and Three Phase AC Sources.
- This Course aims at making the student to conversant with different techniques of solving the problems in the field of Electric Circuits and Analysis.

OBJECTIVES:

The students should be able to:

- Explain the concept of Resistance, Capacitance and analyze different Circuit Elements, Energy Sources and analysis of Networks by Kirchhoff's Laws.
- Analyze the concepts of Nodal and Mesh Analysis and Analyze different Theorems for DC Circuits.
- Analyze Single Phase Circuits using Resistor, Inductor & Capacitor Elements.
- Analyze Balanced Three Phase AC Circuits and perform the Three Phase Power Measurement Calculations.
- Explain the Concept of storage batteries, care, maintenance and applications.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DC CIRCUITS** Basic Concepts of Current, EMF, Potential Difference, Resistance and Resistivity– Ohm's Law –Work, Power, Energy- Resistance in Series, Parallel and Series - Parallel Circuits — Kirchhoff's Laws — Concept of Capacitance - Capacitors in Series and in Parallel - Problems in the above Topics.	18
II	**CIRCUIT THEOREMS** Definitions of Node, Branch and Network – Mesh Equations–Nodal Equations–Star / Delta Transformations – Superposition Theorem – Thevenin's Theorem –Norton's Theorem – Maximum Power Transfer Theorem. (Problems in DC Circuits only)	18
III	**SINGLE PHASE CIRCUITS** Definitions of Sinusoidal Voltage and Current– Instantaneous, Peak, Average and Effective Values – Form Factor and Peak Factor (Derivation for Sine Wave) – Pure Resistive, Inductive and Capacitive Circuits –RL, RC, RLC Series Circuits – Impedance – Phase Angle – Use of 'J' Notations–Rectangular and Polar Coordinates - Phasor Diagram Power and Power Factor – Power Triangle – Apparent Power, Active and Reactive Power– Parallel Circuits (Two Branches Only)- Conductance, Susceptance and Admittance–Problems in all above topics. **RESONANCE** Concept of Series Resonance — Parallel Resonance (R, L & C)- Applications (No Problems)	10 8

IV	**THREE PHASE AC CIRCUITS** Three Phase AC Systems-Phase Sequence –Necessity of Three Phase System–Concept of Balanced and Unbalanced Load - Balanced Star & Delta Connected Loads–Relation between Line andPhase Voltages and Currents — Phasor Diagram Three Phase Power — Power Factor — Three Phase Power and Power Factor Measurement by Single Wattmeter and Two Wattmeter Methods–Problems in all Topics.	8 10
V	**STORAGE BATTERIES** Classification of cells – Construction, Chemical action and physical changes during charging and discharging of Lead Acid, Nickel Iron and Nickel Cadmium Cells – Advantages and Disadvantages of Nickel Ion and Nickel Cadmium Cells over Lead Acid Cell - indication of fully charged and discharged battery – defects and their remedies – capacity - AH efficiency and WH efficiency (no problems) – methods of charging - care and maintenance – applications – maintenance free batteries – Lithium Cells, Lithium - Ion Cells and Mercury Cells – Concept of Recharged Cell.	17

TEXTBOOK

S.No	Name of the Book	Author	Publisher
1.	Electric Circuit Theory	Dr.M.Arumugam	Khanna Publishers

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher
1.	Circuits and Networks Analysis and Synthesis	A Sudhakar Shyammohan S Palli	Tata McGraw Hill Education Private
2.	Electric Circuits	Mahamood Nahvi Joseph A Edminister	Schaum Publishing Company, Newyork

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030330

Semester : III Semester

Subject Title : ELECTRICAL MACHINES-I

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL MACHINES-I	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	DC Generators	15
II	DC Motors	15
III	Single Phase Transformer	15
IV	Three Phase Transformer	15
V	Maintenance of DC Machines and Transformers	13
	Test & Model Exam	07
	Total	**80**

RATIONALE

- ✓ This subject is classified under core technology group which intends to teach the facts, concepts, principles of electrical machines, such as DC generators, DC motors, Brushless DC motor, Single & Three Phase Transformers and DC Electrical Source (battery).
- ✓ Students will be able to analyze the characteristics of DC Generators and Motors, Brushless Dc Motor, Single & Three Phase Transformer, Battery & Qualitative Parameters of these Static and Dynamic Machines. These Machines are used in Transmission, Distribution and Utilization Systems.
- ✓ Knowledge gained by students will be helpful in the study of advanced subjects like Utilization of Electrical Energy, Switchgear & Protection, Manufacturing Processes and Maintenance of Electrical Machines.

OBJECTIVES

Students will be able to:

1. Explain the concept Electromagnetism and Principles.
2. Know the constructional details and working principles of DC Machines and Transformers.
3. Evaluate the performance of DC Generators, Motors and Transformers.
4. Study the applications of DC Generator, Motor and Transformer for specific fields.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DC GENERATORS** Review of electromagnetic induction – Faraday's laws –Lenz's law - Fleming's right hand rule – Principle of operation of D.C. generator – Construction of D.C. generator – Types of armature windings(No Winding diagram) – EMF equation(Simple problems) –Types of D.C. generators – No load and load characteristics of DC generators – Causes of failure to build-up voltage and remedy – armature reaction – methods of compensating armature reaction – process of commutation – methods of improving commutation. Load characteristics of DC generators – Applications of DC generators	15
II	**DC MOTORS** Principle of operation of D.C. Motor – Fleming's left-hand rule – Construction Back emf – Torque equation – Types of DC motors –Torque-current, Speed-current, Speed- Torque characteristics of different DC motors – Speed control of DC motors– Field control and armature control – necessity of Starters– 3 Point and 4 Point starters –losses in D.C. Machines – Testing of D.C. Machines – Predetermination of efficiency of motor and generator by Swinburne's test – Problems in the above topics – Applications of D.C. Motors.	15
III	**SINGLE PHASE TRANSFORMER** Principle of operation – Constructional details of core and shell type Transformers – EMF Equation – Voltage ratio –Transformer on No load – Transformer Full load – Current ratio – Phasor diagram on no load and Full load at different power factors. O.C. test, S.C. test –Determination of equivalent circuit constants– Determination of voltage regulation and efficiency – Condition for maximum efficiency– All day efficiency – Problems on the above topics - polarity test–Parallel operation of Single Phase transformers– Auto transformer –principle – Applications of	15

	transformers – Energy Efficient Transformer – Dry Type Transformer & Amorphous Core Transformer.	
IV	**THREE PHASE TRANSFORMER** Three phase Transformer – construction, types of connections of transformer. Parallel operation of three phase transformers – grouping of transformers – Pairing of transformers - Load sharing of transformers with equal and unequal ratings –Cooling of transformers – Various cooling arrangements – Transformer accessories – conservator, breather, explosion vent, bucholz relay – ON load and OFF load tap changer.	15
V	**MAINTENANCE OF DC MACHINES AND TRANSFORMERS** Maintenance – Importance, Preventive and Breakdown maintenance - Advantages of preventive maintenance - Causes of Sparking in Commutators – Defects in Commutators and Remedies – Resurfacing of Commutators and Brushes – Maintenance of Brush Holder – Staggering of Brushes, Brush Pressure - Defects in DC Armature winding – Maintenance of Earthing of DC Machines. Maintenance of Transformer Oil - Transformer oil tester – Acidity test, BDV Test - Earthing – Measurement of earth resistance.	13

TEXTBOOK

Sl.No.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	A Textbook of Electrical Technology Volume II	B.L. Theraja	S.Chand & Co.New Delhi
2	Electrical Technology	Edward Hughes	Addision – Wesley International Student Edition

REFERENCE BOOK

Sl.No.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	Elements of Electrical Engineering	Maria Louis	Prentice - Hall of India Pvt
2	Electrical Machines	Nagarath	TMH Publications
3	Electrical Machines	Bhattacharya	TMH Publications

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject code : 4040340

Semester : III

Subject title : ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
ELECTRONIC DEVICES AND CIRCUITS PRACTICAL	**4**	**64**	**25**	**100***	**100**	**3 Hours**

***Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

Every Electronics Engineer should have sound knowledge about the components used in Electronics Industry. This is vital in R&D Department for chip level troubleshooting. To meet the industrial needs, diploma holders must be taught about the most fundamental subject, electronic devices and Circuits Practical. By doing practical experiments in this, they will be skilled in handling all types of electronic circuits and able to apply the skill in electronic systems.

OBJECTIVES:

On completion of the following experiments, the students must be able to

- Know the Cold Checking of Active and Passive Component
- Find out the Unknown Resistance value of a Resistor using Colour Coding
- Find out the Unknown Capacitance value of a Capacitor using Colour Coding

- Find out the Unknown Inductance value of an Inductor using Colour Coding
- Understand the concept, working principle and applications of PN Junction diode
- Understand the concept, working principle and applications of Zener diode
- Understand the concept, working principle and applications of BJT and FET
- Understand the concept, working principle and applications of UJT
- Understand the concept, working principle and applications of SCR
- Understand the concept, working principle and applications of DIAC and TRIAC
- Understand the concept, working principle and applications of Clippers and Clampers
- Understand the concept, working principle and applications of various types of Negative feedback amplifiers
- Understand the concept, working principle and applications of Astable Multivibrator

DETAILED SYLLABUS

Contents: Practical

Exercises

Note: At least 5 experiments should be done using Soldering board / Bread board

1. Construct a circuit to test the forward and reverse bias characteristics of a PN Junction Silicon diode. Find the value of its cut-in voltage
2. Construct a circuit to test the forward and reverse bias characteristics of a Zener diode. Find the value of its reverse breakdown voltage
3. Construct a Full wave (center tapped) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
4. Construct a Full wave (Bridge) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
5. Construct a Common Emitter Transistor circuit and test its input and output characteristic curves.
6. Construct a Common Source Field Effect Transistor circuit and test its drain and transfer characteristic curves.
7. Construct a circuit to test the Turning on and Turning off characteristics of SCR and find out the forward break over voltage, the value of Latching and Holding currents.
8. Construct a circuit to test the bidirectional characteristics of DIAC and plot its switching characteristics.

9. Construct a circuit to test the bidirectional characteristics of TRIAC and plot its switching characteristics.
10. Construct a Common emitter amplifier circuit and test its frequency response characteristics with and without Current series feedback introduced in it.
11. Construct a circuit to test the switching characteristics of Astable Multivibrator
12. Construct a circuit to test the negative resistance Characteristics of UJT.

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	CIRCUIT DIAGRAM	25
2	CONNECTIONS	25
3	EXECUTION AND HANDLING OF EQUIPMENT	25
4	OUTPUT / RESULT	15
5	VIVA VOCE	10
	TOTAL	100

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	Name of the Equipment	Range	Required Quantity
1.	DC Regulated power supply	0-30V,1A	10
2.	High Voltage Power Supply	0-250V,1A	2
3.	Signal Generator	1MHz	4
4.	Dual trace CRO	20MHz/ 30MHz	5
5.	Digital Multimeter	-	10
6.	DC Voltmeter (Analog/Digital)	Different Ranges	15
7.	DC Ammeter (Analog/Digital)	Different Ranges	15

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030350

Semester : III Semester

Subject Title : ELECTRICAL CIRCUITS AND MACHINES PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL CIRCUITS AND MACHINES PRACTICAL	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

RATIONALE:

- To impart Practical Knowledge to the Diploma Students and Practical Subjects are introduced for every corresponding Theory Subject.
- This Practical Course supports the aim and objective of Electrical Machines- I and Electrical Circuit Theory Subjects.

OBJECTIVES

On completion of this Practical Subject, the Students will be able to:

- Make the various Circuit connections in Machines Laboratory.
- Practically prove all the Theorems and Principles which are dealing with DC Current.
- Understand the Characteristics of Electrical Machines and to determine the Efficiency of the Machines.

- Test the performance of Transformer to find its Efficiency, Voltage Regulation and Characteristics.
- Study the various Speed Control Methods of DC Motor.

DETAILED SYLLABUS

ELECTRICAL CIRCUITS AND MACHINES PRACTICAL

LIST OF EXPERIMENTS:

CIRCUITS:

1. Verification of Super Position Theorem with two different DC Voltages for a common load.
2. Verification of Thevenin's Theorem with DC Supply
3. Measurement of Power
    a. using Ammeter and Voltmeter
    b. using Wattmeter for Single Phase Resistive Load.

MACHINES:

4. No load and FULL Load Characteristics of Self Excited DC Shunt Generator.
5. Load Characteristics of Self Excited DC Series Generator.
6. Load Test on DC Shunt Motor and Draw the Performance Curve.
7. Load Test on DC Series Motor and Draw the Performance Curve.
8. Predetermine the Efficiency of DC Machines by Swinburne's Test.
9. Speed Control of DC Shunt Motor by
    a. Armature Control Method
    b. Field Control Method
10. Load Test on Single Phase Transformer
11. Load Test on Three Phase Transformer
12. Predetermine the Efficiency and Regulation of Single-Phase Transformer by conducting O.C and S.C Tests
13. Find the Equivalent Circuit Constants of Single-Phase Transformer by conducting O.C and S.C Tests.
14. Connect two Single Phase Transformers for Parallel Operation.
15. a) Perform Breakdown Test And determine the Dielectric Strength of Transformer Oil
    b) Conduct Acidity Test on Transformer Oil.

DETAILLED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	CIRCUIT DIAGRAM	**35**
2	CONNECTIONS AND PROCEEDING THE EXPERIMENT	**30**
3	READING/CALCULATION/GRAPH/RESULT	**30**
4	VIVA VOCE	**05**
5	TOTAL	**100**

LIST OF EQUIPMENTS (For a Batch of 30 Students)

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	DC Shunt Motor 3/5 KW (or more) with Loading Arrangement	2
2	DC Series Motor 3/5 KW (or more) with Loading Arrangement	1
3	DC Compound Motor 3/5 KW (or more) with Loading Arrangement	1
4	DC Shunt Generator 3/5 KW (or more) coupled with Prime Mover	1
5	DC Series Generator 3/5 KW (or more) coupled with Prime Mover	1
6	1 Phase Transformer 1KVA (or more) 220V/110V	3
7	3 Phase Transformer 1KVA (or more) 440V/220V	1
8	1 Phase Variac 15 amps	3
9	3 Phase Variac 15 amps	1
10	Dual Regulated Power Supply 0-30V/2A	2
11	Single Regulated Power Supply 0-30V / 2A	2
12	Single Phase Resistive Load 3/5 KW, 220V	2
13	Three Phase Resistive Load 3KW,415V	2
14	Tachometer Analog type	3
15	Rheostat – various ranges 50Ω/5A,100 Ω/5A, 300 Ω/2A, 600 Ω/2A (or equivalent)	4
16	AC Ammeter – various ranges 0-500mA, 0-1/2A, 0-5/10A,0-10/20A (or equivalent)	8

17	DC Ammeter – various ranges 0-500mA, 0-2A,0-5A,0-10A,0-15/30A (or equivalent)	8
18	DC Voltmeter – 0-5/10V, 0-30V, 0-300V	8
19	AC Voltmeter – 0-75V, 0-150V, 0-300V, 0-600V	8
20	Wattmeter – various ranges LPF 150/300/600V 2.5A/5A,1/2.5A	6
21	Wattmeter – various ranges UPF 75/150/300,5/10A	6
22	Wattmeter – various ranges UPF 150/300/600V 10/20A	6
23	Transformer oil tester kit, Acidity test kit	Each 1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030360

Semester : III Semester

Subject Title : ELECTRICAL WORKSHOP PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ELECTRICAL WORKSHOP PRACTICAL	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 Marks.**

RATIONALE

- To impart practical knowledge to the Diploma Students for servicing of Domestic Appliances.
- This Subject is assigned to develop Skill on Assembling and test the Household ElectricalAppliances.

OBJECTIVES

At the end of the practical the students will be able to:

- ✓ Identify and use the tools used in servicing of Electrical Appliances.
- ✓ Assemble the various parts of Domestic Appliances.
- ✓ Make the Electrical Connections and test their performance.

DETAILED SYLLABUS

LIST OF EXPERIMENTS:

1. Familiarization of tools used for Electrical repair works and personal Protection Equipments.
2. Dismantling of Electrical Iron Box, identifying the parts, checking theconditions, assembling, and testing.
3. Dismantling of Mixer Grinder, identifying the parts, checking the conditions,assembling and testing.
4. Dismantling of Wet Grinder, identifying the parts, checking the conditions, assembling, and testing.
5. Assembling the accessories of Ceiling Fan, test the connections of winding& Capacitor and run the Fan with Speed Regulator.
6. Connect the Battery and Inverter to supply partial load in a Domestic Wiring during Mains Failure.
7. Assembling and testing of 15watts LED Light.
8. Battery Charging through Solar Panel. Connect Solar Panel to chargeBattery through Charge Controller.
9. Dismantling of Induction Heater, identifying the parts, checking theconditions, assembling, and testing
10. Dismantling of Microwave Oven, identifying the parts, checking theconditions, assembling and testing.

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1.	Tools: Screwdriver, Cutting pliers, Wire Stripper, Hammer, Spanner set, Line Tester, Nose pliers.	Each2set
2.	Personal Protective Equipments: Safety helmet, Google, Safety gloves, Nose mask, Ear plug, Safety Belt.	Each2Set
3.	Automatic Iron Box	2
4.	Wet Grinder	2
5.	Mixer Grinder	2
6.	Ceiling Fan	2
7.	LED Light, PCB, Driver Circuit and Outer Cover	10
8.	Lead Acid Battery	2
9.	Inverter	2
10.	Solar Photo Voltaic Module	2
11.	Charge controller	2
12.	Microwave oven	1
13.	Multi meter	8
14.	Induction Heater	1

DETAILED ALLOCATION OF MARKS

S.No.	NAMEOFTHE ACTIVITY	MARKS ALLOCATED
1.	Connection Diagram	25
2.	Tools Required	20
3.	Dismantling and Assembling Procedure	30
4.	Testing	20
5.	Viva Voce	05
	TOTAL	**100**

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030370

Semester : III Semester

Subject Title : WIRING & WINDING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
WIRING & WINDING PRACTICAL	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

RATIONALE

To provide concept and hands on experience in Electrical Wiring and Winding including different Wiring Systems, Installation Methods and Basic Winding Preparation. Each topic in the syllabus serves as guide for students to deal with the process of connecting various accessories for the distribution of Electrical Energy from the Meter Board.

OBJECTIVES

At the end of this Practical Course the Students should be able to:

- Execute the Emergency Alarm Circuit
- Execute the wiring for Single Phase Service Connection with necessary items.
- Execute the wiring of Three Phase Supply using 3 Rotary Switches, MCB and DB tochange the Phases by connecting Single Phase Lamp Load
- Execute the wiring to controlling the intensity of Lamp by six places by using two 2-Way Switches and 4 Intermediate Switches.
- Execute the wiring to connect a Single-Phase Motor with Main Switch, D.O.L Starterand M.C.B
- Execute The Wiring to Connect A 3 Phase Induction Motor with Main Switch, Star / Delta Starter and E.L.C.B.
- Execute the wiring to control lamps (Sodium Vapor Lamp, Mercury Vapor Lamp, Fluorescent Lamp)
- Execute the wiring for Test Board with necessary items.
- Execute the Go down /Tunnel wiring
- Prepare winding for Transformer and No Volt Coil.
- Give end connections for 3 Phase Induction Motor Winding.
- Testing of faulty Ceiling Fan.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

WIRING

1. Emergency alarm wiring with 3 Bells and 3 Pushbuttons.
2. House Wiring for a Service Connection with Single Phase Digital Energy Meter Cutout, Main Switch, 4 Way D.B, Indicator Lamp.
3. Wiring and Testing of 3 Phase Supply using 3 Rotary Switches, MCB and DB to change the Phases by connecting Single Phase Lamp Load.
4. Controlling a Lamp by Six Places by using Two, 2-Way Switches& Four Intermediate Switches.
5. Wiring of Single-Phase Motor using Single Phase Main Switch, D.O.L Starter and MCB
6. Wiring of Three Phase Induction Motor with Main Switch,Star/Delta Starter and ELCB.
7. Wiring of Sodium Vapor and Mercury Vapor Lamp.
8. Wiring and troubleshooting the Fluorescent Tube light.
9. Design and implement a Test Board with Indicator Lamp, FuseUnit to Test Electrical Appliances.
10. Go down / Tunnel wiring using 4 Lamps.

WINDING

1. Design, construct and test a 230/12-0-12 Volt, 500mA Transformer.
2. Design No Volt Coil for a 230/440 AC Contactor.
3. Demonstrate the end connection for a 3 Phase Induction MotorWinding for a 2 Poles / 4Pole Operations.
4. Dismantling a faulty Ceiling Fan and identify the fault, run the fanafter rectifying the fault.

DETAILED ALLOCATION OF MARKS

S. No	NAME OF ACTIVITY	MARK ALLOCATION
1.	Wiring diagram / Design	30
2.	Execution	40
3.	Result	25
4.	Viva-voce	05
	Total Marks	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.NO.	DESCRIPTION	SPECIFICATION	QTY
1.	SPST Flush Type Switch	250V/5A	10
2.	Intermediate Switch	250V/5A	10
3.	Rotary Switches	500V/32A	6
4.	Three Phase Control Panel Board	500V/32A	2
5.	Batten Lamp Holder	-	10
6.	Round Block	-	20
7.	Switch Board	20cm*15 cm	4
		10cm*10cm	15
8.	M.C.B.	250V/10A ,2 pole	6
		440V/32A	3
9.	Push Button Switch	250V/5A	5
10.	2 Plate Ceiling Rose	250V/5A	10
11.	Electric Bell	250V/5A	3
12	Single Phase D.P.I.C. Main Switch	250V/16A	3
13.	Single Phase D.O.L. Starter	250V/10A	1
14.	Three Phase T.P.I.C. Main Switch	500V/30A	2
15.	Star / Delta Starter	440V/5HP	1
16.	E.L.C.B.	30mA/100mA	1
17.	Single Phase, Digital Energy Meter	250V/15A,50HZ	1
18.	Cut out	16A	1
19.	Single Phase, 4 Way Distribution Box	250V/15A	2
20.	Mercury Vapor Lamp with accessories		1 Set
21.	Sodium Vapor Lamp with accessories		1 Set
22.	Fluorescent Tube Light with Electronic Choke and Holder	40W	2 Set
23.	Two Way Flush Type Switch	250V/5A	15
24.	Wooden Box	30 cm*15cm	4
25.	PVC Pipe	¾”/1″	Req.Qty
26.	Saddle Clips	¾”/1 ″	Req.Qty
27.	Copper Wire	2.5Sq.Mm, 1.5Sq.Mm	Req.Qty
28.	1” Junction Box	1 way,2way,3way	Req.Qty
29.	Screws		Req.Qty
30.	Bare Copper Wire	2.5 Sq.Mm	Req.Qty
31.	Lamps (C.F.L. or Incandescent)	Different ratings	Req.Qty

32.	EI60 Type Stampings Of 0.35 Mm Thickness	-	55
33.	Readymade Bobbins (EI60/21)	-	Req.Qty
34.	Enameled Copper Wire	26SWG 36SWG 37SWG 38SWG	Req.Qty
35.	Varnish	-	Req.Qty
36.	Winding Machine	-	1
37.	Ceiling Fan	-	2
38.	Single Phase Induction Motor	0.5 HP/50HZ,240V	1
39.	Three Phase Squirrel Cage Induction Motor	3HP, 500 V, 50 Hz	1
40.	Gauge Plate for Measurement of SWG	-	1
41.	Winding Study Motor (3Φ Squirrel Cage Type)	-	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030410

Semester : IV

Subject Title : Electrical Machines – II

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL MACHINES - II	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Alternator Principles and Construction	12
II	Alternator Performance and Testing	16
III	Three Phase Induction Motor	16
IV	Single Phase Induction Motor & Synchronous Motor	15
V	Maintenance of Induction Motors & Starters	14
	Test & Model Exam	7
	Total	**80**

RATIONALE

- This subject is classified under Core Technology group intended to teach Students about facts, concepts, Principles of Electrical Machines such as Induction Motor, Alternator and Synchronous Motor.
- Students will be able to analyze the characteristics and qualitative parameters of these Machines.
- These Machines are widely used in Industries and for generation of electricity.
- The knowledge gained by the student is useful in the study of Technological Subjects such as Utilization System, Manufacturing Processes and Testing and Maintenance of Electrical Machines.
- The knowledge and skills obtained will be helpful in discharging Technical Functions such as Supervision, Controlling and as R & D Technicians.

OBJECTIVES

. The students will be able to understand the concepts of:

- Alternator Principle, Construction and their Types, EMF Induced and Cooling Techniques of Machines
- Performance of an Alternator, Testing, Characteristics, Parallel Operation, Load Sharingetc.,
- Three Phase Induction Motor, Principle, Construction, Types, Characteristics and Applications, Starting Methods
- Single Phase Motor Types, Construction, Characteristics and Applications, Synchronous Motor, Starting, Construction, Characteristics and Applications
- Maintenance of Induction Motors and Starters.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ALTERNATOR PRINCIPLES AND CONSTRUCTION** Basic Principle of Alternators — Types of Alternators — Stationary Armature Rotating Field – Advantages of Rotating Field – ConstructionDetails of Alternator — Salient Pole Rotor — Cylindrical Type Rotor — Types of A.C. Armature Windings – Types of Slots – Full Pitch and ShortPitched Windings – Phase Spread Angle and Effect of Distribution Factor – Pitch Factor – Relation between Frequency, Speed and Number of Poles – EMF Equation – Problems Methods of obtaining Sine Wave – Critical Speed of Rotor – Ventilation of Turbo Alternators – Advantages of Hydrogen Cooling and its Precaution – Excitation and Exciters.	10 2
II	**ALTERNATOR PERFORMANCE AND TESTING** Load Characteristics of Alternators – Reason for Change in Terminal Voltage –Qualitative Treatment of Armature Reaction for various Power Factor Loads — Effective Resistance — Leakage Reactance — Synchronous Reactance, Synchronous Impedance — Voltage Regulation – Determination of Voltage Regulation of Alternator by Direct Load Test - Pre-Determination of Regulation of Alternator by Indirect Method (EMF, MMF, and ZPF). Necessity and conditions for Parallel Operation of Alternators – Synchronizing by Dark Lamp Method, Bright Lamp Method, Dark - Bright Lamp Method and Synchro scope Method– Synchronizing Current, Synchronizing Power and Synchronizing Torque – Load Sharing of Alternators –Infinite Bus Bar.	10 6
III	**THREE PHASE INDUCTION MOTOR** Rotating Magnetic Field — Principle of Operation of Three Phase Induction Motors – Slip and Slip Frequency – Comparison between Cage and Slip Ring Induction Motors –Development of Phasor Diagram – Expression for Torque in Synchronous Watts — Slip-Torque Characteristics – Stable and Unstable Region – No Load Test and Blocked Rotor Test – Development of Approximate Equivalent Circuit – Problems on the above topics-Simplified Circle Diagram	10

	Determination of Maximum Torque, Slip (Problems Not Required) – Starting Torque and Starting Current Expression – Relationship between Starting Torque and Full Load Torque – Speed Control of Induction Motors. Starters of Induction Motors – Direct online Starter and Its Merits for Cage Motors – Star Delta Starter- Auto Transformer Starter - Rotor Resistance Starter – Cogging –Crawling in Induction Motor– Double Cage Induction Motor-Induction Generator.	6
IV	**SINGLE PHASE INDUCTION MOTOR** Single Phase Induction Motors — Not Self Starting — Methods of Making itself Starting – Construction, Working Principle – Phasor Diagram-Slip Torque Characteristics- Split Phase Motor - Capacitor Motor - Shaded Pole Motor - Repulsion Motor - Universal Motor — Operation of Three Phase Motor with Single Phase Supply. **SYNCHRONOUS MOTOR** Principle of Operation –Not Self Starting – Methods of Starting–Effects of Excitation on Armature Current and Power Factor– 'V' Curve and Inverted 'V" Curve of Synchronous Motor — The Phenomenon of Hunting and Prevention of Hunting by Damper Winding — Comparison between Synchronous Motor and Three Phase Induction Motor - Applications -Problems on Power Factor Improvement.	8 7
V	**MAINTENANCE OF INDUCTION MOTORS AND STARTERS** BIS Publication Dealing with The Code of Practice of Induction Motors and Starters – Classification of Cage Motor – Continuous Rating and Intermittent Rating – Various Types of Enclosures – Specifications of Motors – Selecting the Cable Rating – Single Phase Prevention using Current Operated Relay – Commissioning - Annual Maintenance Selection of Starters of Induction Motor – Common Induction Motor Troubles and their Remedies – Causes of Noise and Vibration – Care of Bearings – Static Balancing – Degreasing – Vacuum Impregnation - Varnishing – Effect of Unbalanced Supply on the Performance of Induction Motor.	7 7

TEXTBOOK

S.No	Author	Title	Publisher
1.	B.L. Theraja	A Textbook of Electrical Technology -Volume II	S.Chand& Co. New Delhi
2.	Edward Hughes	Electrical Technology	Addision– Wesley International Student Edition

REFERENCE BOOK

S.No	Author	Title	Publisher
1.	M.G.Say	Performance and Design of AC Machines	Pitman PublishingLtd
2.	Nagarath	Electrical Machines	TMH Publications
3.	Bhattacharya	Electrical Machines	TMH Publications

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME
(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030420

Semester : IV Semester

Subject Title : MEASUREMENTS, INSTRUMENTS AND TRANSDUCERS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MEASUREMENTS, INSTRUMENS AND TRANSDUCERS	5	80	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

TOPICS AND ALLOCATION OF HOURS

Unit	Topic	Hours
I	Classification and Characteristics of Instruments	15
II	Measurement of current Voltage and Resistance	15
III	Measurement of Power, Power Factor and Frequency	15
IV	Measurement of L, C Parameters, Waveforms and Signal Conditioners	13
V	Sensors and Transducers	15
	Revision and Test	07
	Total	**80**

RATIONALE

Measurement is the basic and primary operation, the result of which is used only to describe the system and hence treated as an independent operation. Automation of any kind begins with the measurement of certain system parameters; In fact, Industrial growth moves hand in hand with the growth of the measurement of Science and Technology. Therefore, it is highly essential for Electrical Students to study about the measurement of various Electrical Parameters in a system and the construction and working of different Instruments used in measurement of such parameters.

OBJECTIVES

At the end of the Semester, Students will be able to:

- To define basic measurement terms.
- To learn about various operating Forces and effects used in Instruments.
- To study the construction and working of Moving coil and Moving Iron instruments, CT and PT and Electrostatic Voltmeter.
- To understand the measurement of Resistance using different means.
- To study Single Phase and Three Phase Power Measurement using Wattmeter.
- To study the construction and working of Single Phase, Three Phase Energy Meter and study about calibrations.
- To study the construction and working of Power Factor Meters, and Phase Sequence Indicators.
- To study about the Frequency Measurement using different types of Frequency Meters.
- To learn about the measurement of Inductance and Capacitance using Bridges.
- To study about CRO and its applications.

DETAILED SYLLABUS

CONTENTS: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**CLASSIFICATION AND CHARACTERISTICS OF INSTRUMENTS** General - Definition of Measurement – Functions of Measurement System (Indicating, Recording and Controlling Function) – Applications of Measurement Systems – Classification – Absolute and Secondary Instruments – Indicating Recording and Integrating Instruments –Analog and Digital	**10**
	Definition of True Value, Accuracy, Precision, Error and Error Correction – Instrument Efficiency – Effects used in Instruments – Operating Forces – Deflecting, Controlling and Damping Forces.	**5**
II	**MEASUREMENT OF CURRENT, VOLTAGE AND RESISTANCE** Types of Instruments — Construction, Working and Torque Equation of Moving Coil, Moving Iron, Dynamometer Type (Shaded Pole) Instruments — Extension of Instrument Range Using Shunts and Multipliers. (Calculation, Requirements and Simple Problems). Tong Tester — Electrostatic Voltmeter — Rectifier Type Instruments –Instruments Transformers CT and PT – Testing, Errors and Characteristics of CT and PT.	**10**
	Classification of Resistance – Measurement using Conventional Method – (Ammeter – Voltmeter Method) Measurement of Low Resistance using Kelvin's Bridge Ohmmeter – Measurement of Medium Resistance using Wheatstone Bridge – High Resistance using Megger - Earth Resistance- –u Earth Tester – Multimeters.	**5**

III	**MEASUREMENT OF POWER, POWER FACTOR AND FREQUENCY** Power in D.C and A.C Circuits — Watt Meters in Power Measurement —Measurement of Energy in AC Circuits – Single Phase and Three Phase Energy Meters Construction and Operation —- Digital Energy Meter. Power Factor Meters – Single Phase Electro Dynamometer Type – Construction and Working – Phase Sequence Indicator – Phase Difference Measurement using Synchro scope –Tri-vector Meter – Merz Price Maximum Demand Indicator. Frequency Measurement Frequency Meter – Digital Frequency Meter (Simplified Block Diagram)	**7** **8**
IV	**MEASUREMENT OF L, C PARAMETERS, WAVEFORMS AND SIGNAL CONDITIONERS** Inductance – Maxwell's Inductance Bridge – Andersons Bridge – Measurement of Capacitance using Schering Bridge. CRO — Block Diagram — CRT — Applications - Measurements of Voltage, Frequency and Phase Difference Using CRO – Digital Storage Oscilloscope – Block Diagram. **SIGNAL CONDITIONER:** Basic Components of Signal Conditioning System	**5** **5** **3**
V	**SENSORS AND TRANSDUCERS** Definition – Types of Transducers **PASSIVE TRANSDUCERS**: Resistive Transducer – Strain Gauge – Capacitive Transducer – Inductive Transducer – Proximity Sensor – Construction and Operation of LVDT and RVDT **ACTIVE TRANSDUCERS**: RTD – Thermistor - Thermocouple – Synchrous – Piezoelectric Transducer-Measurement of Pressure and Vibration – Hall Effect Transducer – Photovoltaic Transducer – Photoconductive Transducer. **TELEMETRY:** Block Diagram and its Applications	**8** **7**

TEXT BOOKS:

S.No	Title	Author	Publishers
1.	A Course in Electrical and Electronics Measurements and Instrumentation	A.K. Sawhney	Puneet Sawhney Dhanpat Rai & Co (P) Ltd., New Delhi 1993

REFERENCE BOOKS:

S.No	Title	Author	Publishers
1.	Electronic Instrumentation	HS Kalsi	Tata Mc Graw Hill Publishing Co., Delhi 2010
2.	Modern Electronic Instrumentation and Measurement techniques	Albert D. Helfrick William David Cooper	Prentic – Hall of India (P)Ltd., New Delhi 2010
3.	Electronics and Instrumentation	Dr.S.K.Battachariya Dr. Renu Vig	S.K. Kataria & Sons, New Delhi
4.	A course in Electrical and Electronic Measurement and Instrumentation	Umesh Sinha	Satya Prakashan, New Delhi

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040430

Semester : IV

Subject title : ANALOG AND DIGITAL ELECTRONICS

TEACHING AND SCHEME OF EXAMINATION

No of weeks/ semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Board Examination	Total	
ANALOG AND DIGITAL ELECTRONICS	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of hours

Unit	Topic	Hrs
I	Linear ICs and OP-amps	10
II	A/D, D/A, Special Function ICs and IC Voltage Regulators	13
III	Boolean Algebra and Arithmetic operations	10
IV	Combinational and Sequential Logic Circuits	12
V	Memories	12
	Tests and Model Exam	7
Total		**64**

RATIONALE:

The subject Analog and Digital Electronics holds applications in all branches of engineering instrumentation and Industrial Automation. This will impart in depth knowledge of Number Systems, Logics of Combinational &Sequential circuits and memories.

OBJECTIVES:

On completion of the following units of the syllabus contents, the students must be able to

- Understand the basics of operational amplifier.
- Know the op-amp applications.
- Know the waveform generator and Active filter.
- Know the concept of D/A and A/D converters
- Know the applications of Special function IC, IC 555 Timer.
- Understand various Number Systems used in Digital Circuits
- Understand basic Boolean postulates and laws.
- Understand the De-Morgan's theorem.
- Understand the concept of Karnaugh Map.
- Learn about Basic logic Gates.
- Study about Boolean techniques.
- Learn the different digital logic families
- Learn arithmetic circuits- Adder/Subtractor
- Understand the encoder/decoder & MUX / DEMUX
- Understand the concept of parity Generator and checker
- Understand various types of flip-flops.
- Understand various types of counters
- Understand various modes of shift registers
- Understand various types of memories

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**LINEAR ICS AND OP-AMPS** **1.1: OPERATIONAL AMPLIFIER** Ideal Op-Amp – Block diagram and Characteristics – Op-amp parameters CMRR – Slew rate – Concept of Virtual ground **1.2: APPLICATIONS OF OP-AMP** Inverting amplifier –Summing amplifier – Non inverting amplifier – Voltage follower - Comparator – Zero crossing detector – Integrator – Differentiator- waveform generation (Schmitt Trigger only)–RC Low pass Active filter. **1.3: OP-AMP SPECIFICATIONS** OP-amp 741 – Symbol – Pin diagram – Specifications	**4** **4** **2**
II	**A/D, D/A, SPECIAL FUNCTION ICs AND IC VOLTAGE REGULATORS** **2.1: SAMPLING AND QUANTIZATION** **2.2: A/D CONVERTER** Analog to digital conversion using Ramp method – Successive approximation method – Dual slope method – Specifications of A/D converter **2.3: D/A CONVERTER** Basic concepts – Weighted Resistor D/A converter – R-2R Ladder D/A converter – Specifications of DAC IC **2.4: SPECIAL FUNCTION ICs** 2.4.1: IC 555 Timer – Pin diagram - Functional Block diagram of IC 555 in Astable and Monostable Multivibrator mode - Schmitt trigger using IC 555 2.4.2: IC 565-PLL-Pin Diagram-Functional Block diagram of IC 565 2.4.3: IC 566-VCO-Pin Diagram-Functional Block diagram of IC 566 **2.5.: IC VOLTAGE REGULATORS** Positive IC Voltage Regulators: 78XX - Negative IC Voltage Regulators: 79XX and General-purpose IC Voltage Regulators using LM 723.	**2** **3** **2** **3** 3

III	**BOOLEAN ALGEBRA AND ARITHMETIC OPERATIONS** **3.1: NUMBER SYSTEMS** Decimal – Binary – Octal – Hexadecimal – BCD – Conversion from one number system to other – Boolean Algebra – Basic laws and Demorgan's Theorems **3.2: UNIVERSAL GATES** Realization of basic logic gates using universal gates NAND and NOR -Tristate Buffer circuit **3.3: PROBLEMS USING 2, 3, AND 4 VARIABLES** Boolean expression for outputs – Simplification of Boolean expression using Karnaugh map (up to 4 variable)- Constructing logic circuits for the Boolean expressions **3.4:ARITHMETIC OPERATIONS** Binary Addition-Binary Subtraction-1's compliment and 2's compliment-Signed binary numbers **3.5: ARITHMETIC CIRCUITS** Half Adder-Full Adder-Half Subtractor-Full Subtractor	**2** **2** **2** **2** **2**
IV	**COMBINATIONAL AND SEQUENTIALLOGIC CIRCUITS** **4.1: PARITY GENERATOR AND CHECKER** **4.2: DECIMAL to BCD ENCODER** **4.3: 3 to 8 DECODER** **4.4: MULTIPLEXER:** 4 to 1 Multiplexer **4.5: DEMULTIPLEXER** :1 to 4 Demultiplexer **4.6: FLIP-FLOPS (FF)** RS FF– JK FF: Master Slave FF and Edge triggered FF – D and T FF **4.7: COUNTERS** 4 bit Asynchronous Up Counter –Mod N counter – Decade counter – 4 bit Synchronous up counter **4.8: SHIFT REGISTER** 4 bit shift register – Serial in Serial out	**1** **1** **1** **1** **1** **2** **3** **2**

V	**MEMORIES** **5.1: CLASSIFICATION OF MEMORIES** **5.2:RAM** RAM organization-Address Lines and Memory Size- Read/write operations-Static RAM-Bipolar RAM cell- Dynamic RAM- SD RAM- DDR RAM. **5.3:ROM** ROM organization-Expanding memory- PROM- EPROM- and EEPROM- Flash memory- Anti Fuse Technologies.	**6** **6**

TEXT BOOKS:

1. Roger L. Tokheim Macmillan – Digital Electronics – McGraw – Hill –1994.
2. D.Roychoudhury & shail. B.Jain- Linear Integrated Circuits -New age International publishers - II Edition -2004.

REFERENCE BOOKS:

1. Albert Paul Malvino and Donold P. Leach – Digital Principles and Applications
2. William H.Goth Mann – Digital Electronics – An introduction to theory and practice – PHI 1998.
3. Linear Integrated Circuits by B.Suseela & T.R.Ganesh babu -Scitech publications-2018
4. Integrated circuits by K.R.Botkar-Khanna publisher's-1996.
5. R.P.Jain – Modern Digital Electronics – TMH 2003.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology

Subject Code : 4020440

Semester : VI

Subject Title : E - VEHICLE TECHNOLOGY & POLICY

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
E - VEHICLE TECHNOLOGY AND POLICY	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Environmental impact and history& Electric vehicle Types	12
II	Electric vehicle & Drive System	12
III	Energy Storages, Charging System, Effects and Impacts	12
IV	Electric Mobility Policy Frame work India	11
V	Tamilnadu E-Vehicle Policy 2019	10
Test & Model Exam		7
Total		64

RATIONALE

The world is transitioning to cleaner mobility options with the aim at improving air quality and reducing dependency on fossil fuels. Electric Vehicles (EVs) have emerged a popular clean mobility choice to reduce emissions. EVs are powered fully or partially by batteries, they can help to reduce dependence on fossil fuels also air quality. Tamil Nadu is one of the most advanced states in India. Tamil Nadu has a highly developed industrial eco-system and is very strong in sectors like automobiles and auto-components. Many globally renowned companies have setup their manufacturing facilities in Tamil Nadu. Due the rapid depletion of fossil fuel and increase in fuel cost, environmental pollution, the shift to clean transport is necessary. This subject introduced by keeping all the above factors.

OBJECTIVES

1. To learn the environmental impact and history of Electric Vehicles.
2. To understand the concept of Electric Vehicle and its types.
3. To study the configurations of Electric Vehicles
4. To acquire knowledge about Energy Storages, Charging System, Effects and Impacts
5. To appreciate the Electric Mobility Policy Frame work India and EV Policy Tamil Nadu 2019.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Environmental impact and history& Electric vehicle Types:** Environmental impact and history: Air pollution – Petroleum resources – History of Electric vehicles - History of Hybrid Electric Vehicles – Historyof Fuel Cell Vehicles – Hybrid electric Vehicle (HEV) - Plug-in Hybrid Electric Vehicle (PHEV) - Battery Electric Vehicle (BEV) – Fuel Cell Electric Vehicle (FCEV) – Description.	12
II	**Electric vehicle & Drive System:** Electric Vehicles: Configurations of Electric Vehicle – Performance ofElectric Vehicles— Tractive Effort in Normal Driving — Energy Consumption. Hybrid Electric Vehicles: Concept of Hybrid Electric Drive Trains – Architecture of Hybrid Electric Drive Trains. Electric Propulsion Systems: Drive Systems: DC Motor Drives - Principle of Operation – Induction Motor Drives - Basic Operation Principles – Permanent Magnetic Brush Less DC Motor Drives – Principles – Construction and Classification.	12
III	**Energy Storages, Charging System, Effects and Impacts:** Energy Storages: Electrochemical Batteries – Battery Technologies – Lead Acid Batteries – Nickel Based Batteries – Lithium Based Batteries – Charging system –DC charging – Wireless charging – Power conversiontechniques. Effects of EV — Impacts on Power grid — Impacts on Environment — Impacts on Economy.	8 4
IV	**Electric Mobility Policy Frame work India:** Government of India Electric Mobility Policy Frame Work – Global Scenario of EV Adoption – Electric Mobility in India – National Electric Mobility Mission Plan 2020 –Action led by Original Equipment Manufacturers – Key Performance Indicator - Global Impact – Trends and Future Developments.	11

V	**Tamilnadu E-Vehicle Policy 2019:** Tamilnadu E-vehicle Policy 2019: Vehicle Population in Tamilnadu – Need of EV Policy — Advantage of EV Eco system — Scope and Applicability of EV Policy – Objectives of EV Policy – Policy Measures –Demand Side Incentives – Supply Side Incentives to promote EV. Manufacturing – Revision of Transport Regulation of EV – City Building Codes — Capacity Building and Skilling — Charging Structure — Implementing Agencies – R&D and Business Incubation – Recycling Ecosystem – Battery and EVs.	5 5

TEXT BOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York.
2. Comparison of Electric and Conventional Vehicles in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Vehicle (IJSR),Akshat Bansal, Akriti Agarwal

REFERENCE BOOKS:

1. A Comprehensive Study of Key Electric Vehicle (EV) Components, Technologies, Challenges, Impacts, and Future Direction of Development (MDPI), Fuad Un-Noor, Sanjeevi kumar Padmanaban, Lucian Mihet-Popa, Mohammad NurunnabiMollah and Eklas Hossain.
2. Electric Vehicles: A future Projection CII October 2020 report.
3. Design and analysis of aluminum/air battery system for electric vehicles, Shaohua Yang, Harold Knickle, Elsevier.
4. Propelling Electric Vehicles in India, Technical study of Electric Vehicles and Charging Infrastructure
5. Zero Emission Vehicles (Zevs): Towards A Policy Framework – Niti Aayog.
6. Faster Adoption of Electric Vehicles in India: Perspective of Consumers and Industry, The Energy and Resources Institute, New Delhi.
7. India EV Story: Emerging Opportunities by Innovation Norway.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME
(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030450

Semester : IV

Subject Title : Electrical Machines and Instrumentation Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL MACHINES AND INSTRUMENTATION PRACTICAL	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

RATIONALE:

- To impart practical knowledge to the Diploma Students, Practical's are introduced for every corresponding Theory Subject.
- This Practical Subject supports the Aim and Objective of Electrical Machines II and Measurements and Instruments subjects.

OBJECTIVES:

On completion of this practical Subject the Students will be able to:

- Understand the characteristics of AC Machines.
- Make various Electrical Measurements.
- Use Transducers in Non-Electrical Quantity Measurement

DETAILED SYLLABUS

Contents: Practical

Name of the Topics: Electrical Machines and Instrumentation Practical

Exercise:

1. Predetermine the Regulation of Alternator.
2. Load test on 3 Phase Alternator.
3. Synchronization of 3 Phase Alternator
4. Load test on Single Phase Induction Motor.
5. Load test on 3 Phase Induction Motor.
6. Determine the Equivalent Circuit Constants of 3 Phase Induction Motor.
7. Predetermine the performance of a 3 Phase Induction Motor.
8. Improvement of Power Factor of an Induction Motor with load.
9. Calibration of given Ammeter and Voltmeter.
10. Calibration of given Wattmeter.
11. Calibration of 3 Phase Energy Meter.
12. Measurement of Alternator Winding Resistance using Wheatstone Bridge
13. Measurement of value of unknown Capacitance using Schering Bridge.
14. Measurement of value of unknown Inductance using Anderson Bridge.
15. Displacement measurement using LVDT.
16. Measurement of earth Resistance by using Megger.

LIST OF EQUIPMENTS (For a Batch of 30 Students)

S.NO	NAME OF TH EQUIPMENTS	QUANTITY REQUIRED
1.	Three Phase Squirrel Cage Induction motor 5 HP, 440V,1440 rpm with starting and loading arrangement	2
2.	Three Phase Squirrel Cage Induction motor 5 HP,440V,1440 rpm without starting and loading arrangement	1
3.	Three phase Slip ring Induction motor 5HP, 440V, 940/1450 rpm with starting and loading arrangement	1
4.	Single phase induction motor with staring and loading arrangement 2HP, 250V, 10A, 1440 rpm.	1
5.	Wheatstone bridge.	2
6.	Anderson Bridge.	2
7.	Schering Bridge.	2
8.	1 Phase Energy meter induction type, 250V, 10A.	2
9.	3 Phase Energy meter Induction type 440V, 10/20A.	2
10.	Earth megger with necessary connecting leads and rods.	1
11.	3 phase Alternator with prime mover.	2
12.	Synchronizing panel.	1
13.	PF meter (power factor meter).	2
14.	LVDT trainer.	2
15.	3 phase capacitor bank rating of 1KVAR, 400/440 V.	1

DETAILLED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Circuit Diagram	30
2	Connections And Conduction of the Experiment	30
3	Reading/Calculation	20
4	Graph/Result	15
5	Viva Voce	05
	Total	100

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject code : 4040460

Semester : IV

Subject title : ANALOG AND DIGITAL ELECTRONICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
ANALOG AND DIGITAL ELECTRONICS PRACTICAL	**5**	**80**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

Every Electronic Engineer should have sound knowledge about the ICs used in Electronics Industry. This is vital in R&D Department for Chip level troubleshooting. To meet the industrial needs, diploma holders must be taught about the most fundamental subject, Analog and Digital Electronics Practical. By doing practical experience in this, they will be skilled in handling all types of ICs and able to apply the skill in electronic system design and the designing of PCBs.

OBJECTIVES:

On completion of the following experiments, the students must be able to

- Know the Verification of truth table of OR, AND, NOT, NOR, NAND, EX-OR gates
- Know the Realization of basic gates using NAND & NOR gates.
- Know the verification of Half Adder and Full Adder using IC's.
- Know the verification of Half Subtractor and Full Subtractor using IC's.
- Know the Verification of Truth Table for Decoder/Encoder.

- Know the Verification of truth table for RS, D, T & JK flip-flop.
- Test Inverting Amplifier and Non inverting amplifier using Op-amp
- Test Summing Amplifier, Difference Amplifier and Voltage Comparator using Op-amp.
- Test Integrator and Differentiator.
- Test Astable multivibrator using IC 555
- Design IC Voltage Regulator Power Supplies using IC 7805, IC 7912
- Design the PCB of 4- bit ripple counter using FF

4040460 ANALOG AND DIGITAL ELECTRONICS PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

Note: At least 6 experiments should be constructed using breadboard

1. Realization of basic gates using NAND & NOR gates.
2. Realization of logic circuit for De-Morgans Theorems
3. Test the performance of Half Adder and Full Adder.
4. Test the performance of Half Subtractor and Full Subtractor.
5. Test the performance of Decoder/Encoder.
6. Test the performance of RS, D, T & JK flip-flops.
7. Test the performance of Parity generator and checker using parity checker/ generator IC's.
8. Test the performance of Multiplexer/De-multiplexer using IC 4051
9. Test the performance of Inverting Amplifier and Non inverting amplifier using Op-amp IC 741.
10. Test the performance of Summing Amplifier, Difference Amplifier.
11. Test the performance of Zero Crossing Detector and Voltage Comparator using Op-amp IC 741.
12. Test the performance of Integrator and Differentiator using Op-amp IC 741.
13. Test the performance of Astable multivibrator using IC 555.
14. Test the performance of IC Voltage Regulator Power Supplies using IC 7805, IC 7912.
15. Design the PCB of 4- bit ripple counter using FF using Software tool Multisim/OrCAD

DETAILED ALLOCATION OF MARKS

S.No.	NAME OF THE ACTIVITY	MARK ALLOCATION
1	CIRCUIT DIAGRAM	25
2	CONNECTION	30
3	EXECUTION & HANDLING OF EQUIPMENT	20
4	OUTPUT / RESULT	15
5	VIVA – VOCE	10
	TOTAL	100

LIST OF EQUIPMENTS (For a Bach of 30 Students)

S. NO	Name of the Equipments	Range	Required Nos
1	DC Regulated power supply	0-30V,1A	5
2	IC Voltage Power Supply	0-5V,1A 15-0-15V, 1A	5 5
3	Signal Generator	1MHz	4
4	Dual trace CRO	20MHz/ 30MHz	5
5	Digital Trainer	-	10
6	DC Voltmeter (Analog/Digita)	Different Ranges	5
7	DC Ammeter (Analog/Digital)	Different Range	5
8	Desk Top Computer	-	5
9	Simulation Tool	Multisim/OrCAD	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030470

Semester : IV

Subject Title : Electrical Circuits and Simulation Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL CIRCUITS AND SIMULATION PRACTICAL	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

RATIONALE

All the Engineering applications are simulated through Computers. They are tested and then built using real components for commercial implementation. Simulation Software is available for all Engineering Fields. Hers is an attempt to impart the knowledge of using Simulation Software for realizing some of the Electrical and Electronics Circuits for the Diploma students.

OBJECTIVES

On Completion Of This Practical subject, the Students will be able to know :

- ✓ The Various Aspects of Simulation Software
- ✓ Simulate and Test the Simple Electrical and Electronics Circuits
- ✓ Simulate and Test the Wave Generating Circuits

- ✓ Simulate and Prove the Simple Theorems
- ✓ Simulate and Test the Performance Characteristics of Converters
- ✓ Design and Verify the Results of Various Electric Circuits Using Simulation Software

DETAILED SYLLABUS

Contents: Practical

Name of the Topics: Electrical Circuits and Simulation Practical

Exercise

1. Generate the following waveforms
   (i) Sinusoidal waveform of Fundamental Frequency (50Hz)
   (ii) 3^{rd} Order, 5^{th} Order and 7^{th} Order Harmonics for the Fundamental frequency.
2. Simulation of RLC series and RLC Parallel Response Circuits.
3. Step Response of RL and RC Series Circuit.
4. Simulation of Mesh and Nodal analysis for DC Circuits.
5. Verification of Superposition Theorem.
6. Verification of Thevenin's and Norton's Theorem.
7. Verification of Maximum Power Transfer Theorem.
8. Simulation of Full Wave Rectifier (Center Tapped and Bridge) with RL load.
9. Simulation of Single-Phase Half Wave Controlled Converter with RL Load and FreeWheeling Diode.
10. Simulation of Single-Phase Full Wave Controlled Converter with RL Load and FreeWheeling Diode.
11. Simulation of Three Phase Star Connected Balanced and Unbalanced Load
12. Simulation of Three Phase Delta Connected Balanced and Unbalanced Load
13. Simulation of Three Phase Non-Linear Star Connected Load with Three Phase 3 WireSystem.
14. Simulation of Three Phase Non-Linear Star Connected Load with Three Phase 4 Wire System.
15. Simulation basic Logic Gates, Universal Logic Gates and Realization of Logic Gates usingUniversal Logic Gates.
16. Simulation of Half Adders and Full Adder.

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No.	LISTOFEQUIPMENTS	QUANTITYREQUIRED
1.	PC with any suitable simulation software	30
2.	UPS 5KVA with half an hour battery backup	1
3.	Printer	1

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Circuit Diagram (Manual Diagram)	30
2	Development of circuit diagram	30
3	Simulation Performance & print out	35
4	Viva Voce	05
	Total	100

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030510

Semester : V Semester

Subject Title : GENERATION, TRANSMISSION AND SWITCH GEAR

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
GENERATION, TRANSMISSION AND SWITCHGEAR	5	80	25	100*	100	3 Hrs.

Examinations will be conducted for 100 marks and it will be reduced to 75 Marks.

Topics and Allocation of Hours

Unit	Topic	Hours.
I	Generation of Electrical Power	16
II	A.C. And H.V.D.C Transmission	14
III	FACTS, Line Insulators and Underground Cables	14
IV	Circuit Breakers and Over Voltage Protection	14
V	Protective Relays and Grounding	15
Test & Model Exam		7
Total		**80**

RATIONALE

Energy is the basic necessity for the Economic Development of a Country and also there is a growing impulse towards green and reduction in the use of Fossil Fuels. As a matter of fact, there is a close relationship between the Energy used per person and his standard of living. The Modern Society is so much dependent upon the use of Electrical Energy that it has become a part of our life. So, to have adequate knowledge in Electrical Power Generation and Transmission, Switch Gear and efficiency associated with them, it becomes necessary to include this subject.

OBJECTIVES

To Understand

- Conventional Power Plants-Layout and choice of site
- Renewable Energy Sources and Power Generation
- A.C Transmission-Supports, Conductors, Effects, Regulation and Efficiency
- H.V.D.C Transmission
- FACTS, Line Insulators and Underground Cables
- Circuit Breakers, Protective Relay and Lightning Arresters

DETAILED SYLLABUS

Contents: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**GENERATION OF ELECTRICAL POWER** Introduction- Conventional methods of power generations — schematic arrangement and choice of site for Hydro, Thermal, Nuclear power plants-Advantages and Disadvantages-comparison of these power plants - Principle and types of co-generation.	4
	Schematic arrangement of Diesel, Gas, Pumped storage schemes-Advantages and Disadvantages-Grid or Inter connected system-Advantages of Inter connected systems- Load Transfer through Inter connector-Load curves and Load duration curves-connected load-Average load-Maximum Demand Factor- Plant capacity factor-Load factor and its significance-Diversity factor-Simple problems- Load sharing between base load and peak load plants.	10
	Renewable Energy sources- Basic principle of Solar Energy, Wind Power Generation-Hybrid Renewable Energy Systems.	2

II	**A.C. AND H.V.D.C TRANSMISSION** **A.C. Transmission:** Introduction-Typical Layout of A.C. Power supply scheme -Advantages and Disadvantages of A.C Transmission- High Transmission Voltage-Advantages-Economic choice of Transmission voltage-Elements of a Transmission Line-over Head Line-Conductor materials and their properties-Line supports-its properties-Types of supports and their applications-spacing between conductors-length of span-Sag in overhead lines-Calculation of Sag-When the supports are at equal and unequal levels- Problems- Effect of wind and ice loading over the line conductor (Qualitative treatment only) - constants of a Transmission line- Transposition of Transmission lines-Skin Effect- Ferranti Effect-Corona formation and corona loss-Factors affecting corona-Advantages and Disadvantages –Classification of O.H Transmission lines-Performance of single phase short transmission line-voltage regulation and Transmission Efficiency-Problems. **H.V.D.C Transmission:** Advantages and Disadvantages of D.C Transmission- Layout Scheme and principle of High Voltage D.C Transmission-D.C link configurations (Monopolar, Bipolar and Homopolar)-HVDC convertor Station (Schematic diagram only).	10 4

III	**FACTS, LINE INSULATORS AND UNDERGROUND CABLES:** Definition-Need for FACTS controllers- types of FACTS controllers-SVS-STATCOM-UPFC (block diagram explanation only) **Line Insulators:** Introduction - Line Insulator Materials-Properties of Insulators- Types & causes of failure of Insulators-Testing of Insulators-Potential Distribution over suspension Insulator String-String Efficiency - Methods of improving string efficiency- problems. **Underground cables:** Introduction-Advantages and requirement of cables-construction of a three-core cable-Insulating materials for cables- properties of Insulating materials used in cables-classification of cables- cables for three phase service-construction of Belted cable, screened cable, pressure cables-Laying of underground cables-Direct laying, Drawing system, Advantages and Disadvantages.	7 7
IV	**CIRCUIT BREAKERS AND OVER VOLTAGE PROTECTION** Switch gear-Essential features of Switch gear-faults in a Power system (definition only). **CIRCUIT BREAKERS:** Basic principle of circuit Breaker -Arc Phenomenon- methods of Arc Extinction-Arc voltage –Re-striking voltage and recovery voltage-Rate of rise of re-striking voltage C.B ratings – Breaking capacity, making capacity, short time rating - Auto reclosing in circuit Breakers - Classification of Circuit Breakers — Construction and Working principle of Air Circuit Breakers, E.L.C.B, Residual current circuit breaker SF6 and vacuum Circuit Breaker Maintenance of Circuit Breakers – Rupturing capacity of circuit breaker-conditions to trip – Auto reclose breaker – Fault clearance time – Inverse time overload relay – Maintenance Requirement for oil circuit breakers – SF6 Circuit Breakers. **FUSES**- L.V fuses- Re-wirable fuse, HRC fuse-H.V. fuses & Cartridge Type, Liquid Type and Metal Clad-Fuses. **OVER VOLTAGE PROTECTION:** Voltage surge- causes of over voltage-Lightning-Types of lightning strokes -	7 3 4

	Direct stroke, indirect stroke-Harmful Effects of lightning Protection against lightning- Earthing screen, overhead ground Wires, Lightning arresters- Expulsion type, Gapless arrester.	
V	**PROTECTIVE RELAYS AND GROUNDING** **PROTECTIVE RELAYS:** Basic principle-Fundamental requirements of protective relaying- Primary and back up Protection-relay characteristics-relay timing - Instantaneous relay -Inverse time relay and Definite time lag relay- Inverse definite minimum time relay -classification of relays-Construction, Principle of operation and applications of Induction type over current relay (Directional and Non-directional), Differential relay. Static relays- Basic elements of static relay-Over Current-Distance relay (Block diagram explanation only). **GROUNDING:** Introduction-Equipment grounding- system grounding- ungrounded neutral system-Necessity of Neutral grounding — Methods- solid grounding Resistance grounding, Reactance grounding, Resonant grounding.	10 5

TEXT BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	Principles of PowerSystem	V.K.Metha	S.Chand & Company, NewDelhi	4th Edition Reprint 2007

REFERENCE BOOK

Sl. No	Name of the Book	Author	Publisher	Edition
1.	Electrical Power System	CLWadhawa	New Age International, New Delhi	Fourth Edition, 2009
2.	A Course in Electrical Power	Soni, Gupta	DhanpathRai&Co (P) Ltd, New Delhi	
3.	Electrical Power	S.L Uppal	Khanna Delhi Publishers	

4.	A Course in Electrical Power	J.B. Gupta	Kaison Publishing House	Reprint 2004
5.	HVDC Power Transmission System & Technology	KR. Padiyar	New Age International, New Delhi	Reprint 2005
6.	Digital Protection – Protective Relaying from Electromechanical to Microprocessor	LP Singh	New Age International	Second Edition 1997
7.	Power System Protection and Switchgear	B Ram & DN Viswakarma	TMH 1995	Reprint 2000
8.	Thyristor-Based Facts Controllers for Electrical Transmission Systems	Mohan Mathur.R., Rajiv. K.Varma,	IEEE press and John Wiley & Sons, Inc., New	2005
9.	Understanding FACTS - Concepts and Technology of Flexible AC Transmission Systems	Narain G. Hingorani, Laszio. Gyugyi	Standards publishers, New Delhi	2001

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040520

Semester : V

Subject Title : MICROCONTROLLER AND ITS APPLICATIONS

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
MICROCONTROLLER AND ITS APPLICATIONS	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Architecture of 8051 Microcontroller	15
II	8051 Instruction set and Programming	16
III	Peripherals of 8051	15
IV	Interfacing techniques	16
V	Advanced Microcontrollers	11
Test & Model Exam		7
Total		**80**

RATIONALE:

The introduction of this subject will enable the students to learn about microcontroller 8051 architecture, Pin details, Instruction sets, Programming and interfacing. This subject enables the students to do the project effectively. It also helps the students to choose the field of interest. If the student is aiming for higher studies, this subject is foundation.

OBJECTIVES:

On completion of the syllabus, the students must be able to

-> Know the difference between microprocessor and microcontroller.

-> Understand the architecture of 8051.

-> Write programs using 8051 ALP.

-> Understand the programming of I/O ports, Timer, Interrupt and Serial Programming.

-> Use the interfacing techniques

-> Know the types of microcontrollers

-> Explain IoT.

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DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Architecture Of 8051 Microcontroller** **1.1 : Architecture** Microprocessor-Microcontroller-Comparison of microprocessor and microcontroller-Architecture diagram of microcontroller 8051-Functions of each block-Pin details of 8051-ALU- ROM-RAM-Memory organization of 8051- Special function registers-Program counter-PSW register-Stack-I/O ports-Timer-Interrupt-serial port-External memory- Oscillator and Clock-Reset-Power on reset-Clock cycle-machine cycle-Instruction cycle-Overview of 8051 family.	15
II	**8051 Instruction set and programming** **2.1: Instruction Set Of 8051** Instruction set of 8051-Classification of 8051 instructions-data transfer instructions - Arithmetic Instructions-Logical Instructions-Branching Instructions-Bit manipulation instructions- Assembling and running an 8051 program-Structure of Assembly Language-Assembler Directives-Different Addressing modes of 8051-Time delay routines. **2.2: Assembly language programs** 16-bit addition and 16-bit subtraction-8-bit multiplication and 8 bit division-BCD to HEX code conversion-HEX to BCD code conversion. - Smallest number/ Biggest number.	8 8
III	**Peripherals of 8051** **3.1: I/O Ports** Bit addresses for I/O ports-I/O port programming-I/O bit manipulation programming. **3.2: Timer/Counter** SFRS for Timer- Modes of Timers/counters- Programming 8051 Timer (Simple programs). **3.3: Serial Communication** Basics of serial communication-SFRs for serial communication-RS232 standard-8051 connection to RS 232-8051 serial port programming.	3 4 4

	3.4: Interrupts 8051 interrupts-SFRs for interrupt-Interrupt priority.	4
IV	**Interfacing Techniques** **4.1: IC 8255** IC 8255-Block Diagram-Modes of 8255-8051 interfacing with 8255 **4.2: Interfacing** Interfacing external memory to 8051-Relay interfacing- Sensor interfacing -Seven segment LED display interfacing-Keyboard Interfacing-Stepper motor interfacing-ADC interfacing- DAC interfacing-DC motor interfacing using PWM-LCD interfacing.	3 13
V	**Advanced Microcontrollers** **5.1: Types of microcontrollers** PIC microcontroller-General Block diagram-Features-Applications-Arduino- General Block diagram-Variants-Features-Applications-Raspberry pi-General Block diagram-Features-Applications-Comparison of microcontrollers. **5.2: IoT** Introduction to IoT-Block diagram of home automation using IoT.	8 3

TEXT BOOKS:

1. ”Ajit pal” “Microcontrollers, Principles and Applications ”,PHI Ltd,-2011.
2. ”Mazidi,Mazidi and D.MacKinlay” “8051 Microcontroller and Embedded Systems using Assembly and C”,2006 Pearson Education Low Price Edition.

REFERENCE BOOKS:

1. ”R. Theagarajan” “Microprocessor and Microcontroller”, Sci Tech Publication, Chennai.
2. www.microchip.com, www.raspberrypi.org,www.arduino.org.
3. “J.B. Peatman” ”Design with PIC microcontrollers”.
4. ”Michael McRoberts”, ”beginning Arduino.
5. ”Matt Richardson”, ”Getting started with Raspberry Pi”.
6. 8.”Samuel Greengard”, ”The Internet of Things”.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030511

Semester : V

Subject Title : CONTROL OF ELECTRICAL MACHINES

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
CONTROL OF ELECTRICAL MACHINES	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Control Circuit Components	16
II	Motor Control Circuits	15
III	Industrial Control Circuits	14
IV	Programmable Logic Controller	14
V	PLC Programming and SCADA	14
	Test & Model Exam	7
	Total	**80**

RATIONALE

The Energy Conversion between Electrical and Mechanical Systems is performed by the Control of Electrical Machines in both directions.

Various Control Operations are to be performed on the Electrical Machines to meet the Industrial requirements. Especially Technicians are mainly employed to look after the control Panels. To make our students Employable, they have to be trained in using various Control Components and Circuits. This subject fulfills the requirement.

OBJECTIVES

At the end of the Semester the Students must be able to understand theconcepts of:

1. Electrical Control Circuit Elements including Various Types of Industrial Switches, Relays, Timers, Solenoids, Contactors and Interlocking arrangements.
2. DC Motor and AC Motor Control Circuits for Acceleration Control, Speed Control, Direction Control, Braking Control and jogging using Contactors.
3. Different Control Circuits for Industrial Applications.
4. Basics of Programmable Logic Controllers.
5. PLC Programming and SCADA.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**CONTROL CIRCUIT COMPONENTS** Switches – Push Button, Selector, Drum, Limit, Pressure, Temperature (Thermostat), Float, Zero Speed and Proximity Switches. Relays — Voltage Relay, DC Series Current Relay, Frequency Response Relay, Latching Relay and Phase Failure Relay (Single Phasing Preventer). Over Current Relay — Bimetallic Thermal Over Load Relay and Magnetic Dash Pot Oil Filled Relay. Timer — Thermal Pneumatic and Electronic Timer. Solenoid Valve, Solenoid Type Contactor (Air Break Contactor), Solid State Relay, Simple ON-OFF Motor Control Circuit, Remote Control Operation and Interlocking of Drives.	10 6
II	**MOTOR CONTROL CIRCUITS** **CHAPTER: 2.1: DC MOTOR CONTROL CIRCUITS** Series Relay and Counter EMF Starters – Field Failure Protection – Jogging Control, Dynamic Braking **CHAPTER: 2.2:AC MOTOR CONTROL CIRCUITS** DOL Starter – Automatic Auto Transformer Starter (Open Circuit and Closed-Circuit Transition) – Star/Delta Starter (Semi-Automatic and Automatic) – Starter for Two Speed Two Winding Motor – Reversing the Direction of Rotation of Induction Motor – Dynamic Braking – Three Step Rotor Resistance Starter for Wound Induction Motor – Secondary Frequency Acceleration Starter.	3 12
III	**INDUSTRIAL CONTROL CIRCUITS** Planner Machine Control – Skip Hoist Control – Automatic Control of a Water Pump – Control of Electric Oven – Control of Air Compressor – Control of Over Head Crane - Control of Battery-Operated Truck – Control of Conveyor System – Control of Elevator - Trouble Spots in Control Circuits – General Procedure for Trouble Shooting.	14

IV	**PROGRAMMABLE LOGIC CONTROLLER** Automation — Types of Automation (Manufacturing and Non-Manufacturing) – Advantages of Automation –PLC Introduction – Block Diagram of PLC–Principle of Operation–Modes of Operation– PLC Scan–Memory Organization–Input Module (Schematic and Wiring Diagram) – Output Module (Schematic and Wiring Diagram). Types of Programming Devices – Comparison between Hardwire Control System and PLC System –PLC Types (Fixed and Modular) — Input Types — Output Types – Criteria for Selection of Suitable PLC – List of Various PLCs available.	7 7
V	**PLC PROGRAMMING AND SCADA** Different Programming Languages – Ladder Diagram – Relay Type Instruction — Timer Instruction — ON Delay and OFF Delay Timer — Retentive Timer Instruction – Cascading Timers – Counter Instruction UP Counter — Down Counter — UP/DOWN Counter - Ladder Logic Diagram for DOL Starter, Automatic STAR-DELTA Starter - Rotor Resistance Starter and EB to Generator Change over System. Supervisory Control Data Acquisition System (SCADA) – Block Diagram of SCADA, Features and Functions of SCADA – Introduction to DCS.	7 7

TEXT BOOKS:

1. "S.K.Battacharya" "Control of Electrical Machines", New Age International Publishers, New Delhi

REFERENCE BOOKS:

1. "Pradeep Kumar, Srivastava" Exposing Programmable Logic Controllers with Application", BPB Publications
2. "Stephen Herman" Industrial Motor Control", 6th Edition, Cengage Learning
3. "David Bailey, Edwin Wright" "Practical SCADA for Industry", Newnes Publishers

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030512

Semester : V

Subject Title : PROGRAMMABLE LOGIC CONTROLLER

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
PROGRAMMABLE LOGIC CONTROLLER	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Introduction to PLC	16
II	**I**nput / Output Modules	15
III	PLC Programming	14
IV	Networking	14
V	Data Acquisition Systems	14
Test & Model Exam		7
Total		80

RATIONALE

Various control operations are to be performed automatically and sequentially on the electrical machines to suit the industrial requirements. Programmable controllers are mainly employed to control the process in industries. In order to impart knowledge on programmable Logic Controller this theory subject is introduced.

OBJECTIVES

Unit: 1

After completing this chapter, students should able to:

- ✓ Explain the meaning of automation and List the types of automation
- ✓ Define PLC and Explain why their use is valuable
- ✓ Explain what PLC can do
- ✓ Compare fixed and modular PLC
- ✓ Explain the advantages of PLC
- ✓ Explain the functions of various elements of power supply unit

Unit: 2

After completing this chapter, students should able to:

- ✓ Know the difference between digital and analog input and output signals
- ✓ Observe how digital field device information gets into a PLC
- ✓ Observe how analog field device information gets into a PLC
- ✓ Understand I/O addresses and how they are used in a PLC

Unit: 3

After completing this chapter, students should able to:

- ✓ Describe PLC timer instruction and differentiate between a non-retentive and retentive timer
- ✓ Program the control of outputs using the timer instruction
- ✓ List and describe the functions of PLC counter instructions
- ✓ Create PLC programs involving program control instructions, math instructions

Unit: 4

After completing this chapter, students should able to:

- ✓ Explain the functionality of different levels of industrial network
- ✓ Explain the concept of network topology and network protocols
- ✓ Explain the concept of I/O bus networks etc.,

Unit: 5

After completing this chapter, students should able to:

- ✓ Describe the computer control of process
- ✓ Explain the operation of SCADA
- ✓ Explain the functions of the major components of a process control system
- ✓ Explain how on/off control and PID control work.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**INTRODUCTION TO PLC:** Automation – Types of Automation (Manufacturing and Non-Manufacturing) – Advantages of Automation - PLC Introduction - Definition – Block diagram of PLC – Principle of Operation – Modes of Operating System – PLC Scan - Hardwire Control System compared with PLC System - Advantages and Disadvantages of PLCs. Criteria for selection of suitable PLC –Memory Organization – Input Types – Discrete input – Analog in/out - Elements of Power Supply Unit - PLC Types (Fixed I/O and Modular I/O) - List of various PLCs available –Applications of PLC.	**10** **6**
II	**INPUT/OUTPUT MODULES** The I/O Section - Discrete I/O Modules (DC and AC) – Analog I/O Modules - Special I/O Modules– I/O Module Specification - Typical Discrete and Analog I/O field Devices –Sensors — Limit Switch– Reed Switch — Proximity Sensor (Inductive and Capacitive). Types of Photo Electric Sensor - Sinking and Sourcing I/O Modules– TTL Output Module — Relay Output Module –Isolated Output Module –Input /Output Addressing Scheme in important commercial PLCs.	7 8

III	**PLC PROGRAMMING** Types of Programming Methods – Types of Programming Devices – Logic Functions – AND Logic – OR Logic – NOT Logic - Relay Typeinstructions –Timer Instructions – ON Delay and OFF Delay Timer. Retentive Timer Instruction — Cascading Timers — Counter Instruction – UP Counter – DOWN Counter – UP/DOWN Counter – Cascading Counters — Program Control Instructions –Data Manipulation Instruction – Data Compare Instructions – Math Instructions - Sequencer Instructions - PID Instruction – PWM Function – Simple programs using above instructions. Develop ladder logic for: Bottle Filling System – Automatic Car Parking System - EB To Generator Changeover System – Batch Process – Elevator System -DOL Starter- Automatic Star-Delta Starter – Traffic Light Control.	**4** **5** **5**
IV	**NETWORKING** Levels of Industrial Network – Network Topology –Network Protocol – OSI Reference Model - Networking with TCP / IP Protocol - I/O Bus networks – Block diagram of I/O Bus networks – Types of I/O Bus networks. Protocol standards — Advantages of I/O Bus networks - Gateway — Token passing — Data Highway — Serial Communication – Device Net – Control Net – Ethernet – Modbus –Fieldbus — Profibus- Sub Netting — Subnet mask - File transfer protocol.	**7** **7**
V	**DATA ACQUISITION SYSTEMS** Computers in Process Control – Types of Processes - Structure of Control system — ON/OFF Control — Closed loop Control - PID Control – Motion Control –Block diagram of Direct Digital Control. Supervisory Control and Data Acquisition (SCADA)– Block diagram of SCADA – Features of SCADA – Functions of SCADA - SCADA software - Data Loggers – Tags – Alarms - landlines for SCADA – use of modems in SCADA.	**7** **7**

TEXT BOOK:

S.No	Name of the Book	Author	Publisher	Edition
1	Introduction to Programmable Logic Controllers	Gary Dunning	Cengage Learning India PvtLtd — Third Edition 2011	
2	Technician's Guide to Programmable Logic Controllers	Richard A. Cox	Delmer — Sixth Edition 2011	
3	Programmable Logic Controllers – Principle andApplications	John W. Webb	Prentice Hall	
4	Programmable Logic Controllers – ProgrammingMethods and Applications	John R Hackworth and Fredrick D. Hackworth	Pearson Education	
5	Programmable Logic Controllers	W. Bolton	Newness	
6	Programmable Controller Theory and Implementation	L.A.Bryan E.A.Bryan	An Industrial Text Company Publication – Second Edition 1997	

REFERENCE BOOKS:

S.No	Name of the Book	Author	Publisher	Edition
1	Programmable Logic Controllers	Frank D.Petruzella	Tata McGraw Hill Edition-Fourth Edition 2011	
2	Practical SCADA for industry	David Bailey Edwin Wright	Newnes	

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030513

Semester : V

Subject Title : **Elective Theory I:** RENEWABLE ENERGY SOURCES

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
RENEWABLE ENERGY SOURCES	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Fundamentals of Energy Systems and Solar Radiation	16
II	Solar Thermal Conversion and Solar PV Systems	15
III	Wind, Tidal and Wave Energy	14
IV	Bio – Energy	14
V	Geothermal and Oceanic Energy	14
Test & Model Exam		7
Total		80

RATIONALE

Electrical Energy requirement is the major crisis and hence any saving in Electrical energy is equivalent to production of Electrical Energy. Saving can be achieved by the utilization of Renewable Energy Sources.

OBJECTIVES

- Study about the fundamentals of Energy.
- Study the applications of solar energy for thermal and powergeneration.
- Understand the concept of wind, tidal and wave energies and theirapplications.
- Understand the Bio energy sources and energy conversion technologies.
- Understand the development of geothermal energy and OTEC principle.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**FUNDAMENTALS OF ENERGY SYSTEMS AND SOLAR RADIATION** 1.1. FUNDAMENTALS OF ENERGY SYSTEMS: Introduction to Energy - Energy consumption and standard of living - classification of Energy Resources-consumption trend of Primary Energy Resources-importance of Renewable Energy Sources- Energy for Sustainable Development. - Various Forms of Renewable Energy 1.2 SOLAR RADIATION: Outside Earth's Atmosphere – Earth Surface —Analysis of Solar Radiation Data — Geometry — Measurement of Solar Radiation – Solar Radiation Data in India.	**8** **8**
II	**SOLAR THERMAL CONVERSION AND SOLAR PV SYSTEMS** 2.1 SOLAR THERMAL APPLICATIONS: Solar Collectors - Flat Plate Collectors- Concentrating Collectors - Comparison of Collectors - Selection of Collector for Various Applications - Solar Water Heaters - Solar Industrial Heating System — Solar Cookers - Solar Pond Electric Power Plant. 2.2. SOLAR PV SYSTEMS: A Brief History of PV, PV in Silicon: Basic Principle, Classification of PV Cells - Equivalent Circuit and Electrical Characteristics of Silicon PV Cells — Series Parallel Connections of Solar Cells - Solar PV Array and Solar Panel - Solar Panel Applications - Grid Connected PV System – Stand Alone Solar PV Power Plant – Hybrid Solar PV System.	**7** **8**

III	**WIND, TIDAL & WAVE ENERGY** **WIND ENERGY**: Introduction-Basic Principles of Wind Energy Conversion: Nature of the Wind, Power in the Wind, Forces on the Blades and Wind Energy Conversion-Wind Data and Energy Estimation-Site Selection-Classification of Wind Energy Conversion Systems - Types of Wind Machines-Horizontal Axis Wind Turbine(HAWT) -Vertical Axis Wind Turbine(VAWT) — Comparison Between HAWT & VAWT - Generating System - Energy Storage — Applications of Wind Energy — Power Generation – Pumping Station -Safety and Environmental Aspects. **TIDAL & WAVE ENERGY:** Basic Principle of Tidal Power – Components and Operation of Tidal Power Plant – Wave Energy- Wave Energy Conversion Devices.	**10** **4**
IV	**BIO – ENERGY** **BIOMASS RESOURCES**: Introduction – Photo Synthesis – Usable Forms of Bio Mass, Their Composition and Fuel Properties - Biomass Resources. **BIOMASS ENERGY CONVERSION**: Biomass Conversion Technologies – Urban Waste to Energy Conversion – Biomass Gasification — Biomass Liquification — Biomass to Ethanol Production – Biogas Production from Waste Biomass – Types of Bio Gas Plants - Applications – Bio Diesel Production – Biomass Energy Scenario in India.	**6** **8**
V	**GEOTHERMAL AND OCEANIC ENERGY** **GEO THERMAL ENERGY**: Energy inside the Earth – Uses of Geothermal Energy – Geothermal Wells – Potential in India - Types of Geothermal Heat Pump Systems - Types of Geothermal Power Plants. **OCEANIC ENERGY**: Ocean Energy Resources – Principle of Ocean Thermal Energy Conversion (OTEC) — Method of Ocean Thermal Electric Power Generation.	**7** **7**

TEXT BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	Non-Conventional Energy Sources	G.D. Rai	Khanna Publishers, New Delhi	1999

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Non-Conventional Energy Sources and Utilization	R.K. Rajput	S.Chand & Company Ltd.	2012
2	Renewable Energy Sources	Twidell J.W. and Weir A	EFN Spon Ltd.	1986
3	Non-Conventional Energy Resources	B.H.Khan	Tata Mc Graw Hill., New Delhi.	2nd Edn, 2009

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADUDIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030514

Semester : V

Subject Title : CONTROL OF ELECTRICAL MACHINES PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
CONTROL OF ELECTRICAL MACHINES PRACTICAL	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

The controlling techniques of various types of AC and DC Electrical Machines are to be practically learned to meet the present industrial requirements. The Controlling Process is mainly to be known to Diploma Engineer and become a successful Employee or Technician. This Subject will make our students with knowledge of application-oriented skills in Industrially Operated Machines.

OBJECTIVES

On completion of this practical subject the students will be able to:

- Make use of various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and inter locking arrangement.
- Construct various types of automatic starters for electrical motors.
- Construct control circuits for braking, jogging, reversing operations.
- To make use of PLCs for control applications.
- To program PLCs for controlling the motor.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

Exercise

1. Wire and Test the Control Circuit for Jogging in Cage Induction Motor.
2. Wire and Test the Control Circuit for Semi-Automatic Star –Delta Starter.
3. Wire and Test the Control Circuit for Automatic Star –Delta Starter.
4. Wire and Test the Control Circuit for Dynamic Braking of Cage Motor.
5. Wire and Test the Control Circuit for Two Speed Pole Changing Motor.
6. Wire and Test the Control Circuit for Forward and Reverse Operation.
7. Wire and Test the Control Circuit for Automatic Rotor Resistance Starter.
8. Wire and Test the DOL Starter with Single Phase Preventer using PLC.
9. Wire and Test the Star –Delta Starter using PLC.
10. Wire and Test the Control Circuit for Automatic Rotor Resistance Starter using PLC.
11. Develop and execute the Ladder Logic Diagram in PLC for 3 Stage Lift Operation.
12. Wire and Test the Sequential Operation of Solenoid Valve and a Motor for Tank FillingOperation using PLC.

13. Develop and execute the Ladder Logic to Interface PLC with Conveyor Model for countingthe object moving in the Conveyer.
14. Wire and Test the Control Circuit for Jog Forward, Jog Reverse, Forward and ReverseOperations using PLC.

Note: The performance of control circuit is to be verified with Induction motor for the experiments 1 to 10.

DETAILED ALLOCATION OF MARKS

S.No	NAME OF ACTIVITY	MARK ALLOCATION
1.	Drawing Connection/Ladder Diagram and Writing Details of the Components/Equipment/Machines used	25
2.	Making the correct circuit connections	20
3.	Conducting the Experiment - Following the correct procedure - Verifying the operation / appropriate readings - Following the appropriate safety procedure	30
4.	Tabulation of Readings / Interpretation of Results Graphical Representation (If required)	20
5.	Viva-voce	05
	Total Marks	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S. No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	Transformer oil Tester Kit, Acidity Test kit	Each 1
2	Thermal Overload Relay	3
3	AC Contactor 230v/440v, 16A	26
4	Push Button With NO/NC Elements	30
5	Induction Motor 440 V, 1440 rpm, any HP rating (apart fromEM-II lab)	3
6	Proximity Switch	2
7	PLC (any brand) suitable for above experiments	5
8	Solenoid Valve	2
9.	Three Stage Lift Model, Conveyor Model	Each 1
10.	Forward, Reverse and Jogging (Forward and Reverse) Operation Model	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics

Subject Code : 4030515

Semester : V Semester

Subject Title : PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
PROGRAMMABLE LOGIC CONTROLLER PRACTICAL	5	80	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

Various control operations are to be performed automatically and sequentially on the electrical machines to suit the industrial requirements. Programmable controllers are mainly employed to control the process in industries. In order to train our students on handling of programmable controllers this practical subject is introduced.

OBJECTIVE

On completion of this practical subject the students will be able to

- Develop ladder logic for different types of starters.
- Develop ladder logic for EB to Generator changeover.
- Develop ladder logic for Automatic load transfer.
- Develop ladder logic for sequential control process like water filling, fire alarm and conveyor sorting etc.,
- To program PLCs for controlling Heater and motors.

DETAILED SYLLABUS

PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

LIST OF EXPERIMENTS

1. Interfacing of Limit switch, Reed switch and Proximity switch with PLC.
2. DOL starter with single phase prevention.
3. EB to Generator Change over switch implementation with interlocking
4. Star Delta starter
    a. Single phasing prevention
    b. Adjustable star-delta transfer time
    c. Pre-settable overload trip time
5. Automatic load transfer
    a. Transfers load from one phase to another when one phase in a three-phase system fails
    b. Automatically restores when power is resumed
    c. Time delays are affected to prevent action during short time failure
6. Fill the water in water tank and maintain the water level.
    a. When water level comes below lower-level switch ON the pump
    b. When water level reaches the high level switch OFF the pump
    c. Include manual switch to operate the pump at any level of water.

7. Fire alarm
    a. Multiple alarms
    b. Sound alarm
    c. If not acknowledged, Sound alarms 1 and 2
    d. Similarly go up to 4 alarm conveyor belt sorting
8. Three floor Lift control
9. Traffic light control
10. Automatic operation of double acting pneumatic cylinder – Multi cycle
11. Sequential operation of two Double Acting Cylinders for the sequence A+,B+,B-,A-
12. Analog input to PLC as a set of valves for a comparator function block
    -The input is multilevel illumination control. The input is setting is by means of a potentiometer in an analog input to the PLC. The outputs turn on several groups of lamps to obtain desired level illumination.
13. Heater control with PID function of the PLC
    - A 1000 W water heater is controlled using the PID function of the PLC. The temperature transducer is a temperature transmitter with 4 to 20 mA output and Pt 100 Probe.
14. Round table liquid filling system
    - Dropping of Reagents into test tubes. The feedback is from potentiometer. The program must ensure that the end limits of the pot are never reached by carefully balancing the clockwise and anti- clockwise revolution.
15. Slow speed motor control using PWM function of the PLC
    - Slow speed 12V DC 18W permanent magnet motor with fly wheel is controlled with the PWM output and feedback from a low-resolution encoder.

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	PLCs suitable to conduct above Experiments	3
2	Limit Switch	1
3	Reed Switch	1
4	Inductive Proximity Sensor	1
5	Capacitive Proximity Sensor	1
6	PC (or) Laptop	3

DETAILED ALLOCATION OF MARKS

S.No.	NAME OF THE ACTIVITY	MARKS ALLOCATED
1.	Drawing Connection/Ladder Diagram and Writing Details of the Components/Equipments/Machines used	20
2.	Making the correct circuit connections	25
3.	Conducting the Experiment - Following the correct procedure - Verifying the operation / appropriate readings - Following the appropriate safety procedure	30
4.	Tabulation of Readings / Interpretation of Results Graphical Representation (If required)	20
5.	Viva-Voce	05
	Total Marks	**100**

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Electrical and Electronics Engineering
Subject Code : 4030516
Semester : V
Subject Title : Elective Practical – I: Renewable Energy Sources Practical

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	M			Duration
			Internal Assessment	Board Examinations	Total	
RENEWABLE ENERGY SOURCES PRACTICAL	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 M and it will be reduced to 75 M.**

RATIONALE

Modern world aims to tap and utilize the Renewable Energy Sources as they are available almost at free of cost and eco-friendly nature. Our government also promotes the utilization of Renewable Energy Sources in full mind.

OBJECTIVES

- To measure the Solar Radiation
- To study the I-V and P-V Characteristics of PV Modules
- To measure Power flow of standalone PV System
- To study the Solar Thermal Equipments

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DETAILED SYLLABUS

Contents: Practical

Name of the topic	Exp. No	Experiment
Solar PV Module	1	Measurement of Solar Radiation
	2	I-V and P-V Characteristics of PV Module
	3	I-V and P-V Characteristics of PV Modules in Series
	4	I-V and P-V Characteristics of PV Modules in Parallel
	5	Effect of Tilt Angle on PV Module power
	6	Effect of shading on output of Solar Panel
	7	Working of Blocking Diode
Power flow calculation	8	Power flow calculation of standalone PV System for AC Load
	9	Power flow calculation of standalone PV system for DC Load
	10	Calculation of Maximum Power Point
Solar Thermal conversion	11	Direct type Solar Dryer
	12	Indirect type Solar Dryer
	13	Solar Water Heater
	14	Solar Cooker
	15	Solar Air Heater
Wind mill	16	Demo model of Wind Mill

DETAILED ALLOCATION OF MARKS

S.No.	Name of the Activity	Marks Allocation
1	Procedure	**25**
2	Sketches/Circuit diagram	**25**
3	Tabulation	**15**
4	Calculation/graph	**15**
5	Result	**15**
6	Viva – voce	**05**
	TOTAL	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

Ex. No	Equipments	Quantity
1	Solar panel PV Training Kit	6
2	Infra-red Thermometer	1
3	Lux Meter	2
4	Solar Power Meter	1
5	Solar Panel 100 Watts (Mono -1, Poly – 2)	3
6	Inverter (PWM, MPPT – 1 no. Each)	2
7	Battery 12V, 13 AH	1
8	Charge Controller 12V/10A	2
9	MC Voltmeter (0 – 100V)	6
10	MC Ammeter (0 – 15A)	6
11	AC/DC Digital Tong Tester	2
12	Rheostat 50 Ohm	1

13	Direct type Solar Dryer Kit	1
14	Indirect type Solar Dryer Kit	1
15	Solar Water Heater Kit	1
16	Solar Cooker Kit	1
17	Solar Air Heater Kit	1
18	Model Wind Mill	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030540

Semester : V Semester

Subject Title : COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL	4	64	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

This subject is introduced in order to impart skill of making Computer Aided Electrical Drawing.

OBJECTIVES

At the end of the semester the students must be able to draw:

- 2D Diagrams using Auto CAD
- Symbols widely used in Electrical and Electronics Circuits
- Single Line Diagram of different types of Panels.
- Single Line Diagrams of Substation Layout.
- Winding Diagrams
- Line Diagram of Distribution Panels

DETAILED SYLLABUS

PART-A

ELECTRICAL SYMBOLS-DRAWING (5*2=10)

1. Draw the symbols for Components: Resistor, Capacitor, Inductor, Diode, Transistor, FET, SCR, UJT, TRIAC, DIAC, and Gates AND, OR, NOT, NAND, NOR, EXOR.
2. Draw the Symbols used in Electrical Wiring: Relays, Contactors, Fuses, Main Switch, Electric Bell, Earth, DPST, DPDT, TPST, and Neutral Link.
3. Draw the Symbols for Instruments: Ammeter, Voltmeter, Wattmeter, Energy Meter, Frequency Meter, Power Factor Meter, Timer and Buzzers.
4. Draw the Symbols for Machines: Armatures, Alternators, Field winding (Shunt, Series and Compound) Transformer and Autotransformer.

PART-B

(1*60=60)

ELECTRICAL CONNECTION DIAGRAMS- DRAWING

1. Draw the Single Line Diagram of Single Phase MCB Distribution Board.
2. Draw the Single Line Diagram of Three Phase MCB Distribution Board.
3. Draw the Single Line Diagram of typical MV Panel.
4. Draw the Single Line Diagram of Motor Control Centre (MCC) Panel.
5. Draw the Single Line Diagram of Fire Alarm Riser Arrangement in Multi-Storey Building.
6. Draw the Single Line Diagram of Intercom Arrangement in Multi Storey Building.
7. Draw the Front-End Schematic Diagram of typical Sub Switch Board (SSB).
8. Draw the Winding Diagram of Lap Connected DC Armature withCommutators Connections and Brush Positions.
9. Draw the Control and Main Circuit of Automatic Star Delta Starter.
10. Draw the Mush Winding Diagram of a Three Phase Induction Motor.
11. Draw the Concentric Winding Diagram of a Single-Phase Induction Motor.

NOTE FOR EXAMINERS

1. Five symbols should be asked from part A exercise 1to 4 with at least onefrom each.
2. One sketch should be asked from part B exercise 1 to 13.
3. Printed output of the given symbols and sketch is to be evaluated

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	NAME OF THE EQUIPMENT	QUANTITY REQUIRED
1.	PC – Pentium Dual Core	30
2.	Electrical CAD Software multi user	01
3.	UPS – 5KVA with half an hour batterybackup	01

ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1.	SYMBOLS IN CAD	20
2.	MANUAL DRAWING OF ELECTRICAL CONNECTIONDIAGRAM	20
3.	ELECTRICAL CONNECTION DIAGRAM IN CAD	40
4.	PRINT OUT	15
5.	VIVA VOCE	05
	Total	**100**

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040550

Semester : V

Subject Title : MICROCONTROLLER PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
MICROCONTROLLER PRACTICAL	**4**	**64**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

The introduction of this subject will enable the students to have hands on experience in using 8051 trainer kits. The students are exposed to learn simple programs using assembly language. They can also get familiar with the C compiler platform. They also gain knowledge by using application specific interfacing boards.

OBJECTIVES:

The students are able to

-> Understand the use of instruction set by writing and executing simple ALP.

-> Know the connection details between microcontroller and peripherals.

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DETAILED SYLLABUS

Contents: Practical

Exercises

Part A

The following experiments should be written using 8051 assembly language program and should be executed in the 8051-Microcontroller trainer kit.

1. 8 / 16 bit addition
2. 8 / 16 bit subtraction
3. 8 bit multiplication
4. 8 bit division
5. BCD to Hex code conversion
6. Hex to BCD code conversion
7. Smallest / Biggest number
8. Time delay routine (Demonstrate by Blinking LEDS).
9. Using Timer/ counter of 8051

Part B (Interfacing Application Boards)

The following experiments can be written using C compiler or 8051 assembly language and to be executed.

10. Interfacing Digital I/O board
11. Interfacing DAC
12. Interfacing Stepper motor
13. Interfacing Seven segment LED display or LCD
14. Sending data through the serial port between microcontroller kits
15. Interfacing DC motor using PWM.

BOARD EXAMINATION

Note:

1.Students are provided with Hex code sheet for manual hand assembly.

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1.	ALGORITHM OR FLOW CHART	20
2.	PROGRAM	30
3.	EXECUTION	30
4.	RESULT	10
5.	VIVA VOCE	10
	Total	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No.	Name of the Equipments	Required No.s
1	8051 Microcontroller Kit	14
2	Digital I/O Interface Board	2
3	Seven Segment LED Display Interface Board	2
4	8 Bit DAC Interface Board	2
5	Stepper Motor Control Interface Board	2
6	DC Motor Control Interface Board	2
7	RS 232 Serial Port Cable	2
8	LCD Interface Board	2
9	Laptop / Desktop Computer	6

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic Year 2020-2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology and Special Programs

Subject Code : 4040570

Semester : V

Subject Title : ENTREPRENERUSHIP AND STARTUPS

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENTREPRENEURSHIP AND STARTUPS	**4**	**64**	**25**	**75**	**100**	**3 Hrs**

Topics and Allocation of Hours

UNIT	Topic	Hours
I	Entrepreneurship – Introduction and Process	10
II	Business Idea and Banking	10
III	Startups, E-cell and Success Stories	10
IV	Pricing and Cost Analysis	10
V	Business Plan Preparation	10
Revision, Field visit and Preparation of case study report		14
Total		64

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and startups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:

At the end of the study of 5th semester the students will be able to

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spirit and resourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture
- Familiarization with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turnover
- Familiarization of various financial and non-financial schemes
- Aware the concept of incubation and starts ups

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
I	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** ● Concept, Functions and Importance ● Myths about Entrepreneurship ● Pros and Cons of Entrepreneurship ● Process of Entrepreneurship ● Benefits of Entrepreneur ● Competencies and Characteristics ● Ethical Entrepreneurship ● Entrepreneurial Values and Attitudes ● Motivation ● Creativity ● Innovation ● Entrepreneurs - as problem solvers ● Mindset of an employee and an entrepreneur ● Business Failure – causes and remedies ● Role of Networking in entrepreneurship	**10**
II	**BUSINESS IDEA AND BANKING** ● Types of Business: Manufacturing, Trading and Services ● Stakeholders: Sellers, Vendors and Consumers ● E- Commerce Business Models ● Types of Resources - Human, Capital and Entrepreneurial tools ● Goals of Business and Goal Setting ● Patent, copyright and Intellectual Property Rights ● Negotiations - Importance and methods ● Customer Relations and Vendor Management ● Size and Capital based classification of business enterprises ● Role of Financial Institutions ● Role of Government policy ● Entrepreneurial support systems	**10**

	● Incentive schemes for State Government ● Incentive schemes for Central Government	
III	**STARTUPS, E-CELL AND SUCCESS STORIES** ● Concept of Incubation center's ● Activities of DIC, financial institutions and other relevance institutions ● Success stories of Indian and global business legends ● Field Visit to MSME's ● Various sources of Information ● Learn to earn ● Startup and its stages ● Role of Technology – E-commerce and social media ● Role of E-Cell ● E-Cell to Entrepreneurship	**10**
IV	**PRICING AND COST ANALYSIS** ● Calculation of Unit of Sale, Unit Price and Unit Cost ● Types of Costs - Variable and Fixed, Operational Costs ● Break Even Analysis ● Understand the meaning and concept of the term Cash Inflow and Cash Outflow ● Prepare a Cash Flow Projection ● Pricing and Factors affecting pricing ● Understand the importance and preparation of Income Statement ● Launch Strategies after pricing and proof of concept ● Branding - Business name, logo, tag line ● Promotion strategy	**10**
V	**BUSINESS PLAN PREPARATION** ● Generation of Ideas, ● Business Ideas vs. Business Opportunities ● Selecting the Right Opportunity ● Product selection ● New product development and analysis	**10**

	• Feasibility Study Report – Technical analysis, financial analysis and commercial analysis • Market Research - Concept, Importance and Process • Marketing and Sales strategy • Digital marketing • Social Entrepreneurship • Risk Taking-Concept • Types of business risks	

TEXT BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra - 282002
2. Dr. G.K. Varshney, Business Regulatory Framework, Sahitya Bhawan Publications, Agra – 282002

REFERNCE BOOKS:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301
2. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
3. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
4. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
5. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
6. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
7. I. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers, Rajasthan
8. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
9. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioner’s guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030610

Semester :VI

Subject Title : Distribution and Utilization

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
DISTRIBUTION AND UTILIZATION	6	96	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Distribution	20
II	Industrial Drives	18
III	Electric Traction	17
IV	Illumination	17
V	Electric Heating and Welding	17
Test & Model Exam		7
Total		96

RATIONALE

Electrical Energy requirement is the major crisis and hence any saving in Electrical energy is equivalent to production of Electrical Energy. Saving can be achieved by the utilization of Renewable Energy Sources.

OBJECTIVES

At the end of the Semester, Students will be able to understand the concepts of :

- Substation arrangements.
- Distribution of Power.
- Industrial Drives - Suitability for different applications.
- Track Electrification-Traction Mechanics – Traction Motor Controls
- Illumination – Design of Lighting Schemes – Sources of Light.
- Electric Heating – Methods – Electric Furnace – Temperature Control.
- Electric Welding and Welding Equipments.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DISTRIBUTION** **1.1. Substation:** Introduction-Sub Stations-Classification of Sub Stations-Indoor and Outdoor S.S — Gas Insulated S.S-Comparisons-Layout 110/11KV Substation and 11KV/400V Distribution Substation-Substation Equipments-Bus Bar- Types of Bus Bar Arrangement -Advantages and Disadvantages. **1.2 Distribution:** Distribution System-Requirements of a Distribution System-Part of Distribution System- Classification of Distribution Systems-Comparison of Different Distribution Systems (A.C And D.C) -A.C Distribution -Types-Connection Schemes of Distribution System-A. C Distribution Calculations-Calculation of Voltage At Load Points on Single Phase Distribution Systems (With Concentrated Load Only)- Distribution Fed At One End, Both Ends and Ring Mains-Problems- Three Phase, Four Wire, Star Connected Unbalanced Load Circuit-Problems- Consequence of Disconnection of Neutral in Three Phase Four Wire System (Illustration with an Example)	**8** **12**
II	**INDUSTRIAL DRIVES** Introduction to Electric Drive – Advantages of Electric Drives – Transmission of Power-Types of Electric Drives-Individual, Group and Multi Motor Drives — Advantages and Disadvantages of Individual And Group Drive -Factors Governing The Selection of Motors-Nature and Classification of Load Torque-Matching of Speed Torque Characteristics of Load and Motor-Standard Ratings of Motor- Classes of Load Duty Cycles -Selection of Motors for Different Duty Cycles-Selection of Motors for Specific Application-Braking- Features of Good Braking System- Types of Braking - Advantages of Electric Braking - Plugging, Dynamic	**18**

	and Regenerative Braking - As Applied to Various Motors.	
III	**ELECTRIC TRACTION** Introduction To Traction Systems - Advantages and Disadvantages of Electric Traction. System of Track Electrification - Methods of Supplying Power-Rail Connected System and Over Head System-O.H. Equipments-Contact Wire, Centenary and Droppers — Current Collection Gear for OHE —Bow and Pantograph Collector-Different Systems of Track Electrification-Advantages of Single Phase Low Frequency A. C. System- Booster Transformer-Necessity- Methods of Connecting B.T-Neutral Sectioning. **Traction Mechanics:** Units and Notations used in Traction Mechanics-Speed Time Curve for Different Services - Simplified Speed Time Curve-Derivation of Maximum Speed-Crest Speed, Average Speed, Schedule Speed (Definitions Only)-Tractive Effort and Power Requirement- Specific Energy Output-Specific Energy Consumption - Traction Motors and Control: Desirable Characteristics of Traction Motors-Motors used for Traction Purpose-Methods of Starting and Speed Control of D.C Traction Motors- Rheostatic Control-Energy Saving with Plain Rheostatic Control Series- Parallel Control- Energy Saving with Series Parallel Starting - Shunt Transition -Bridge- Transition-Multiple Unit Control –Regenerative Braking. Recent Trends in Electric Traction-Magnetic Levitation (MEGLEV) — Suspension Systems.	**8** **9**

IV	**ILLUMINATION** Introduction - Definition and Units of Different Terms used in Illumination-Plane Angle, Solids Angle, Light, Luminous Flux, Luminous Intensity, Luminous Efficacy Candle Power, Lumen, Illumination, M.S.C.P, M.H.C.P, M.H.S.C.P- Reduction Factor, Luminance, Glare Lamp Efficiency. Space-Height Ratio, Depreciation Factor Utilization Factor, Waste Light Factor, Absorption Factor, Beam Factor, Reflection Factor. Requirements of Good Lighting System- Laws of Illumination-Problems. Types of Lighting Scheme- Factors to be Considered while Designing Lighting Scheme- Design of Lighting Scheme (Indoor and Outdoor)- Problems- Lighting Systems- Factory Lighting, Flood Lighting, Street Lighting. **Sources of Light:** Arc Lamp, Incandescent Lamp, HalogenLamp, Sodium Vapour Lamp, High Pressure Mercury Vapour Lamp, Fluorescent Tube –Induction Lamp- Energy Saving Lamps (C.F.L And L.E.D Lamps)-Limitation and Disposal Of C.F.L-Benefits of Led Lamps-Comparison of Lumen Output for LED, CFL and Incandescent Lamp **Earthing and Maintenance of Lighting:** Fluorescent Lamp Disposal – Precautions in erecting lighting installations – Symptoms to identify the end of the useful life of lamp – Causes for lowering the illumination level.	**8** **9**

V	**ELECTRIC HEATING AND WELDING** **Electric Heating:** Introduction – Advantages of Electric Heating – Modes of Heat Transfer - Classification of Electric Heating - Power Frequency Electric Heating — Direct and Indirect Resistance Heating-Infrared Heating-Arc Heating –High Frequency Electric Heating – Induction Heating-Induction Stove –Eddy Current Heating and Dielectric Heating. **Electric Furnaces:** Resistance Furnace-Requirements of Heating Elements-Commonly used Heating Element Materials-Resistance Furnace for Special Purposes-Temperature Control of Resistance Furnace-Arc Furnace -Direct and Indirect Arc Furnace- Temperature Control of Arc Furnace-Reasons for Employing Low Voltage and High Current Supply - Induction Furnace-Direct and Indirect Core Type Induction Furnace-Coreless Induction Furnace-Power Supply for Coreless Induction Furnace. **Electric Welding:** Introduction-Types of Electric Welding-Requirements of Good Weld- Preparation of Work -Resistance Welding- Butt Welding, Spot Welding, Seam Welding, Projection Welding and Flash Welding-Arc Welding-Carbon Arc Welding, Metal Arc Welding, Atomic Hydrogen Arc Welding, Inert Gas Metal Arc Welding- Comparison between Resistance and Arc Welding. Radiation Welding - Ultrasonic Welding, Electron Beam Welding, Laser Beam Welding-Electric Welding Equipments (A.C. And D.C).	**5** **6** **6**

TEXT BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	A Course in Electrical Power	Soni&Gupta	Dhanpat Rai& Sons, New Delhi	

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Electric Power	SL Uppal	Khanna Publishers, New Delhi	
2	Modern Electric Traction	H Partab	Dhanpat Rai & sons, New Delhi	
3	Electrical Power Distribution System	AS Pabla	Tata McGraw Hill Publishing Co, New Delhi	
4	Utilization of Electric Power	NV Suryanarayana	Tata McGraw Hill Publishing Co, New Delhi	

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030630

Semester : IV

Subject Title : Energy Conservation and Audit

TEACHING AND SCHEME OF EXAMINATION

No of weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENERGY CONSERVATION AND AUDIT	**4**	**64**	**25**	**100***	**100**	**3 Hrs.**

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Energy Conservation and its Importance	11
II	Energy Conservation in Electrical Machines	11
III	Energy Conservation in Electrical Installation Systems	11
IV	Energy Audit and Instruments	12
V	Energy Costs and Energy Audit Report	12
	Test & Model Exam	7
	Total	**64**

RATIONALE

Energy conservation is the effort made to reduce the consumption of energy by using less of an energy service. Energy can be conserved by reducing wastage and losses, improving efficiency through technological upgrades and improved operation and maintenance. Energy Audit is the key to a systematic approach for decision-making in the area of energy management. The effective use of energy to maximize profits (minimize costs) and enhance competitive positions, it is necessary to conserve energy. Hence it is necessary to study energy auditing methods and energy saving opportunities in electrical system.

OBJECTIVES

At the end of the Semester, Students will be able to:

- ✓ Explain necessity and importance of Energy Conservation
- ✓ Explain the goal with energy conservation techniques is to reducedemand, protect supplies, develop and use Alternative Energy Sources.
- ✓ Explain the energy efficient technologies in Electrical System
- ✓ Explain the Periodic maintenance of Electrical Systems.
- ✓ Explain Technical losses and commercial losses in installation Systems.
- ✓ Explain How to product output or to lower operating costs.
- ✓ Discuss about Energy Conservation Equipment
- ✓ Explain Energy Conservation in Lighting System
- ✓ Identify where and how energy and factors affecting consumptionconsumed.
- ✓ Explain Energy Costs.
- ✓ Explain how to Detect and improving energy Efficiency.
- ✓ Explain the concept and types of Energy of Energy Audit.
- ✓ Explain the importance of Energy Audit.
- ✓ List the Instruments for Audit and Monitoring Energy and Energy Savings
- ✓ Explain Energy cost in Indian Scenario.
- ✓ Draw the Energy Audit Report Format

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ENERGY CONSERVATION AND ITS IMPORTANCE** Definition - Need for and importance of Energy Conservation - Primary and Secondary Energy - Energy Demand and Supply - Energy Conservation in Household, Industries and Community Level - Energy for sustainable Development - Energy Conservation in India - Energy Conservation Approaches – Safe working of Electrical Equipments and Electrical Safety. Energy Conservation Techniques - Principles of Energy Conservation Methods - Difference between Energy conservation and Energy audit - Relevant clauses of Energy Conservation - BEE and its Roles - MEDA and its Roles - Energy Audit in Energy Conservation Star Labelling: Need and its benefits – Role of Tamilnadu Energy Development Agency (TEDA) – Introduction to ISO 50001 – Energy Audit Certificate.	**5** **6**
II	**ENERGY CONSERVATION IN ELECTRICAL MACHINES** Need for Energy Conservation in Induction Motor and Transformer - Methods of Energy Conservation in Induction Motor - Energy Saving Opportunities with Energy Efficient Motors - Energy Conservation Techniques in Induction Motor By: Improving Power Quality -Variation in Efficiency and Power Factor with Loading Motor Survey Matching Motor Rating with Load - Minimizing the Idle and Redundant Running of Motor Operating in Star Mode -Rewinding of Motor - Replacement by Energy Efficient Motor Periodic Maintenance Energy Conservation Techniques in Transformer. Loading Sharing Parallel Operation Isolating Techniques. Replacement by Energy Efficient Transformers - Periodic Maintenance - Energy Conservation Equipment: Soft Starters, Automatic Star Delta Convertor, Variable Frequency Drives, Automatic P. F. Controller (APFC), Intelligent P. F. Controller (IPFC)Energy Efficient Motor; Significant Features, Advantages, Applications and Limitations.	**6** **5**

III	**ENERGY CONSERVATION IN ELECTRICAL INSTALLATIONSYSTEMS** Aggregated Technical and commercial losses (ATC); Power system at state, regional, national and global level. Technical losses; causes and measures to reduce by - Controlling I2R losses. Optimizing distribution voltage. Balancing phase currents Compensating reactive power flow Commercial losses: pilferage causes and remedies. Energy conservation equipment: Maximum Demand Controller, KVAR Controller, Automatic Power Factor controller (APFC) Energy Conservation in Lighting System Replacing Lamp sources. Using energy efficient luminaries. Using light-controlled gears. Installation of separate transformer / servo stabilizer for lighting. Periodic survey and adequate maintenance programs. Energy Conservation techniques in fans, electronic regulators.	6 5
IV	**ENERGY AUDIT AND INSTRUMENTS** Definition, objective and principles of Energy Management, Need of Energy Audit and Management, types of Energy Audit, Audit Process, Energy Audit of Building System, Lighting System, HVAC System, Water Heating System, Heat Recovery opportunities during Energy Audit, Industrial Audit Opportunities. Energy Flow Diagram (Sankey Diagram) Simple Payback Period, Energy Audit Procedure (walk through audit and detailed audit) Instruments for Audit and Monitoring Energy and Energy Savings Energy Audit Instruments - Basic Measurements — Electrical Measurements, Light, Pressure, Temperature and Heat Flux, Velocity and Flow Rate, Vibrations, etc. Instruments Used in Energy systems: Load and Power Factor Measuring Equipments, Wattmeter, Flue Gas Analysis, Temperature and Thermal Loss Measurements, Air Quality Analysis etc.	6 6

V	**ENERGY COSTS AND ENERGY AUDIT REPORT** Understanding Energy Costs Energy Cost in Indian Scenario - Co-generation and Tariff - Concept, Significance for Energy Conservation - Co-generation - Types of Cogenerations on basis of sequence of Energy use (Topping cycle, bottoming cycle) - Types of Co-generation basis of Technology (Steam Turbine Co-generation, Gas Turbine Co-generation, Reciprocating Engine Co-generation) Factors governing the selection of Co-generation System. Advantages of Co-generation - Tariff: Types of Tariff Structure: Special Tariffs; Time-Off-Day Tariff, Peak-Off-Day Tariff, Power Factor Tariff, Maximum Demand Tariff, Load Factor Tariff - Application of Tariff System to reduce Energy bill. Benchmarking and Energy Performance - Energy Audit Report Format - Guidelines for writing Energy Audit Report - Data presentation in Report.	6 6

TEXT BOOKS:

1. "M A Chaudhari, S M Chaudhari & S A Asarkar ", "Energy Conservation & Audit ", "Nirali Prakashan" Publication.

2. "Y. B. Mandake", "Pankaj Mohan", "Dr. D.B. Talange" Energy Conservation and Audit, "Tech – Neo" Publications.

REFERENCE BOOKS

1. "Er. Udit Mamodiya" "Electrical Energy Conservation & Auditing", Ashirwad Publication.

2. O.P. Gupta, "Energy Technology", Khanna Publishing House, New Delhi

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030621

Semester : VI

Subject Title : Elective Theory – II - POWER ELECTRONICS

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
POWER ELECTRONICS	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Thyristor Family, Trigger and Commutation Circuits	13
II	Phase Controlled Rectifiers	15
III	Choppers and Inverters	15
IV	Control of DC Drives	15
V	Control of AC Drives	15
Test & Model Exam		7
Total		**80**

RATIONALE

Developments in Electronics have their own impact in other fields of Engineering. Today all the Controls and Drives for the Electrical Machines are formed by Electronic Components and there are many Electronic Devices available to handle Eclectic Power in terms Kilo-Amps and Kilo-Volts. This subject gives a comprehensive knowledge base about the devices and circuits used in Electrical Power Control.

OBJECTIVES

On completion of these units, the student should be able to:

- Explain the scope and application of Power Electronics
- Explain the operating region and working of Thyristor family devices.
- Explain and state the application for Commutation Circuits and Trigger Circuits of SCR.
- Familiarize the Phase Controlled Rectifier for different kinds of Loads.
- Study the complete protection of Converter Circuits.
- Understand the working and applications of different types of Choppers and Inverters.
- Understand the application of Power Electronics devices as UPS, SMPS.
- Understand the control of DC Drives.
- Know the various methods of Speed Control of DC Drives.
- Familiarize the Control of AC Drives.
- Study the Speed Control of Three Phase Induction Motor using PWM and Slip Power Recovery Scheme.
- Understand the Closed Loop Control of DC Drive and AC Drive.
- Know the operation of Single Phase and Three Phase Cyclo Converter.
- Study the need of Microcomputer Based Motor Control.

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DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**THYRISTOR FAMILY, TRIGGER AND COMMUTATION CIRCUITS** Thyristor Family (Review) –SCS, SUS, SBS, LASCR and GTO. Symbol, Circuit, Working, Characteristics and Applications - UJT, SCR, DIAC, TRIAC, IGBT, GTO and MOSFET. Gate Triggering Circuits — Requirements, Types. Circuit, working of — R, RC, Synchronized UJT Triggering Circuits. Pulse Transformer in Trigger Circuits —— IC based Advance Triggering Circuits for SCR & TRIAC (Using IC TCA 785) - Driver and Power circuits for Thyristor. Commutation Circuits – SCR Turn Off Methods – Natural Commutation – Forced Commutation – Class A, Class B, Class C, Class D, Class E and Class F. SCR rating and their importance.	7 6
II	**PHASE CONTROLLED RECTIFIERS** Introduction — Phase Controlled Rectifiers. Circuit Diagram, Working and Waveform - Half Wave, Full Wave Controlled Rectifier with Resistive, Inductive Loads and Free Wheeling Diode - Single Phase Fully Controlled Bridge, Single Phase Dual Converter with R Load, RL Load - Single Phase Semi Converter with Continuous and Discontinuous Load Current. AC – AC Converter. Three Phase Half Controlled Bridge, Fully Controlled Bridge with RL Load - Complete Protection of Thyristors against Surge Current, Surge Voltage, Dv/Dt, Di/Dt Protection.	8 7

III	**CHOPPERS AND INVERTERS** **Choppers** — Introduction, Principle of Chopper Operation. Control Strategies — Constant Frequency System and Variable Frequency System. Chopper Circuit Classification — Step Up Chopper, Step Down Chopper, Voltage, Current, Load Commutated Chopper, Fist Quadrant, Second Quadrant, Two Quadrant and Four Quadrant Choppers. Circuit Diagram, Working and Waveform – Step Up Chopper, Morgan Chopper, Jones Chopper. Applications of Choppers – SMPS	8
	Inverters – Introduction, Classification of Inverter. Circuit Diagram, Working and Waveform Parallel Inverter, Half Bridge Inverter, Full Bridge Inverter, Modified MC Murray Full Bridge Inverter, MC Murray Bedford Full Bridge Inverter.	3
	Three Phase Bridge Inverter Under 180° Mode,120° Mode Operations - Pulse Width Modulated Inverters, (Single Pulse, Multiple Pulse, Sinusoidal Pulse) Applications of Inverters — UPS - Online, Offline.	4
IV	**CONTROL OF DC DRIVES** Introduction — DC Drive. Basic DC Motor Speed Equation — Operating Region, Armature Voltage Control, Field Current Control, Constant Torque and Constant HP Regions - Circuit Diagram, Output Waveforms and Output Equation of — Separately Excited DC Motor in — A) Single Phase Full Converter Drives B) Single Phase Dual Converter Drives C)Three Phase Semi Converter Drives.	7
	DC Chopper for Series Motor Drive – Four Quadrant Control of DC Motor — DC to DC Converter using MOSFET and IGBT - Block Diagram, Explanations of Closed Loop Control of DC Drives, Phase Locked Loop Control of DC Drives - Microprocessor Based Closed Loop Control of DC Drives.	8

V	**CONTROL OF AC DRIVES** Introduction AC Drive - Torque Speed Characteristics of Three Phase Induction Motor, Speed Control of Induction Motor, Stator Voltage Control, Variable Frequency Control, Necessity of Maintaining V/F Ratio. Rotor Resistance Control Inverters for Variable Voltage and Variable Frequency Control -Static VAR Compensation. Speed Control by Rotor Resistance for Slip Ring Induction Motors — Static Scherbius Drive (Slip Power Recovery Scheme) - Closed Loop Control of AC Drive Block Diagram — Micro Computer based PWM Control of Induction Motor – Introduction to Cyclo Converter with Simple Circuit – Single Phase and Three Phase.	8 7

TEXT BOOKS

S. No.	Author	Title	Publication	Edition
1	MD Singh, KB Khanchandani	Power Electronics	McGraw Hill Publishing CompanyNew Delhi	Third reprint 2008

REFERENCE BOOKS

S. No.	Author	Title	Publication	Edition
1.	Mohammed H.Rashid	Power Electronics	New Age Publication.	Third Edition,2004
2.	Mohan, Undeland, Robbins.	Power Electronics	Wiley India Edition.	Media Enhanced Third Edition
3.	Dr.P.S.Bimbhra	Power Electronics	Khanna Publishers.	Fourth Edition, 2011.
4.	M.S.Jamil Asghar	Power Electronics	PHI Learning Private Limited	Eastern Economy Edition, 2010

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030622

Semester : VI

Subject Title : ELECTIVE THEORY - II: BIO MEDICAL NSTRUMENTATION

TEACHING AND SCHEME OF EXAMINATION

Number of Weeks per Semester: 16 weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours / Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
BIO MEDICAL INSTRUMENTATION	5	80	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

TOPICS AND ALLOCATION

Unit	Topic	Hours
I	Bio - Electric Signals, Electrodes and Clinical Measurement	13
II	Bio - Medical Recorders	15
III	Therapeutic Instruments	15
IV	Biotelemetry and Patient Safety	15
V	Modern Imaging Techniques	15
VI	Revision & Test	07
	TOTAL	80

RATIONALE

Bio Medical Engineering Education is in the growing stage. But every year, there is a tremendous increase in the use of Modern Medical Equipment in the Hospital and Health Care Industry therefore it is necessary for every Student to understand the functioning of various Medical Equipments. This Subject to enable the students to learn the basic principles of different Biomedical Instruments viz Clinical Measurement, Bio - Medical Recorders, Therapeutic Instruments, Biotelemetry and Modern Imaging Techniques Instruments.

OBJECTIVES

After learning this subject, the student will be able to understand the about:

- The generation of Bio-Potential and its measurement using various Electrodes.
- The measurement of Blood Pressure.
- The measurement of Lung Volume.
- The measurement of Respiration Rate.
- The measurement of Body Temperature and Skin Temperature.
- The principles of operations of ECG Recorder.
- The principles of operations of EEG Recorder.
- The principles of operations of ENG Recorder.
- The working principles of Audio Meter.
- The principles of operations of Pacemaker.
- The basic principle of Dialysis.
- The basic principle of Short-Wave Diathermy.
- The basic principle of Ventilators.
- The working principles of Telemetry.
- The basic principle of Telemedicine.
- To learn about Patient Safety.
- The various methods of Accident Prevention.
- The basic principle of various types of Lasers.
- The basic principle of CT and MRI Scanner.
- The principle of operation of various Imaging Techniques

DETAILED SYLLABUS

Contents: Theory

Units	Name of the topic	Hours
I	**BIO-ELECTRIC SIGNALS AND ELECTRODES** Bio – Potential and Their Generation – Resting and Action Potential –Propagation of Action Potential. Electrodes – Micro – Skin Surface – Needle Electrodes. **CLINICAL MEASUREMENT** Measurement of Blood Pressure (Direct, Indirect) – Blood Flow Meter (Electro Magnetic& Ultrasonic Blood Flow Meter) – Blood Ph Measurement - Measurement Of Respiration Rate – Measurement of Lung Volume – Heart Rate Measurement – Measurement of Body and Skin Temperature - Chromatography, Photometry, Flurometry.	3 10
II	**BIO - MEDICAL RECORDERS** Electro Cardiograph (ECG) – Lead System – ECG Electrodes – ECG Amplifiers — ECG Recording Units — Analysis of ECG Curves. Electroencephalograph (EEG) — 10-20 Lead System — EEG Recording Units – EEG Wave Types – Clinical use of EEG – BrainTumor. Electro Myograph (EMG) — EMG Waves — Measurement of Conduction Velocity - EMG Recording Units – Electro Retino Graph (ERG)- ERG Recording Units, Audiometer - Principle – Types – Basics Audiometer Working.	8 7

III	**THERAPEUTIC INSTRUMENTS** Cardiac Pacemaker — Classification — External Pace Makers — Implantable Pacemaker – Programmable Pacemaker – Cardiac Defibrillators – Types – AC and DC Defibrillators -Heart Lung Machine with Block Diagram. Dialysis – Hemo Dialysis – Peritoneal Dialysis. Endoscopes Endoscopic Laser Coagulator and Applications – Physiotherapy Equipment – Short Wave Diathermy – Micro Wave Diathermy – Ultrasonic Therapy Unit (Block / Circuit) – Ventilators – Types – Modern Ventilator Block Diagram.	15
IV	**BIOTELEMETRY AND PATIENT SAFETY** Introduction to Biotelemetry – Physiological – Adaptable to Biotelemetry – Components of a Biotelemetry System – Application of Telemetry - – Tele-medicine - Introduction, Working, Applications. Patient Safety: Physiological effects of Electric Current – Micro and Macro Shock – Leakage Current – Shock Hazards from Electrical Equipment. Methods of Accident Prevention – Grounding – Double Insulation — Protection by Low Voltage — Ground Fault Circuit Interrupter – Isolation of Patient Connected Parts – Isolated Power Distribution System. Safety Aspects in Electro Surgical Units – Burns, High Frequency Current Hazards, Explosion Hazards.	8 7
V	**MODERN IMAGING TECHNIQUES** LASER Beam Properties – Block Diagram – Operation of CO2 And Ndyag LASER – Applications of LASER in Medicine. X Ray Apparatus –Block Diagram – Operation – Special Techniques in X-Ray Imaging – Tomogram — Computerized Axial Tomography, CT Scanner — Ultrasonic Imaging Techniques – Echo Cardiograph – Angiography – Magnetic Resonance Imaging Techniques.	5 10

TEXT BOOK

1. Dr.M. Arumugam – Biomedical Instrumentation, Anuradha Publications, Chennai.

REFERENCE BOOKS

1. Leslie Cromwell –Fred j. Wibell, Erich A.P Feither – Bio Medical Instrumentation andMeasurements, II Edition.
2. Jacobson and Webstar – Medicine and Clinical Engineering.
3. R.S .Khandpur – Hand book of Bio –Medical Instrumentation.
4. Medical Electronics - Kumara doss
5. Introduction to Medical Electronics. B.R. Klin
6. Introduction to Biomedical Instrumentation Mandeep Singh Printice Hall India2010.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code :4030623

Semester :VI

Subject Title : Elective: III - COMPUTER HARDWARE AND NETWORKS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examination	Total	
COMPUTER HARDWARE AND NETWORKS	5	80	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

TOPICS AND ALLOCATION OF HOURS

Unit	Topic	Hours
1	Mother Board Components and Memory Storage Devices	13
2	I/O Devices and Interface	15
3	Maintenance and Trouble Shooting of Desk top and Mobile Phones	15
4	Computer Network Devices and OSI Layers	15
5	802.X and TCP/IP Protocols	15
	Revision and Test	7
	TOTAL	80

RATIONALE

Maintaining and servicing the computers, laptops and peripherals are essential requirements of the computer students. The clear understanding of computer network devices and protocols are also taught in this subject.

OBJECTIVES

1. On completion of the following units of syllabus contents, the students can Identify the major components that make up the system unit.
2. Understand the principle of operations of Keyboard, mouse and displays.
3. Study about the specification of I/O Ports of all I/O devices like serial, parallel, USB – Game port, Blue tooth and IP Connectors
4. Understand the technology of high-quality multiple color graphic output devices like Dot matrix, Inkjet, Laser, Line, MFP and computer system.
5. Understand the operations to Power Supply devices. Know the use of diagnostic Software. Identify the major components of Laptop. Troubles shoot the problems in Laptop.
6. Understand the concept of data communication.
7. Discuss the advantages and disadvantages of different network topologies. Compare different network classifications based on different category.
8. Know the use of different network devices.
9. Understand the different layers of OSI and their functions. Compare different LAN protocols. Identify the protocols used in TCP /IP and compare with OSI model. Understand IP address concepts and TCP/IP suite.

DETAILED SYLLABUS

UNIT I - MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES		**13 HOURS**
1.1	**Introduction:** Parts - Mother board, sockets, expansion slots, memory, power supply, drives and front panel and rear panel connectors – Hardware, Software and Firmware.	**3**
1.2	**Processors:** Architecture and block diagram of multi core Processor (any one), Features of new processor Definition only chipsets (Concepts only)	**2**
1.3	**Bus Standards** Overview and features of PCI, AGP, USB, PCMCIA, Processor BUS – High	**2**
1.4	**Primary Memory**: Introduction-Main Memory, Cache memory –DDR2- DDR3, RAM versions – 1TB RAM – Direct RDRAM	**1**
1.5	**Secondary Storage:** Hard Disk – Construction – Working Principle – Specification of IDE, Ultra ATA, Serial ATA; HDD Partition - Formatting. Troubleshooting hard disk drives.	**3**
1.6	**Removable Storage:** CD&DVD construction – reading & writing operations; CD-R, CD-RW; DVD-ROM, DVD-RW; construction and working of DVD Reader / Writer. Blue-ray: Introduction – Disc Parameters – Recording and Playback Principles – Solid state memory devices.	**2**
UNIT II I/O DEVICES AND INTERFACE		**15 HOURS**
2.1	**Keyboard and Mouse:** Keyboard: Signals – operation of membrane and mechanical keyboards–troubleshooting; wireless Keyboard**.** Mouse- types, connectors, operation of Optical mouse and Troubleshooting.	**3**
2.2	**Printers:** Introduction – Types of printers– Dot Matrix, Laser, line printer, MFP (Multi-Function Printer), Thermal printer - Operation – Construction – Features and Troubleshooting	**4**
2.3	**I/O Ports:** Serial, Parallel, USB, Game Port, Bluetooth interface, IR connector, fire ware, Signal specification problems with interfaces.	**3**
2.4	**Displays and Graphic Cards:** Panel Displays– Principles of LED, LCD and TFT Displays. SVGA Port signals – common problems and solutions.	**3**
2.5	**Power Supply:** SMPS: Principles of Operation and Block Diagram of ATX Power Supply, connector specifications	**2**

UNIT III Maintenance and Trouble Shooting of Desk top and Mobile Phones		**15 HOURS**
3.1	**BIOS:** Standard CMOS setup, Advanced BIOS setup, Power management, advanced chipset features, PC Bios communication – upgrading BIOS, Flash BIOS - setup.	**3**
3.2	**POST:** Definition – IPL hardware – POST Test sequence – beepcodes and error messages.	**2**
3.3	M**obile phone components:** Basics of mobile communication. Components - battery**-** antenna-ear piece- microphone -speaker-buzzer-LCD- keyboard. Basic circuit board components **—** Namesand functions of different ICs used in mobile phones.	**3**
3.4	**Tools & Instruments used in mobile servicing**: Mobile servicing kit – soldering and de-soldering components using different soldering tools - Use of multi- meter and battery booster.	**2**
3.5	**Installation & Troubleshooting:** Assembling and disassembling of different types of mobile phones – Installation of OS - Fault finding & troubleshooting- Jumpering techniques and solutions.	**2**
3.6	**Software and Antivirus**: Flashing- Formatting- Unlocking -Use of secret codes- Downloading- Routing; Mobile Viruses – Precautions – Antivirus Software.	**3**
UNIT – IV COMPUTER NETWORK DEVICES AND OSI LAYERS		**15 HOURS**
4.1	**Data Communication:** Components of a data communication – Data flow: simplex – half duplex – full duplex; Networks – Definition - Network criteria – Types of Connections: Point to point – multipoint; Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology.	**3**
4.2	**Types of Networks:** LAN – MAN – WAN – CAN – HAN – Internet –Intranet –Extranet, Client-Server, Peer to Peer Networks.	**3**
4.3	**Transmission Media:** Classification of transmission media - Guided – Twisted pair, Coaxial, Fiber optics; Unguided – Radiowaves – Infrared – LOS – VSAT – cabling and standards.	**3**
4.4	**Network devices:** Features and concepts of Switches – Routers (Wired and Wireless) – Gateways.	**3**
4.5	**Network Models:** Protocol definition - standards - OSI Model – layered architecture – functions of all layers.	**3**

UNIT V 802.X AND TCP/IP PROTOCOLS		15 HOURS
5.1	**Overview of TCP / IP:** OSI & TCP/IP – Transport Layers Protocol – connection oriented and connectionless Services –Sockets – TCP & UDP.	**3**
5.2	**802.X Protocols:** Concepts and PDU format of CSMA/CD (802.3) – Token bus (802.4) – Token ring (802.5) – Ethernet – type of Ethernet (Fast Ethernet, gigabit Ethernet) –Comparison between 802.3, 802.4 and 802.5	**3**
5.3	**Network Layers Protocol:** IP –Interior Gateway Protocols (IGMP, ICMP, ARP, RARP Concept only).	**3**
5.4	**IP Addressing:** Dotted Decimal Notation –Subnetting & Super netting – VLSMTechnique-IPv6 (concepts only)	**3**
5.5	**Application Layer Protocols:** FTP– Telnet – SMTP– HTTP – DNS – POP	**3**

TEXT BOOKS

S.No	Title	Author	Publisher	Year of Publishing / Edition
1.	Computer Installation and Servicing	D.Balasubramanian	Arasan Ganesan Institute of Technology	1993
2.	The complete PC upgrade and Maintenance	Mark Minasi	BPB Publication	1997
3.	Troubleshooting, Maintaining and Repairing PCs	Stephen J Bigelow	Tata MCGraw Hill Publication	2004
4.	Computer Networks	Andrew S.Tanenbaum	Prentice-Hall of India, New Delhi	2002
5.	Data Communication and networking	Behrouz A.Forouzan	Tata Mc-Graw Hill, New Delhi	2006
6.	Data and Computer Communications	William Stallings	Prentice-Hall of India	Eighth Edition 2007

REFERENCE BOOKS

S.No	Title	Author	Publisher	Year of Publishing / Edition
1.	Computer Networks	Achyut Godbole	Tata Mc-Graw Hill - New Delhi	
2.	Principles of Wireless Networks– A unified Approach	Kaveh Pahlavan and Prashant krishnamoorthy	Pearson Education	2002

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030640

Semester : VI

Subject Title : ELECTRICAL ESTIMATION AND COSTING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL ESTIMATION AND COSTING PRACTICAL	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75marks.**

RATIONALE

To enable the students to prepare the schedule of materials with specification and estimate the cost for different types of Electrical Installations. This will empower the students with the necessary principles of Planning, Electrical Rules and Method of Installations.

OBJECTIVES

On completion of the following units of syllabus contents, the students must be able to:

- Draw the Conventional Symbols for various Electrical Installations.
- To quote the relevant IE Rules for a given Electrical Installation, Earthing and clearanceof Service Lines.
- Familiarize the types of Wiring.
- Explain the necessity and types of Earthing.
- Estimate the quantity of materials and cost required for Domestic and Industrial Wiring.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

Exercise

1. To study the various Electrical Symbols, IE Rules 28, IE Rules 30, IE Rules 31, IE Rules54, IE Rules 56, IE Rules 87.
2. To study the various types of Earthing.
3. To study the various types of Electrical Wiring Methods.
4. Estimate the quantity of material and cost required for Residential Building (1BHK).
5. Estimate the quantity of material and cost required for Computer Centre having 10 Computers, AC Unit, UPS, Light and Fan.
6. Estimate the quantity of material and cost required for Industrial Power Wiring having 4 Machines.
7. Estimate the quantity of material and cost required for street light service having 12 Lamps Light Fitting.
8. Estimate the quantity of material and cost required for 3 Phase Service connection to abuilding having 5KW Load.
9. Estimate the quantity of material and cost required for Irrigation Pump Wiring (5HP).
10. Estimate the quantity of material and cost required for School Building having 3 Class Rooms.
11. Estimate the quantity of material and cost required for erection of a 15HP Induction Motor in a Saw Mill/Flour Mill.

REFERENCE BOOKS

Sl.No.	Title of the book	Author	Publisher
1.	Electrical Design Estimating and Costing.	K.B.Raina&K.Battacharya.	Khanna Publications.
2.	Electrical Installation Estimating and Costing.	J.B.Gupta	S.K.Kataria and Sons
3.	Electrical Wiring, Estimating and Costing.	Dr.S.L.Uppal	New age international (p) limited
4.	Electrical Estimating and Costing.	Surjit Singh	DhanpatRai company.
5.	Electrical wiring, Estimating and costing	B.D.Arora	R.B. Publication.

DETAILED ALLOCATION OF MARKS

Sl.No	NAME OF ACTIVITY	MARK ALLOCATION
1.	LAYOUT / DETAILS OF FITTING	20
2.	LOAD CALCULATION	20
3.	MATERIAL CALCULATION	30
4.	MATERIAL SCHEDULE AND APPROXIMATE COST	25
6.	VIVA-VOCE	05
	TOTAL	**100**

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030624

Semester : VI

Subject Title : POWER ELECTRONICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
POWER ELECTRONICS PRACTICAL	6	96	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

- The advent of Thyristors has revolutionized art of Electric Power Conversation and its Control.
- The use of the Power Electronic Devices has pervaded the Industrial Applications relating to the field of Electrical, Electronics, Instrumentation and Control Engineering.
- This Subject is introduced to impart practical skills to the students in using some important Power Electronic Devices and Circuits.

OBJECTIVES

At the end of the Course, Students will be able to:

- Construct and test various Triggering Circuits for SCR.
- Construct and test different types of Phases Controlled Converters invarious configurations at different load conditions.
- Construct and observe the performance of different types of Chopper and Inverters.
- Construct and test the performance of Open Loop and Closed LoopControl of DC and AC drives.
- Construct and test the performance of Single Phase Cyclo Converter.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics: Power Electronics Practical

Exercise

1. Construct the Line synchronized Ramp trigger circuit using UJT with ACLoad to measure Firing Angles.
2. Construct Lamp control circuit using DIAC – TRIAC to measure various outputvoltage for Firing Angles.
3. Construct and test the SCR Commutation Circuits (Class B & Class D)
4. Construct and test the Half Wave Controlled Rectifier with R- Load, RL Load
5. Construct and test the Single Phase Fully Controlled Bridge with RL- Load andFree Wheeling Diode.
6. Construct and test the Single-Phase Semi Controlled Bridge with R- Load
7. Construct and test the DC Chopper Control Circuit using Thyristor (any class).
8. Construct and test the Step-Up Chopper.
9. Construct PWM based Step Down DC Chopper using MOSFET/IGBT.
10. Construct and test the Single-Phase Single Pulse / Sinusoidal PWM Inverter using MOSFET/IGBT.
11. Construct and test the SMPS using MOSFET/IGBT.
12. Construct and test the Open Loop Speed Control Circuit for DC Shunt Motor and Single-Phase AC Motor.

13. Construct and test the Control Circuit using TRIAC for Universal Motor.
14. Construct and test the Closed Loop Speed Control for a DC and AC Motor.
15. Construct and test the Single-Phase Parallel Inverter using MOSFET/IGBT
16. Construct and test the Single Phase to Single Phase Cyclo Converter.

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.NO	NAME OF THE EQUIPMENT	NO OF QUANTITY
1.	Line Synchronized Ramp Trigger Circuit Using UJT Trainer Kit.	1
2.	Lamp Control Circuit Using DIAC – TRIAC Trainer Kit.	1
3.	SCR Commutation Circuits (Class B & Class D)	1
4.	Half Wave Controlled Rectifier with R- Load & RL Load Trainer Kit.	
5.	Single Phase Fully Controlled Bridge with RL- Load And Freewheeling Diode Trainer Kit.	1
6.	Single Phase Semi Controlled Bridge with R- Load Trainer Kit.	1
7.	Construct and Test the DC Chopper Control Circuit using Thyristor (Any Class) Trainer Kit.	1
8.	Step Up Chopper Trainer Kit.	1
9.	PWM Based Step Down DC Chopper using MOSFET/IGBT Trainer Kit.	1
10.	Single Phase Single Pulse / Sinusoidal PWM Inverter using MOSFET/IGBT Trainer Kit.	1
11.	SMPS using MOSFET/IGBT Trainer Kit.	1
12.	Open Loop Speed Control Circuit for DC Shunt Motor and Single-Phase AC Motor Trainer Kit	1
13.	Control Circuit Using TRIAC for Universal Motor Trainer Kit.	1
14.	Closed Loop Speed Control of DC and AC Motor Trainer Kit.	1
15.	Single Phase Parallel Inverter using MOSFET/IGBT Trainer Kit	1
16.	Single Phase to Single Phase Cyclo Converter Trainer Kit.	1
17.	CRO With Power Probe	4
18.	Multi Meter	5

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Circuit Diagram	25
2	Connections	25
3	Procedure	20
4	Reading/Graph/Result	25
5	Viva Voce	05
	Total	100

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030625

Semester : VI

Subject Title : BIO-MEDICAL INSTRUMENTATION PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
BIO-MEDICAL INSTRUMENTATION PRACTICAL	6	96	25	100*	100	3 hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

Recent advances in Medical Field have been fueled by the Instruments developed by the Electronics and Instrumentation Engineers. Pacemakers, Ultrasound Machine CAT, Medical Diagnostic Systems are few names which have been contributed by Engineers. Now Health Care Industry uses many Instruments which are to be looked after by Instrumentation Engineers.

OBJECTIVES

1. Will enable the Students to learn the basic principles of different Instruments/Equipment used in the Health Care Industry.
2. The practical work done in this area will impart skill in the use, Servicing and Maintenance of this Instruments/Equipment.
3. Proficiency in this area will widen the knowledge and skill of Diploma Holders in the field of Biomedical Instrumentation.

DETAILED SYLLABUS

List of Experiments:

1. Construction and Testing of Differential amplifier.
2. Construction and Testing of Instrumentation amplifier.
3. Measurement of pH of given solution.
4. Measurement of Blood pressure.
5. Measurement of ECG waveform.
6. Construction and verification of pacemaker circuit.
7. Construction and testing of high gain amplifier.
8. Measurement of Body and Skin temperature.
9. Study, handle and use the following Instruments/Equipments:
    a. Cardiac monitor.
    b. ECG stimulator.
    c. Muscle stimulator.
    d. Vascular Doppler recorder.
    e. Pressure plethysmograph.
    f. Skin sympathetic response meter.

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Circuit Diagram / Connection Diagram / Block Diagram	**35**
2	Connections and Proceeding the Experiment	**35**
3	Reading/Calculation/Graph/Result	**25**
4	Viva Voce	**05**
	Total	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	pH meter and conductivity meter	1
2	Photo transducer for pulse measurement	1
3	Sphygmomanometer and Stethoscope	1
4	Blood flow measurement system	1
5	Multi parameter (ECG, EMG, EEG) Simulator	1
6	GSR measurement setup.	1
7	Function generator	8
8	DSO	8
9	Regulated Power supplies	8
10	Bread boards	8

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code :4030626

Semester : VI

Subject title : COMPUTER HARDWARE AND NETWORKING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instructions		Examination			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
COMPUTER HARDWARE AND NETWORK PRACTICAL	6	96	25	100*	100	3Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

The course aims at making the students familiar with various parts of computers and laptops and how to assemble them and the different types of peripherals desired. In addition, the course will provide the students with necessary knowledge and skills in computer and laptop software installation and maintenance and to make him diagnose the software faults. This subject also gives the knowledge and competency to diagnose the problems in computer hardware and peripherals and also gives the knowledge for trouble shooting for systematic repair and maintenance of computers and laptops.

OBJECTIVES

On completion of the following exercises, the students must be able to

- Know the various indicators, switches and connectors used in Computers.
- Familiarize the layout of SMPS, motherboard and various Disk Drives.
- Configure Bios set up options.
- Install various secondary storage devices with memory partition and formatting.
- Know the various types of printer installation and to handle the troubleshooting
- Assemble PC system and checking the working condition.
- Installation of Dual OS in a system.
- Identify the problems in Computer systems, software installation and rectification
- Assembling and disassembling of Laptop to identify the parts and to install OS and configure it.
- Enable to perform different cabling in a network.
- Configure Internet connection and use utilities to debug the network issues.
- Configure router for any topology
- Install and configure Windows 2008 / 2013 Server
- Design Windows server Active directory Services.
- Install and configure server hardware devices.

DETAILED SYLLABUS

PART A - COMPUTER SERVICING AND NETWORKPRACTICAL	
1	Identification of system layout (Study Exercise) a) Front panel indicators & switches and front side & rear side connectors. b) Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, HDD, DVD and add on cards. c) Configure bios setup program and troubleshoot the typical problems using BIOS utility.
2	HARD DISK a) Install Hard Disk. b) Configure CMOS-Setup. c) Partition and Format Hard Disk. d) Identify Master /Slave / IDE Devices. e) Practice with scan disk, disk cleanup, disk De-fragmentation, Virus Detecting and Rectifying Software.
3	a) Install and Configure a DVD Writer & Blu-ray Disc Writer. b) Recording a Blank DVD & Blu-ray Disc.
4	Assemble a system with add on cards and check the working condition of the system and install Dual OS.
5	Identification of mobile phone components (Study Exercise) a) Basic mobile phone components. b) Familiarizing the basic circuit board components: Marking position of different IC and Switches in the Network and Power sections of the PCB.
6	Flashing, Unlocking and Formatting memory cards in Mobile phones.
7	Do the following cabling works in a network a) Cable Crimpling b) Standard Cabling c) Cross Cabling d) I/O Connector Crimping e) Testing the Crimped cable using a Cable tester
8	a) Configure Host IP, Subnet Mask and Default Gateway in a system in LAN(TCP/IP Configuration). b) Configure Internet connection and use IPCONFIG, PING / Tracert and Net stat utilities to Debug the Network issues.
9	Transfer files between systems in LAN using FTP Configuration. Install a printer in LAN and share it in the network.

PART B – SYSTEM ADMINISTRATION PRACTICAL	
10	Installation of Windows 2008 / 2013 Server.
11	Installation and configuration of DHCP Server.
12	Installation and configuration of Mail Server.
13	a) Installation of Red Hat Linux using Graphical mode. b) Installation of Red Hat Linux using VMware.
14	a) Creating a user in Linux Server and assigning rights. b) Configuring and troubleshooting.
15	a) Configuring and troubleshooting of /etc/grub.conf b) Configuring and trouble shooting of /etc/passwd

Note:

The students must and should install software's. After the demonstration, the same is uninstalled. Each batch has to learn to install and use the tools.

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Procedure Writing – One Question from PART – A	**10**
2	Procedure Writing – One Question from PART - B	**15**
3	Executing Exercise (PART – A)	**10**
4	Executing Exercise (PART – B)	**20**
5	Result (PART – A)	**5**
6	Result (PART – B)	**5**
7	Demonstration of mini project	**5**
8	VIVA – VOCE	**5**
	TOTAL	**75**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

Hardware Requirements:	
Desktop Systems	30 Nos
Hard disk drive	06 Nos
DVD, Blu-ray Drive	06 Nos
Blank DVD , Blu-ray Disc	20 Nos
Head cleaning CD	
Dot matrix Printer	02 Nos
Laser Printer	02 Nos
Server	01 Nos
Mobile phones	06 Nos
Network Requirements:	
Crimping Tool	06 Nos
Screwdriver set	06 Nos
Network Cables	
Modem	02 Nos
Hub	01 No
Router	01 No
Switch	02 Nos
Software Requirements:	
Windows OS	
Windows Server 2008 / 2013 and LINUX.	
Antivirus software.	
DVD and Blu-ray Burning S/W.	
Mobile Phone Flashing S/W	

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040: Electronics and Communication Engineering

Subject Code : 4040660

Semester : VI

Subject Title : Project Work & Internship

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16

Subject	Instruction		Examination		
	Hours/ Week	Hours/ Semester	Assessment Marks		
			Internal	Board Exam	Total
PROJECT WORK & INTERNSHIP	**6**	**96**	**25**	**100***	**100**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Minimum Marks for Pass is 50 out of which minimum 50 marks should be obtained out of 100 marks in the Board Examination alone.

OBJECTIVES:

- The project work and internship is aimed to assemble and test a photo type model of any one item/gadget.
- Real time application problems if any may be identified from any industry and may be chosen.
- The knowledge and the skill so far acquired may be made use of.
- The team spirit may be motivated.
- The entrepreneurship ideas may be motivated by conducting a career guidance programme.
- Learn and understand the gap between the technical knowledge acquired through curriculum and the actual industrial need through internship .

INTERNAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Detail of assessment	Period of assessment	Max. Marks
First Review	6th week	10
Second Review	12th week	10
Attendance	Entire semester	5
Total		**25**

EVALUATION FOR BOARD EXAMINATION:

Details of Mark allocation	Max Marks
Demonstration/Presentation	**25**
Report	**25**
Viva Voce	**30**
Internship report	**20**
Total	**100**

List of Equivalent Subjects for M - Scheme to N – Scheme

M - SCHEME		N – SCHEME	
III SEMESTER			
Subject Code	Subject Name	Subject Code	Subject Name
34031	Electronic Devices and Circuits	4040310	Electronic Devices and Circuits
33031	Electrical Circuit Theory	4030320	Electrical Circuit Theory
33032	Electrical Machines-I	4030330	Electrical Machines -I
34034	Electronic Devices and Circuits Practical	4040340	Electronic Devices and Circuits Practical
33034	Electrical Circuits and Machines Practical	4030350	Electrical Circuits and Machines Practical
33036	Electrical Work Shop Practical	4030360	Electrical Workshop Practical
33064	Wiring and Winding Practical	4030370	Wiring & Winding Practical
IV SEMESTER			
33041	Electrical Machines – II	4030410	Electrical Machines -II
33042	Measurements and Instruments	4030420	Measurements, Instruments and Transducers
33044	Transducers and Signal Conditioners	4030320	Measurements, Instruments and Transducers
34043	Digital Electronics	4040430	Analog and Digital Electronics
		4000440	E-Vehicle Technology and Policy
33045	Electrical Machines and Instrumentation Practical	4030450	Electrical Machines and Instrumentation Practical
34046	Integrated Circuits Practical	4040460	Analog and Digital Electronics Practical
33065	Electrical Circuits Simulation Practical	4030470	Electrical Circuits and Simulation Practical

V SEMESTER			
33051	Generation Transmission and Switchgear	4030510	Generation Transmission and Switchgear
34052	Micro Controller	4040520	Micro Controller and its Applications
33055	Computer Aided Electrical Drawing Practical	4030540	Computer Aided Electrical Drawing Practical
33071	Control of Electrical Machines	4030511	Control of Electrical Machines
33072	Programmable Logic Controller	4030512	Programmable Logic Controllers
		4030513	Renewable Energy Sources
33074	Control of Electrical Machines Practical	4030514	Control of Electrical Machines Practical
33075	Programmable Logic Controller Practical	4030515	Programmable Logic Controller Practical
		4030516	Renewable Energy Sources Practical
34056	Micro Controller Practical	4040550	Microcontroller and its ApplicationsPractical
		4040570	Entrepreneurship and Startups
VI SEMESTER			
33061	Distribution and Utilization	4030610	Distribution and Utilization
		4030630	Energy Conservation and Audit
33053	Electrical Estimation and Energy Auditing	4030640	Electrical Estimation and Costing Practical
33081	Power Electronics	4030621	Power Electronics
34082	Bio-Medical Instrumentation	4030622	Bio-Medical Instrumentation
34682	Computer Hardware and Networks	4030623	Computer Hardware and Networks
33084	Power Electronics Practical	4030624	Power Electronics Practical
33085	Bio-Medical Instrumentation Practical	4030625	Bio-Medical Instrumentation Practical
34684	Computer Hardware and Networks Practical	4030626	Computer Hardware and Networks Practical
33067	Project Work	4020660	Project Work and Internship

DIPLOMA IN ENGINEERING AND TECHNOLOGY

(1040,3040)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER PATTERN

N – SCHEME

IMPLEMENTED FROM 2020 - 2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION
CHENNAI-600 025, TAMIL NADU

DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING

Syllabus Revision Committee

Chairperson

Tmt.G.LaxmiPriya IAS
Director
Directorate of Technical Education
Chennai – 600 025.

Coordinator

Tmt J Rama
Principal, Government Polytechnic College
R K Nagar, Chennai - 81

Convener

Tmt J Rama
Principal, Government Polytechnic College
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DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2020 - 2021)

N – SCHEME

R E G U L A T I O N S*

**Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology.*

1. Description of the Course:

a. Full Time (3 years)

The Course for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year iscommon to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Sandwich Diploma in Engineering shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Yearis common to all Engineering Branches. The subjects of three years full timediploma course being regrouped for academic convenience.

During 4th and/or during 7thsemester the students undergo industrial training forsix months/ one year. Industrial training examination will be conducted after completion of every 6 months of industrial training.

c. Part Time (4 years)

The course for the Part Time Diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3 year full time diploma courses being regrouped for academic convenience.

* ***Each Semester will have 16 weeks duration of study with 35 hrs. / Week for Regular DiplomaCourses and 18 hrs. / Week for Part-Time Diploma Courses.***

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Coursesviz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2020 – 2021 academic year onwards.

2. Condition for Admission:

Condition for admission to the Diploma courses shall be required to have passed in the S.S.L.C Examination of the Board of Secondary Education,Tamil Nadu.

(Or)

The Anglo Indian High School Examination with eligibility for Higher SecondaryCourse in Tamil Nadu.

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamil Nadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (LateralEntry):

A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board with eligibility for University Courses of study or equivalent examination& Should have studied the following subjects.

A pass in 2 Years ITI with appropriate Trade or Equivalent examination.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational		Industrial Training Institutes Courses
		Subjects Studied	Subjects Studied		
			Related subjects	Vocational subjects	
1.	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Maths / Physics / Chemistry	Related Vocational SubjectsTheory & Practical	2 years course to be passed with appropriate Trade
2.	Diploma Coursein Commercial Practice	English & Accountancy English & Elements of Economics English & Elements of	English & Accountancy, English & Elements of Economics, English & Management	Accountancy & Auditing, Banking, Business Management, Co-operative	-

		Commerce	Principles & Techniques, English & Typewriting	Management, International Trade, Marketing & Salesmanship, Insurance& Material Management, Office Secretaryship.	

- For the Diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practicals may also be taken for arriving the eligibility.
- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.
- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Commercial Practice Diploma courses the candidates studied the related subjects will be given first preference.
- *Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.*

4. Age Limit: No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, Tamil Nadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses are as given below:

Diploma Course	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
FullTime (Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

This will come into effect from N Scheme onwards i.e. from the academic year 2020-2021.

7. Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical subjects.

The curriculum outline is given in Annexure – I.

8. Examinations:

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment. Board Examinations are conducted for 100 marks and reduced to 75.

The total marks for result are 75 + 25 = 100 Marks.

9. Continuous Internal Assessment:

A. <u>For Theory Subjects:</u>

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

<u>i) Subject Attendance</u> **5 Marks**

(Award of marks for subject attendance to each subject Theory/Practical willbe as per the range given below)

80%	-	83%	1 Mark
84%	-	87%	2 Marks
88%	-	91%	3 Marks
92%	-	95%	4 Marks
96%	-	100%	5 Marks

<u>ii) Test #</u> **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Average of the these two test marks will be taken and the marks to be reduced to:	05 Marks
The Test – III is to be the Model Examination covering all the five units and the marks obtained will be reduced to :	05 Marks

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	**Model Examination:** Covering all the 5 Units. (Board Examinations-question paper-pattern).	End of 16th week	100	3 Hrs

From the Academic Year 2020 – 2021 onwards.

Question Paper Pattern forthe Test -I and Test – II is as follows. The tests should be conducted by proper schedule. Retest marks should not be considered for internal assessment.

Without Choice:

Part A Type questions:	6 Questions × 1 mark	06 marks
Part B Typequestions:	7Questions × 2marks	14 marks
Part C Type questions:	2 Questions × 15 marks	30 marks
	Total	**50 marks**

iii) Assignment **5 Marks**

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 5 marks.

iv) Seminar Presentation **5 Marks**

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second Year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation.For the Third Year, the students should present the seminar individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject.The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2½ marks for the material submitted in writing and 2 ½ marks for the seminar

presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks.

All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for onesemester after publication of Board Exam results and produced to the flying squad and the inspection team at the time of inspection/verification.

B. <u>For Practical Subjects:</u>

The Internal Assessmentmark for a total of 25 marks which are to be distributed as follows:-

a) Attendance :**5Marks**

(Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/
Other Practical related Work :**10Marks**

c) Record writing :**10Marks**

TOTAL : **25Marks**

- *All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examinations.*
- The observation note book / manual should be maintained for 10 marks. The observation note book / manual withsketches, circuits, programme, reading and calculation written by the students manually depends upon the practical subject during practical classes should be evaluated properly during the practical class hours with date.
- The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 10 marks for each exercise as per the above allocation.
- At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks (including Observation and Record writing) and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)
- Only regular students, appearing first time have to submit the duly signed bonafiderecord note book/file during the Practical Board Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Log Book of the staff, who is handling the theory subject.

The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Log Book of the staff, who is handling the practical subject.

10. Communication Skill Practical, Computer ApplicationPractical and Physical Education:

The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase the Communication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physical education is introduced to encourage students to remain healthy and fit by including physical activities and sports.

11. Project Work and Internship:

The students of all the Diploma Courseshave to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the samesemester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work &Internship:

Project Review I	…	**10 marks**
Project Review II	…	**10 marks**
Attendance	…	**05 marks**(Award of marks same as theory subject pattern)
Total	…	**25 marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work &Internship in Board Examinations:

Demonstration/Presentation	25 marks
Report	25 marks
Viva Voce	30 marks
Internship Report	20 marks
Total	**100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individualstudent during the Project Work &Internship Board examination.

12.Scheme of Examinations:

The Scheme of examinations for subjects is given in Annexure - II.

13.Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than *40% in theory subjects* and *50% in practical subjects* out of the total prescribed maximum marks including both the Internal Assessment and the Board Examinations marks put together, subject to the condition that he/she secures at least a minimum of 4*0 marks out of 100 marks in the Board Theory Examinations and a minimum of 50 marks out of 100 marks in the Board Practical Examinations.*

14. **Classification of successful candidates:**

Classification of candidates who will pass out the final examinations fromApril 2023 onwards (Joined first year in 2020 -2021) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3/ 3½/ 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3/ 3½/ 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 2 / 3/ 3½/ 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

Second Class:

All other successful candidates will be declared to have passed in **Second Class.**

The above classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2023 /April 2024 onwards (both joined First Year in 2020 -2021)

15. Duration of a period in the Class Time Table:

The duration of each period of instruction is1 hour and the total period of instruction hours excluding interval and lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

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ANNEXURE I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING SYLLABUS

N SCHEME

(Implemented from the Academic year 2020- 2021 onwards)

CURRICULUM OUTLINE

FULL TIME(1040)

THIRD SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040310	Electronic Devices and Circuits	5	-	-	5
4040320	Electrical Circuits and Instrumentation	6	-	-	6
4040330	Programming in 'C'	5	-	-	5
4040340	Electronic Devices and Circuits Practical	-	-	4	4
4040350	Electrical Circuits and Instrumentation Practical	-	-	4	4
4040360	Programming in 'C' Practical	-	-	4	4
4040370	Simulation Practical			4	4
	Physical Education	-	2	-	2
	Library	-	1	-	1
Total		16	3	16	35

FOURTH SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040410	Industrial Electronics	5	-	-	5
4040420	Communication Engineering	5	-	-	5
4040430	Analog and Digital Electronics	4	-	-	4
4040440	Industrial Electronics Practical	-	-	5	5
4040450	Communication Engineering Practical	-	-	4	4
4040460	Analog and Digital Electronics Practical	-	-	5	5
4020620	E-Vehicle Technology & Policy #	4	-	-	4
	Physical Education	-	2	-	2
	Library	-	1	-	1
Total		18	3	14	35

 # Common with Mechanical Engineering

FIFTH SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040510	Analog and Digital Communication systems	5	-	-	5
4040520	Microcontroller and its Applications	5	-	-	5
4040531	Elective 1.Very Large Scale Integration	4	-	-	4
4040532	2.Consumer Electronics				
4040533	3.Basics of Digital Signal and Image processing				
4040540	Analog and Digital Communication Practical	-	-	5	5
4040550	Microcontroller Practical	-	-	4	4
4040561	Elective practical 1.Very Large Scale Integration Practical	-	-	5	5
4040562	2.Consumer Electronics Practical				
4040563	3.Signal and Image processing Practical				
4020570	Entrepreneurship and Start –ups #			4	4
	Physical Education	-	2	-	2
	Library	-	1	-	1
Total		14	3	18	35

 # Common with Mechanical Engineering

SIXTH SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040610	Computer Hardware Servicing and Networking	5	-	-	5
4040620	Biomedical Instrumentation	5	-	-	5
	Elective Theory				
4040631	1. Television Engineering	5	-	-	5
4040632	2. Mobile and Optical Communications				
4040633	3.Embedded Systems				
4040640	Computer Hardware Servicing and Networking Practical	-	-	6	6
4040651	Elective Practical 1.Television Engineering Practical	-	-	5	5
4040652	2.Mobile and Optical Communication Practical				
4040653	3. Embedded Systems practical				
4040660	Project Work and Internship	-	-	6	6
	Physical Education	-	2	-	2
	Library	-	1	-	1
Total		15	3	17	35

ELECTRONICS AND COMMUNICATION ENGINEERING

(PART TIME)(3040)

THIRD SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040310	Electronic Devices and Circuits	4	-	-	4
4040320	Electrical Circuits and Instrumentation	4	-	-	4
40015	Engineering Graphics I		4		4
4040340	Electronic Devices and Circuits Practical	-	-	3	3
4040350	Electrical Circuits and Instrumentation Practical	-	-	3	3
	Total	8	4	6	18

FOURTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040330	Programming in 'C'	4	-	-	4
4040410	Industrial Electronics	4	-		4
40025	Engineering Graphics II		4		4
4040360	Programming in 'C' Practical	-		3	3
4040370	Simulation Practical	-		3	3
	Total	8	4	6	18

FIFTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040420	Communication Engineering	4	-	-	4
4040430	Analog and Digital Electronics	4	-	-	4
4040440	Industrial Electronics Practical	-	-	4	4
4040450	Communication Engineering Practical	-	-	3	3
4040460	Analog and Digital Electronics Practical	-	-	3	3
	Total	8		10	18

SIXTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040510	Analog and Digital Communication systems	4	-	-	4
4040520	Microcontroller and its Applications	4	-	-	4
40001	Communication skill Practical			3	3
4040540	Analog and Digital Communication Practical	-	-	3	3
4040550	Microcontroller Practical	-	-	4	4
	Total	8		10	18

SEVENTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040610	Computer Hardware Servicing and Networking	3	-	-	3
4040531	Elective 1.Very Large Scale Integration	3	-	-	3
4040532	2.Consumer Electronics				
4040533	3.Basics of Digital Signal and Image processing				
4020620	E-Vehicle Technology & Policy #	3	-	-	3
4040561	Elective practical 1.Very Large Scale Integration Practical	-	-	3	3
4040562	2.Consumer Electronics Practical				
4040563	3.Signal and Image processing Practical				
4040640	Computer Hardware Servicing and Networking Practical	-	-	3	3
40002	Computer Application Practical			3	3
	Total	9	-	9	18

 # Common with Mechanical Engineering

EIGHTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		THEORY HOURS	TUTORIAL HOURS	PRACTICAL HOURS	TOTAL HOURS
4040620	Biomedical Instrumentation	4	-	-	4
	Elective Theory				
4040631	1. Television Engineering	4	-	-	4
4040632	2. Mobile and Optical Communications				
4040633	3.Embedded Systems				
4020570	Entrepreneurship and Start -ups #			3	3
4040651	Elective Practical 1.Television Engineering Practical	-	-	3	3
4040652	2.Mobile and Optical Communication Practical				
4040653	3 Embedded Systems Practical				
4040660	Project Work and Internship	-	-	4	4
	Total	8		10	18

 # Common with Mechanical Engineering

ANNEXURE II

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ELECTRONICS AND COMMUNICATIONENGINEERING SYLLABUS

N SCHEME

(Implemented from the Academic year 2020- 2021 onwards)

SCHEME OF EXAMINATION

(FULL TIME)(1040)

THIRD SEMESTER

Subject Code	Subject	Examination			
		Marks			Duration
		Internal Assessment	Board Examinations	Total	
4040310	Electronic Devices and Circuits	25	100*	100	3 Hrs.
4040320	Electrical Circuits and Instrumentation	25	100*	100	3 Hrs.
4040330	Programming in 'C'	25	100*	100	3 Hrs.
4040340	Electronic Devices and Circuits Practical	25	100*	100	3 Hrs.
4040350	Electrical Circuits and Instrumentation Practical	25	100*	100	3 Hrs.
4040360	Programming in 'C' Practical	25	100*	100	3 Hrs.
4040370	Simulation Practical	25	100*	100	3 Hrs.
	Physical Education				
	Library				

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

FOURTH SEMESTER

Subject Code	Subject	Examination			
		Marks			Duration
		Internal Assessment	Board Examinations	Total	
4040410	Industrial Electronics	25	100*	100	3 Hrs.
4040420	Communication Engineering	25	100*	100	3 Hrs.
4040430	Analog and Digital Electronics	25	100*	100	3 Hrs.
4040440	Industrial Electronics Practical	25	100*	100	3 Hrs.
4040450	Communication Engineering Practical	25	100*	100	3 Hrs.
4040460	Analog and Digital Electronics Practical	25	100*	100	3 Hrs.
4020620	E-Vehicle Technology & Policy #	25	100*	100	3 Hrs.
	Physical Education				
	Library				

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

 # Common with Mechanical Engineering

FIFTH SEMESTER

Subject Code	Subject	Examination			
		Marks			Duration
		Internal Assessment	Board Examinations	Total	
4040510	Analog and Digital Communication systems	25	100*	100	3 Hrs.
4040520	Microcontroller and its Applications	25	100*	100	3 Hrs.
4040531	Elective Theory 1.Very Large Scale Integration	25	100*	100	3 Hrs.
4040532	2.Consumer Electronics	25	100*	100	3 Hrs.
4040533	3.Basics of Digital Signal and Image processing	25	100*	100	3 Hrs.
4040540	Analog and Digital Communication Practical	25	100*	100	3 Hrs.
4040550	Microcontroller Practical	25	100*	100	3 Hrs.
4040561	Elective practical 1.Very Large ScaleIntegration Practical	25	100*	100	3 Hrs.
4040562	2.Consumer Electronics Practical	25	100*	100	3 Hrs.
4040563	3.Signal and Image processing Practical	25	100*	100	3 Hrs.
4020570	Entrepreneurship and Start –ups #	25	100*	100	3 Hrs.
	Physical Education				
	Library				

*** Examination will beconducted for 100 marks and it will be reduced to 75 marks.**

 # Common with Mechanical Engineering

SIXTH SEMESTER

Subject Code	Subject	Examination			
		Marks			Duration
		Internal Assessment	Board Examinations	Total	
4040610	Computer Hardware Servicing and Networking	25	100*	100	3 Hrs.
4040620	Biomedical Instrumentation	25	100*	100	3 Hrs.
	Elective Theory	25	100*	100	3 Hrs.
4040631	1. Television Engineering	25	100*	100	3 Hrs.
4040632	2. Mobile and Optical Communications	25	100*	100	3 Hrs.
4040633	3.Embedded Systems	25	100*	100	3 Hrs.
4040640	Computer Hardware Servicing and Networking Practical	25	100*	100	3 Hrs.
4040651	Elective Practical 1.Television Engineering Practical	25	100*	100	3 Hrs.
4040652	2.Mobile and Optical Communication Practical	25	100*	100	3 Hrs.
4040653	3 Embedded Systems practical	25	100*	100	3 Hrs.
4040660	Project Work and Internship	25	100*	100	3 Hrs.
	Physical Education				
	Library				

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

List of Equivalent Subjectsfor M- Scheme to N– Scheme

THIRD SEMESTER

Code No	M Scheme	Code No	N scheme
34031	Electronic Devices and Circuits	4040310	Electronic Devices and Circuits
34032	Electrical Circuits and Instrumentation	4040320	Electrical Circuits and Instrumentation
34033	Programming in C	4040330	Programming in C
34034	Electronic Devices and Circuits Practical	4040340	Electronic Devices and Circuits Practical
34035	Electrical Circuits and Instrumentation Practical	4040350	Electrical Circuits and Instrumentation Practical
34036	Programming in C Practical	4040360	Programming in C practical
34037	Computer Application Practical for Electronics	40002	Computer Application Practical

FOURTH SEMESTER

Code No	M Scheme	Code No	N scheme
34041	Industrial Electronics	4040410	Industrial Electronics
34042	Communication Engineering	4040420	Communication Engineering
34043	Digital Electronics	4040430	Analog and Digital Electronics
34044	Linear Integrated Circuits	4040430	Analog and Digital Electronics
34045	Industrial Electronics and Communication Engineering Practical	4040440	Industrial Electronics Practical
34046	Integrated Circuits Practical	4040460	Analog and Digital Electronics Practical
30002	Life and Employability Skill Practical	----------	No Equivalent

FIFTH SEMESTER

Code No	M Scheme	Code No	N scheme
34051	Advanced Communication Systems	4040510	Analog and Digital Communication Systems
34052	Microcontroller	4040520	Microcontroller and its Applications
34053	VLSI	4040531	VLSI
34071	Digital Communication	----------	No Equivalent
34272	Programmable Logic Controller	----------	No Equivalent
34073	Electronic Systems Design	----------	No Equivalent
34055	Advanced communication Systems Practical	4040540	Analog and Digital Communication Practical
34056	Microcontroller Practical	4040550	Microcontroller Practical
34057	VLSI Practical	4040561	VLSI Practical

SIXTH SEMESTER

Code No	M Scheme	Code No	N scheme
34061	Computer Hardware Servicing and Networking	4040610	Computer Hardware Servicing and networking
34062	Bio Medical Instrumentation	4040620	Bio Medical Instrumentation
34081	Television Engineering	4040631	Television Engineering
34082	Test Engineering	----------	No Equivalent
34083	Mobile Communication	4040632	Mobile and Optical Communication
34064	Computer Hardware Servicing and Networking Practical	4040640	Computer Hardware Servicing and Networking Practical
34084	PCB Design Practical	----------	No Equivalent
34085	Test Engineering Practical	----------	No Equivalent
34066	Embedded Systems Practical	4040653	Embedded Systems Practical
34067	Project Work	----------	No Equivalent

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject Code : 4040310

Semester :IIISemester

Subject title : ELECTRONIC DEVICESANDCIRCUITS

TEACHINGAND SCHEME OF EXAMINATION

No ofweeks/ semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Board Examination	Total	
Electronic Devices and Circuits	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and allocation of hours

UNIT	TOPIC	Hrs
I	Filters, Zener diode and Opto-electronic devices	14
II	Bipolar Junction Transistor, Field Effect Transistor and UJT	16
III	Feedback, Amplifiers and Oscillators	16
IV	Special Semiconducting Devices(SCR, DIAC AND TRIAC)	14
V	Wave shaping Circuits	13
	Tests and Model Exam	7
Total		80

RATIONALE:

EveryElectronicsEngineershouldhavesoundknowledgeaboutthecomponentsused in Electronics Industry.This is vitalin R&DDepartment for chip level troubleshooting. To meet theindustrialneeds,diplomaholders mustbetaughtaboutthemostfundamentalsubject, ElectronicdevicesandCircuits.Bystudyingthissubject,theywillbeskilledinhandlingall types ofelectronic devices and ableto applythe skill in electronics system.

OBJECTIVES:

On completion ofthefollowing units of syllabus contents, the students must be able to:

- Know the importance of Filters
- Know the construction,working principle and applications ofZener diode
- Know the construction,working principle and applications ofOptoelectronic devices
- Know the biasing methods of Transistors and their applications
- Study the performance of special devices like UJT,FET
- Studythe Concept of Feedback, different types of Negative feedback connections
- Know the Types of Transistor amplifiers ,Transistor oscillators and their applications
- Study the performance of Special semiconducting devices like SCR, DIAC, andTRIAC
- Explain the concept ofwave shaping circuits, Bistable Multivibrator and Schmitt trigger
- Studytheworking principle ofclippers , clampers , Voltage Multipliers and their applications

4040310 ELECTRONIC DEVICES AND CIRCUITS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**FILTERS, ZENER DIODES AND OPTO-ELECTRONIC DEVICES** **1.1: FILTERS** Definition - Types - Capacitor filter - Inductor filter - L section filter - Pi section and RC filter - Comparison and Applications of Filters **1.2: ZENER DIODE** Construction, Working principle and Characteristics of Zener Diodes- Zenerbreakdown-Avalanchebreakdown- Zenerdiode asa Voltageregulator. **1.3: OPTO-ELECTRONIC DEVICES** Definition - Types - Symbol, Working , Characteristics and Applications of LED, 7 Segment LED - Photo diode, Photo transistor and Opto- coupler	**5** **5** **4**
II	**BIPOLAR JUNCTION TRANSISTOR (BJT), FIELD EFFECT TRANSISTOR (FET) AND UNI JUNCTION TRANSISTOR (UJT)** **2.1: BIPOLAR JUNCTION TRANSISTOR** Transistorbiasing: Need for biasing - Types- Fixedbias,Collector tobase bias andSelfbias (Operation only ,No derivation of circuit elements and parameters)– Define: Stability factor - Operation of Common Emitter TransistorasanA mplifier andasa switch. **2.2**: **FIELD EFFECT TRANSISTOR (FET)** Construction– Workingprinciple–Classification - Drain and Transfer Characteristics -Applications–Comparison betweenFETandBJT- FET amplifier (common source amplifier). **2.3: UNIJUNCTION TRANSISTOR (UJT)** Construction- Equivalentcircuit-Operation-Characteristics- UJTasa relaxation oscillator	**7** **5** **4**

III	**FEEDBACK , AMPLIFIERS AND OSCILLATORS** **3.1: FEEDBACK** Concept - effects of negativefeedback-Types of negativefeedback connections - Applications **3.2: AMPLIFIERS** Transistor amplifiers - Types - RC coupled amplifier - Working and Frequency responsecharacteristics –Working of Common Collector Amplifier(Emitter follower) **3.3 : OSCILLATORS** **Transistoroscillators**–Conditionsforoscillation(Barkhausencriterion)-Classifications– HartleyOscillator– Colpitts Oscillator – RC Phaseshift oscillator	**6** **6** **4**
IV	**SPECIAL SEMICONDUCTING DEVICES (SCR, DIAC AND TRIAC)** **4.1:SCR (SILICON CONTROLLED RECTIFIER)** Symbol – Layered Structure – Transistor analogy - Working–VIcharacteristics– Applications - ComparisonbetweenSCRand Transistor **4.2: DIAC (Diode for Alternating Current)** Symbol – Layered structure - Working – VIcharacteristics- Applications **4.3: TRIAC (Triode for Alternating Current)** Symbol – Layered structure - Working – VIcharacteristics- Applications	**5** **5** **4**
V	**WAVE SHAPING CIRCUITS** **5.1: CLIPPERSAND CLAMPERS** Construction and working of Positive, Negative and biased Clippers - Construction and working of Positive and Negative Clamper **5.2: Voltage Multipliers** Construction and working of Voltage Doubler and Tripler. **5.3 :Multivibrator and SchmittTrigger** Construction – Working – Waveform of Astable and Monostable Multivibratorusing Transistorsand SchmittTrigger usingTransistors	**5** **3** **5**

Reference Books:

1. Electronics Devices & Circuits bySalivahananS,N.Suresh Kumar, A.Vallavaraj Tata McGrawPublication 3rdEdition 2016
2. Electronics Devices and circuit theorybyBoyestad&Nashelsky, PHI , NewDelhi 2009
3. Electronic Principles byMalvino,-Tata McGrawHill Publication 2010.
4. ElectronicsDevices&CircuitsbyJacobMillmanandHalkias3rdEdition 2010, Tata McGraw– Hill publication
5. Optical Fiber Communication byGerdKeiser 5thEdition, Tata McGraw– Hill .

STATE BOARD OF TECHNICAL EDUCATION ANDTRAINING, TAMILNADU

DIPLOMAINENGINEERING / TECHNOLOGY SYLLABUS

N SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

SubjectCode. : 4040320

Semester :III

SubjectTitle :ELECTRICALCIRCUITSANDINSTRUMENTATION

TEACHINGANDSCHEMEOFEXAMINATION

NumberofWeeks/Semester:16weeks

Subject	Instructions		Examination			
			Marks			
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	Duration
ElectricalCircuits andInstrumentation	**6**	**96**	**25**	**100***	**100**	**3Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs
I	DCCircuitsandTheorems	18
II	ACCircuits	17
III	ElectricalMachines	18
IV	Transducers andCRO	18
V	Measurement and Instruments	18
Revision ,Test& Model Exam		7
TOTAL		96

RATIONALE:

This subject enables the students with concepts of DC circuits & network theorems, AC circuits. The subject also deals with principles and working of different Measuringinstruments and Electrical Machines.Theintroductionofthissubjectimpart the knowledge forstudents to analyze the electrical circuits.

OBJECTIVES:

Onsuccessfulcompletionofthecourse,thestudentsmustbeable to

- State ohm'slawandKirchoff'slaws.
- Understand the DC circuit and network theorems.
- Understandseriesandparallelcircuits.
- Define varioustermsrelatedtoACcircuits.
- Get knowledge on ACcircuits.
- Understand aboutresonance in seriesandparallelcircuits.
- Know theoperationof different Electrical machines.
- Know theoperationof measuringinstruments.
- Have basic knowledge on circuit analysis.

4040320 ELECTRICAL CIRCUITS AND INSTRUMENTATION DETAILEDSYLLABUS

Contents: Theory

UNIT	NAMEOF THE TOPIC	HOURS
1	**D.C.CIRCUITSAND THEOREMS** 1.1 Definition and Unit: Voltage, current, power, resistance andconductance . 1.2 Electrical laws: Ohm's law – Simple problems in ohm'slaw – Kirchoff's current law and Kirchoff's voltage law. 1.3 Basic DC circuits: Series and Parallel connections of resistors – Voltage and Current division in series and parallel circuits – Mesh analysis for DC circuits (simpleproblems). 1.4 Network theorems: Thevenin's theorem –Superpositiontheorem – Maximumpower transfer theorem (Statement, Explanation, Simpleproblems).	**3** **4** **5** **6**
2	**A.C.CIRCUITS** 2.1 Basic AC circuits: Definition for impedance, reactance, admittance andpower factor Sinusoidal and Non sinusoidal waveforms – Average and RMS value – Current and Voltage relationship in R, L and C circuits – Analysis of RL, RC and RLC series circuits – Analysis of RL, RC and RLC parallel circuits (simple problems). 2.2 Resonance: Series resonance – Parallel resonance – Conditionfor resonance – frequency response – Resonant frequency, Q factor and bandwidth.	**9** **8**
3	**ELECTRICAL MACHINES** 3.1 Transformer : Construction – workingprinciple – EMF equation – Losses in transformer – efficiency of a transformer – OC, SC test ontransformer– Applications of transformer. 3.2 Single phase and three phase supply : Introduction to single phase and three phase supply – Star Deltatransformation – Differencebetweensinglephaseandthreephasesupply. 3.3 DC Generator: Construction, working principle, EMF equation. 3.4 Electric Motors: DC motor –Single phase induction motor –Three phase	**5** **5** **3** **5**

	induction motor – Capacitor start induction motor –stepper motor – Universal Motor.	
4	**TRANSDUCERS& CRO:** 4.1 Transducers: Classification of Transducers – Strain gauge: Principle of operation, construction, types, advantage, disadvantage and application, Advantage of semiconductor strain gauge over metallic strain gauge – Photo electric transducer – LVDT – RVDT– Loadcell. 4.2 CRO: CRT – Block diagram and operation of CRO – Applications of CRO – Dual trace – Digital storageOscilloscope:Blockdiagram,working principle – FunctionGenerator : Block Diagram, workingprinciple.	**9** **9**
5	**MEASUREMENT AND INSTRUMENTS:** 5.1 Definition : Definition for Measurement, Accuracy, precision, resolution, Calibration. 5.2 Instruments: Operation of Thermocouple – working principle of Thermistor – PMMC Instrument: Construction and working principle – Moving Iron Instrument: Construction and working principle – Shuntsand Multipliers – Potentiometer – DCammeter – DCvoltmeter – Voltmetersensitivity. 5.3 Measurement: Errors inMeasurement –Temperaturemeasurement using thermocouple –Temperaturemeasurement using thermistors–Resistance measurement: Wheatstone bridge – Measurement of Inductance: Maxwell's bridge – Measurement of Capacitance: Schering Bridge.	**2** **8** **8**

REFERENCEBOOKS:

1."B.L.Theraja,A.K.Theraja"" A Text book of ElectricalTechnology", S. Chand & co publisher, New Delhi 2005.

2.."R.K.Rajput"" Electronic MeasurementsandInstrumentation", S. Chand (Third Edition)-2008.

3. "Dr.M.Arumugam,N.Premkumaran"," ElectricCircuitTheory", KhannaPublishers, New Delhi ,5th edition 1979.

4. "A.K.Sawhney"" A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat raj & co-1993.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name :1040:Electronics and Communication Engineering

Subject Code : 4040330

Semester :IIISemester

Subject title : PROGRAMMING IN C

TEACHINGAND SCHEME OF EXAMINATION

No ofweeks/ semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Board Examination	Total	
Programming in C	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

TOPICS&ALLOCATIONOFHOURS

UnitNo.	Topics	No.ofHours
I	BASICS OF 'C'	14
II	COPERATORS ,DECISIONMAKING,BRANCHING AND LOOPING STATEMENTS	15
III	ARRAYS AND STRINGS	15
IV	STRUCTURE AND UNION	15
V	FUNCTIONS &FILES I/O	14
	Revision,Test&Model Exam	7
	TOTAL	**80**

RATIONALE:

'C' language is the most widely used computer language, which is being taught as a core course. C is the generalpurpose high level language. Due to the flexibility, it is suitable for different development environments. 'C' language has importance and popularity in recently developed and advanced softwareindustry. 'C' language can also be used for system level programming and it is still considered as first priorityprogramming language. This course covers the basic concepts of 'C'.

OBJECTIVES:

The course aims to provide exposure / train the students to do programming in C.
AttheendoftheCourse,thestudents will be able to

- Know the basics of C.
- Writealgorithm andflowchartforanyproblems.
- Know operators used in 'C' and Decision making statements.
- Define and understand aboutarraysandfunctions.
- Defineand understand aboutstructureandunion.
- Understand strings, string handling functions.
- Developprogramsusing C operators, decision making statements.
- Developprogramsusing arrays, function, and structure.

4040330PROGRAMMINGINC
DETAILEDSYLLABUS

Contents: Theory

UNIT	NAMEOF THE TOPICS	HOURS
I	**BASICS OF C:** **1.1 Introduction to C:** History of 'C' – Structure of C program – Steps for execution of C program – Functions performed by Compiler, Linker – Algorithm & flow chart – Low level and High level Programming language – C character set –Tokens –Constants – Key words – Variables – Data types – Declaration of Variables – Assigningvaluestovariables . **1.2 I/O statements:** Formatted input, Formatted output, Unformatted I/O statements.	**8** **6**
II	**C OPERATORS , DECISIONMAKING,BRANCHING AND LOOPING STATEMENTS:** **2.1 C operators:** Arithmetic, Logical, Assignment, Relational,Increment,Decrement,Conditional,Bitwise and Special operators –Precedence and Associativity – C expressions: Arithmeticexpressions, Evaluation ofexpressions. **2.2 Decisionmaking,branching and looping statements:** Simpleifstatement ,if- else,else-if ladderand nestedif-else statement – switchstatement – while, do-while statements – for loop, go to, break& continuestatement – Programtofindwhetherthegivennumberiseven or odd – ProgramtoperformtheArithmeticoperationsusingswitchstatement – Program to find sum of series using "while" loop .	**7** **8**
III	**ARRAYS AND STRINGS:** **3.1 Arrays:** Definition of array – Declaration andinitializationofOnedimensional,Two dimensional arrays – Accessing array elements –Program to find sum of the elements of array – Program for matrix addition. **3.2 STRINGS:** Declaration and initialization of string variables, String handling Functions: strlen (), strcpy() , strcat(), strcmp() – Program to sort the set of strings using string handling functions.	**8** **7**

IV	**STRUCTURE AND UNION** **4.1 Structure:** Definition of structure – Need of structure – Defining and initializing structure – Arrays of structures, Arrays within structures, structures within structures – Programtopreparethetotalmarksfor Nstudentsbyreadingthe Name,Reg. No,Marks1toMarks5usingarrayofstructure. **4.2 Union:** Declaring and Initializing unions – Program to declare, initialize an UNION – Advantages of unions – DifferencebetweenUnionandstructure.	**8** **7**
V	**FUNCTION AND C FILES I/O:** **5.1 Function:** Types – Inbuilt functions – User defined functions – Function definition – Function call: call by value – Program to find factorial of given N numbers using function– Program to count the number of digits in a number using function. **5.2 C Files I**/O: Opening, Reading, Writing and closing a file – Program using file.	**7** **7**

REFERNCE BOOKS:

1. “Prof. E. BALAGURUSAMY” “Programming in ANSI C”,TATA Mc Graw HILL publications - 2008.

2. “YashavantKanetkar”” LetusC”, BPBPublications - 2002.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject code : 4040340

Semester : III

Subject title : ELECTRONIC DEVICES ANDCIRCUITS PRACTICAL

TEACHINGAND SCHEME OFEXAMINATION:

No.ofweeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
Electronic Devices and Circuits Practical	**4**	**64**	**25**	**100***	**100**	**3 Hours**

***Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

EveryElectronicsEngineershouldhavesoundknowledgeaboutthecomponentsused in Electronics Industry.This is vitalin R&DDepartment for chip level troubleshooting. To meet theindustrialneeds,diplomaholders mustbetaughtaboutthemostfundamentalsubject, ElectronicdevicesandCircuits Practical.Bydoing practical experience in this,theywillbeskilledinhandlingall types ofelectronic circuits and ableto applythe skill in electronic systems.

OBJECTIVES:

On completion ofthefollowing experiments, the students must be able to

- Know the Cold Checking of Active and Passive Component
- Find out the Unknown Resistance value of a Resistor using Colour Coding
- Find out the Unknown Capacitance value of a Capacitor using Colour Coding
- Find out the Unknown Inductance value of an Inductor using Colour Coding

- Understand the concept, working principle and applications of PN Junction diode
- Understand the concept, working principle and applications of Zener diode
- Understand the concept, working principle and applications of BJT and FET
- Understand the concept, working principle and applications of UJT
- Understand the concept, working principle and applications of SCR
- Understand the concept, working principle and applications of DIAC and TRIAC
- Understand the concept, working principle and applications of Clippers and Clampers
- Understand the concept, working principle and applications of various types of Negative feedback amplifiers
- Understand the concept, working principle and applications of AstableMultivibrator

4040340 ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

Note: At least 5 experiments should be done using Soldering board / Bread board

1. Construct a circuit to test the forward and reverse bias characteristics of a PN Junction Silicon diode. Find the value of its cut-in voltage
2. Construct a circuit to test the forward and reverse bias characteristics of a Zener diode. Find the value of its reverse breakdown voltage
3. Construct a Full wave (center tapped) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
4. Construct a Full wave (Bridge) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
5. Construct a Common Emitter Transistor circuit and test its input and output characteristic curves.
6. Construct a Common Source Field Effect Transistor circuit and test its drain and transfer characteristic curves.
7. Construct a circuit to test the Turning on and Turning off characteristics of SCR and find out the forward break over voltage, the value of Latching and Holding currents.
8. Construct a circuit to test the bidirectional characteristics of DIAC and plot its switching characteristics.
9. Construct a circuit to test the bidirectional characteristics of TRIAC and plot its switching characteristics.
10. Construct a Common emitter amplifier circuit and test its frequency response characteristics with and without Current series feedback introduced in it.
11. Construct a circuit to test the switching characteristics of AstableMultivibrator
12. Construct a circuit totest the negative resistance Characteristics of UJT.

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CIRCUIT DIAGRAM	:	25
CONNECTION	:	25
EXECUTION & HANDLING OF EQUIPMENT	:	25
OUTPUT / RESULT	:	15
VIVA – VOCE	:	10
TOTAL	:	100

MODEL QUESTION PAPER
4040340ELECTRONICDEVICES&CIRCUITSPRACTICAL

Note: At least 5 experiments should be done using Soldering board / Bread board

1. Construct a circuit to test the forward and reverse bias characteristics of a PN Junction Silicon diode. Find the value of its cut-in voltage
2. Construct a circuit to test the forward and reverse bias characteristics of a Zener diode. Find the value of its reverse breakdown voltage
3. Construct a Full wave (center tapped) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
4. Construct a Full wave (Bridge) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
5. Construct a Common Emitter Transistor circuit and test its input and output characteristic curves.
6. Construct a Common Source Field Effect Transistor circuit and test its drain and transfer characteristic curves.
7. Construct a circuit to test the Turning on and Turning off characteristics of SCR and find out the forward break over voltage, the value of Latching and Holding currents.
8. Construct a circuit to test the bidirectional characteristics of DIAC and plot its switching characteristics.
9. Construct a circuit to test the bidirectional characteristics of TRIAC and plot its switching characteristics.
10. Construct a Common emitter amplifier circuit and test its frequency response characteristics with and without Current series feedback introduced in it.

11. Construct a circuit to test the switching characteristics of Bistable Multivibrator .
12. Construct a circuit to generate Sawtooth waveform using UJT Relaxation oscillator and test its performance.

LIST OF EQUIPMENTS

S.NO	Name oftheEquipments	Range	RequiredNos.
1.	DCRegulated powersupply	0-30V,1A	10
2.	High VoltagePowerSupply	0-250V,1A	2
3.	SignalGenerator	1MHz	4
4.	DualtraceCRO	20MHz/ 30MHz	5
5.	DigitalMultimeter	-	10
6.	DCVoltmeter(Analog/Digital)	DifferentRanges	15
7.	DCAmmeter(Analog/Digital)	DifferentRanges	15

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject code : 4040350

Semester : III

Subject title : ELECTRICAL CIRCUITS AND INSTRUMENTATION PRACTICAL

TEACHINGAND SCHEME OFEXAMINATION

No.ofweeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
Electrical Circuits and Instrumentation Practical	**4**	**64**	**25**	**100***	**100**	**3 Hours**

***Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

This subject enables the students with concepts of DC circuits & network theorems, AC circuits. The subject also deals with principles and working of different Measuringinstruments and Electrical Machines.Theintroductionofthissubjectimpart the knowledge forstudents to analyze the electrical circuits.

OBJECTIVES:

Oncompletionof all theexperiments,thestudentsmustbeable to

- Verify Ohm'slaw.
- Verify Kirchoff'slaws
- Verify network theorems.
- Test the performance of electric circuit.
- Determine the characteristics of measuring instruments.
- Use CRO.

4040350 ELECTRICAL CIRCUITS AND INSTRUMENTATION PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

Note: Atleast 9experiments should be constructed using breadboard

1. Constructa circuitto verifyOhm's law.
2. Constructa circuitto verifyKirchoff's voltage andcurrentlaw.
3. Constructacircuit toverifySuperposition theorem.
4. Constructa circuitto verifyThevenin's Theorem.
5. ConstructacircuittoverifyMaximumpowertransferTheorem.
6. Construct and test the performance of series resonant circuit.
7. Calibratethegivenammeterandvoltmeter.
8. ConstructandtesttheperformanceofWheatstonebridge.
9. Measuretheamplitude andfrequencyofsignalsusing CRO.
10. TesttheperformanceofLVDT.
11. Measurestrainusingstraingauge.
12. Determinethecharacteristicsofathermistor.

BOARD EXAMINATION

DETAILED ALLOCATIONOFMARKS

CIRCUITDIAGRAM	:	30
CONNECTION	:	30
EXECUTION&HANDLINGOFEQUIPMENT:		25
OUTPUT/RESULT	:	10
VIVA–VOCE	:	05
TOTAL	**:**	**100**

MODEL QUESTION PAPER

4040350 ELECTRICAL CIRCUITS AND INSTRUMENTATION PRACTICAL

1.Constructa circuitto verifyOhm's law.

2.Constructa circuitto verifyKirchoff's voltage andcurrentlaw.

3.Constructacircuit toverifySuperposition theorem.

4.Constructa circuitto verifyThevenin's Theorem.

5.ConstructacircuittoverifyMaximumpowertransferTheorem.

6.Construct and test the performance of series resonant circuit.

7.Calibratethegivenammeterandvoltmeter.

8.ConstructandtesttheperformanceofWheatstonebridge.

9.Measuretheamplitude andfrequencyofsignalsusing CRO.

10.TesttheperformanceofLVDT.

11.Measurestrainusingstraingauge.

12.Determinethecharacteristicsofathermistor.

LIST OF EQUIPMENTS

S No	Name of the Equipments	Range	Required No's
1.	DCregulatedpowersupply	(0-30V),1A	8
2.	Signalgenerators	1MHZs	3
3.	CRO	20MHZ	4
4.	DCVoltmeter	(0-15V)	8
5.	DCAmmeter	(0-300µA)	6
6.	DCAmmeter	(0-100mA)	8
7.	Multimeter	-	4
8.	Galvanometer	-	1
9.	DecadeResistanceBox	-	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject code : 4040360

Semester : III

Subject title : PROGRAMMING IN C PRACTICAL

TEACHINGAND SCHEME OFEXAMINATION

No.ofweeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
Programming in C Practical	**4**	**64**	**25**	**100***	**100**	**3 Hours**

***Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE: To Provide the platform for software

OBJECTIVES:

At the end of the Course, the students will be able to

- Thinkthelogictosolvethegivenproblem.
- Know the concepts of constants, variables, data types and operators
- Developprograms to evaluate expression by knowing ‘c’ precedence rule.
- Write programs using different decision making, looping statements.
- Writeprogramsusingarrays, function and structure.

4040360PROGRAMMINGINCPRACTICAL

DETAILED SYLLABUS

Contents:Practical

Exercises

1. Write Cprogramtocalculate simple interest and compound interest.
2. WriteCprogramtofindthesolutionofaquadraticequation.
3. WriteCprogramtofindwhetherthegivennumberiseven or odd.
4. WriteCprogramtofindthesumof seriesusing 'While'loop.
5. WriteCprogramtoperformtheArithmeticoperationbasedonthenumerickeypressusingswitchcasestatement.(1-Addition,2-Subtraction,3–multiplication,4 -Division).
6. Write C program to find the biggest number among three numbers.
7. WriteCprogramto print Fibonacci series.
8. WriteCprogramtofindfactorialofgivenNnumbersusingfunction.
9. WriteCprogramtopreparethetotalmarksforNstudentsbyreadingtheName,Reg.No,Marks 1toMarks6usingarrayofstructure.
10. WriteCprogramtoswapthevaluesoftwovariables.
11. WriteCprogramtocalculate the sum and average of given three numbers using function.
12. Write C program to sort the names in alphabetical order.
13. WriteCprogramtocount the number of digits in a given integer and print the reverse number.
14. WriteCprogramfor matrix addition.
15. WriteCprogram to print multiplication table.

BOARD EXAMINATION

DETAILED ALLOCATIONOFMARKS

No.	Allocation	Marks
1	Algorithm/Flowchart	30
2	Program	30
3	Executingprogram	25
3	Result	10
4	VivaVoce	05
Total		100

MODEL QUESTION PAPER

4040360 PROGRAMMINGINCPRACTICAL

1. Write Cprogramtocalculate simple interest and compound interest.
2. WriteCprogramtofindthesolutionofaquadraticequation.
3. WriteCprogramtofindwhetherthegivennumberiseven or odd.
4. WriteCprogramtofindthesumof seriesusing 'While'loop.
5. WriteCprogramtoperform theArithmeticoperationbasedonthenumerickeypressusingswitchcasestatement.(1-Addition,2-Subtraction,3–multiplication,4-Division).
6. Write C program to find the biggest number among three numbers.
7. WriteCprogramto print Fibonacci series.
8. WriteCprogramtofindfactorialofgivenNnumbersusingfunction.
9. WriteCprogramtopreparethetotalmarksforNstudentsbyreadingtheName,Reg.No,Marks1toMarks6usingarrayofstructure.
10. WriteCprogramtoswapthevaluesoftwovariables.
11. WriteCprogramtocalculate the sum and average of given three numbers using function.
12. Write C program to sort the names in alphabetical order.
13. WriteCprogramtocount the number of digits in a given integer and print the reverse number.
14. WriteCprogramfor matrix addition.
15. WriteCprogram to print multiplication table.

LIST OF EQUIPMENTS

Hardware Requirement:

Desktop / Laptop Computers: 15 Nos

Laserprinter:1no

Softwarerequirement:

C-compilerandeditor

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject code : 4040370

Semester : III

Subject title : SIMULATION PRACTICAL

TEACHINGAND SCHEME OFEXAMINATION

No.ofweeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
Simulation Practical	**4**	**64**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

EveryElectronicEngineershouldhavesoundknowledgeaboutthecomponentsused in Electronic Industry.This is vitalin R&DDepartment for chip level troubleshooting. To meet theindustrialneeds,diplomaholdersmustbetaughtaboutthemostfundamentalsubject, ElectronicdevicesandCircuits Practical.Bydoing practical experience in this,theywillbeskilledinhandlingall types ofelectronic circuits and ableto applythe skill in electronic systems. While designing electronic circuits to test a particular application we have to experiment it in a trial and error manner. In this situation, simulating the circuit is very useful to find out the results and select the suitable circuit elements.

OBJECTIVES:

To study the Simulation Softwares (Multisim / PSpice) and using the simulation of the given Circuits to design and verify the various electronic circuits and can further design the PCBs in the Computer.

4040370 SIMULATION PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

Note:

All experiments should be designed and verified through simulation tools like Multisim/PSpice/Lab View/TINA

1. Zener diode (Forward and Reverse bias characteristics)
2. Rectifier circuits (Half wave and Full wave Bridge Rectifiers with Capacitor filter)
3. Power supply with Zener diode as Regulator
4. Common Base transistor output characteristics
5. Common emitter amplifier (Implementation of Current Series negative feedback)
6. Emitter follower (Implementation of Voltage Series negative feedback)
7. RC Coupled amplifier (Implementation of the concept of multistage amplifier)
8. Clippers and Clampers
9. RC Phase shift oscillator (Medium frequency Sine wave generators)
10. Hartley oscillator (High frequency Sine wave generator)
11. Astable Multivibrator (Square or Rectangular wave generator)
12. Gate triggering of SCR with various gate currents.

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CONNECTION	::	35
EXECUTION & HANDLING OF EQUIPMENT	:	40
OUTPUT / RESULT	:	15
VIVA – VOCE	:	10
TOTAL	:	100

MODEL QUESTION PAPER

4040370SIMULATIONPRACTICAL

Note:

All experiments should be designed and verified through simulation tools like Multisim/PSpice/Lab View/TINA

1. Zener diode Forward and Reverse bias characteristics
2. Rectifier circuits (Half wave and Full wave Bridge Rectifiers with Capacitor filter)
3. Power supply with Zener diode as Regulator
4. Common Base transistor output characteristics
5. Common emitter amplifier (Implementation of Current Series negative feedback)
6. Emitter follower (Implementation of Voltage Series negative feedback)
7. RC Coupled amplifier (Implementation of the concept of multistage amplifier)
8. Clippers and Clampers
9. RC Phase shift oscillator (Medium frequency Sine wave generators)
10. Hartley oscillator (High frequency Sine wave generator)
11. Astable Multivibrator (Square or Rectangular wave generator)
12. Gate triggering of SCR.

LIST OF EQUIPMENTS

S.NO	Name oftheEquipments	Range/Spec	RequiredNos.
1.	Simulation Tool	Multisim/PSpice	
2.	Desk top Computers		20 Nos.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name **:** 1040:Electronics and Communication Engineering

Course Code : 4040410

Semester **:** IV Semester

Subject Title **:** INDUSTRIAL ELECTRONICS

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
INDUSTRIAL ELECTRONICS	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	POWER DEVICES AND TRIGGER CIRCUITS	15
II	CONVERTERS AND CHOPPERS	15
III	INVERTERS & APPLICATIONS	14
IV	PROGRAMMABLE LOGIC CONTROLLER	14
V	BUILDING BLOCKS OF A ROBOT	15
	REVISION – TESTS – MODEL	7
Total		**80**

RATIONALE:

The rationale behind the modifying this subject is to give clear explanation of power devices and circuits that are widely used today in modern industry. It also gives exposure to PLCs & ROBOT's which can perform various control functions in industrial environments.

OBJECTIVES:

On completion of the following units of the syllabus contents, the students must be able to

- Study working principle of MOSFET, IGBT
- Study the methods of triggering
- Learn about converters and its types.
- understand commutation concepts in SCR
- Learn about choppers.
- Study about inverters and types.
- Understand the concept of HVDC.
- Know about SMPS.
- Understand about UPS and its types.
- Learn about PLC.
- Discuss about ladder diagrams.
- To understand the basic concepts associated with the design, functioning, applications and social aspects of robots
- To study about the electrical drive systems and sensors used in robotics for various applications

4040410 INDUSTRIAL ELECTRONICS

DETAILED SYLLABUS

Contents:Theory

Unit	Name of the Topics	Hours
I	**POWER DEVICES AND TRIGGER CIRCUITS** **1.1 POWER DEVICES** Insulated gate bipolar transistor (IGBT), MOSFET and GTO - Symbol, principle of working, VI characteristics and applications. Comparison between power MOSFET, power transistor and power IGBT. **1.2 TRIGGER CIRCUITS** Triggering of SCR - Gate triggering – Types –Concepts of DC triggering, AC triggering, Pulse gate triggering – Pulse transformer in trigger circuit – Electrical isolation by opto isolator - Resistance capacitor firing circuit and waveform, Synchronized UJT triggering (ramp triggering) circuit and waveform.	**7** **8**
II	**CONVERTERS AND CHOPPERS (Qualitative treatment only)** **2.1 CONVERTERS**Converters – Definition – Single phase Half controlled bridge converter with R load and RL load - importance of flywheel diode – Single phase fully controlled bridge converter with resistive load – voltage and current waveforms – Single phase fully controlled bridge converter with RL load – voltage and current waveforms Commutation- Natural commutation – Forced commutation – Types **2.2 CHOPPERS** Chopper – Definition –principle of DC chopper operation – Typical chopper circuit (Jones chopper) – Applications of DC chopper – Principle of working of single phase AC chopper - Chopper using MOSFET.	**9** **6**
III	**INVERTERS & APPLICATIONS** **3.1 INVERTERS** inverter with resistive load – Single phase inverter with RL load – Methods to obtain sine wave output from an inverter- Output voltage control in inverters - McMurray inverter – advantages – Parallel **3.2 INVERTER APPLICATIONS** SMPS Types - Block diagram of SMPS – advantages and disadvantages. UPS-Type (ON Line, OFF Line), Comparison.- Battery Banks.	**8** **6**

IV	**PROGRAMMABLE LOGIC CONTROLLER** **4.1 BASICS OF PLC** Evolution – advantages over relay logic- Introduction to PLC – Relays- Block diagram of PLC - PLC Programming Languages - Arithmetic Functions (add, sub, mul, div, sqr) – Comparison of functions - Basics of Input and output module. **4.2 PLC FUNCTIONS** (digital input and output module) - Logic functions- AND logic, OR logic, NAND logic, EX-OR logic - symbols used in ladder logic diagram. Ladder programming – Ladder diagram for simple systems – Star delta starter, Conveyer control and Lift control. PLC interface with GSM	**7** **7**
V	**INTRODUCTION TO ROBOT** **5.1 BUILDING BLOCKS OF A ROBOT** Types of electric motors - DC, Servo, Stepper; specification, drives for motors - speed & direction control and circuitry, Selection criterion for actuators, direct drives, non-traditional actuators. **5.2 ROBOT SENSOR** Sensors for localization, navigation, obstacle avoidance and path planning in known and unknown environments – optical, inertial, thermal, chemical, biosensor, other common sensors; Case study on choice of sensors and actuators for maze solving robot and self-driving cars	**8** **7**

REFERENCE BOOKS:

1. Power Electronics by M.H.Rashid - PHI Publication-3 rd Edition-2005

2. Industrial Electronics and control by Biswanath Paul –PHI publications2 nd Edition -2010

3. Programmable Logic Controllers - “Frank D.Petruzela “PHI publications 4. Power Electronics by Dr.P.S.Bimbhra, Khanna publishers -2 nd Edition1998

4. Saeed. B. Niku, Introduction to Robotics, Analysis, system, Applications, Pearson educations, 2002

5. Roland Siegwart, Illah Reza Nourbakhsh, Introduction to Autonomous Mobile Robots, MIT Press, 2011.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name :1040:Electronics and Communication Engineering

Subject Code : 4040420

Semester : IV

Subject title : COMMUNICATION ENGINEERING

TEACHINGAND SCHEME OF EXAMINATION

No ofweeks/ semester: 16weeks

Subject	Instruction		Examination			
			Marks			
	Hours /Week	Hours /Semester	Internal Assessment	Board Examination	Total	Duration
Communication Engineering	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and allocation of hours

Unit	Topic	Hrs
I	Networks, Filters, Antenna and Propagation	16
II	Amplitude Modulation	15
III	Frequency Modulation	15
IV	Pulse Modulation	13
V	Audio , Video Systems and Displays	14
	Tests and Model Exam	7
Total		**80**

RATIONALE:

Todaycommunication engineering has developedto a great extent that there isalways the need for studyofvarious communication concepts.Thissubject fulfills the need forstudents to have a thorough knowledge of Filters,varioustypes of Antennas, modulations, audio systems, video systems and displays

OBJECTIVES:

On completionofthefollowing units ofthe syllabus contents, the students must be able to

- Understand the concepts of networks
- Understand the applications of Filters
- Know the Electro Magnetic Frequency Spectrum
- Know the relationship between Wave length and Frequency
- Understand the principlesofworking ofantennas
- Understand the theoryofPropagation
- Understand the conceptof modulation
- StudyAmplitude Modulation Process
- Learn about different types ofAM Transmitters&receivers
- Studythe FrequencyModulation Process
- Learn about different types ofFM Transmitters &Receivers
- Understand the conceptPulse Modulation
- Learn about different type of Pulse Analog modulation Techniques
- Learn about different type of Pulse Digital modulation Techniques
- Learn Different typesofMicrophones
- Learn Different typesofLoudspeaker
- Understand the principlesofMonochrome &colourTV fundamentals
- Understand the concept of Colour transmission and reception in PAL COLOUR TV Receiver
- Understand the concept of various types of displays

4040420 COMMUNICATION ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**NETWORKS, FILTERS, ANTENNA AND PROPAGATION**.	
	1.1: SYMMETRIACAL AND ASYMMETRICAL NETWORKS	**3**
	Definition – Comparison – Characteristic impedance and Propagation constant	
	1.2: FILTERS	**3**
	Definition,Types–circuitelements andcut-offfrequencies of Constant K-LPF,HPFand BPF(Qualitative analysis only) -applications.	
	1.3: ELECTROMAGNETIC FREQUENCY SPECTRUM	**2**
	Electromagnetic Frequency Spectrum - Types of Electro Magnetic Radiation and their applications	
	1.4: RELATIONSHIP BETWEEN WAVELENGTH AND FREQUENCY	**1**
	1.5: ANTENNA	**3**
	Definition-types of antenna:Monopoleanddipole antenna, directionaland Omnidirectionalantenna,Dipolearrays-Yagi antenna, parabolic antenna-Antenna parameters:radiation pattern andpolarization-applications.	
	1.6: PROPAGATION	**4**
	Types of Propagation - Concept, Frequency Range, Advantages, Applications of Ground wave,SkywaveandSpacewave propagation – Factors affecting the field strength in Ground wave propagation – Effects of Atmosphere in Space wave propagation – Definition of the terms in Sky wave propagation: Critical Frequency, MUF(Maximum Usable Frequency and Skip distance)	
II	**AMPLITUDE MODULATION**	
	2.1: Introduction to Modulation	**3**
	Definition- Need for modulation - Types of modulation - Electromagnetic frequency spectrum - Relationship between Wavelength and Frequency.	
	2.2: Amplitude modulation (AM)	**4**
	Definition - Waveform representation of AM - Expression for AM and modulation index - Frequency spectrum of AM - AM sidebands: DSB, SSB and VSB.	
	2.3: AM Transmitter	**4**

	Types of transmitters: High level AM transmitter, Low level AM transmitter and SSB transmitter. **2.4: AM Receiver** Super Heterodyne receiver - Importance of IF in AM Receiver. Selection of IF (Intermediate Frequency)	**4**
III	**FREQUEENCY MODULATION** **3.1: Frequencymodulation** Definition-Waveform representation of Frequencymodulation, Expression forFrequencymodulation andmodulationindex. Frequency spectrum of FM – Effects of modulation index in frequency spectrum. **3.2: FMTransmitter** Types-DirectFMtransmitter–IndirectFMtransmitterandStereophonicFMtransmitter. **3.3: FMReceiver** Stereophonic FMreceiver-AFC - Comparison ofFMandAM.	**6** **5** **4**
IV	**PULSEMODULATION TECHNIQUES** **4.1: INTRODUCTION** Definition- Types of Pulse modulation- Sampling and Quantization- Sampling theorem- Nyquist sampling rate **4.2:PULSE ANALOG MODULATION TECHNIQUES** GenerationanddetectionofPAM,PWM,PPM **4.3: PULSE DIGITAL MODULATION TECHNIQUES** PCM&DPCM- Delta modulation-Adaptive Delta modulation	**4** **5** **4**
V	**AUDIO AND VIDEO SYSTEMS** **5.1: Microphones** Definition-Construction andperformance ofthe followingmicrophones: Carbon,MovingcoilandVelocityribbon. **5.2: Loudspeakers** Construction and workingof dynamic cone type -Surround-soundsystems. **5.3: MonochromeTelevision** Scanning principles-synchronization -aspect ratio-Composite Video Signal - TV broadcastingstandards.	**3** **3** **3** **3**

	5.4: ColorTV Principlesofcolortransmissionandreception-Block diagram and working of PAL Colour TV Receiver **5.5: DISPLAYS** Construction and working principle of LED ,OLED and Plasma display	**2**

REFERENCE BOOKS:

1. Networkslines and fields – John D.Ryder, PHI
2. Electronic communication Systems– Kennedy–TMH
3. Electronic Communication– Dennis RoddyandJohn colen– PHI
4. Fundamentals ofAcoustics–Kingsler&frey–WileyEastern ltd.
5. TV and Video engineering– Arvind M.Dhake – TMH.
6. CommunicationElectronics–Principlesandapplication–LouisEFrenzel, Third Edition, Tata McGrawhillpublication
7. AudioandVideosystem–Principles,maintenanceandTroubleshooting byR.Gupta Second Edition McGrawHill Education(P) Ltd.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name :1040:Electronics and Communication Engineering

Subject Code : 4040430

Semester :IV

Subject title : ANALOG AND DIGITAL ELECTRONICS

TEACHINGAND SCHEME OF EXAMINATION

No ofweeks/ semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Board Examination	Total	
Analog and Digital Electronics	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of hours

Unit	Topic	Hrs
I	Linear ICs and OP-amps	10
II	A/D, D/A,Special Function ICs and IC Voltage Regulators	13
III	Boolean Algebra and Arithmetic operations	10
IV	Combinational and Sequential Logic Circuits	12
V	Memories	12
	Tests and Model Exam	7
Total		**64**

RATIONALE:

The subject Analog and Digital Electronics holds applications in all branches of engineering instrumentation and Industrial Automation.Thiswillimpartindepth knowledgeofNumber Systems , Logics of Combinational &Sequential circuits and memories.

OBJECTIVES:

On completionofthefollowing units ofthe syllabus contents, the students must be able to

- Understand the basicsofoperational amplifier.
- Know the op-amp applications.
- Know the waveform generator and Active filter.
- Know the concept of D/A and A/D converters
- Know the applications of Special function IC, IC 555 Timer.
- Understand various Number Systems used in Digital Circuits
- Understand basic Boolean postulates and laws.
- Understand the De-Morgan's theorem.
- Understand the concept ofKarnaugh Map.
- Learn about Basic logic Gates.
- Studyabout Boolean techniques.
- Learn the different digital logic families
- Learn arithmetic circuits- Adder/Subtractor
- Understand the encoder/decoder & MUX / DEMUX
- Understand the concept ofparityGeneratorand checker
- Understand various types of flip-flops.
- Understand various types ofcounters
- Understand various modes ofshift registers
- Understand various types of memories

4040430 ANALOG AND DIGITAL ELECTRONICS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**LINEAR ICS AND OP-AMPS** **1.1: OPERATIONAL AMPLIFIER** Ideal Op-Amp – Block diagram and Characteristics – Op-amp parameters CMRR – Slew rate – Concept of Virtual ground **1.2: APPLICATIONS OF OP-AMP** Inverting amplifier –Summing amplifier – Non inverting amplifier – Voltage follower - Comparator – Zero crossing detector – Integrator – Differentiator- waveform generation (SchmittTrigger only)–RC Low pass Active filter. **1.3: OP-AMP SPECIFICATIONS** OP-amp 741 – Symbol – Pin diagram – Specifications	**4** **4** **2**
II	**A/D, D/A ,SPECIAL FUNCTION ICs AND IC VOLTAGE REGULATORS** **2.1: SAMPLING AND QUANTIZATION** **2.2: A/D CONVERTER** Analog to digitalconversion using Ramp method – Successive approximation method – Dual slopemethod – Specifications of A/D converter **2.3: D/A CONVERTER** Basic concepts – Weighted Resistor D/A converter – R-2R Ladder D/Aconverter – Specifications of DAC IC **2.4:SPECIAL FUNCTION ICs** 2.4.1:IC555 Timer – Pin diagram - Functional Block diagram of IC 555 in Astable and MonostableMultivibrator mode - Schmitt trigger using IC 555 2.4.2:IC 565-PLL-Pin diagram-Functional Block diagram of IC 565 2.4.3:IC 566-VCO-Pin diagram-Functional Block diagram of IC 566 **2.5.: IC VOLTAGE REGULATORS** Positive IC Voltage Regulators: 78XX - Negative IC Voltage Regulators: 79XX and General purpose IC Voltage Regulatorsusing LM 723.	**2** **3** **2** **3** 3

III	**BOOLEAN ALGEBRA AND ARITHMETIC OPERATIONS** **3.1: NUMBER SYSTEMS** Decimal – Binary – Octal – Hexadecimal – BCD – Conversion from one number system to other – Boolean Algebra – Basic laws and Demorgan's Theorems **3.2: UNIVERSAL GATES** Realization of basic logic gates using universal gates NAND and NOR -Tristate Buffer circuit **3.3: PROBLEMS USING 2, 3, AND 4 VARIABLES** Boolean expression for outputs – Simplification of Boolean expression using Karnaugh map (up to 4 variable)- Constructing logic circuits for the Boolean expressions **3.4:ARITHMETIC OPERATIONS** Binary Addition-Binary Subtraction-1's compliment and 2's compliment-Signed binary numbers **3.5: ARITHMETIC CIRCUITS** Half Adder-Full Adder-Half Subtractor-Full Subtractor	**2** **2** **2** **2** **2**
IV	**COMBINATIONAL ANDSEQUENTIALLOGIC CIRCUITS** **4.1: PARITY GENERATOR AND CHECKER** **4.2: DECIMAL to BCD ENCODER** **4.3: 3 to 8 DECODER** **4.4: MULTIPLEXER:** 4 to 1 Multiplexer **4.5: DEMULTIPLEXER** :1 to 4 Demultiplexer **4.6: FLIP-FLOPS (FF)** RS FF– JK FF: Master Slave FF and Edge triggered FF – D and T FF **4.7: COUNTERS** 4 bit Asynchronous Up Counter –Mod N counter – Decade counter – 4 bit Synchronous up counter **4.8:SHIFT REGISTER** 4 bit shift register – Serial in Serial out	**1** **1** **1** **1** **1** **2** **3** **2**

V	**MEMORIES** **5.1:CLASSIFICATION OF MEMORIES** **5.2:RAM** RAMorganization-AddressLines and MemorySize- Read/writeoperations-Static RAM-BipolarRAMcell- Dynamic RAM- SD RAM- DDR RAM. **5.3:ROM** ROM organization-Expanding memory- PROM- EPROM- and EEPROM- Flash memory- Anti Fuse Technologies.	**6** **6**

Reference books:

1. Albert Paul Malvino and Donold P. Leach – Digital Principles and Applications
2. Roger L. Tokheim Macmillan – Digital Electronics – McGraw – Hill –1994.
3. William H.Goth Mann – Digital Electronics – An introduction to theoryand practice – PHI 1998.
4. Linear integrated circuits byB.Suseela&T.R.Ganeshbabu -Scitech publications-2018
5. Integrated circuits by K.R.Botkar-Khanna publisher's-1996.
6. D.Roychoudhury&shail. B.Jain- Linear Integrated Circuits -New age International publishers - II Edition -2004.
7. R.P.Jain – Modern Digital Electronics – TMH 2003.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name **:** 1040:Electronics and Communication Engineering

Course Code : 4040440

Semester **:** IV Semester

Subject Title **:** INDUSTRIAL ELECTRONICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
INDUSTRIAL ELECTRONICS PRACTICAL	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

The rationale behind the modifying this subject is to give clear explanation of power devices and circuits that are widely used today in modern industry. It also gives exposure to PLCs &Inverters which can perform various control functions in industrial environments.

OBJECTIVES:

- All the experiments given in the list of experiments should be completed and given for the endSemester practical examination.
- In order to develop best skills in handling Instruments/Equipment and taking readings in the practicalclasses, every three students should be provided with a separate experimental setup for doingexperiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not begiven to more than three students while admitting a batch of 30 students during Board Examinations.

4040440 INDUSTRIAL ELECTRONICS PRACTICAL

DETAILED SYLLABUS

Contents:Practical

Exercises

1. Phase control characteristics of SCR and testing a commutation circuit.
2. Construct a Lamp dimmer using TRIAC (in Bread Board Only)
3. Construct and test a MOSFET based PWM chopper circuit
4. Construct and test an IC based buck converter using PWM
5. Write and implement a simple ladder logic program using digital inputs and outputs for PLC
6. Write and implement a simple ladder logic program for interfacing a lift control with PLC.
7. Write and implement a simple ladder logic program for interfacing a conveyer control with PLC.
8. Write and implement a simple ladder logic program using timer and counter with branching and subroutines with PLC.
9. Construct and draw the VI characteristics of IGBT.
10. Construct and draw the VI characteristics of Power MOSFET.
11. Construct and draw single phase half controlled bridge converter with resistive load.
12. Construct and designa fan regulator using TRIAC and DIAC.

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CIRCUIT DIAGRAM	: 25
CONNECTION	: 25
EXECUTION & HANDLING OF EQUIPMENT	: 25
OUTPUT / RESULT	: 15
VIVA – VOCE	:10

TOTAL : 100

MODEL QUESTION PAPER

4040440 INDUSTRIAL ELECTRONICS PRACTICAL

1 Phase control characteristics of SCR and testing a commutation circuit.

2. Construct a Lamp dimmer using TRIAC (in Bread Board Only)

3. Construct and test a MOSFET based PWM chopper circuit

4. Construct and test an IC based buck converter using PWM

5. Write and implement a simple ladder logic program using digital inputs and outputs for PLC

6. Write and implement a simple ladder logic program for interfacing a lift control with PLC.

7. Write and implement a simple ladder logic program for interfacing a conveyer control with PLC

8. Write and implement a simple ladder logic program using timer and counter with branching and subroutines with PLC..

9. Construct and draw the VI characteristics of IGBT.

10. Construct and draw the VI characteristics of Power MOSFET.

11. Construct and draw single phase half controlled bridge converter with resistive load.

12. Construct and designafan regulator using TRIAC and DIAC.

LIST OF EQUIPMENTS

S.NO	Name of the Equipment	Range	Required Nos
1	Regulated Power supply	0-30v	5
2	Dual trace CRO	-	2
3	Signal generator	-	2
4	PAM kit	-	1
5	Pcm kit	-	1
6	PLC’s	-	5
7	Computers	-	5
8	Software For PLC	-	-
9	Multimeter		10

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040 :Electronics and Communication Engineering

Subject code : 4040450

Semester : IV

Subject title : COMMUNICATION ENGINEERING PRACTICAL

TEACHINGAND SCHEME OFEXAMINATION

No. of weeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
Communication Engineering Practical	**4**	**64**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

EveryElectronicsEngineershouldhavesoundknowledgeaboutthecomponentsused in Electronics Industry.This is vitalin R&DDepartment for chip level troubleshooting. To meet the telecommunication industrialneeds,diplomaholders mustbetaughtaboutthefundamentalsubject, Communication Engineering Practical.Bydoing practical experience in this,theywillbeskilledinhandlingall types of Communication circuits and ableto applythe skill in trouble shooting of Audio and Video Systems and all electronic systems in various applications.

OBJECTIVES:

On completion of thefollowing experiments, the students must be able to understand the concept, working principle and applications of all Analog and Digital modulation techniques and all types of transmitters.

4040450 COMMUNICATION ENGINEERING PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

Note: At least 5experimentsshould be constructed using breadboard /soldering

1. Construct and test the performance of symmetrical T and π attenuators
2. Construct and test the performance of passive Low pass and High pass filters.Find out the cut-off frequency from the frequency response characteristics
3. Construct and test the performance of Band pass filter.Find out the cut-off frequencies and find the Bandwidth from the frequency response characteristics
4. Construct and test the performance of series and shunt equalizers.
5. Construct and test the performance of Amplitude modulator
6. Construct and test the performance of AM linear diode detector.
7. Construct and test the performance of Pulse Width Modulator (PWM)
8. Construct and test the performance of Pulse Position Modulator(PPM)
9. Determine the directional characteristics of Moving Coil Microphone.
10. Determine the directional characteristics of Dynamic cone Loudspeaker
11. Determine the frequency response characteristics of Two way cross over network
12. Design the PCB of AM modulator using simulation tools like Multsim/OrCAD

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CIRCUIT DIAGRAM	:	25
CONNECTION	:	25
EXECUTION & HANDLING OF EQUIPMENT	:	25
OUTPUT / RESULT	:	15
VIVA – VOCE	:	10
TOTAL	:	100

MODEL QUESTION PAPER

4040450COMMUNICATION ENGINEERING PRACTICAL

Note: At least 5 experiments should be done using Soldering board / Bread board

1. Construct and test the performance of symmetrical T and π attenuators
2. Construct and test the performance of passive Low pass and High pass filters. Find out the cut-off frequency from the frequency response characteristics
3. Construct and test the performance of Band pass filter.Find out the cut-off frequencies and find the Bandwidth from the frequency response characteristics
4. Construct and test the performance of series and shunt equalizers.
5. Construct and test the performance of Amplitude modulator
6. Construct and test the performance of AM linear diode detector.
7. Construct and test the performance of Pulse Width Modulator (PWM)
8. Construct and test the performance of Pulse Position Modulator(PPM)
9. Determine the directional characteristics of Moving Coil Microphone.
10. Determine the directional characteristics of Dynamic cone Loudspeaker
11. Determine the frequency response characteristics of Two way cross over network
12. Design the PCB of AM modulator simulation tools like Multsim /OrCAD

LIST OF EQUIPMENTS

S.NO	Name of the Equipment	Range	Required No.
1.	Regulated Power Supply	0 – 30V	10
2.	Dual trace CRO	60 MHz	5
3.	Signal Generator	-	10
4.	Desk Top Computer	-	2
5.	Decade Resistance Box	0 - 100KOhm	5
6.	Decade Capacitance Box	0 - 100uF	5
7.	Decade Inductance Box	0 - 10H	5
8.	Dynamic cone Loud speaker	-	2
9.	Moving coil Microphone	-	1
10.	Velocity Ribbon Micro phone	-	1
11.	Software Tool	Multisim/OrCAD	

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject code : 4040460

Semester : IV

Subject title : ANALOG AND DIGITAL ELECTRONICS PRACTICAL

TEACHINGAND SCHEME OFEXAMINATION

No.ofweeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
Analog and Digital Electronics Practical	**5**	**80**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

EveryElectronic Engineershouldhavesoundknowledgeaboutthe ICs used in Electronics Industry.This is vitalin R&DDepartment for Chip level troubleshooting. To meet theindustrialneeds,diplomaholders mustbetaughtaboutthemostfundamentalsubject, Analog and Digital Electronics Practical.Bydoing practical experience in this,theywillbeskilledinhandlingall types of ICs and ableto applythe skill in electronic system design and the designing of PCBs.

OBJECTIVES:

On completion of thefollowing experiments, the students must be able to

- Know the Verification of truth table of OR, AND, NOT, NOR, NAND, EX-OR gates
- Know the Realization of basic gates using NAND & NOR gates.

- Know the verification of Half Adder and Full Adder using IC's.
- Know the verification of Half Subtractor andFull Subtractor using IC's.
- Know theVerification of Truth Table for Decoder/Encoder.
- Know the Verification of truth table for RS, D, T & JK flip-flop.
- Test Inverting Amplifier and Non inverting amplifier using Op-amp
- Test Summing Amplifier, Difference Amplifier and Voltage Comparator using Op-amp.
- Test Integrator and Differentiator.
- Test Astablemultivibrator using IC 555
- Design IC Voltage RegulatorPower Supplies using IC 7805, IC 7912
- Design the PCB of4- bit ripple counter using FF

4040460 ANALOG AND DIGITAL ELECTRONICS PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

Note: At least 6 experiments should be constructed using breadboard

1. Realization of basic gates using NAND & NOR gates.
2. Realization of logic circuit for De-Morgans Theorems
3. Test the performance of Half Adder and Full Adder.
4. Test the performance of Half Subtractor andFull Subtractor.
5. Test the performance of Decoder/Encoder.
6. Test the performance of RS, D, T & JK flip-flops.
7. Test the performance of Parity generator and checker using parity checker/ generator IC's.
8. Test the performance of Multiplexer/De-multiplexer using IC 4051
9. Test the performance of Inverting Amplifier and Non inverting amplifier using Op-amp IC 741.
10. Test the performance of Summing Amplifier, Difference Amplifier.
11. Test the performance ofZero Crossing Detector and VoltageComparator using Op-amp IC 741.
12. Test the performance of Integrator and Differentiator using Op-amp IC 741.
13. Test the performance ofAstablemultivibrator using IC 555.
14. Test the performance of IC Voltage Regulator Power Supplies using IC 7805, IC 7912.

15. Design the PCB of4- bit ripple counter using FF using Software tool Multisim/OrCAD etc

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CIRCUIT DIAGRAM	:	25
CONNECTION	:	30
EXECUTION & HANDLING OF EQUIPMENT	:	20
OUTPUT / RESULT	:	15
VIVA – VOCE	:	10
TOTAL	:	100

MODEL QUESTION PAPER
4040460 ANALOG AND DIGITAL ELECTRONICSPRACTICAL

Note: At least 6 experiments should be done using Bread board

1.Realization of basic gates using NAND & NOR gates.

2.Realization of logic circuit for De-Morgans Theorems.

3.Test the performance of Half Adder and Full Adder.

4.Test the performance of Half Subtractor andFull Subtractor..

5.Test the performance of Decoder/Encoder.

6.Test the performance of RS, D, T & JK flip-flops.

7.Test the performance of Parity generator and checker using parity checker/ generator IC's.

8.Test the performance of Multiplexer/De-multiplexer using IC 4051.

9.Test the performance of Inverting Amplifier and Non inverting amplifier using Op-amp IC 741.

10.Test the performance of Summing Amplifier, Difference Amplifier.

11.Test the performance ofZero Crossing Detector and VoltageComparator using Op-amp IC 741.

12.Test the performance of Integrator and Differentiator using Op-amp IC 741.

13.Test the performance ofAstablemultivibrator using IC 555.

14.Test the performance of IC Voltage Regulator Power Supplies using IC 7805, IC 7912.

15.Design the PCB of4- bit ripple counter using FF using Software tool Multisim/OrCAD etc.

LIST OF EQUIPMENTS

S NO	Name ofthe Equipments	Range	Required Nos
1	DCRegulated powersupply	0-30V,1A	5
2	IC VoltagePowerSupply	0-5V,1A 15-0-15V, 1A	5 5
3	SignalGenerator	1MHz	4
4	DualtraceCRO	20MHz/ 30MHz	5
5	DigitalTrainer	-	10
6	DC Voltmeter(Analog/Digital)	DifferentRanges	5
7	DCAmmeter(Analog/Digital)	DifferentRange	5
8	DeskTop Computer	-	5
9	Simulation Tool	Multisim/OrCAD	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 : Mechanical Engineering

Subject Code : 4020620

Semester : VI

Subject Title : E Vehicle Technology & Policy

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
4020620 E Vehicle Technology & Policy	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
	4	64	25	100*	100	3 Hrs.

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks for result.**

Topics and Allocation of Hours

Unit	Topics	Hours
I	Environmental impact and history & Electric vehicle Types	12
II	Electric vehicle & Drive System	12
III	Energy Storages, Charging System, Effects and Impacts	11
IV	Electric Mobility Policy Frame Work	11
V	Tamilnadu E-Vehicle Policy 2019	11
Test And Revision		7
Total		**64**

RATIONALE:

The world is transitioning to cleaner mobility options with the aim at improving air quality and reducing dependency on fossil fuels. Electric Vehicles (EVs) have emerged a popular clean mobility choice to reduce emissions. EVs are powered fully or partially by batteries, they can help to reduce dependence on fossil fuels also air quality. Tamil Nadu is one of the most advanced states in India. Tamil Nadu has a highly developed industrial eco-system and is very strong in sectors like automobiles and auto-components. Many globally renowned companies have setup their manufacturing facilities in Tamil Nadu. Due the rapid depletion of fossil fuel and increase in fuel cost, environmental pollution, the shift to clean transport is necessary. This subject introduced by keeping all the above factors.

OBJECTIVES:

- To learn the environmental impact and history of Electric Vehicles.
- To understand the concept of Electric Vehicle and its types.
- To study the configurations of Electric Vehicles
- To acquire knowledge about Energy Storages, Charging System, Effects and Impacts
- To appreciate the Electric Mobility Policy Frame work India and EV Policy Tamil Nadu 2019.

4020620 E Vehicle Technology & Policy

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Environmental impact and history:** Environmental impact of conventional vehicle **-** Air pollution – Petroleum resources – History of Electric vehicles & Hybrid Electric Vehicles - Conventional drive train system – Rear Wheel, Front Wheel and All wheel - Parts of Drive train system **Electric vehicle Types:** Introduction to Battery Electric Vehicle (BEV) – Definition BEV – Necessity BEV – Different between BEV and Conventional Vehicle - Advantages of BEV - Block diagram of BEV – Hybrid electric Vehicle (HEV) - Plug-in Hybrid Electric Vehicle (PHEV) – Fuel Cell Electric Vehicle (FCEV) – Description.	12
II	**Electric Vehicles:** Configurations of Electric Vehicle – Performance of Electric Vehicles – Tractive Effort in Normal Driving – energy consumption. Hybrid Electric Vehicles: Concept of Hybrid electric drive trains – Architecture of Hybrid Electric Drive trains – Series, Parallel and Series & Parallel **Electric Propulsion Systems:** Types of EV motors - DC motor drives– Permanent Magnetic Brush Less DC Motor Drives (BLDC) – Principles, Construction and Working – Hub motor Drive system – Merits and Demerits of DC motor drive, BLDC motor drive	12
III	**Energy Storages:** Electrochemical Batteries – Battery Technologies – Construction and working of Lead Acid Batteries, Nickel Based Batteries and Lithium Based Batteries Role of Battery Management System (BMS)– Battery pack development Technology– Cell Series and Parallel connection to develop battery pack. **Charging:**	11

	Battery Charging techniques - Constant current and Constant voltage, Trickle charging – Battery Swapping Techniques – DC charging – Wireless charging **–** Maintenance of Battery pack – Latest development in battery chemistry. **Effects and Impacts:** Effects of EV – Impacts on Power grid – Impacts on Environment – Impacts on Economy.	
IV	**Electric Mobility Policy Frame Work** Government of India Electric Mobility Policy Frame work – Global Scenario of EV adoption – Electric mobility in India – National Electric Mobility Mission Plan 2020 – Action led by Original Equipment Manufacturers – Need of EV Policy – Advantage of EV Eco system – Scope and Applicability of EV Policy – ARAI Standards for Electric Vehicle – AIS 038, AIS 039 &AIS 123 - Key Performance Indicator - Global impact – Trends and Future Developments	11
V	**Tamil Nadu E-Vehicle Policy 2019** Tamil Nadu E-vehicle Policy 2019: Vehicle Population in Tamil Nadu – Objectives of EV Policy – Policy Measures – Demand side incentives – Supply side incentives to promote EV manufacturing – Revision of Transport Regulation of EV – City building codes – Capacity Building and Skilling – Charging structure – implementing agencies – R&D and Business Incubation – Recycling Ecosystem – Battery and EVs	11

Reference Books

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York.
2. Comparison of Electric and Conventional Vehicles in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Vehicle (IJSR), Akshat Bansal, Akriti Agarwal
3. A Comprehensive Study of Key Electric Vehicle (EV) Components, Technologies, Challenges, Impacts, and Future Direction of Development (MDPI), Fuad Un-Noor, SanjeevikumarPadmanaban, Lucian Mihet-Popa, Mohammad NurunnabiMollah and Eklas Hossain.
4. Electric Vehicles: A future Projection CII October 2020 report.
5. Design and analysis of aluminum/air battery system for electric vehicles, Shaohua Yang, Harold Knickle, Elsevier.

6. Propelling Electric Vehicles in India, Technical study of Electric Vehicles and Charging Infrastructure
7. ZERO EMISSION VEHICLES (ZEVs): TOWARDS A POLICY FRAMEWORK – NTI Aayog.
8. FASTER ADOPTION OF ELECTRIC VEHICLES IN INDIA: PERSPECTIVE OF CONSUMERS AND INDUSTRY, The Energy and Resources Institute, New Delhi.
9. India EV Story: Emerging Opportunities by Innovation Norway.
10. Automotive Industry Standards – AIS 038, AIS 039 & AIS 123 – Manual

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name :1040: Electronics and Communication Engineering

Subject Code :4040510

Semester :V

Subject title : ANALOG AND DIGITAL COMMUNICATION SYSTEMS

TEACHINGAND SCHEME OF EXAMINATION

No ofweeks/ semester: 16weeks

Subject	Instruction		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Analog and Digital communication systems	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and allocation of hours

Units	TOPIC	Hrs
I	Radar, Navigational Aids, Telephony	14
II	Digital Communication	14
III	Optical Communication	15
IV	Satellite Communication	15
V	Mobile Communication	15
	Tests and Model Exam	7
Total		**80**

RATIONALE:

The subject Analog and Digital communication systems will enable the students to learn about the advancement in communication systems. it will give exposure to the various modes of communication viz Radar, Telephone, digital communication, digital codes, optical communication, satellite communication, microwave communication, mobile communication and satellite multiple access techniques.

OBJECTIVES:

On completionofthefollowing units ofthe syllabus contents, the students must be able

- To understand principles of Radar.
- To understand principles of navigational aids .
- To study Electronic Exchange .
- To study basic digital communication system and discuss the characteristics of data transmission circuits.
- To learn Error detection and correction codes and various digital modulation techniques
- To learn optical sources, optical detectors.
- To discuss the applications of fiber optic communication
- To Study satellite system, orbits, launching, Antennas
- To Study earth segment and space segment components
- To study about satellite services
- To study fundamental cellular concepts such as frequency reuse, handoff.
- To learn multiple access techniques.
- To learn digital cellular system-GSM

4040510 ANALOG AND DIGITAL COMMUNICATION SYSTEMS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**ADAR AND NAVIGATIONAL AIDS:** **1.1 RADAR :** Basic Radar System– Applications – Radar Range Equation(Qualitative Treatment Only) – Factors Influencing Maximum Range – Basic Pulsed Radar System – Block Diagram – Display Methods- A - Scope, PPI Display - Instrument Landing System –Ground Controlled Approach System. **1.2 TELEPHONY :** Telephone System–Public Switched Telephone Network (PSTN) - Electronic Switching System – Block Diagram – ISDN –Architecture, Features - Video Phone – Block Diagram	7 7
II	**DIGITAL COMMUNICATION:** **2.1 BASICS OF DIGITAL COMMUNICATION SYSTEM:** Basic Elements Of Digital Communication System – Block Diagram- Characteristics Of Data Transmission Circuits -Bandwidth Requirement – Speed – Baud Rate – Noise -Crosstalk – Distortion. **2.2 DIGITAL CODES**: ASCII Code – EBCDIC Code – Error Detection Codes – Parity Check Codes – Redundant Codes – Error Correction Codes -Retransmission- Forward Error Correcting Code – Hamming Code – Digital Modulation Techniques – ASK, FSK, PSK, QPSK Modulation/Demodulation Techniques (Only Block Diagram And Operation)	5 8

III	**OPTICAL COMMUNICATION :** **3.1 BASICS OF OPTICAL COMMUNICATION AND LOSSES:** Optical Communication System – Block Diagram – Advantages Of Optical Fiber Communication Systems – Principles Of Light Transmission In A Fiber Using Ray Theory – Single Mode Fibers, Multimode Fibers – Step Index Fibers, Graded Index Fibers (Basic Concepts Only) – Attenuation In Optical Fibers -Absorption Losses, Scattering Losses, Bending Losses, Core And Cladding Losses **3.2 OPTICAL SOURCES AND APPLICATIONS:** Optical Sources – LED – Semiconductor LASER – Principles – Optical Detectors – PIN And APD Diodes - Optical Transmitter – Block Diagram – Optical Receiver – Block Diagram – Application Of Optical Fibers – Networking, Industry And Military Applications.	7 7
IV	**SATELLITE COMMUNICATION:** **4.1SATELLITE SYSTEM:** Kepler's I,II,II laws – orbits – launching orbits – types - Geostationary synchronous satellites - Advantages – Apogee – Perigee - Active and passive satellite - Earth eclipse of satellite **4.2ANTENNA:** Parabolic reflector antenna **4.3SPACE SEGMENT:** Space segment: Power supply- Attitude control- station keeping – Transponders – TT and C subsystem – Antenna subsystem. **4.4 EARTH SEGMENT:** Earth segment: Block diagram of Transmit receive earth station - Satellite mobile services - Basics of GPS. **4.4 MICROWAVE COMMUNICATION:** Microwave frequency ranges - microwave devices – Parametric amplifiers – Travelling wave tubes – simple block diagram of microwave transmitter, receiver	4 1 3 3 4

	and microwave link repeater	
V	**MOBILE COMMUNICATION AND MUTIPLE ACCESS TECHNIQUES:** **5.1MOBILE COMMUNICATION:** (Qualitative Treatment only) Cellular telephone– fundamental concepts – Simplified Cellular telephone system - frequency reuse – Interference – Co-channel Interference – Adjacent Channel Interference – Improving coverage and capacity in cellular systems – cell splitting – sectoring – Roaming and Handoff – Basics of blue tooth technology **5.2SATELLITE MULTIPLE ACCESS TECHNIQUES:** TDMA, FDMA, CDMA. Digital cellular system – Global system for mobile communications (GSM) –GSM services – GSM System Architecture – Basics of GPRS.	7 7

Reference Books:

1. Electronic communication systems - Kennedy - Davis - fourth Edition – Tata McGraw Hill - 1999.
2. Electronics communication - Dennis Roddy and John coolen – Third Edition - PHI – 1988
3. Optical fiber communication - Gerd Keiser - Third Edition - McGraw Hill – 2000
4. Satellite communication - Dr. D.C. Agarwal - Third Edition –Khannapublishers– 1995
5. Satellite communication - Dennis Roddy - Third Edition - McGraw Hill – 2001
6. Electronic communication systems-Fundamentals through Advanced –Wayne Tomasi-fifth Edition –pearson Education-2005

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040: Electronics and Communication Engineering

Subject Code : 4040520

Semester : V

Subject Title : Microcontroller and its applications

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
Microcontroller and its Applications	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Architecture of 8051 Microcontroller	15
II	8051 Instruction set and Programming	16
III	Peripherals of 8051	15
IV	Interfacing techniques	16
V	Advanced Microcontrollers	11
Test & Model Exam		7
Total		**80**

RATIONALE:

The introduction of this subject will enable the students to learn about microcontroller 8051 architecture, Pin details, Instruction sets, Programming and interfacing. This subject enables the students to do the project effectively. It also helps the students to choose the field of interest. If the student is aiming for higher studies, this subject is foundation.

OBJECTIVES:

On completion of the syllabus, the students must be able to

-> Know the difference between microprocessor and microcontroller.

-> Understand the architecture of 8051.

-> Write programs using 8051 ALP.

-> Understand the programming of I/O ports, Timer, Interrupt and Serial Programming.

-> Use the interfacing techniques

-> Know the types of microcontrollers

-> Explain IoT.

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4040520 MICROCONTROLLER AND ITS APPLICATIONS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Architecture Of 8051 Microcontroller** **1.1 : Architecture** Microprocessor-Microcontroller-Comparison of microprocessor and microcontroller-Architecture diagram of microcontroller 8051-Functions of each block-Pin details of 8051-ALU- ROM-RAM-Memory organization of 8051- Special function registers-Program counter-PSW register-Stack-I/O ports-Timer-Interrupt-serial port-External memory- Oscillator and Clock-Reset-Power on reset-Clock cycle-machine cycle-Instruction cycle-Overview of 8051 family.	15
II	**8051 Instruction set and programming** **2.1: Instruction Set Of 8051** Instruction set of 8051-Classification of 8051 instructions-data transfer instructions-Arithmeticinstructions-Logical instructions-Branching instructions-Bit manipulation instructions- Assembling and running an 8051 program-Structure of Assembly language-Assembler directives-Different Addressing modes of 8051-Time delay routines. **2.2: Assembly language programs** 16 bit addition and 16 bit subtraction-8 bit multiplication and 8 bit division-BCD to HEX code conversion-HEX to BCD code conversion.-Smallest number/ Biggest number.	8 8
III	**Peripherals of 8051** **3.1: I/O Ports** Bit addresses for I/O ports-I/O port programming-I/O bit manipulation programming. **3.2: Timer/Counter** SFRS for Timer- Modes of Timers/counters- Programming 8051 Timer(Simple programs). **3.3: Serial Communication** Basics of serial communication-SFRs for serial communication-RS232	 3 4 4

	standard-8051 connection to RS 232-8051 serial port programming.. **3.4: Interrupts** 8051 interrupts-SFRs for interrupt-Interrupt priority.	4
IV	**Interfacing Techniques** **4.1: IC 8255** IC 8255-Block diagram-Modes of 8255-8051 interfacing with 8255 **4.2: Interfacing** Interfacing external memory to 8051-Relay interfacing- Sensor interfacing -Seven segment LED display interfacing-Keyboard interfacing-Stepper motor interfacing-ADC interfacing- DAC interfacing-DC motor interfacing using PWM-LCD interfacing.	3 13
V	**Advanced Microcontrollers** **5.1: Types of microcontrollers** PIC microcontroller-General Block diagram-Features-Applications-Arduino- General Block diagram-Variants-Features-Applications-Raspberry pi-General Block diagram-Features-Applications-Comparison of microcontrollers. **5.2: IoT** Introduction to IoT-Block diagram of home automation using IoT.	8 3

Reference Books :

1. ”Ajit pal” “Microcontrollers, Principles and Applications ”,PHI Ltd,-2011.

2 .”Mazidi,Mazidi and D.MacKinlay” “8051 Microcontroller and Embedded Systems using Assembly and C”,2006 Pearson Education Low Price Edition.

3. ”R. Theagarajan” “Microprocessor and Microcontroller”, Sci Tech Publication,Chennai.

4. www.microchip.com, www.raspberrypi.org,www.arduino.org.

5. “J.B. Peatman” ”Design with PIC microcontrollers”.

6. ”Michael McRoberts”, ”beginning Arduino.

7. ”Matt Richardson”, ”Getting started with Raspberry Pi”.

8.”Samuel Greengard”, ”The Internet of Things”.

STATE BOARD OF TECHNICAL EDUCATION ANDTRAINING, TAMILNADU

DIPLOMAINENGINEERING / TECHNOLOGY SYLLABUS

N SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040: Electronics and Communication Engineering

Subjectcode: 4040531

Semester:V

SubjectTitle:VERYLARGESCALEINTEGRATION

TEACHINGANDSCHEMEOFEXAMINATION

Noofweekspersemester:16weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
VERYLARGESCALEINTEGRATION	4	64	25	100*	100	3Hours

***Examination will be conducted for 100 marks and it will be reduced to 75 marks**

TopicsandAllocationofHours

Unit	Topic	Hours
I	INTRODUCTION TO VLSI	12
II	INTRODUCTION TO VHDL	10
III	COMBINATIONAL CIRCUIT DESIGN	12
IV	SEQUENTIAL CIRCUIT DESIGN	12
V	PROGRAMMABLE LOGIC DEVICES	11
	Test& Model Exam	7
	Total	**64**

RATIONALE:

Very Large Scale Integration technology, when especially used fordesigning digital systems, it is mandatory that thebehaviorof therequired system to be described (modeled) and verified (simulated)before synthesis, translate the design into real hardware fabricationin the foundry (gates and wires).Hardware DescriptionLanguage (HDL)allows designs to be described using any methodology- top down,bottomup approach. VHDLcan be used to describe hardware atthe gatelevel or in a more abstract way. This course is to introduce the digital system design conceptsthrough hardware descriptionLanguage,VHDL programming, design flow of VLSI andarchitectures ofCPLD, FPGA.Itis mainlyaimedatdesignofcombinational andsequentialfunctions and simulates or verifiestheirfunctionalityusingtheHardwaredescriptionLanguage(HDL).

OBJECTIVES:

Onsuccessfulcompletionofthecourse,thestudentsmustbeableto

- Understand the concepts of VLSIdesignprocess.
- DevelopaVHDLcodeforcombinationalcircuit
- DevelopaVHDLcodeforsequentialcircuit.
- ExplaintheimportanceofPROM,PLA,and PAL.
- DifferentiatePROM, PLAandPAL.
- Developthecircuitusing PROM, PALandPLA.
- Understand CPLDandFPGAhardware.
- Differentiate ASIC, CPLD, FPGA.

4040531 VERY LARGE SCALE INTEGRATION
DETAILEDSYLLABUS

Contents:Theory

Unit	NameoftheTopic	Hours
I	**INTRODUCTION TO VLSI:** 1.1 NMOS,CMOS logic: NOT, AND, OR, NAND, and NOR Gates using NMOS – NOT, AND, OR, NAND, and NOR Gates using CMOS – Implementation of logic function (SOP, POS) in CMOS. 1.2 VLSI design process: Different level of abstractions in VLSI design – steps involved in VLSI design process: Design Entry,Simulation, Synthesis, Placement and Routing – Layout rules, Stick diagram.	**6** **6**
II	**INTRODUCTION TO VHDL**: 2.1 Introduction: HDL – Different types of modeling – General format for VHDL program . 2.2 VHDL statements: Syntax for process statement, if statement, if else statement, if elsif else statement, case statement –Syntax for signal declaration and signal assignment statement –Syntax for variable declaration and variable assignment statement, component declaration. 2.3 VHDL code example: VHDL code for Logic gatesAND, OR, NOT, NAND, NOR gate and XOR gates.	**2** **4** **4**
III	**COMBINATIONAL CIRCUIT DESIGN:** 3.1 Combinational circuit: Half adder, Full adder , Half subtractor and Full subtractor – 4 to 1 Mux, 1 to 4 Demux, 4 to 2 Encoder, 2 to 4 decoder andcomparator – FourbitArithmeticadder – FourbitArithmeticsubtractor . 3.2 VHDL program for Combinational circuit: VHDL program for Half adder, Full adder – VHDL program for Hall subtractor and Full subtractor – 4 to 1 Mux, 1 to 4 Demux, 4 to 2 Encoder, 2 to 4 decoder andcomparatorinVHDL – VHDL program forFourbitArithmeticadder (structural) – VHDL program forFourbitArithmeticsubtractor (structural) .	**6** **6**

IV	**SEQUENTIAL CIRCUIT DESIGN:** 4.1 Sequential circuit: Flip-flops: D,JKandTFlip-flops – counters:3 bit up Counter,3 bit down counter and 3 bit up/down counter,Decadecounter, ring counter and JohnsonCounter. 4.2 VHDL program for Sequential circuit: VHDLprogramforD,JKandTFlip-flopswith resetinput, withoutresetinput – VHDL program for 3 bit up Counter,3 bit down counter and 3 bit up/down counter,Decadecounter, ring counter and JohnsonCounter.	**6** **6**
V	**PROGRAMMABLE LOGIC DEVICES**: 5.1 PROM, PLA and PAL : Introduction to PROM, PLA and PAL – ImplementationofcombinationalcircuitswithPROM,PALandPLA (upto4variables) – ComparisonbetweenPROM,PALandPLA. 5.2 CPLD,FPGA and ASIC : Architecture of Complex Programmable Logic device (CPLD) – Architecture of FieldProgrammableGateArrays(FPGA) – Introduction to Application Specific Integrated Circuit(ASIC) – TypesOf ASIC – ASIC design flow.	**5** **6**

ReferenceBooks:

1.“M.MorrisMano,MichaelDCiletti ““DigitalDesign”PearsonEducation2008.

2. “BhaskerJ ““VHDLPrimer”PrenticeHallIndia-2009.

3. “NEIL H.E.WESTE, KAMRAN ESRHAGHIAN” “Principles of CMOS VLSI design”, Addison – Wesley professional, second edition 1994.

4.“NigelP.Cook” “DigitalElectronicswithPLDIntegration”,Pearson 2000.

5.“Ashok K.Sharma” “ProgrammableLogicHandbook:PLDs,CPLDs,andFPGAs”,Mcgraw-Hill,1998.

6. “Michael John Sebastian Smith””Application Specific Integrated Circuits”,Addison – Wesley professional,first edition 1997.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name **:** 1040:Electronics and Communication Engineering

Course Code : 4040532

Semester **:** V Semester

Subject Title **:** CONSUMER ELECTRONICS

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
Consumer Electronics	**4**	**64**	**25**	**100***	**100**	**3 Hrs.**

***Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Audio system	11
II	Audio recording and reproducing system	12
III	Colour TV	12
IV	Digital Transmission and reception	12
V	Consumer Appliances	10
Test & Model Exam		7
Total		**64**

RATIONALE:

The objective of teaching this subject is to give students in depth knowledge of various electronic audio and video devices and systems. Further, this subject will introduce the students with working principles, block diagram, main features of consumer electronics Gadgets/goods/devices. This in-turn will develop in them capabilities of assembling, fault Diagnosis and rectification in a systematic way.

OBJECTIVES:

- Understand the various types of microphones and loud speakers.
- To identify the various digital and analog signal.
- Describe the basis of television and composite video signal.
- Describe the various kinds of colour TV standards and system.
- Compare the various types of digital TV system.
- Understand the various types of consumer goods.
- Maintain various consumer electronic appliances.

4040532 CONSUMER ELECTRONICS
DETAILED SYLLABUS

Contents: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**INTRODUCTION TO AUDIO SYSTEM** **1.1 Audio System** Microphones and Loudspeakers: Carbon, moving coil, cordless microphone,Direct radiating and horn loudspeaker, Multi-speaker system. **1.2 Sound Recording** Magnetic Recording, Digital Recording, Optical Recording (CD system, DVD, Blu-ray Disc).	6 5
II	**2.1 Reproducing system** Sound reproducing Systems: Monophonic, Stereophonic, Surround System. Hi-Fi system, block diagram and use of Home Theatre Systems . **2.2 Audio recording** Sound Recording: Principles of Sound recording: Magnetic Recording/ Reproduction. Audio CD Recording/ Reproduction, Study of working principle of audio and VCD, Digital sound recording on CD system, MP3.	6 6
III	**3.1 Colour TV** Primary colours, concepts of additive and subtracting mixing of colours, concepts of luminance, Hue and Saturation, Representation of a colour in colour triangle, non-spectral colour, visibility curve. **3.2 TV ENCODERS**:Compatibility of colour TV system with monochrome system. Basic colour TV system-NTSC, SECAM, and PAL their advantages and disadvantages. Construction and working principles of Trinitron and PIL types of colour picture tubes.	6 6
IV	**4.1 DIGITAL TRANSMISSION** Digital satellite television, Direct-To-Home (DTH) satellite television, Introduction to: Video on demand, CCTV, High Definition (HD)-TV. **4.2 RECEPTION** Introduction to Liquid Crystal and LED Screen Televisions Basic block diagram ofLCD and LED Television and their comparison.	6 6

V	**5.1 CONSUMER APPLIANCES** Basics principle and working of Microwave Oven and Photostat Machine and Digital Camera, Cam CorderWashing Machine: wiring diagram, electronic controller for washing machine, technical specifications, types of washing machine, fuzzy logic .	10

REFERENCE BOOKS:

1. Consumer Electronics- Bali S.P.- Pearson Education India,2010 , latest edition
2. Colour TV by A.Dhake
3. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
4. Consumer Electronics by Yagnik & Jain – Ishan Publication.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name :1040: Electronics and Communication Engineering

Subject Code : 4040533

Semester :V

Subject title : BASICS OF DIGITAL SIGNAL AND IMAGE PROCESSING

TEACHING AND SCHEME OF EXAMINATION

No ofweeks/ semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Board Examination	Total	
Basics of Digital Signal and Image Processing	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and allocation of hours

Unit	TOPIC	Hrs
I	Classification of Signals and systems	10
II	Analysis of continuous time Signals	13
III	Digital Image Fundamentals	10
IV	Image Enhancement and Image Restoration	12
V	Image Segmentation and compression	12
	Tests and Model Exam	7
Total		**64**

RATIONALE:

The subject basic of digital signal and image processing introduce visualization and mathematical representation of continuous time and discrete time signals and ability to analyses LTI system and give clear explanation of image compression, restoration, enhancement, segmentation. The student will have depth of knowledge about signal and image processing which will help in industries and in bio medical field.

OBJECTIVES:

On completion of the following units of the syllabus contents, the students must be able to

- Know about basic knowledge of signals and system
- Know fourier representation of periodic signals
- Be able to characterize LTI system
- Steps in image processing
- Simple image fundamental
- Various image enhancement techniques
- Histogram processing
- Spatial filtering
- Understand various compression models
- Study JPEG techniques
- Detection of point, line, edge in images

4040533 BASICS OF DIGITAL SIGNAL AND IMAGE PROCESSING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**CLASSIFICATION OF SIGNALS AND SYSTEMS** **1.1 SIGNALS:** Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids_ Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals **1.2 SYSTEMS:** Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.	5 5
II	**ANALYSIS OF CONTINUOUS TIME SIGNALS** **2.1 FOURIER TRANSFORM:** Fourier series for periodic signals – Fourier Transform – properties **2.2 LAPLACE TRANSFORM:** Laplace Transforms and properties	7 6
III	**DIGITAL IMAGE FUNDAMENTALS** **3.1 BASICS OF IMAGE PROCESSING;** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Relationships between pixels **3.2 IMAGE SAMPLING AND QUANTIZATION** **3.3 COLOR IMAGE FUNDAMENTALS** RGB, HSI models**.**	6 2 2

IV	**IMAGE ENHANCEMENT AND IMAGE RESTORATION** **4.1 IMAGE ENHANCEMENT:** Spatial Domain: Gray level transformations – Histogram processing Basics of Spatial Filtering–Smoothing and Sharpening Spatial filtering. **4.2 IMAGE RESTORATION :** Image Restoration – degradation model, Noise models	7 5
V	**IMAGE SEGMENTATION AND COMPRESSION** **5.1 IMAGE SEGMENTATION:** Edge detection, Region based segmentation – Region growing – Region splitting and merging **5.2 IMAGE COMPRESSION:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG	6 6

REFERENCE BOOKS:

1. Signals, System and communication -B.P.Lathi, B.S Publication 2003
2. Signals and Systems – A.V. Oppenheim, A.S. willsky and S.H. Nawab, PHI 2nd Edition
3. Signals and Systems – Simon Haykin and van. Veen.Wiley, 2nd Edition
4. RafelC.Gonzalez and Richard Ewoods – Digital Image processing –Pearson Inc- 4th Edition – 2018
5. Anil K-Jain – Fundamental of Digital Image processing – Pearson Education, Inc – 2002

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject code : 4040540

Semester : V

Subject title : ANALOG AND DIGITAL COMMUNICATION PRACTICAL

TEACHINGAND SCHEME OFEXAMINATION

No. of weeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
ANALOG AND DIGITAL COMMUNICATION PRACTICAL	**5**	**80**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

This laboratory is based on communication system based on analog and digital system. The Student will able to test various communication equipments including transmitter and receiver. This lab system enable students to apply many experiments and activities covers various topics in analog and digital communication system of different types which gain the various skill in day today life.

OBJECTIVES:

On completion ofthefollowing experiments, the students must be able to

- know the concept of analog transmitter and receiver
- know the concept of digital (ASK/ FSK/ PSK)
- know about TDM
- Knowthe fiber optical link

- know the losses in optical fiber
- Test the performance of Manchester encoder and decoder
- know about DTH system

4040540 ANALOG AND DIGITAL COMMUNICATION PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

1. Construct a sample and hold circuit, test and trace its waveforms.
2. Test the performance of ASK modulator and demodulator &drawits input and output waveform
3. Test the performance of FSK modulator and demodulator &drawits input and output waveform
4. Test the performance of PSK modulator and demodulator &drawits input and output waveform
5 Test the performance of Time Division Multiplexer and draw its input and output waveforms
6. Test the performance of analog transmitter and receiver and draw its input and output waveforms
7. Test the performance of a fiber optic analog link and draw its input and output waveforms
8. Test the performance of a fiber optic digital link and draw its input and output waveforms
9. Find the bending loss and propagation loss in fiber with two different fiber lengths
10. Test the performance of Manchester encoder and decoder using optical communication.
11. Test the performance of a voice link using optical fiber.
12. Test the Horizontal and Vertical deflection sensitivity of CRT.
13. Install a DTH system and test its performance.

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CIRCUIT DIAGRAM/BLOCK DIAGRAM:		25
CONNECTION	:	30
EXECUTION & HANDLING OF EQUIPMENT	:	20
OUTPUT / RESULT	:	15
VIVA – VOCE	:	10
TOTAL	:	100

MODEL QUESTION PAPER

4040540 ANALOG AND DIGITAL COMMUNICATION PRACTICAL

1. Construct a sample and hold circuit, test and trace its waveforms.
2. Test the performance of ASK modulator and demodulator & drawits input and output waveform
3. Test the performance of FSK modulator and demodulator & drawits input and output waveform
4. Test the performance of PSK modulator and demodulator & drawits input and output waveform
5 Test the performance of Time Division Multiplexer and draw its input and output waveforms
6. Test the performance of analog transmitter and receiver and draw its input and output waveforms
7. Test the performance of a fiber optic analog link and draw its input and output waveforms
8. Test the performance of a fiber optic digital link and draw its input and output waveforms
9. Find the bending loss and propagation loss in fiber with two different fiber lengths
10. Test the performance of Manchester encoder and decoder using optical communication.

11. Test the performance of a voice link using optical fiber.

12. Test the Horizontal and Vertical deflection sensitivity of CRT

13. Install a DTH system and test its performance.

LIST OF EQUIPMENTS

S.NO	Name oftheEquipments	Range	RequiredNos.
1	DualtraceCRO	100MHz	2
2	PSK Modulation Kit		1
3	PSK Demodulation Kit		1
4	Fiber optic demonstration kit		2
5	DTH		1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronicsand Communication Engineering

Subject Code : 4040550

Semester : V

Subject Title : Microcontroller Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
Microcontroller Practical	**4**	**64**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

The introduction of this subject will enable the students to have hands on experience in using 8051 trainer kit. The students are exposed to learn simple programs using assembly language. They can also get familiar with the C compiler platform. They also gain knowledge by using application specific interfacing boards .

OBJECTIVES:

The students are able to

-> Understand the use of instruction set by writing and executing simple ALP.

-> Know the connection details between microcontroller and peripherals.

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4040550 MICROCONTROLLER PRACTICAL

DETAILED SYLLABUS

Contents:Practical

Exercises

Part A

The following experiments should be written using 8051 assembly language program and should be executed in the 8051 microcontroller trainer kit.

1. 8 / 16 bit addition
2. 8 / 16 bit subtraction
3. 8 bit multiplication
4. 8 bit division
5. BCD to Hex code conversion
6. Hex to BCD code conversion
7. Smallest / Biggest number
8. Time delay routine (Demonstrate by Blinking LEDS).
9. Using Timer/ counter of 8051

Part B (Interfacing Application Boards)

The following experiments can be written using C compiler or 8051 assembly language and to be executed.

10. Interfacing Digital I/O board
11. Interfacing DAC
12. Interfacing Stepper motor
13. Interfacing Seven segment LED display or LCD
14. Sending data through the serial port between microcontroller kits
15. Interfacing DC motor using PWM.

BOARD EXAMINATION

Note:

1.Students are provided with Hex code sheet for manual hand assembly.

DETAILED ALLOCATION OF MARKS

I.	Algorithm or Flow chart	: 20 marks
II.	Program	: 30 marks
III.	Execution	: 30 marks
IV.	Result	: 10 marks
V.	Viva	: 10 marks
	TOTAL	:100 marks

MODEL QUESTION PAPER

4040550 MICROCONTROLLER PRACTICAL

1.Write an assembly language program for adding two 8 bit / 16 bit numbers and execute the same using 8051 trainer kit. Store the output result in memory. Input numbers can be given as immediate data or can be stored in the memory.

2.Write a program to interface stepper motor with microcontroller 8051 and execute. Check the execution for varying the speed of the motor and also the forward/reverse rotation of the motor.

3.Write a 8051 Assembly Language program to use Timer/ Counter of 8051 microcontroller to generate time delay and observe the output.

4.Write a 8051 Assembly language program to generate 1 second time delay using Time delay routine and verify the output at LEDS.

5.Write a program to interface DAC interface board with microcontroller and verify the analog output.

6. Write a program to interface LCD interface board with microcontroller and observe the output at LCD.

7.Write a program to interface Digital I /O board with microcontroller and verify all input and output operations.

8.Write an assembly language program using 8051 to convert the given BCD number to hexadecimal number and store the result in memory. The input can be given as an immediate data or can be stored in the memory.

9. Write an assembly language program using 8051 to convert the given hexadecimal number to BCD number and store the result in memory. The input can be given as an immediate data or can be stored in the memory.

10.Write an assembly language program using 8051 to find the smallest number of the array of given numbers and store the result in the memory. The size of the array and the input numbers can be stored in the memory.

11.Write an assembly language program using 8051 to perform 8 bit multiplication and store the result in the memory. The input numbers can be given as immediate data or can be stored in the memory.

12. Write an assembly language program for subtracting two 8 bit / 16 bit numbers and execute the same using 8051 trainer kit. Store the output result in memory. Input numbers can be given as immediate data or can be stored in the memory.

13. Write an assembly language program using 8051 to perform 8 bit division and store the result in the memory. The input numbers can be given as immediate data or can be stored in the memory.

14.Write a program to perform serial communication between two 8051 microcontroller kits and verify the output.

15.Write a program to interface seven segment LED interface with microcontroller and verify the output at seven segment display .

16.Write a program to interface a DC motor with microcontroller and verify the rotation of motor in both directions using PWM method.

LIST OF EQUIPMENTS

S.NO	Name of the Equipments	Required Nos
1.	8051 Microcontroller kit	14
2.	Digital I/O Interface board	2
3.	Seven segment LED display interface board	2
4.	8 bit DAC interface board	2
5.	Stepper motor control interface board	2
6.	DC motor control interface board	2
7.	RS 232 serial port cable	2
8.	LCD interface board	2
9.	Laptop / Desktop Computer	6

STATE BOARD OF TECHNICAL EDUCATION ANDTRAINING,TAMILNADU

DIPLOMAINENGINEERING / TECHNOLOGY SYLLABUS

N SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name:1040:Electronics and Communication Engineering

SubjectCode: 4040561

Semester :V

SubjectTitle: VeryLarge Scale IntegrationPractical

TEACHINGANDSCHEMEOFEXAMINATION

Noofweekspersemester:16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours/ Week	Hours/Semester	Internal Assessment	Board Examination	Total	
VeryLargeScaleIntegrationPractical	5	80	25	100*	100	3Hrs

***Examination will be conducted for 100 marks and it will be reduced to 75 marks**

RATIONALE:

VHDL is a versatile and powerful hardware description language which isuseful for modeling digital systems at various levels of design abstraction.This language is mainly for describing the hardware. Execution of a VHDL program results in asimulation of the digital system allows us to validate the design prior tofabrication of Digital Integrated circuit. This practical will enable the students to have hands on experience in using FPGA kit. The students are exposed to do programming in VHDL.

OBJECTIVES:

Thestudentswillbeableto

- Understand the use of VHDL statements by writing program in VHDL.
- DevelopaVHDLcodeforany digital circuits.
- Understand the concepts of digital circuits / logic function by simulating VHDL programs through XILINX software.
- Understand the concepts of digital circuits by using FPGA kit.
- To know the usage of input switches, output LEDs and seven segment display in FPGA kit.

4040561VERYLARGESCALEINTEGRATIONPRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

NOTE: Behavioral or structural model can be used for allexperiments

1.SIMULATIONOFVHDLCODEFOR LOGIC GATES (AND GATE,OR GATE)
Develop code for logic gates. Simulate the code in the software.

2.SIMULATIONOFVHDLCODEFORCOMBINATIONALFUNCTION
Optimize a 4 variable combinational function (SOP), describe it inVHDL codeandsimulateit.Example:F=(0,1,4,5,8,9,12)insop

3.SIMULATIONOFVHDLCODEFOR HALF ADDER AND FULL ADDER
Develop code for half adder and full adder. Simulate the code in the software .

4.SIMULATIONOFVHDLCODEFOR HALF SUBTRACTOR AND FULL SUBTRACTOR
Develop code for half subtractor and full subtractor. Simulate the code in the software.

5.SIMULATIONOFVHDLCODEFOR SINGLE BIT DIGITAL COMPARATOR
Develop Boolean expression for A>B, A=B, A<B, write a VHDL code and simulate the code in the software.

6.VHDLIMPLEMENTATIONOF8 TO 1 MULTIPLEXER
Develop the code for a 8 to 1 multiplexer and implement it in FPGA kit in which switches are connected for select inputs and for data inputs, a LED is connected to the output.

7.VHDLCODE FOR JK FLIPFLOP (SIMULATION/IMPLEMENTATION)
Develop the code for JK flipflop and simulate using software or implement it in FPGA kit**.**

8.VHDLIMPLEMENTATIONOF 1 TO 8 DEMULTIPLEXER

Develop the code for a 1 t0 8 Demultiplexer and implement it in FPGA kit in which Switches are connected for select inputs and a data input, Eight LEDs are connectedtotheoutputofthe circuit.

9.VHDLIMPLEMENTATIONOF7SEGMENTDECODER – BOOLEAN EXPRESSION

DevelopBooleanexpressionfor4inputvariablesand7outputvariables.Develop a seven segment decoder in VHDL for 7 equations. A seven segment display is connected to the output of the circuit. Four switches areconnectedtotheinput.The4bitinputisdecodedto7segmentequivalent.

10.VHDLIMPLEMENTATIONOF7SEGMENTDISPLAY - WITH COUNTER

Design and develop a seven segment decoder in VHDL. Design and developa 4 bit BCD counter, the output of the counter is given to seven segment decoder.A seven segment display is connected to the output of the decoder. The displayshows0,1,2..9foreveryonesecond

11.VHDLIMPLEMENTATIONOF 8 TO 3ENCODER

Develop code for 8 to 3 encoder. There willbe 8 switches and 3 LEDs in the FPGA kit. The input givenfrom switches and it is noted that any one of the switch is active. The binaryequivalentforthecorrespondinginputswitchwillbeglowingintheLEDasoutput.

12.VHDLIMPLEMENTATION OF2 TO 4 DECODER

Develop code for 2 to 4 decoder and implement it in FPGA kit in which 2 Switches are connected for inputs , four LEDs foroutput.

13.VHDLIMPLEMENTATIONFORBLINKINGALED

Develop a VHDL Code for delay .Delay is adjusted in such a way that LED blinks for every 1 or 2seconds.

14.VHDLIMPLEMENTATIONFORBLINKINGANARRAYOFLEDS

Design and develop a VHDL Code for 4 bit binary up counter. Four LEDs areconnected at the output of the counter. The counter should up for every onesecond.

15.VHDLIMPLEMENTATIONOFASPELLERWITHANARRAYOFLEDS

Design and develop VHDL Code for a 5 bit Johnson ring counter 4 bit TheLEDs are connected at the output of the counter. The speller should work foreveryonesecond.

BOARD EXAMINATION

NOTE:

1.All the experiments given in the list of experiments should be completed andgivenfortheendsemesterpracticalexamination.

2.In order to develop best skills in handling Instruments/Equipment practical classes, every three students should be provided with a separateexperimentalsetupfor doingexperimentsinthelaboratory.

3.The external examiners are requested to ensure that a single experimentalquestion should not be given to more than three students while admitting abatchof30studentsduringBoardExaminations.

DETAILED ALLOCATIONOFMARKS

Algorithm orflowchart		30marks
Program		30Marks
Execution	25marks	
Result		10 marks
VivaVoce		5marks
Total		100Marks

MODEL QUESTION PAPER
4040561 VERYLARGESCALEINTEGRATIONPRACTICAL

1.Write aVHDLcodefor logic gates (AND gate, OR gate) and simulate the code.

2. Simplify the function f=(0,1,4,5,8,9,12). Write aVHDLcodeforthe simplified function andsimulateit.

3.Write aVHDLcodefor half adder and full adder and simulate the code.

4.Write aVHDLcodeforhalf subtractor and full subtractor and simulate the code.

5.Write aVHDLcodefor single bit digital comparator and simulate the code.

6.Write aVHDLcodefor8 to 1 multiplexer and implement it in FPGA kit.

7.Write aVHDLcodeforJK flipflop and simulate using software or implement it in FPGA kit.

8.Write aVHDLcodefor1 to 8 demultiplexer and implement it in FPGA kit.

9.Write aVHDLcodefor7segmentdecoder – Boolean expression and implement it in FPGA kit.

10.Write aVHDLcodefor7segmentdisplay - with counter and implement it in FPGA kit.

11.Write aVHDLcodefor 8 to 3 encoder and implement it in FPGA kit.

12.Write aVHDLcodefor2 to 4 decoder and implement it in FPGA kit.

13.Write aVHDLcodeforblinkingaLED and implement it in FPGA kit.

14.Write aVHDLcodeforblinkinganarrayofLEDs and implement it in FPGA kit.

15.Write aVHDLcodeforspellerwithanarrayofLEDs and implement it in FPGA kit.

LISTOFEQUIPMENTS

1. FPGA KIT with atleast 10 switches for input, 8 LEDs for output, a 7 segmentdisplay, debounced push switch (2 Nos) for manual clock input and external clocksource–10Nos with software.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name **:** 1040:Electronics and Communication Engineering

Course Code : 4040562

Semester **:** V Semester

Subject Title **:** Consumer Electronics Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
Consumer Electronics Practical	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

The objective of teaching this subject is to give students an in depth knowledge of various electronic audio and video devices and systems. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices. This in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

OBJECTIVES:

On completion ofthefollowing experiments, the students must be able to

- Troubleshoot different types of Microphones and loudspeakers.
- Maintain and troubleshoot of audio systems.
- Troubleshoot LED TV Receiver.
- Know about installation and troubleshoot of CCTV and Dish antenna.

- Know about various sensors and their functionalities of washing machine.
- Know about Installation and troubleshoot of A/C
- Maintain various consumer Electronic appliances.

4040562 CONSUMER ELECTRONICS PRACTICAL
DETAILED SYLLABUS

Contents:Practical

Exercises

1. To study public address system and its components.
2. To plot the directional response of a Microphone.
3. To plot the directional response of a Loud Speaker.
4. Trouble shooting of CD/DVD Player.
5. To perform fault identification in LED TV.
6. Installation of Dish Antenna for best reception.
7. Installation of CCTV system.
8. Demonstration of Microwave Oven.
9. Demonstration of Automatic Washing Machine and locate various sensors used in that washing machines.
10. To study the various parameters in the Smartphone and Tablet.
11. Explore digital cameras settings.
12. To build and test temperature control system.
13. To build and test circuit for A/C motor control.
14. Verify functions of Camcorder.
15. Installation of LCD/LED Projector and verify the functionalities.

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CIRCUIT DIAGRAM	: 25
PROCEDURE	: 30
EXECUTION & HANDLING OF EQUIPMENT	: 20
OUTPUT / RESULT	: 15
VIVA – VOCE	: 10

TOTAL : 100

MODEL QUESTION PAPER
4040562 CONSUMER ELECTRONICS PRACTICAL

1. To study public address system and its components.
2. To plot the directional response of a Microphone.
3. To plot the directional response of a Loud Speaker.
4. Trouble shooting of CD/DVD Player.
5. To perform fault identification in LED TV.
6. Installation of Dish Antenna for best reception.
7. Installation of CCTV system.
8. Demonstration of Microwave Oven.
9. Demonstration of Automatic Washing Machine and locate various sensors used in that washing machines.
10. To study the various parameters in the Smartphone and Tablet.
11. Explore digital cameras settings.
12. To build and test temperature control system.
13. To build and test circuit for A/C motor control.
14. Verify functions of Camcorder.
15. Installation of LCD/LED Projector and verify the functionalities.

LIST OF EQUIPMENTS

S.NO	Name of Equipment with specification	Quantity
1.	Digital Multimeter	10
2.	Microphone (Different types)	10
3.	Loud Speaker	10
4.	LED TV	2
5.	Dish Antenna	1
6.	Microwave Oven, Washing machine, A/C	2
7.	Digital Camera, Smart Phone/Tablet, Camcorder	2
8.	LCD/LED Projector.	2
9.	CCTV Cameras	5

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject code : 4040563

Semester : V

Subject title : SIGNAL AND IMAGE PROCESSING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
Signal and Image Processing Practical	**5**	**80**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

This laboratory makes the student to understand the basic concepts of signal and image processing .signal processing focuses on analyzing, modifying and synthesizing signals such as sound, images and scientific measurements. The need to extract information from images and interpret their contents has been one of the driving factors in the development of image processing and computer vision during the past decades .Image processing application cover a wide range of human activities such as Medical application, Industrial, Military, Consumer Electronics, Law Enforcement and security, The internet particularly the world wide web.

OBJECTIVES:

On completion ofthefollowing experiments, the students must be able to

- know to generate discrete sequence signal.
- knowabout fourier transform
- know first order low pass filter and first order high pass filter
- know about spatial domain
- know about contrast stretching.
- know graylevel slicing and bitplane slicing
- know about masking
- know frequency domain of ideal lowpass filter and ideal high pass filter

4040563 SIGNAL AND IMAGE PROCESSING PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

1. Write a MATLAB program to generate the discrete sequence unit step and unit impulse. Plot all sequences
2. Write a MATLAB program to generate the discrete sequence ramp and periodic sinusoidal signal.plot all sequences.
3. Find the Fourier transform of a square pulse using MATLAB .Plot its amplitude and phase spectrum.
4. Write a MATLAB program to generate a random sinusoidal signal and plot four possible realizations of random signals
5. Write a MATLAB program to find the magnitude and phase response of first order low pass filter. Plot the responses in logarithmic scale.
6. Write a MATLAB program to find the magnitude and phase response of first order high pass filter. Plot the responses in logarithmic scale.
7. Write a MATLAB program in spatial domain for image negatives and log transformation
8. Obtain the power law transformation in spatial domain using MATLAB.
9. Write a MATLAB program for contrast stretching.
10. Write a MATLAB program in spatial domain for linear filter
11. Write a MATLAB program for graylevel slicing andbitplane slicing.
12. Write a MATLAB program for histogram equalization

13. Write a MATLAB program for unsharp masking.
14. Obtain the frequency domain of ideal lowpass filter in MATLAB.
15. Obtain the frequency domain of ideal high pass filter in MATLAB.

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

WRITING PROGRAM:		40
EXECUTION OF PROGRAM :		35
OUTPUT / RESULT :		15
VIVA – VOCE	:	10
TOTAL	:	100

MODEL QUESTION PAPER

4040563SIGNAL AND IMAGE PROCESSINGPRACTICAL

1. Write a MATLAB program to generate the discrete sequence unit step and unit impulse. Plot all sequences
2. Write a MATLAB program to generate the discrete sequence ramp and periodic sinusoidal signal.plot all sequences.
3. Find the Fourier transform of a square pulse using MATLAB .Plot its amplitude and phase spectrum.
4. Write a MATLAB program to generate a random sinusoidal signal and plot four possible realizations of random signals
5. Write a MATLAB program to find the magnitude and phase response of first order low pass filter. Plot the responses in logarithmic scale.
6. Write a MATLAB program to find the magnitude and phase response of first order high pass filter. Plot the responses in logarithmic scale.
7. Write a MATLAB program in spatial domain for image negatives and log transformation
8. Obtain the power law transformation in spatial domain using MATLAB.
9. Write a MATLAB program for contrast stretching.
10. Write a MATLAB program in spatial domain for linear filter
11. Write a MATLAB program for gray level slicing and bit plane slicing
12. Write a MATLAB program for histogram equalization
13. Write a MATLAB program for unsharp masking.
14. Obtain the frequency domain of ideal lowpass filter using MATLAB.

15. Obtain the frequency domain of ideal high pass filter using MATLAB.

LIST OF EQUIPMENTS

S.NO	Name oftheEquipments	Range	RequiredNos.
1.	Desk Top Computer		15
2.	Simulation Tool	MATLAB	1

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic Year 2020-2021 onwards)

Course Name :1020:Mechanical Engineering

Subject Code : 4020570

Semester : V

Subject Title : ENTREPRENEURSHIP AND START-UPS

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
Entrepreneurship and Startups	**4 hours**	**64 hours**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hours
1	Entrepreneurship – Introduction and Process	10
2	Business Idea and Banking	10
3	Start ups, E-cell and Success Stories	10
4	Pricing and Cost Analysis	10
5	Business Plan Preparation	10
Revision, Field visit and Preparation of case study report		14
Total		64

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and start ups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:

At the end of the study of 5th semester the students will be able to

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spirit and resourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture
- Familiarization with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turnover
- Familiarization of various financial and non financial schemes
- Aware the concept of incubation and starts ups

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
1	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** ● Concept, Functions and Importance ● Myths about Entrepreneurship ● Pros and Cons of Entrepreneurship ● Process of Entrepreneurship ● Benefits of Entrepreneur ● Competencies and Characteristics ● Ethical Entrepreneurship ● Entrepreneurial Values and Attitudes ● Motivation ● Creativity ● Innovation ● Entrepreneurs - as problem solvers ● Mindset of an employee and an entrepreneur ● Business Failure – causes and remedies ● Role of Networking in entrepreneurship	**10**
2	**BUSINESS IDEA AND BANKING** ● Types of Business: Manufacturing, Trading and Services ● Stakeholders: Sellers, Vendors and Consumers ● E- Commerce Business Models ● Types of Resources - Human, Capital and Entrepreneurial tools	**10**

	● Goals of Business and Goal Setting ● Patent, copyright and Intellectual Property Rights ● Negotiations - Importance and methods ● Customer Relations and Vendor Management ● Size and Capital based classification of business enterprises ● Role of Financial Institutions ● Role of Government policy ● Entrepreneurial support systems ● Incentive schemes for State Government ● Incentive schemes for Central Government	
3	**STARTUPS, E-CELL AND SUCCESS STORIES** ● Concept of Incubation centre's ● Activities of DIC, financial institutions and other relevance institutions ● Success stories of Indian and global business legends ● Field Visit to MSME's ● Various sources of Information ● Learn to earn ● Startup and its stages ● Role of Technology – E-commerce and Social Media ● Role of E-Cell ● E-Cell to Entrepreneurship	**10**
4	**PRICING AND COST ANALYSIS** ● Calculation of Unit of Sale, Unit Price and Unit Cost	

	• Types of Costs - Variable and Fixed, Operational Costs • Break Even Analysis • Understand the meaning and concept of the term Cash Inflow and Cash Outflow • Prepare a Cash Flow Projection • Pricing and Factors affecting pricing • Understand the importance and preparation of Income Statement • Launch Strategies after pricing and proof of concept • Branding - Business name, logo, tag line • Promotion strategy	**10**
5	**BUSINESS PLAN PREPARATION** • Generation of Ideas, • Business Ideas vs. Business Opportunities • Selecting the Right Opportunity • Product selection • New product development and analysis • Feasibility Study Report – Technical analysis, financial analysis and commercial analysis • Market Research - Concept, Importance and Process • Marketing and Sales strategy • Digital marketing • Social Entrepreneurship • Risk Taking-Concept • Types of business risks	**10**

REFERNCE BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra - 282002
2. Dr. G.K. Varshney, Business Regulatory Framework , Sahitya Bhawan Publications, Agra - 282002
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301
4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
5. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
6. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
7. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
8. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
9. I. V. Trivedi, RenuJatana, Indian Banking System, RBSA Publishers, Rajasthan
10. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
11. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioners guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

Board Examination – Evaluation Pattern

Internal Mark Allocation

Assignment (Theory portion)*	- 10
Seminar Presentation	- 10
Attendance	- 5
TOTAL	**- 25**

Note: * Two assignments should be submitted. The same must be evaluated and converted to 10 marks.

Guidelines for assignment:

First assignment – Unit I

Second assignment – Unit II

Guidelines for Seminar Presentation--Unit III

Each assignment should have five three marks questions and two five marks questions.

BOARD EXAMINATION

Note

1. The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.
2. The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Board Practical Examinations.
3. The question paper consists of theory and practical portions. All students should write the answers for theory questions (40 Marks) and practical portions (60 Marks) should be completed for board examinations.
4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do the examination for 3Hrs.
5. For Written Examination: theory question and answer: 45 Marks

   Ten questions will be asked for 3 marks each. Five questions from each unit 1 & 2. (10 X 3 = 30).

   Three questions will be asked for 5 marks each. One question from each unit 1, 2 & 3. (3 X 5 = 15)
6. For Practical Examination: The business plan/Feasibility report or Report on Unit 4 & 5 should be submitted during the board practical examinations. The same have to be evaluated for the report submission (40 marks).

DETAILED ALLOCATION OF MARKS

Sl. No	Description	Marks
Part A	Written Examination - Theory Question and answer (10 questions x 3 marks:30 marks & (3 questions x 5 marks: 15 marks)	45
Part B	Practical Examination – Submission on Business Plan/Feasibility Report or Report on Unit 4 & 5	40
Part C	Viva voce	15
	Total	100

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject code : 4040610

Semester : VI

Subject title : COMPUTER HARDWARE SERVICING AND NETWORKING

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
Computer hardware Servicing and Networking	**5**	**80**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topics	Hours
I	MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES	16
II	I/O DEVICES AND INTERFACE	14
III	TROUBLE SHOOTING OF DESKTOP AND LAPTOPS	15
IV	COMPUTER NETWORK DEVICES AND OSI LAYERS	14
V	802.X AND TCP/IP PROTOCOLS	14
	Tests and Model	7
	Total	**80**

RATIONALE:

Maintaining and servicing the computers, laptops and peripherals are essential requirements of the computer students. The clear understanding of computer network devices and protocols are also taught in this subject.

OBJECTIVES:

On completion of the following units of syllabus contents, the students can

- Identify the major components ofCPU.
- Understand the principle of operations of all the interfacing boards, IO/Memory slots and interfacingdevices.
- Know the use of diagnostic Software.
- Trouble shoot the problems inLaptop.
- Understand the different layers of OSI and their functions. Compare different LANprotocols.
- Identify the protocols used in TCP /IP and compare with OSI model. Use of IP addressing and TCP/ IP protocolsbriefly.

4040610 COMPUTER HARDWARE SERVICING AND NETWORKING

DETAILED SYLLABUS

Contents : Theory

Unit No.	Name of the Topic	Hours
I	**MOTHERBOARD COMPONENTS AND MEMORY STORAGEDEVICES** **1.1 Introduction:** Hardware, Software and Firmware. Mother board, IO and memory expansion slots, SMPS, Drives, front panel and rear panel connectors. **1.2 Processors:** Architecture and block diagram of multicore Processor, Features of new processor (Definition only)-chipsets (Concepts only) **1.3Bus Standards:** Overview and features of PCI, AGP, PCMCIA **1.4 Primary Memory**: Introduction-Main Memory, Cache memory – DDR2, DDR3, DDR4 and Direct RDRAM. **1.5 Secondary Storage:** Hard Disk – Construction – Working Principle Specification of IDE, Ultra ATA, Serial ATA; HDD Partition - Formatting, SSD Introduction. **1.6 Removable Storage:** CD-R, CD-RW, DVD –ROM and DVD –RW**:** construction and reading & writing operations, Zip Drive; Blu-ray – Introduction – Disc Parameters.	3 3 2 3 3 2
II	**I/O DEVICES AND INTERFACE** **2.1 Keyboard:** Signals – operation of membrane and mechanical keyboards– troubleshooting; wireless Keyboard. **2.2Mouse:** Types, connectors, operation of Optical mouse and Troubleshooting. **2.3 Printers**: Introduction – Types of printers- Dot Matrix, Inkjet, Laser, MFP (Multi-Function Printer) and Thermal printer – Operation, Construction andFeatures - Troubleshooting **2.4 I/O Ports:** Serial, Parallel, USB, Game Port and HDMI. **2.5 Displays:** Principles of LED (OLED, AMOLED, POLED), LCD & TFT Displays.	2 2 2 1 2

	2.6 Graphic Cards: VGA and SVGA card. **2.7 Modem:** Working principle. **2.8 Power Supply:** Servo Stabilizers, online and offline UPS - working principles; SMPS: Principles of Operation and block diagram of ATX Power supply, Connector Specifications.	2 1 2
III	**MAINTENANCE AND TROUBLE SHOOTING OF DESKTOP AND LAPTOPS** **3.1 Bios-setup:** Standard CMOS setup, Advanced BIOS setup, Power management, advanced chipset features, PC Bios communication – upgrading BIOS, Flash BIOS - setup. **3.2 POST:** Definition – IPL hardware – POST Test sequence – beep codes **3.3 Diagnostic Software and Viruses:** Computer Viruses – Precautions –Anti-virus Software – identifying the signature of viruses – Firewalls and latest diagnostic softwares. **3.4 Laptop:** Types of laptop – block diagram – working principles – configuring laptops and power settings - SMD components, ESD & precautions. **3.5 Laptop components:** Adapter – types, Battery – types, Laptop Mother Board - block diagram, Laptop Keyboard and Touchpad. **3.6 Installation and Troubleshooting:** Formatting, Partitioning and Installation of OS – Trouble Shooting Laptop Hardware problems - Preventive maintenance techniques for laptops.	2 2 2 2 3 4
IV	**COMPUTER NETWORK DEVICES AND OSI LAYERS** **4.1 Data Communication:** Components of a data communication. **4.2 Data flow:** Simplex – half duplex – full duplex; **4.3 Topologies:** Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology. **4.4 Networks:** Definition -Types of Networks: LAN – MAN – WAN – CAN – HAN – Internet –Intranet –Extranet, Client-Server, Peer to Peer Networks. **4.5 Network devices:** Features and concepts of Switches – Routers (Wired and Wireless) – Gateways. **4.6 Network Models:** Protocol definition - standards - OSI Model – layered architecture – functions of alllayers.	1 1 2 4 3 3

V	**802.X AND TCP/IP PROTOCOLS** **5.1 Overview of TCP / IP:** TCP/IP – Transport Layers Protocol – connection oriented and connectionless Services – Sockets - TCP & UDP. **5.2 802.X Protocols:** Concepts and PDU format of CSMA/CD (802.3) – Token bus (802.4) – Token ring (802.5) – Ethernet – type of Ethernet (Fast Ethernet, gigabit Ethernet) – Comparison between 802.3, 802.4 and 802.5 **5.3 Network Layers Protocol:** IP – Interior Gateway Protocols (IGMP, ICMP, ARP, RARP Concept only). **5.4 IP Addressing:** Dotted Decimal Notation – Subnetting & Supernetting. **5.5 Application Layer Protocols:** FTP - Unmanageable Switch - manageable Switch – Telnet – SMTP– HTTP – DNS – pop	3 4 3 2 2

REFERENCEBOOKS:

1. IBM PC and CLONES, B. Govindrajalu, Tata McGraw-Hill Publishers, IBM PC and CLONES
2. Computer Installation and Servicing, D. Balasubramanian, Tata McGraw Hill
3. Computer Installation and Servicing
4. The complete PC upgrade and Maintenance, Mark Minasi, BPB Publication, The complete PC upgrade and Maintenance
5. Troubleshooting, Maintaining and Repairing PCs, Stephen J Bigelow, Tata McGraw Hill Publication, Troubleshooting Maintaining and Repairing PCs
6. Upgrading and repairing laptops, Scott Mueller, QUE Publication, Upgrading and repairing laptops
7. Data Communication and networking, Behrouz A. Forouzan, Tata Mc-Graw Hill, New Delhi,
8. Data and Computer Communications, William Stallings, Prentice-Hall of India, Eighth Edition
9. Computer Networks, Andrew S. Tanenbaum, Prentice-Hall of India, New Delhi,
10. Computer Networks, Achyut Godbole, Tata McGraw Hill - New Delhi
11. Principles of Wireless Networks– A unified Approach, Kaveh Pahlavan and Prashant Krishnamurty, Pearson Education, 2002

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name :1040: Electronics and Communication Engineering

Subject Code : 4040620

Semester :VI

Subject title : BIOMEDICAL INSTRUMENTATION

TEACHINGAND SCHEME OF EXAMINATION

No ofweeks/ semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Board Examination	Total	
Biomedical instrumentation	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and allocation of hours

UNIT	TOPIC	Hours
I	Bio-electric potentials, Electrodes and Clinical measurements	14
II	Diagnostic Instruments	15
III	Therapeutic Instruments	16
IV	Biotelemetry and Patient Safety	15
V	Modern Imaging Techniques	13
	Tests and Model Exam	7
Total		80

RATIONALE:

Every year,thereisatremendousincreaseintheuseof Modern Electronic medicalequipment inthehospitalandhealthcareindustry. Thereforeitisnecessary forevery student ttounderstandthe functioning of various medical equipments.

OBJECTIVES:

After learning this subject the studentwill beable to understand the about

- The generation ofBio-potential and its measurement using various electrodes.
- The measurement ofblood pressure.
- The measurement oflung volume.
- The measurement ofrespiration rate.
- The measurement ofbodytemperature and skin temperature.
- The principleofoperation ofECG recorder and the analysis of ECG waves
- The principle ofoperationofEEG recorder and the analysis of EEG waves
- The principle ofoperation ofEMG recorder.
- Theworking principles of audio meter.
- The principleofoperation ofpacemaker.
- The basic principle ofdialysis.
- The basic principle ofventilators.
- Theworking principles of telemetry.
- The basic principle oftelemedicine.
- To learn about patient safety.
- The various methods ofaccident prevention.
- The basic principle ofvarious types oflasers and their applications
- The basic principle of various types of Medical Imaging Systems.

4040620 BIOMEDICAL INSTRUMENTATION

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**BIO-ELECTRIC POTENTIALS, ELECTRODES AND CLINICAL MEASUREMENTS** **1.1: BIOPOTENTIALS AND ELECTRODES** Elementaryideas ofcell structure, Bio-electric potentialsand their origin- Resting and action potentials– Propagation ofaction potential - Electrodes – Micro – Skinsurface– needle electrodes. **1.2: CLINICAL MEASUREMENTS:** Measurement ofBlood pressure : Sphygmomanometer– Blood flowmeter (Electromagnetic& ultrasonic blood flowmeter)– Acid base balance: pH, Measurement of pH value of various body fluids- Measurement ofRespiration rate : Impedance Pneumograph– Measurement of Lung volume: Spiro meter– Heart rate monitor– Medical laboratory equipment: Auto analyzer	7 7
II	**DIAGNOSTIC INSTRUMENTS:** **2.1: Electro- Cardio Graph (ECG) :** 12 Lead system of ECG– ECG recorder– Analysis of abnormal ECG waves. **2.2: Nervous system:** Electro- EnchephaloGraph(EEG) - 10-20 EEG lead system– EEG recorder–EEGwave types– Clinical uses of EEG **2.3: Electro– Myo Graph (EMG) :** EMGwaves– Measurement of conduction velocity– EMG recorder **2.4: Electro- Retino Graph (ERG) :** ERG recorder – ERG wave **2.5: Audiometer:** Principle– types – Basics audiometer working- Air conduction and bone conduction test	3 3 3 3 3

III	**THERAPEUTIC INSTRUMENTS** **3.1: Cardiac pacemaker** Need for Pacemaker-Classification – R-wave triggered and Ventricular inhibited implantable pacemakers– Programmable pacemaker **3.2: Cardiac defibrillators** Need for Defibrillator - Classification – AC and DC defibrillators **3.3: Heart lung machine** : Need for Heart Lung Machine –Blockdiagram – working **3.4: Dialysis** Need for Dialysis – Processes involved in Dialysis - Hemo dialysis– peritoneal dialysis - Comparison of Hemodialysis and Peritonael dialysis **3.5: Lithitripsy** Need for Lithotriptor- block diagram and working **3.6: Ventilators** Need for Ventilators - Types – modern ventilator blockdiagram – Working	2 3 3 3 3 2
IV	**BIOTELEMETRY AND PATIENTSAFETY:** **4.1: Biotelemetry** Physiological parameters adaptable to biotelemetry - componentsofa biotelemetrysystem– applications of biotelemetry–Radio telemetry with sub carrier: single channel and multi channel telemetry system- Telemedicine: concept and applications. **4.2: Patient safety** Physiological effects ofelectric current– Micro and macro shock–Hazardous situations of micro and macro shocks- leakage current– lethal effects of leakage current **4.3:Methods ofAccident Prevention** Grounding – Double Insulation – Ground fault circuit interrupter (GFI)– Safetyaspectsin electrosurgicalunits:burns –Highfrequency currenthazard-explosionhazard. Precautionstominimize electric shock hazards	5 5 5

V	**MODERN IMAGINGTECHNIQUES:** **5.1: LASER** Laser beamproperties– Blockdiagram and explanation of ND-Yag LASER – Applications ofLASER inpatient care. **5.2: X ray** Properties of X-Rays - Working of X ray apparatus– Special techniques inX-rayimaging: C arm image intensifier- Computerized Axial tomography– CT scanner- Angiography **5.3: Ultrasonic imaging techniques:** Pulse echo system - Echo Cardiography – Operating modes – Working **5.4:** Magnetic Resonance Imaging techniques – Working – Superiority of MRI Scan	3 3 3 4

Reference Books:

1. LeslieCromwell– Fredj.Wibell,ErichA.PFeither- Biomedical Instrumentation andmeasurements,IIEdition Jacobson andWebstar–Medicine andclinicalEngineering.
2. R.S.Khandpur–HandbookofBiomedical Instrumentation.
3. Medical Electronics - Kumara doss
4. Introduction to Medical Electronics. B.R. Klin
5. Introduction to Biomedical Instrumentation Mandeep SinghPrintice Hall India 2010.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject Code : 4040631

Semester : VI

Subject Title : Television Engineering.

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
Television Engineering	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Television Fundamentals.	15
II	Camera Tubes and Picture Tubes.	14
III	Television Transmitter and Television Receiver.	17
IV	Modern Television Technology.	14
V	Advanced Television Systems.	13
	Test & Model Exam	7
	Total	**80**

RATIONALE:

This subject makes the students to understand from the basic concepts of TV to advanced techniques of TV .It also enables the students to have the knowledge about the Modern Technology including flat panel display. This subject makes the students to understand about Color TV fundamentals .The subject also introduces troubleshooting techniques. It gives the clear understanding about TV standards .

OBJECTIVES:

On completion of the syllabus, the students must be able to

->Understand CVS and CCVS signal. .

-> Understand the different types of scanning.

-> Study the types of camera tubes and picture tubes.

-> Explain about TV transmitter and TV receiver(Monochrome and PAL).

-> Study the Modern TV technology.

->Understand the use of Advanced TV systems.

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4040631 TELEVISION ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Television Fundamentals** **1.1 : Monochrome TV** Basic block diagram of monochrome TV transmitter and receiver -scanning process -horizontal, vertical and sequential scanning -Flicker-Interlaced scanning(qualitative treatment only) -need for synchronization -blanking pulses-Aspect ratio -Resolution -vertical and horizontal resolution -video bandwidth -composite video signal (CVS) -Definitions for vertical sync pulse, serrated vertical pulse, Equalizing pulse -Positive and negative modulation -TV standards . **1.2 : Colour TV Fundamentals** Additive mixing of colours -colour perception -Chromaticity diagram-Definition for Luminance, Hue ,Saturation and Chrominance- Formation of chrominance signal in PAL system with weighting factors- colour composite video signal(CCVS).	8 7
II	**Camera tubes and Picture Tubes** **2..1 : Camera Tube** Characteristics-Types of camera tube-working principle of Vidicon camera tube-study of Target plate (only) of plumbicon camera tube -CCD camera-Video processing of camera pick up signal-Block diagram and principle of working of colour TV camera tube. **2.2 : Picture Tube** Magnetic deflection and Electrostatic focusing -Screen phosphor -Screen burn-screen persistence-Aluminized screen- types of colour picture tubes-Construction and working principle of Trinitron colour picture tube -Automatic degaussing.	7 7
III	**Television Transmitter and Receiver**	

	3.1:Television Transmitter Types-Comparison-principle-Block diagram of low level IF modulated TV Transmitter -Visual Exciter-Aural Exciter -Principle of working of CIN Diplexer-colour compatibility -PAL colour Coder working operation-merits and demerits of PAL system. **3.2:Television Receiver** Block diagram of monochrome receiver- functions of each block-need for AGC-merits of AGC-Video Amplifier Requirements -High and low frequency compensation--Block diagram of PAL colour receiver-need for sync separator -Basic sync separator circuit- Integrator and Differentiator -AFC-need for AFC-Horizontal AFC.	9 8
IV	**Modern Television Technology** **4.1:Modern TV** Flat panel Display-Principles of operation-Large screen display -Types of TV-projection TV-plasma TV-merits of plasma TV-construction and working operation of LCD TV-LED TV -Types of LED TV -working operation of LED TV-merits of LED TV-LCD projector working operation -set top box-principles of DTH-Trouble shooting of set top box-communication cables-Types-Feeder wire-coaxial cable and optical fiber cable-RF TV Tuner card.	14
V	**Advanced Television Systems** **5.1:Advanced TV** Block diagram of a digital colour TV receiver -Remote control IR transmitter and receiver -closed circuit TV System -Applications of CCTV -scrambler-necessity-basic principle -types- descrambler block diagram -Telecine equipment -Digital CCD telecine system-Introduction to high definition TV(HDTV) and 3DTV. **5.2:TV connector Ports** HDMI port-USB port-RF in-AV Jack.	10 3

Reference Books:

1.”R.R. Gulati”,”Modern Television Practice-Transmission,Reception,Applications “,New age international 5th Edition 2015.
2.”A.M.Dhake” “TV and Video Engineering” ,Second Edition TMH-2003
3.”R.R Gulati” “Monochrome and Color TV “, New Age Publishers-2003
4.”S.P.bali” “color TV, Theory and Practice” TMH-1994.
5.” Manohar Lotia& Pradeep Nair “ “Modern VCD-Video CD player Introduction, servicing and troubleshooting “,BPB Publications 2002

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name :1040:Electronics and Communication Engineering

Subject Code : 4040632

Semester : VI

Subject title : MOBILE AND OPTICAL COMMUNICATION

TEACHINGAND SCHEME OF EXAMINATION

No ofweeks/ semester: 16weeks

Subject	Instruction		Examination			
			Marks			
	Hours /Week	Hours /Semester	Internal Assessment	Board Examination	Total	Duration
Mobile and Optical Communication	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and allocation of hours

UNIT	TOPIC	Hours
I	Mobile Communication concepts	14
II	Equalization, Diversity, Channel coding and Speechcoding	15
III	Wireless Networking , Personal Communication Services/ Networks(PCS/PCNS) and Network data bases	16
IV	Optical Cables, Connectors, Splicers, Optical Digital and Analog link	14
V	WDM Concepts and Components	14
	Tests and Model Exam	7
Total		80

RATIONALE:

Communication is one ofthe integral parts ofscience that hasalways beena focuspointfor exchanginginformation amongpartiesatlocations

physicallyapart.Afteritsdiscovery, telephones havereplacedthetelegrams andletters.Similarly,theterm‘mobile’hascompletely revolutionizedthe communicationby openingupinnovativeapplicationsthatarelimitedtoone’s imagination.Today,mobilecommunicationhas becomethebackboneofthe society.Allthe mobile systemtechnologieshaveimprovedtheway ofliving.Usually Mobile cellular networks have both Circuit Switching and Packet Switching for handling calls. For Circuit Switching ,Optical fiber using WDM is employed. Hence inthis subject, with Mobile communication , Optical communication is added.

OBJECTIVES:

On completion ofthefollowing units of syllabus contents, the students must be able to:

- Know the concept of Mobile Communication
- Know the concept of Channel Assignments
- Know aboutthe Handoff processes performed in Mobile Communication
- Know the interferences and system capacity
- Know the methods of improving coverage and capacity to avoid network congestion
- Know the concept of equalization, diversity , channel coding and speech coding
- Know the concept of LTE and VoLTE (Voice over Long Term Evolution
- Know about wireless networking , Personal Communication Services/ Networks(PCS/PCNS) and network data bases
- Know about Universal Mobile Telecommunication System (UMTS)
- Know about Fiber optic cables
- Know about Power launching and coupling
- Know about Fiber-to-fiber joints
- Know about Fiber splicing techniques
- Know aboutOptical fiber connectors
- Know about Digital transmission systems
- Know about WDMconcepts and components
- Know about Opticalnetworks

4040632 MOBILE AND OPTICAL COMMUNICATION

DETAILED SYLLABUS

Contents:Theory

Unit	Name of the topics	Hours
I	**MOBILE COMMUNICATION** **1.1: CELLULAR CONCEPTS**	3
	CHANNEL ASSIGNMENT STRATEGIES 1**.2: HANDOFF STRATEGIES** Prioritizing Handoffs-Practical Handoff Considerations	3
	1**.3: INTERFERENCE AND SYSTEM CAPACITY** Co-channel interference and System Capacity- Channel Planning for wireless Systems- Adjacent Channel Interference-Power Control for Reducing Interference	4
	1.4: IMPROVING COVERAGE AND CAPACITY Cell splitting and Cell sectoring - Repeaters for Range Extension – Micro cell Zone Concept	4
II	**EQUALIZATION, DIVERSITY , CHANNEL CODING AND SPEECH CODING** **2.1: FUNDAMENTALS OF EQUALIZATION** Introduction – Training a Generic Adaptive Equalizer – Equalizers in Communication Receiver – Survey of Equalization Techniques	3 3
	2.2: DIVERSITY TECHNIQUES Practical considerations in space diversity – Polarization diversity – Frequency diversity – Time diversity – RAKE Receiver - Interleaving.	3
	2.3: FUNDAMENTALS OF CHANNEL CODING **2.4: SPEECH CODING** Introduction – Characteristics of Speech signals – Probability Density Function – Autocorrelation function – Frequency Domain Coding of Speech – Sub band Coding – Adaptive Transform Coding – Vocoders – The GSM Codec.	3 3
	2.5: LTE AND VoLTE(Voice over Long Term Evolution)	

III	**WIRELESS NETWORKING , PERSONAL COMMUNICATION SERVICES/ NETWORKS(PCS/PCNs) AND NETWORK DATA BASES** **3.1: INTRODUCTION TO WIRELESS NETWORKS** **3.2: DIFFERENCE BETWEEN WIRELESS NETWORKS AND FIXED NETWORKS** Limitations in wireless networking – Merging wireless network and PSTN Development of Wireless Networks **3.3: WIRELESS DATA SERVICES** Cellular Digital Packet Data (CDPD) – Advanced Radio Data Information Systems (ARDIS) – RAM Mobile Data (RMD) **3.4: PERSONAL COMMUNICATION SERVICES/ NETWORKS(PCS/PCNs)** Packet Vs Circuit Switching for PCN – Cellular Packet Switched Architecture **3.5: NETWORK DATABASES** Distributed Database for Mobility Management **3.6:UNIVERSAL MOBILE TELECOMMUNICATION SYSTEM (UMTS)**	3 3 3 3 2 2
IV	**OPTICAL COMMUNICATION** **4.1: FIBER OPTIC CABLES** **4.2: POWER LAUNCHING AND COUPLING** Source to Fiber Power Launching - Source Output Pattern- Schematic diagram of an optical source coupled to an optical fiber-Lensing scheme for coupling improvement **4.3: FIBER-TO-FIBER JOINTS** **4.3: FIBER SPLICING TECHNIQUES** **4.4: OPTICAL FIBER CONNECTORS** **4.5: DIGITAL TRANSMISSION SYSTEMS** Simplex point to point transmission link – System consideration **4.6: ANALOG TRANSMISSION SYSTEMS** Over view of Analog links	2 3 2 2 2 3

V	**WDMCONCEPTS AND COMPONENTS** **5.1: OPERATIONAL PRINCIPLES OF WDM** **5.2: WDM COMPONENTS** 2x2 Fiber couplers - Star matrix representation - 2x2 Waveguide couplers - Star couplers **5.3: OPTICALNETWORKS** Basic Networks - Network topologies –Performance of Star Architecture **5.4: SONET / SDH** Basic concepts -Transmission Formats and Speeds - OpticalInterfaces - SONET/SDH rings - SONET/SDH Networks **5.5: WAVELENGTH - ROUTED NETWORKS** Optical Cross – connects **5.6: OPTICAL CDMA** **5.7: ULTRAHIGH CAPACITY NETWORKS** Ultrahigh Capacity WDM Systems – Bit- interleaved Optical TDM-Time-Slotted Optical TDM.	2 2 2 2 2 2 2

REFERNCE BOOKS:

1.Wireless Communication Principles and Practice Theodore S. Rappaport Pearson Education, 2003

2.Mobile CellularCommunications W.C.Y. Lee 2nd Edition, MC GrawHill, 1995

3.Mobile Communications Jochen Schiller Pearson Education, 2009,Second edition

4.Optical fiber communication- Gerd Keiser - Third Edition – McGraw Hill -2000

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject Code : 4040633

Semester : VI

Subject Title : Embedded Systems

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
Embedded Systems	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Introduction to Embedded systems and ARM processor	16
II	ARM Instruction Set	16
III	LPC 2148 controller	16
IV	LPC 2148 peripherals	15
V	Operating System	10
Test & Model Exam		7
Total		**80**

RATIONALE:

This subject makes the students to understand the definition for Embedded Systems. It also enables the students to have the knowledge about the different architectures, RISC and CISC processors. This subject makes the students to understand about RTOS. To specific, the subject deals with ARM7 RISC processor and the on chip peripherals of LPC2148 .

OBJECTIVES:

On completion of the syllabus, the students must be able to

-> Understand ARM7 processor .

-> Understand the architecture of LPC 2148.

-> Understand ARM7 instruction set.

-> Understand the types of buses.

-> Explain On chip peripherals.

-> Have clear knowledge about RTOS concepts.

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4040633 EMBEDDED SYSTEMS

DETAILED SYLLABUS

Note: Bit level details in registers should not be asked in board theory examination.

Contents: Theory

Unit	Name of the Topics	Hours
I	**Introduction to Embedded Systemsand ARM Processor** **1.1 : Embedded Systems** Definition of Embedded System – Features of Embedded System – Types of Embedded System – List of Embedded System Devices-Harvard and Von-Neumann architectures-RISC and CISC Processors. **1.2:ARM Processor Architecture Fundamentals** Block diagram of ARM based embedded system with hardware components - Pipeline-Data Flow Model-CPU registers – Modes of Operation – PSW -Processor State and Instruction Set-Exceptions-Interrupts-Vector table-Little Endian and Big Endian.	 8 8
II	**ARM Instruction Set** **2.1:Instruction Set** ARM state instruction set- Thumb State Instruction sets(Brief introduction only)-Data processing instructions-Branch instructions-Load-store instructions-Software interrupt instruction-Program status register instructions-stack instructions-Conditional execution. **2.2:Simple programs** Addition, Subtraction and Multiplication using ARM processor assembly language.	12 4
III	**LPC 2148 Controller** **3.1:Introduction to LPC 2148 ARM controller** LPC 2148 ARM Controller – Features-Block diagram – Memory and on chip peripheral devices – ARM 7 TDMI-S Nomenclature– Memory Map – Memory re-map and boot block-Types of buses. **3.2:System control functions** Crystal oscillator-PLL-Power control-RESET-VPB Divider-Wakeup timer-Vector Interrupt controller-(VIC)-Register description-External Interrupts.	 8 8
IV	**LPC 2148 Peripherals** **4.1:Peripherals**	

	Pin connect block-Features-pin connect block register description-GPIO (Slow)- Features-register description -- Timer/Counter – Block diagram – Register description --PWM-features-register description-ADC -features-register description-DAC-features-register description. **4.2:Serial communication in LPC 2148** UART features – UART0 Block diagram—UART0 register description.	10 5
V	**Operating System** **5.1:Embedded OS and RTOS** Introduction to OS- -Functions of OS-Embedded OS-Foreground/background systems -Real time system concepts-Resources-shared resources-Critical section- multitasking-Tasks-kernel-Scheduler-Round Robin-Non Pre-emptive and Pre-emptive scheduling-Context switch- re-entrancy- task priorities- Event flag-mutual exclusion-semaphores and types-Message mail box-Message Queues.	10

Reference Books

1.”Andrew N Sloss””ARM System Developer’s Guide Designing and Optimizing” Elsevier publication,2004.

2.”B.Kanta Rao” “Embedded systems”, PHI publishers.

3.”TammyNoergaard” “Embedded Systems Architecture”,Newness edition.

4.”SteveFurbe “ “ARM System on chip Architecture”, 2nd edition,Pearson Education,2000.

5.”Dr.K.V.K.K Prasad””Embedded Real Time Systems”,Dream tech press,2009.

6.”David Seal” “ARM Architecture Reference Manual”.

7.LPC 2148 User Manual.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject Code : 4040640

Semester : VI Semester

Subject Title : COMPUTER HARDWARE SERVICING AND NETWORKING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
Computer Hardware Servicing and Networking Practical	**6**	**96**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

The course aims at making the students familiar with various parts of computers and laptops and how to assemble them and the different types of peripherals desired. In addition, the course will provide the students with necessary knowledge and skills in computer and laptop software installation and maintenance and to make him diagnose the software faults. This subject also gives the knowledge and competency to diagnose the problems in computer hardware and peripherals and gives the knowledge for trouble shooting for systematic repair and maintenance of computers and laptops

OBJECTIVES:

On completion of the following exercises, the students must be able to

- Know the various indicators, switches, SMPS,motherboard ,connectors and various disk drives used in Computers. .
- Install various secondary storage devices with memory partition andformatting.
- Acquire the practical knowledge about the installation of various devices like printer, scanner, web camera and bio-metricdevices.
- Assemble PC system and laptop and checking
- Install Dual OS in asystem.
- Enable to perform different cabling in anetwork.
- Configure Internet connection and able to debug network issues.

4040640 COMPUTER HARDWARE SERVICING AND NETWORKING PRACTICAL

DETAILED SYLLABUS

Contents:Practical

Exercises

Part A – Computer Hardware servicing

1. IDENTIFICATION OF SYSTEMLAYOUT

i) Identify front panel indicators & switches and Front side & rear side connectors

ii) Familiarize the computer system layout by marking positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards.

2.HARDDISK

i) Configure bios setup program and troubleshoot the typical problems using BIOS utility.

ii) Install, Configure, Partition and Format Hard disk.

3.DVD/BLU-RAYWRITER

i) Install and Configure a DVD Writer and record a blank DVD.

ii) Install and Configure a Blu-ray Writer and record a blank Blu-ray Disc.

4.Printer Installation

i) Install and configure Dot matrix printer

ii) Install and configure Laser printer

5. i) Install and configure Scanner

ii) Install and configure Web cam and bio-metric device

6. i) Assemble a system with add on cards and check the working condition of the system

ii) Install OS in the assembled system.

7. Install Dual OS in a system

8. i) Assemble and Disassemble a Laptop to identify the parts.

ii) Installation of different device drivers and Installation of different Application Software.

Part B – Computer networking

9. Do the following Cabling works for establishing a network

i) Crimp the network cable with RJ 45 connector in Standard cabling mode and cross cabling mode.

ii) Test the crimped cable using a cable tester.

10. Use IPCONFIG, PING, TRACERT and NETSTAT utilities to debug the network issues.

11. Interface two PCs to form Peer To Peer network using the connectivity devices Switch or Router in a LAN.

12. i) Share the files and folders in a LAN
ii) Share a printer in a LAN.

13. Remote Desktop, Remote Assistance, Telnet, HyperTerminal, TeamViewer

14. Configure DNS to establish interconnection between systems and describe how a name is mapped to IP Address

15. i) Install and configure Network Devices: HUB, Switch (4/8/16/24 ports),Routers
ii) Install and Configure NIC.

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CONTENT	Max. Marks	
	Part A	Part B
Procedure	20	20
Execution	20	20
Result with printout	5	5
Viva	10	
Total	100	

MODEL QUESTION PAPER
4040640 COMPUTER HARDWARE SERVICING AND NETWORKING PRACTICAL

1. IDENTIFICATION OF SYSTEMLAYOUT

i) Identify front panel indicators & switches and Front side & rear side connectors

ii) Familiarize the computer system layout by marking positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards.

2.HARDDISK

i) Configure bios setup program and troubleshoot the typical problems using BIOS utility.

ii) Install, Configure, Partition and Format Hard disk.

3.DVD/BLU-RAYWRITER

i) Install and Configure a DVD Writer and record a blank DVD.

ii) Install and Configure a Blu-ray Writer and record a blank Blu-ray Disc.

4.Printer Installation

i) Install and configure Dot matrix printer
ii) Install and configure Laser printer

5. .i) Install and configure Scanner
ii) Install and configure Web cam and bio-metric device

6. i) Assemble a system with add on cards and check the working condition of the system.
ii) Install OS in the assembled system.

7. Install Dual OS in a system

8. i) Assemble and Disassemble a Laptop to identify the parts.
ii) Installation of different device drivers and Installation of different Application Software.

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i) Crimp the network cable with RJ 45 connector in Standard cabling mode and cross cabling mode.
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12. i) Share the files and folders in aLAN
ii) Share a printer in a LAN.

13. Remote Desktop, Remote Assistance, Telnet, HyperTerminal, TeamViewer.

14. Configure DNS to establish interconnection between systems and describe how a name is mapped to IP Address

15. i) Install and configure Network Devices: HUB, Switch (4/8/16/24 ports),Routers
ii) Install and Configure NIC.

LIST OF EQUIPMENTS

Hardware Requirements :

Computer with Pentium / Core processors with inbuilt NIC	-30 Nos
Hard disk drive	-02 Nos
CD / DVD Writer	-02Nos
Blu Ray writer	-01 No
Blank DVD,Blu-ray disk	-30 Nos
Web camera	-02 Nos
Laser Printer Dot	-02 Nos
matrix Printer	-02Nos
Blank DVD	-30Nos
Scanner	-02Nos
Laptop	-02Nos
Biometric device	-02Nos
Crimping Tool	-06Nos
Network Cables	
RJ45Tester	-06Nos
Modem with internet connection	-02Nos
Hub	-02Nos
Switch 2x2/4x4	-02Nos
Router	-02 Nos

Software Requirements:

Windows XP operating system/ Windows 7 OS
DVD/ CD Burning S/W (Ahead Nero or latest S/W)

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040: Electronics and Communication Engineering.

Subject Code : 4040651

Semester : VI

Subject Title : Television Engineering Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
Television Engineering Practical	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

The introduction of this subject will enable the students to get familiar with basic methods used for trouble shooting, servicing and measurement. The Simple methods are used to find the faults in the servicing of TV. The students can find the career in servicing.

OBJECTIVES:

The students are able to

-> Understand the assembling of Antenna.

-> Construct and test the deflection circuits.

-> Construct and test the sync circuits.

->Service TV remote.

-> Check faults in power supply.

-> Find the faults in video section and audio section

-> Understand about DTH connection

-> Study the use of set of box

-> Service the monitors.

.4040651 TELEVISION ENGINEERING PRACTICAL

DETAILED SYLLABUS

Contents:Practical

Exercises

1.Assembling of yagiuda antenna.

2.Construct and test the sync separator circuit.

3.Construct a horizontal sawtooth generator and measure its frequency .

4.Construct a vertical sawtooth generator and measure its frequency.

5.Trouble shooting of IR TV Remote control unit.

6. Fault finding in SMPS and measure its different voltage levels.

7.Trouble shooting of EHT section in TV.

8.Trouble shooting of sound section in TV.

9.Study of RF Tuner.

10.Trouble shooting of deflection yoke with controls.

11.Servicing of computer monitors (observe the VGA signals using CRO)

12.Servicing of LED /LCD monitors.

13.Measure the dc voltages at various points in TV receiver .

BOARD EXAMINATION

Note: All the experiments to be kept for the examination.

DETAILED ALLOCATION OF MARKS

Circuit Diagram	:	25 marks
Connection / Procedure	:	25 marks
Execution and handling of equipment	:	30 marks
Output / Result	:	10 marks
Viva	:	10 marks
TOTAL	**:**	**100** marks

MODEL QUESTION PAPER

4040651 TELEVISION ENGINEERING PRACTICAL

1.Construct a vertical sawtooth generator for the frequency of 50 hz and verify its output.

2.Troubleshoot the sound section in TV receiver and observe the values.

3.Troubleshoot the deflection yoke of TV receiver and draw the observed waveforms.

4.Troubleshoot the EHT section of TV receiver and measure the values.

5. Construct and test the sync separator circuit and observe the waveforms and draw.

6. Assemble the Yagi-uda antenna with the given antenna elements.

7. Service the given computer monitor and observe the VGA signals using CRO.

8 . Service the TV remote and find the fault.

9. Troubleshoot the given LED / LCD monitor and find the faults.

10. Service the given SMPS and measure the voltage levels.

11. Construct the horizontal sawtooth generator for the frequency of 15,625 hz and verify its output.

12. Measure and write down the Voltage levels of the TV receiver given for troubleshooting .

13. Study the given RF tuner and explain the function of sections of RF tuner.

LIST OF EQUIPMENTS

1. Antenna elements (dipole , reflector, director) - 2 Sets.
2. Audio oscillator -5 Nos.
3. CRO – 2 Nos.
4. Power Supply (0 – 30v) – 5 Nos.
5. Multi meters-5.
6. SMPS-4 Nos.
7. IR TV remote receivers – 2 Nos.
8. B/W Television Receiver Trainer kit.
9. Color TV Receiver Trainer kit.
10. VGA Monitors- 2 Nos.
11. LCD / LED monitors -2 Nos.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject code : 4040652

Semester : VI

Subject title : MOBILE AND OPTICAL COMMUNICATION PRACTICAL

TEACHINGAND SCHEME OFEXAMINATION

No.ofweeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
Mobile and Optical Communication Practical	**5**	**80**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

All types of Mobile Communication circuits are merged with Optical fiber links to get Broad band services to Home and all working environments. Hence in this subject Mobile Communication and Optical Communication related practical circuits are going to be tested by the students. By Practicing the following experiments the students can develop their skill which could be helpful for their self employment in future.

OBJECTIVES:

On completion ofthefollowing experiments, the students must be able to

- Understand the concept of Mobile Communication
- Know the working principle of Mobile Networks
- Know the working of Transmitter and Receiver in GSM

- Study the workingofSIMcardinGSMhandset and SIM card detection.
- StudyandobserveTransmitted/ReceivedRFsignal.
- StudyandobserveTransmitted(I&Q)/Received(I&Q)signalsconstellations.
- StudyandanalyzetheBuzzerin4GLTESmartPhoneTechBook.
- StudyandAnalyzetheVibratorin4GLTESmartphoneTechBook
- StudyofswitchfaultsinUserInterface Sectionof4GLTESmart Phone TechBook
- Studyandanalyzethe PowerManagementUnitin4GLTESmart PhoneTechBook
- Generate the Pseudo random binary sequence
- Test the VI characteristics of LED (Light emitter) and Photo diode (Light detector)
- Test the VI Characteristics of anOpto - coupler
- Test the performance of Time Division Multiple Access in Fiber optical communication link
- Determine the Numerical aperture of the given optical fiber

4040652 MOBILE AND OPTICAL COMMUNICATION PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

MOBILE COMMUNICATION

(TounderstandtheBasiccircuitofMobilephone(Transmitter, ReceiverandBasebandcontroISection).

1. Tostudy the workingofSIMcardinGSMhandset and SIM card detection.
2. ToStudyandobserveTransmitted/ReceivedRFsignal.
3. StudyandobserveTransmitted(I&Q)/Received(I&Q)signalsconstellations.
4. StudyandanalyzetheBuzzerin4GLTESmartPhoneTechBook.
5. TostudyandAnalyzetheVibratorin4GLTESmartphoneTechBook
6. StudyofswitchfaultsinUserInterface Sectionof4GLTESmart Phone TechBook
7. Studyandanalyzethe PowerManagementUnitin4GLTESmart PhoneTechBook
8. Generation of Pseudo random binary sequence

OPTICAL COMMUNICATION

9. Construct a circuit to test the VI characteristics of LED (Light emitter) and Photo diode

(Light detector)

10. Construct a circuit to test the VI Characteristics of anOpto - coupler
11. Test the performance of Time Division Multiple Access in Fiber optical communication link
12. Determine the Numerical aperture of the given optical fiber

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CIRCUIT DIAGRAM	:	25
CONNECTION	:	25
EXECUTION & HANDLING OF EQUIPMENT	:	25
OUTPUT / RESULT	:	15
VIVA – VOCE	:	10
TOTAL	:	100

MODEL QUESTION PAPER

4040652 MOBILE AND OPTICAL COMMUNIICATION PRACTICAL

1. Studythe workingofSIMcardinGSMhandset and SIM card detection.
2. StudyandobserveTransmitted/ReceivedRFsignal.
3. StudyandobserveTransmitted(I&Q)/Received(I&Q)signalsconstellations.
4. StudyandanalyzetheBuzzerin4GLTESmartPhoneTechBook.
5. StudyandAnalyzetheVibratorin4GLTESmartphoneTechBook
6. StudyofswitchfaultsinUserInterface Sectionof4GLTESmart Phone TechBook
7. Studyandanalyzethe PowerManagementUnitin4GLTESmart PhoneTechBook
8. Generate Pseudo random binary sequence
9. Construct a circuit to test the VI characteristics of LED (Light emitter) and Photo diode (Light detector)

10. Construct a circuit to test the VI Characteristics of anOpto - coupler
11. Test the performance of Time Division Multiple Access in Fiber optical communication link
12. Determine the Numerical aperture of the given optical fiber

LIST OF EQUIPMENTS

S.NO	Name of the Equipment	Range	Required No.
1.	Regulated Power Supply	0 – 30V	2
2.	Dual trace CRO	60 MHz	5
3.	Signal Generator	-	5
4.	Desk Top Computer	-	2
5.	Smart phone Techbook	-	3
6.	Digital Trainer Kit	-.	2
7.	Digital Multimeter	-	5

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implementedfor the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040:Electronics and Communication Engineering

Subject Code : 4040653

Semester : VI

Subject Title : Embedded Systems Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
Embedded Systems Practical	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

The introduction of this subject will enable the students to have hands on experience in using ARM Based trainer kit. The students are exposed to use the on chip peripherals using embedded C language. They can also get familiar with the use of ARM instruction set. They are learning the different methods for providing time delay and u se of serial communication. 32 bit ARM is a RISC processor which makes the students to expose to the new dimension in the field of embedded systems.

OBJECTIVES:

The students are able to

-> Understand the use of instruction set by writing simple ARM ALP and simulate to see output.

-> Know the application details of on chip peripherals.

-> familiarize with the register map of on chip Timer / counter.

-> Know the use of serial communication concepts using on chip UART0.

-> understand the use of GPIO and the connection of peripheral devices using these on chip GPIO programmable port Pins.

-> Use the interrupts with the help of VIC.

-> Get used with pin connect block registers for programming the GPIO port pins.

-> interface stepper motor and its operation.

-> understand the multiplexing of seven segment LED display device.

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4040653 EMBEDDED SYSTEMS PRACTICAL

DETAILED SYLLABUS

Contents:Practical

Exercises

1. Study of ARM Processor kit.(Example LPC 2148 kit)
2. Write assembly language program for addition, subtraction and multiplication and simulate.
3. Write and execute C program to blink the LEDs using software delay routine.
4. Write and execute C program to blink the LEDs using on chip TIMER// COUNTER for the delay(Using Polling method).
5. Write and execute C program to blink the LEDs using on chip TIMER// COUNTER for the delay(Using interrupt method).
6. Write and execute C program to read the switch and display in the LEDs.
7. Write and execute C program to count external interrupt pulses EINTx (using VIC) and Show the binary count value in LEDs.
8. Write and execute C program to display a number in seven segment LED .
9. Write and execute C program for serial transmission and reception using on chip UART. Send the received character back to the PC by Polling method.
10. Write and execute C program for serial transmission and reception using on chip UART. Send the received character back to the PC by Interrupt method.
11. Write and execute C program for accessing an internal ADC and display the binary output in LEDs.
12. Write and execute C program to generate square wave using on chip DAC.

BOARD EXAMINATION

Note:

1. Manual for the ARM instruction sets and manual for the trainer kit (Excluding sample program) can be allowed for their board exam.
2. Definition for built in function for the board can be given to students for their board function.
3. manual containing procedure for program down loading through boot loader or JTAG can be given to students for their board exam.
4. Bit details of Registers of on chip peripheral devices can be given for the board practical examination.

DETAILED ALLOCATION OF MARKS

I.	Algorithm or Flow chart	:	20 marks
II.	Program	:	30 marks
III.	Execution	:	30 marks
IV.	Result	:	10 marks
V.	Viva	:	10 marks
	TOTAL	:	100 marks

MODEL QUESTION PAPER

4040653 EMBEDDED SYSTEMS PRACTICAL

1.Write a C program to blink a LED with the time delay of 1 second .Time delay can be generated using software delay routine.

2.Write a C program to blink the LEDS with the time delay. Generate the time delay using internal TIMER in polling method and verify.

3.Write a C program to display the following single digit number ------- at seven segment LED device.

4.Write a C program using on chip UART for serial transmission and reception using polling method and check the output .

5.Write an assembly language program to add / subtract 32 bit numbers and simulate the output result.

6. Write a C program to blink the LEDS with the time delay. Generate the time delay using internal TIMER in interrupt method and verify.

7. Write a C program using on chip UART for serial transmission and reception using interrupt method and verify the output.

8.Write a C program to convert analog signal to digital using internal ADC and verify the binary output at the LEDs.

9.Write a C program to use the internal DAC to generate a square wave output and observe the output at CRO.

10.Write a C program to get the input from a switch and display at the LEDs.

11.Write a C program to demonstrate the use of external interrupt using on chip VIC and observe the result at the LEDs.

12.Write an assembly language program to multiply two numbers and simulate the output result.

LIST OF EQUIPMENTS

1.ARM7 TDMI KIT – 15 numbers with interface boards for the above experiments .The chip set may be TMS4701,LPC2138,LPC2148 or STR7 etc.

2.Desktop computer / Laptop -15 Nos

3.Interfaces :Seven segment display. LEDS ,switches and stepper motor .

4. Manual for the trainer kit and Interfaces.

5.Manual for the built in function for the board.

6.Bit details of registers of on chip peripherals.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040: Electronics and Communication Engineering

Subject Code : 4040660

Semester : VI

Subject Title : Project Work & Internship

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16

Subject	Instruction		Examination		
	Hours/ Week	Hours/ Semester	Assessment Marks		
			Internal	Board Exam	Total
PROJECT WORK & INTERNSHIP	**6**	**96**	**25**	**100***	**100**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Minimum Marks for Pass is 50 out of which minimum 50 marks should be obtained out of 100 marks in the Board Examination alone.

OBJECTIVES:

- The project work and internship is aimed to assembleand test a photo type model of any one item/gadget.
- Real time application problems if any may be identified from any industry and maybe chosen.
- The knowledge and the skill sofar acquired may be made use of.
- The team spirit may be motivated.
- The entrepreneurship ideas may be motivated by conducting a career guidance programme.
- Learn and understand the gap between the technical knowledge acquired through curriculum and the actual industrial need through internship .

INTERNAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Detail of assessment	Period of assessment	Max. Marks
First Review	6th week	10
Second Review	12th week	10
Attendance	Entire semester	5
Total		**25**

EVALUATION FOR BOARD EXAMINATION:

Details of Mark allocation	Max Marks
Demonstration/Presentation	**25**
Report	**25**
Viva Voce	**30**
Internship report	**20**
Total	**100**

DIPLOMA IN ENGINEERING AND TECHNOLOGY

1220 DEPARTMENT OF MECHANICAL ENGINEERING (TOOL & DIE)

SEMESTER PATTERN

N – SCHEME

IMPLEMENTED FROM 2020 - 2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION
CHENNAI-600 025, TAMIL NADU

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STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N SCHEME

(Implemented from the Academic Year 2020 -2021 onwards)

Chairperson

Tmt G.LAXMI PRIYA I.A.S.
Director

Directorate of Technical Education, Guindy, Chennai.

Co-ordinator

Thiru R.KANAGARAJ Principal

Government Polytechnic College, Purasaiwakam, Chennai.

1220 DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)	
Convener	
Dr. S.SELVARAJ HOD(I/C) Dept. of Tool & Die Making Murugappa Polytechnic College S.M Nagar, Chennai- 600 062	
Members	
Thiru A.N. Rajendiran, Managing Director, Nutech CNC Pvt Limited, Athipet, Chennai- 600 058	**Dr. R. Rajendran,** Professor, Department of Automobile Engineering, SRM Institute of Science & Technology, Kattankulathur- 603 203
Thiru G.Nallaiya, Lecturer, Dept. of Tool & Die Making, Murugappa Polytechnic College Chennai- 600 062	**Thiru G.Athi Pragash,** Asst. Engineer (Industries), Department of Industries & Commerce, Guindy, Chennai- 600 032
Thiru R.Ramachandran, Head of the Department, Mechanical Engg(Tool & Die), Er. Perumal Manimekalai Polytechnic College, Hosur-635 117	

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DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY
(SEMESTER SYSTEM)

(To be implemented for the students admitted from the year 2020 – 21 onwards)

N – SCHEME

R E G U L A T I O N S*

**Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology.*

1. Description of the Course:

a. Full Time (3 years)

The Course for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Sandwich Diploma in Engineering shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4th and/or during 7th semester the students undergo industrial training for six months / one year. Industrial training examination will be conducted after completion of every 6 months of industrial training.

c. Part Time (4 years)

The course for the Part Time Diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3-year full time diploma courses being regrouped for academic convenience.

* ***Each Semester will have 16 weeks duration of study with 35 hrs. / Week for Regular Diploma Courses and 18 hrs. / Week for Part-Time Diploma Courses.***

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses Viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2020 – 2021 academic year onwards.

2. Condition for Admission:

Condition for admission to the Diploma courses shall be required to have passed in the S.S.L.C Examination of the Board of Secondary Education, Tamil Nadu.

(Or)

The Anglo-Indian High School Examination with eligibility for Higher Secondary Course in Tamil Nadu.

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamil Nadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board with eligibility for University Courses of study or equivalent examination & Should have studied the following subjects.

A pass in 2 Years ITI with appropriate Trade or Equivalent examination.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational		Industrial Training Institutes Courses
		Subjects Studied	Subjects Studied		
			Related subjects	Vocational subjects	
1.	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Maths / Physics / Chemistry	Related Vocational Subjects Theory& Practical	2 years course to be passed with appropriate Trade
2.	Diploma Course in Commercial Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretary ship.	-

- For the Diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practical's may also be taken for arriving the eligibility.
- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.
- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Commercial Practice Diploma courses the candidates studied the related subjects will be given first preference.
- *Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.*

4. Age Limit: No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training,Tamil Nadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses is as given below:

Diploma Course	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
Full Time (Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

This will come into effect from N Scheme onwards i.e., from the academic year 2020-2021.

7. Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical subjects.

The curriculum outline is given in Annexure – I.

8. Examinations:

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment. Board Examinations are conducted for 100 marks and reduced to 75.

The total marks for result are 75 + 25 = 100 Marks.

9. Continuous Internal Assessment:

A. For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

i) Subject Attendance **5 Marks**

(Award of marks for subject attendance to each subject Theory/Practical will be as per the range given below)

80%	-	83%	1 Mark
84%	-	87%	2 Marks
88%	-	91%	3 Marks
92%	-	95%	4 Marks
96%	-	100%	5 Marks

ii) Test # **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Average of these two test marks will be taken and the marks to be reduced to: 05 Marks

The Test – III is to be the Model Examination covering all the five units and the marks obtained will be reduced to: 05 Marks

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	**Model Examination:** Covering all the 5 Units. (Board Examinations-question paper-pattern).	End of 16th week	100	3 Hrs

From the Academic Year 2020 – 2021 onwards.

Question Paper Pattern for the Test - I and Test – II is as follows. The tests should be conducted by proper schedule. Retest marks should not be considered for internal assessment.

Without Choice:

Part A Type questions:	6 Questions × 1 mark	06 marks
Part B Type questions:	7 Questions × 2 marks	14 marks
Part C Type questions:	2 Questions × 15 marks	30 marks
	Total	**50 marks**

iii) Assignment **5 Marks**

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 5 marks.

iv) Seminar Presentation **5 Marks**

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second Year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2 ½ marks for the material submitted in writing and 2 ½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks.

All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of Board Exam results and produced to the flying squad and the inspection team at the time of inspection/verification.

B. <u>For Practical Subjects:</u>

The Internal Assessment mark for a total of 25 marks which are to be distributed as follows: -

a) Attendance : **5 Marks**

(Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/
Other Practical related Work : **10 Marks**

c) Record writing : **10 Marks**

TOTAL : **25 Marks**

- *All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examinations.*
- **<u>The observation note book / manual should be maintained for 10 marks. The observation note book / manual with sketches, circuits, programme, reading and calculation written by the students manually depends upon the practical subject during practical classes should be evaluated properly during the practical class hours with date.</u>**
- **<u>The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 10 marks for each exercise as per the above allocation.</u>**
- **<u>At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks (including Observation and Record writing) and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)</u>**
- Only regular students, appearing first time have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Log Book of the staff, who is handling the theory subject.

The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Log Book of the staff, who is handling the practical subject.

10. Communication Skill Practical, Computer Application Practical and Physical Education:

The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase the Communication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physical education is introduced to encourage students to remain healthy and fit by including physical activities and sports.

11. Project Work and Internship:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.

a) Internal assessment mark for Project Work & Internship:

Project Review I	…	**10 marks**
Project Review II	…	**10 marks**
Attendance	…	**05 marks** (Award of marks same as theory subject pattern)
Total	…	**25 marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work & Internship in Board Examinations:

Demonstration/Presentation	25 marks
Report	25 marks
Viva Voce	30 marks
Internship Report	20 marks
Total	**100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Board examination.

12. Scheme of Examinations:

The Scheme of examinations for subjects is given in Annexure - II.

13. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than *40% in theory subjects* and *50% in practical subjects* out of the total prescribed maximum marks including both the Internal Assessment and the Board Examinations marks put together, subject to the condition that he/she secures at least a minimum of 4*0 marks out of 100 marks in the Board Theory Examinations and a minimum of 50 marks out of 100 marks in the Board Practical Examinations.*

14. **Classification of successful candidates:**

Classification of candidates who will pass out the final examinations from April 2023 onwards (Joined first year in 2020 -2021) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time (lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time (lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

Second Class:

All other successful candidates will be declared to have passed in **Second Class.**

The above classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2023 /April 2024 onwards (both joined First Year in 2020 -2021)

15. Duration of a period in the Class Time Table:

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

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ANNEXURE – I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE) SYLLABUS

N SCHEME

(To be implemented for the students admitted from the year 2020 – 21 onwards)

CURRICULUM OUTLINE

THIRD SEMESTER

Col. No.	Subject Code	SUBJECT	HOURS PER WEEK			
			Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
1	4020310	Strength of Materials @@	5	-	-	5
2	4022320	Manufacturing Technology	5	-	-	5
3	4022330	Engineering Metrology	5	-	-	5
4	4022340	Computer Aided Machine and Tool Drawing		1	3	4
5	4022350	Engineering Metrology Practical	-	-	4	4
6	4022360	Manufacturing Technology Practical	-	-	5	5
7	4022370	Basic Engineering Practical	-	-	4	4
TOTAL			15	1	16	32
Extra / Co-curricular activities		Physical Education	-	-	-	2
		Library	-	-	-	1
GRAND TOTAL						**35**

FOURTH SEMESTER

Col. No.	Subject Code	SUBJECT	HOURS PER WEEK			
			Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
1	4022410	Engineering Materials and Metallurgy	5	-	-	5
2	4022420	Fluid Power and Thermal Engineering	5	-	-	5
3	4022430	Tool Room Special Machines	5	-	-	5
4	4022440	Forging dies, Die casting Dies and Die Maintenance	5	-	-	5
5	4022450	Mechanical Material Testing Practical	-	-	4	4
6	4022460	Hydraulics and Pneumatics Practical	-	-	4	4
7	4022470	Tool Room Special Machines Practical	-	-	4	4
TOTAL			20	-	12	32
Extra / Co-curricular activities		Physical Education	-	-	-	2
		Library	-	-	-	1
GRAND TOTAL						**35**

CURRICULUM OUTLINE (N SCHEME)

FIFTH SEMESTER

Col. No.	Subject Code	SUBJECT	HOURS PER WEEK			
			Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
1	4022510	Jigs, Fixtures and Gauges	5	-	-	5
2	4022520	Press Tools	5	-	-	5
3	-	Elective I Theory	5	-	-	5
4	-	Elective I Practical	-	-	4	4
5	4022550	Jigs and Fixtures Practical	-	-	4	4
6	4022560	Press Tools Practical	-	-	5	5
7	4020570	Entrepreneurship and Start up	-	-	4	4
TOTAL			15	-	17	32
Extra / Co-curricular activities		Physical Education	-	-	-	2
		Library	-	-	-	1
GRAND TOTAL						**35**

SIXTH SEMESTER

Col. No.	Subject Code	SUBJECT	HOURS PER WEEK			
			Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
1	4022610	Tool Design and Drawing	5	-	-	5
2	4022620	Plastic Moulding Technology	5	-	-	5
3	-	Elective II Theory	5	-	-	5
4	-	Elective II Practical	-	-	5	5
5	4022650	Plastic Moulds Practical	-	-	6	6
6	4022660	Project Work and Internship	-	-	6	6
TOTAL			15	-	17	32
Extra / Co-curricular activities		Physical Education	-	-	-	2
		Library	-	-	-	1
GRAND TOTAL						**35**

@@ - Common subject with Mechanical Engineering
$$ - Common subject to all Department

LIST OF ELECTIVE SUBJECTS

Note: Select **one Elective I Theory subject** and **one Related Elective I Practical** subject from the below table

FIFTH SEMESTER

Elective I Theory					
4020531	Computer Integrated Manufacturing @@	5	-	-	5
4020533	Mechatronics@@	5	-	-	5
4020440	Process Planning and Quality Control @@	5	-	-	5
Elective I Practical					
4020561	Computer Integrated Manufacturing Practical @@	-	-	4	4
4020563	Mechatronics Practical @@	-	-	4	4
4020540	Process Automation Practical @@	-	-	4	4

Note: Select **one Elective II Theory subject** and **one Related Elective II Practical** subject from the below table

VI SEMESTER

Elective II Theory					
4020610	Industrial Engineering & Management @@	5	-	-	5
4020631	Industrial Robotics and 3D Printing@@	5	-	-	5
4020620	E Vehicle Technology & Policy @@	5			5
Elective II Practical					
4020640	Solid Modelling Practical @@	-	-	5	5
4020651	Industrial Robotics and 3D Printing Practical @@	-		5	5
4020550	Thermal Engineering Practical @@	-	-	5	5

@@ - Common subject with Mechanical Engineering
$$ - Common subject to all Department

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE) SYLLABUS

N SCHEME

(To be implemented for the students admitted from the year 2020 – 21 onwards)

SCHEME OF THE EXAMINATION

THIRD SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	* Board Exam. Marks	Total Mark		
4020310	Strength of Materials@@	25	100	100	40	3
4022320	Manufacturing Technology	25	100	100	40	3
4022330	Engineering Metrology	25	100	100	40	3
4022340	Computer aided Machine and Tool Drawing	25	100	100	40	3
4022350	Engineering Metrology Practical	25	100	100	50	3
4022360	Manufacturing Technology Practical	25	100	100	50	3
4022370	Basic Engineering Practical	25	100	100	50	3
		175	**700**	**700**		

FOURTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	* Board Exam. Marks	Total Mark		
4022410	Engineering Materials and Metallurgy	25	100	100	40	3
4022420	Fluid Power and Thermal Engineering	25	100	100	40	3
4022430	Tool Room Special Machines	25	100	100	40	3
4022440	Forging Dies, Die casting Dies & Die Maintenance	25	100	100	40	3
4022450	Mechanical Material Testing Practical	25	100	100	50	3
4022460	Hydraulics and Pneumatics Practical	25	100	100	50	3
4022470	Tool Room Special Machines Practical	25	100	100	50	3
TOTAL		**175**	**700**	**700**		

* Examinations will be conducted for 100 Marks and will be converted 75 Marks

SCHEME OF THE EXAMINATION

FIFTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	* Board Exam. Marks	Total Mark		
4022510	Jigs, Fixtures and Gauges	25	100	100	40	3
4022520	Press Tools	25	100	100	40	3
-	Elective I Theory	25	100	100	40	3
-	Elective I Practical	25	100	100	50	3
4022550	Jigs and Fixtures Practical	25	100	100	50	16
4022560	Press Tools Practical	25	100	100	50	16
4020570	Entrepreneurship and Start up	25	100	100	50	3
		175	**700**	**700**		

SIXTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	* Board Exam. Marks	Total Mark		
4022610	Tool Design and Drawing	25	100	100	40	3
4022620	Plastic Moulding Technology	25	100	100	40	3
-	Elective II Theory	25	100	100	40	3
-	Elective II Practical	25	100	100	50	3
4022650	Plastic Moulds Practical	25	100	100	50	16
4022660	Project Work and Internship	25	100	100	50	3
		150	**600**	**600**		

* Examinations will be conducted for 100 Marks and will be converted 75 Marks

@@ - Papers Common with Diploma in Mechanical Engineering Branch
$$- Papers common with other branches of Engineering

Diploma in Mechanical Engineering (Tool & Die)

List of Equivalent Subjects for M & N-Scheme subjects

III SEMESTER

M-SCHEME			N-SCHEME	
S.No	**Subject Code**	**Name of the Subject**	**Subject Code**	**Name of the Subject**
1	32031	Strength of Materials @@	4020310	Strength of Materials@@
2	32232	Manufacturing Technology	Not Equivalent	
3	32233	Engineering Metrology	4022330	Engineering Metrology
4	32234	Machine & Tool Drawing		Not Equivalent
5	32235	Engineering Metrology Practical	4022350	Engineering Metrology Practical
6	32236	Manufacturing Technology Practical	Not Equivalent	
7	30001	Computer Applications Practical $$	Not Equivalent	

IV SEMESTER

M-SCHEME			N-SCHEME	
S.No	**Subject Code**	**Name of the Subject**	**Subject Code**	**Name of the Subject**
1	32241	Engineering Materials and Metallurgy	4022410	Engineering Materials and Metallurgy
2	32242	Fluid Power and Thermal Engineering	Not Equivalent	
3	32243	Tool Room Special Machines	4022430	Tool Room Special Machines
4	32244	Computer Aided Machine & Tool Drawing Practical	4022340	Computer Aided Machine & Tool Drawing Practical
5	32245	Mechanical Material Testing Practical	4022450	Mechanical Material Testing Practical
6	32246	Hydraulics and Pneumatics Practical	4022460	Hydraulics and Pneumatics Practical
7	32247	Tool Room Special Machines Practical	4022470	Tool Room Special Machines Practical

V SEMESTER

M – SCHEME			N - SCHEME	
S.N	**Subject Code**	**Name of the Subject**	**Subject Code**	**Name of the Subject**
1	32251	Jigs, Fixtures and Gauges	4022510	Jigs, Fixtures and Gauges
2	32252	Press Tools	4022520	Press Tools
3	32253	Forging Dies, Die casting Dies & Die Maintenance	Not Equivalent	
4	32254	Tool Design and Drawing	4022610	Tool Design and Drawing
5	32255	Press Tools - I Practical	Not Equivalent	
6	32256	Jigs and Fixtures Practical	4022550	Jigs and Fixtures Practical
7	30002	Life and Employability skill Practical $$	Not Equivalent	

VI SEMESTER

M – SCHEME			N -SCHEME	
S.N	**Subject Code**	**Name of the Subject**	**Subject Code**	**Name of the Subject**
1	32061	Industrial Engineering & Management @@	4020610	Tool Design and Drawing
2	32062	Computer Aided Design and Manufacturing @@	4020531	Computer Integrated Manufacturing @@
3	32263	Plastic Moulding Technology	4022620	Plastic Moulding Technology
4	32064	Computer Aided Design and Manufacturing Practical @@	4020561	Computer Integrated Manufacturing Practical @@
5	32265	Press tools – II Practical	Not Equivalent	
6	32266	Plastic Moulds Practical	4022650	Plastic Moulds Practical
7	32067	Project Work @@	Not Equivalent	

@@ - Papers Common with Diploma in Mechanical Engineering Branch

Board Examination-Question Paper Pattern (Theory)

(Common to all Theory subjects except 4020610 Tool Design & Drawing)

Time: 3 Hrs. **Max.Marks:100**

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions. (7 + 8)

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

III SEMESTER

2020 – 2021 onwards

4020310 –STRENGTH OF MATERIALS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL&DIE)

Subject Code : 4020310

Semester : III

Subject Title : **STRENGTH OF MATERIALS**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
STRENGTH OF MATERIALS	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Engineering Materials	15
II	Deformation of Metals	15
III	Geometrical Properties of Sections and Thin Shells	15
IV	Theory of Torsion and Springs	14
V	SFand BM Diagrams of Beams and Theory of Bending	14
	Test & Model Examinations	7
	Total	**80**

RATIONALE:

Day by day, engineering and technology experience tremendous growth. Design plays a major role in developing engineering and technology. Strength of material is backbone for design. The strength of material deals generally with the behaviour of objects, when they are subject to actions of forces. Evaluations derived from these basic fields provide the tools for investigation of mechanical structure.

OBJECTIVES

- Acquire knowledge about materials properties.
- Calculate the deformation of materials, which are subjected to axial load and shear.
- Determine the moment of Inertia of various sections used in industries.
- Estimate the stresses induced in thin shells.
- Draw the shear force and bending moment diagram of the beam for different load.

DETAILED SYLLABUS

4020310 STRENGTH OF MATERIALS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ENGINEERING MATERIALS** **Chapter: 1.1: Engineering materials:** Classification - definition of Mechanical properties - ferrous metals - cast iron - uses - advantages - types of cast iron - properties and applications - effect of impurities on cast iron. steel - classification - alloying elements - purpose of alloying - effect of alloying elements on steel - uses of steels - properties of mild steel - defects in steel - applications - properties of hard steel - market forms of steels – nonferrous metals - properties and uses. **Chapter: 1.2: Mechanical testing of materials:** Compression test - bend test - hardness test - Brinell hardness test, Vickers hardness test, Rockwell hardness test - impact test - fatigue test - creep test. Tensile test of mild steel in UTM - stress strain diagram - limit of proportionality - elastic limit - yield stress - breaking stress - ultimate stress - percentage of an elongation and percentage reduction in area - problems. **Chapter: 1.3: Friction** Introduction - definition - force of friction - limiting friction - static friction - dynamic friction - angle of friction - coefficient of friction - laws of static and dynamic friction. Description only.	**7** **6** **2**

II	**DEFORMATION OF METALS** **Chapter: 2.1: Simple stresses and strains** Definition - load, stress and strain - classification of force systems: tensile, compressive and shear force systems. Hooke's law - definition Young's modulus - working stress, factor of safety, load factor, shear stress and shear strain - modulus of rigidity. Linear strain - deformation due to tension and compressive forces - simple problems in tension, compression and shear forces. **Chapter: 2.2:Elastic constants** Definition - lateral strain – poison's ratio - volumetric strain - bulk modulus - volumetric strain of rectangular and circular bars - problems connecting linear, lateral and volumetric deformations - elastic constants and their relationship - problems on elastic constants. Composite bar - definition - problems in composite bars subjected to tension and compression. Temperature stresses and strains - simple problems. **Chapter: 2.3 Strain Energy** Definition – proof resilience – modulus of resilience – the expression for strain energy stored in a bar due to axial load – instatntaneous stresses due to gradual, sudden, impact and shock loads – problems computing instantaneous stress and deformation in gradual, sudden, impact and shock loadings.	**4** **7** **4**
III	**GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS** **Chapter: 3.1: Properties of sections** Definition – center of gravity and centroid - position of centroids of plane geometrical figures such as rectangle, triangle, circle and trapezium-problems to determine the centroid of angle, channel, T and I sections only – Definition - centroidal axis - Axis of symmetry. Moment of Inertia – parallel axis theorem and perpendicular axis theorem (statement only). Moment of Inertia of lamina of rectangle, circle, triangle, I and channel sections – Definition - Polar moment of Inertia - radius of gyration – Problems computing moment of inertia and radius of gyration for angle, T, Channel and I sections. **Chapter: 3.2:Thin Shells** Definition – Thin and thick cylindrical shell – Failure of thin cylindrical shell subjected to internal pressure – Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure – simple problems – change in dimensions of a thin cylindrical shell	**8** **7**

	subjected to internal pressure – problems – Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure – simple problems – change in diameter and volume of a thin spherical shell due to internal pressure – problems.	
IV	**THEORY OF TORSION AND SPRINGS** **Chapter: 4.1: Theory of Torsion** Assumptions – torsion equation $\frac{T}{J}=\frac{f_s}{R}=\frac{C\theta}{l}$ - Strength of solid and hollow shafts – power transmitted – Definition – Polar modulus – Torsional rigidity – strength and stiffness of shafts – comparison of hollow and solid shafts in weight and strength considerations – Advantages of hollow shafts over solid shafts – Problems. **Chapter: 4.2:Springs** Types of springs – Laminated and coiled springs and applications –– Difference between open and closely coiled helical springs – closely coiled helical spring subjected to an axial load – problems to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs.	**7** **7**
V	**SF AND BM DIAGRAMS OF BEAMS AND THEORY OF BENDING** **Chapter: 5.1: SF and BM diagrams** Classification of beams – Definition – shear force and Bending moment – sign conventions for shear force and bending moment – types of loadings – Relationship between load, force and bending moment at a section – shear force diagram and bending moment diagram of cantilever and simply supported beam subjected to point load and uniformly distributed load (UDL) – Determination of Maximum bending moment in cantilever beam and simply supported beam when they are subjected to point load and uniformly distributed load. **Chapter: 5.2:Theory of bending** Theory of simple bending – Assumptions – Neutral axis – bending stress distribution – moment of resistance – bending equation – M/I=f/y=E/R – Definition – section modulus - rectangular and circular sections – strength of beam – simple problems involving flexural formula for cantilever and simply supported beam.	**7** **7**

Reference Books:

1. Strength of Materials, R. S. Khurmi, S.Chand & Co., Ram Nagar, New Delhi.
2. Strength of Materials, S. Ramamrutham, 15th Edition 2004, DhanpatRai Pub. Co., New Delhi.
3. Strength of Materials, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 3rd Edition, 2010.
4. Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2008, ISBN 9780070668959,
5. Strength of Materials, B K Sarkar, I Edition, 2003Tata Mcgraw hill, New Delhi.
6. Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 2nd Edition, 2007.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

III SEMESTER

2020 – 2021 onwards

4022320 – MANUFACTURING TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022320

Semester : III

Subject Title : **MANUFACTURING TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
MANUFACTURING TECHNOLOGY	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Casting Processes	15
II	Metal Joining Processes	15
III	Centre Lathe, Semi-Automatic and Automatic Lathe	15
IV	Drilling, Grinding and Broaching Machines	14
V	Planner, Shaper, Slotter Machines	14
Test & Model Examinations		07
Total		**80**

RATIONALE:

To be a mechanical engineer, it is necessary to understand the various recent technologies that are being used in the process of conversion of raw materials into end products. So, it is very essential to learn the basics of various recent technologies and processes that are available and predominantly used in the industries.

OBJECTIVES:

- Acquire knowledge about types of patterns, types of moulding and casting processes
- Acquire knowledge about various metal joining processes
- Appreciate the safety practices used in welding
- Explain the lathe working principles and its various operations
- Explain the Semi-Automatic and Automatic lathe working principles
- Explain the drilling and drilling machine principles and its various operations
- Explain the grinding machine and types of grinding wheels
- Explain the vertical and Horizontal broaching machines
- Describe the working of planer, shaper and slotter

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hrs
I	**Casting Processes** **Chapter: 1.1: Patterns:** Definition-Pattern materials-factors for selecting pattern materials-single piece solid, split patterns-pattern allowances-core prints-color coding patterns. Moulding-definition-moulding boxes, moulding sand-ingredients-silica-clay-moisture and miscellaneous materials-properties of moulding sand-sand additives-moulding sand preparation-mixing-tempering and conditioning-types of moulding-greensand-dry sand-machine moulding-top and bottom squeezer machines-jolting machines-sand slinger-CO2 process core making-types of core-core boxes **Chapter: 1.2:Casting :** Definition-sand casting using green sand and dry sand-gravity die casting-pressure die casting :hot and cold chamber processes-centrifugal casting-continuous casting-chilled casting-malleable casting-melting of cast iron-cupola furnace-melting of nonferrous metals-crucible furnace melting of steel-arc furnaces-induction furnaces-instrument for measuring temperature-optical pyrometer-thermo electric pyrometer-cleaning of casting-tumbling trimming sand and shot blasting-defects in casting causes and their remedies-safety practices in foundry.	8 7
II	**Metal Joining Processes** **Chapter: 2.1: Arc Welding:** Definition-Arc welding equipment-arc welding methods-carbon arc, metal arc, Metal Inert Gas (MIG), Tungsten Inert Gas (TIG), Atomic hydrogen, Plasma arc, Submerged arc and Electro slag welding **Chapter: 2.2: Gas welding:** Definition-Gas welding equipment-Oxy and acetylene welding-Three types of flame. **Chapter: 2.3: Resistance welding:** Classification of resistance welding-butt-spot-seam-projection welding-welding related processes-oxy and acetylene cutting-arc cutting-hand facing bronze welding-soldering and brazing-special welding processes**:** cast iron welding- thermit welding-solid state welding, ultrasonic, diffusion and explosive welding-explosive cladding. **Chapter: 2.4: Modern welding:** Electron beam and laser beam welding-types of welded joints-inspection and testing of welded joints-destructive and nondestructive types of tests-safety practices in welding	4 2 5 4
	Centre Lathe, Semi-Automatic and Automatic Lathe **Chapter: 3.1:Centre Lathe:** Theory of Lathes-specifications-simple sketches-principal parts and its functions-tumbler gear mechanism-quick change gear	

III	box-apron mechanism-carriage cross slide-automatic, longitudinal and cross feed mechanism-work holding devices : face plate, three jaw chuck, four jaw chuck, catch plate and carrier-types of centres-machining operations done on lathe: facing, plain turning, step turning, taper turning, knurling, thread cutting, boring, chamfering-major machining parameters. **Chapter: 3.2: Semi-Automatic Lathe:** Types of Semi-Automatic Lathe – Capstan and turret lathes – difference between turret and capstan – tools and work holding devices – self-opening die head –collapsible tapes **Chapter: 3.3: Automatic Lathe:** Classification of single spindle automatic lathe – principle of automatic lathe – automatic screw cutting machine – multi spindle automatic lathes	**8** **3** **4**
IV	**Drilling, Grinding and Broaching Machine** **Chapter: 4.1: Drilling Machines:** Drills: Flat drills, twist drills-nomenclature-types of drilling machines: bench type, floor type, radial type, gang drill, multi spindle type- principle of operations in drilling-drilling parameters of various materials-methods of holding drill bit: drill chucks, socket and sleeve-drilling operation: drilling, boring, reaming, counter sinking, counter boring, spot facing, tapping, deep hole drilling **Chapter:4.2: Grinding Machine**: Types and Classification-specifications-principles of operations-grinding wheels abrasives: natural and artificial-types of bonds-grit, grade and structure of wheels-wheel shapes and sizes-BIS marking systems of grinding wheels-selection of grinding wheels-dressing and truing of wheels-balancing of grinding wheels. **Chapter: 4.3: Broaching:** Broaching Machine – Basic Process – Vertical broaching Machine – Horizontal Broaching machine – Double cut broaching – Key way Broaching	**7** **5** **2**
V	**Planner, Shaper and Slotter Machine** **Chapter: 5.1: Planner**: Types of Planner-specifications-principles of operation-quick return mechanism-feed mechanism-work holding devices-types of planner operation **Chapter: 5.2: Shaper:** Types of Shaper-specifications-principle of operations-quick return mechanism-crank and slotted link mechanism-feed mechanism-work holding devices-types of shaper operations **Chapter: 5.3: Slotter: Types** of slotter-specifications-principle of operation-Whitworth quick return mechanism-feed mechanism-work holding devices	**5** **5** **4**
	TEST & MODEL EXAMINATIONS	**07**

Text Books

1. Hajra Chowdry & Bhattacharaya, Elements of workshop Technology Volume I & II, Media Promoters & Publishers Pvt. Ltd., Noshir Bharucha Marg, Mumbai
2. WAJ Chapman, Workshop Technology, Volume I, II, & III, Vima Books Pvt. Ltd., ND

Reference Books:

1. Raghuwanshi, Workshop Technology, Khanna Publishers. Jain & Gupta, Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi
2. P. C. SHARMA, Production Technology, Edn. X, S.Chand & Co. Ltd.,
3. HMT, Production Technology, Edn. 18, published by Tata McGraw Hill publishing Co. Ltd., 7 West Patel Nagar, New Delhi 110 008.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

III SEMESTER

2020 – 2021 onwards

4022330 – ENGINEERING METROLOGY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220:DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022330

Semester : III

Subject Title : **ENGINEERING METROLOGY**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENGINEERING METROLOGY	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

TOPICS AND TIME ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I	Introduction to Metrology and Linear Measurement	15
II	Angular Measurement, Measurement of Gears and Threads	15
III	Measurement of Geometric Parameters and Surface Finish	15
IV	Comparators and Measurement by Light Wave Interference	14
V	Measuring Machines and Recent Trends in Metrology	14
	TEST & MODEL EXAMINATIONS	07
	Total	80

Rationale: -

The modern industries demand wide knowledge in the understanding and use of conventional and advanced digital measuring instruments that are being used in the process of manufacture of goods. Hence it is essential to have better understanding of the various measuring techniques and the technology that are being used in the various measuring instruments. The fundamentals of various measuring technique needs to be known to understand the modern measuring equipment's that are being used in Industries.

OBJECTIVES

The objective of this course is to make the Student:

- To understand the Needs & Objectives of metrology.
- To understand about the various linear & angular measuring Instruments.
- To Study about the various Measurement Techniques.
- To Calibrate an Instrument.
- To know about various geometric parameters.
- To use Light rays in Measuring an Object.
- To Measure Force, Torque and temperature.
- To know about the measuring machines.
- To acquire Knowledge about Recent Trends in Metrology.

DETAILED SYLLABUS
4022330 - ENGINEERING METROLOGY

Contents: Theory

Unit No.	Name of the Topics	Hours
I	**Introduction to Metrology and Linear Measurement:** **1.1 Introduction:** Metrology, objectives of metrology, Precision vs Accuracy. Repeatability, calibration, sensitivity and readability, classification of methods of measurement, general care of equipments. **1.2 Non precision Linear Measurements:** Surface plates, Tool maker's flats and high precision surface plates, Angle plates, bench centers, v-blocks, straight edges, Toolmaker's straight edges, using a straight edge, sprit levels, combination set, universal surface gauge, Engineer's square, Engineer's parallel, Radius gauge, feeler gauge, screw pitch gauge, Engineer's taper, wire and thickness gauge. **1.3 Precision Linear Measurements:** Characteristics and principles of precision measuring instruments. Vernier instruments, types of vernier calipers, errors in calipers, Vernier height gauge, Vernier depth gauge, digital readout height gauge. Micrometers – Internal micrometers, micrometer depth gauge, thread micrometer, v-anvil micrometer, dial micrometers, digital micrometers, groove micrometer. Telescope internal gauge, Measuring dia of deep holes, cylinder gauges, Keilpart gauge, slip gauges.	**3** **5** **7**
II	**Angular Measurement, Measurement of Gears and Threads:** **2.1 Angular Measurement:** Instruments for angular measurement-optical bevel protractor, universal bevel protractor, acute angle attachment, optical dividing head, Sine bars, Sine center, angle gauges, clinometers. **2.2 Optical instruments for angular measurement**: - Autocollimator – principle of the autocollimator, micro-optic autocollimator, measurement of straightness and flatness. Angle dekkor – working principle, use of angle dekkor in combination with angle gauges. Optical square. **2.3 Measurement of Gears:** Gear tooth terminology, Gear tooth vernier caliper. **2.4 Thread Measurements**: Screw thread projection, Tool Maker's Microscope, Measurement of Effective Diameter, one wire, Two wire and Three wire Methods using floating carriage micrometer.	**3** **5** **2** **5**

III	**Measurement of Geometric Parameters and Surface Finish:** **3.1 Straightness, Flatness, Parallelism and squareness:** - Definition of straightness, straight edge and its uses, test for straightness by using spirit level and Autocollimator, Flatness definition, flatness testing, procedure for determining flatness, laser equipment for alignment testing. Parallelism definition, various cases of parallelism of lines and planes, measurement of equidistance, checking of coincidence or alignment. Squareness definition, measurement of squareness of lines and planes, checking the perpendicularity of motion, squareness testing methods – indicator method, Engineer's square tester, optical tests for squareness. **3.2 Circularity and Rotation:** - Circularity definition, measurement of circularity, Different types of irregularities of a circular part – ovality, lobbing, irregularities of non-specific form. Roundness and circularity. Devices for measuring circularity error – V block, precision measuring instruments. Tests for checking Rotation – Run out, measurement of run out, Periodical axial slip, camming. **3.3 Surface Finish:** - Surface roughness – definition, terminologies as per BIS, Methods of measuring Surface finish, surface finish parameters – Surface inspection by comparison methods, Direct measurement methods. Analysis of surface traces.	**7** **6** **2**
IV	**Comparators and Measurement By Light Wave Interference:** **4.1 Comparators:** Characteristics and uses of comparators, Working principle, advantages and disadvantages of various types of comparators– Mechanical comparators, optical comparators, Electrical comparators, pneumatic comparators, Fluid displacement comparators, optical Projectors. **4.2 Measurement by light wave interference:** Interferometry, interference of two rays, light source for interferometry, interferometry applied to flatness testing, Interferometers. **4.3 Testing and Calibration of Gauges:** - Calibration of linear and angular measuring instruments – General metrological instrument, optical measuring instruments, Measurement of limit gauges.	**6** **4** **4**
V	**Measuring Machines and Recent Trends In Metrology:** **5.1 Measuring Machines:** Optical profile projector – working principle, use, precaution in use. Coordinate Measuring Machine – Types, uses, advantages, possible source of error in CMM. Electronic Inspection and measuring machines.	**7**

	5.2 Trends in Metrology: Laser Telemetric system, Feeler microscope, Isometric viewing of surface defects. optoelectronic dimensional gauging, computers in metrology, Computer Aided dimensional analysis and reporting system, In process probing, contact less 3D measurements by Laser based system.	**7**
	TEST & MODEL EXAMINATIONS	**07**

Text Books:

1. R.K.Jain., Engineering Metrology, Khanna Publishers, Eleventh edition
2. R.Jenkins, Fundamentals of Mechanical Inspection, McGraw Hill Book company.

Reference books:

1. ASTME, Hand book of Industrial Metrology, Prentice Hall
2. A.J.T Scarr, Metrology and Precision Engineering, McGraw Hill Book company.
3. J.Johnson, Precision Measurement, Pitman publishers
4. R.L.Murty, Precision Engineering in Manufacturing, New Age International Publishers (P)

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

III SEMESTER

2020 – 2021 onwards

4022340 – COMPUTER AIDED MACHINE & TOOL DRAWING

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME
(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022340

Semester : III

Subject Title : **COMPUTER AIDED MACHINE & TOOL DRAWING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
COMPUTER AIDED MACHINE & TOOL DRAWING	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Introduction to CAD software	2
II	Drawing aids and editing commands	4
III	Basic dimensioning, hatching, blocks and views	5
IV	Isometric drawing, printing and plotting	4
V	Cad Drawing Practice Detailed drawings of following machine parts are given to students to assemble and draw the sectional or plain elevations / plans / and side views with dimensioning and bill of materials using cad software – 10 Exercises: Sleeve & Cotter Joint, Screw Jack, Foot Step Bearing, Universal Coupling, Plummer Block, Machine Vice, Drill Jig, Welding Fixture, Blanking Tool, Injection Moulding Tool.	65
	TOTAL	80

RATIONALE:

The contemporary progressing world is fast with the latest production systems. The advanced manufacturing of products is developed instantly using CAD Software. Even a small-scale industry is now using a CAD software as it has become the heart of the Design department. So, CAD has now become inevitable in industries. Accuracy and Precision are the two important things that decide the quality of a product to survive its competitors in the market. Using CAD software design, the uniform accuracy, multiples of copies and storing in a small space for long time are assured.

The CAD software considerably improves the creativity and flexibility of a designer. The syllabus here enables a candidate to draw an industrial drawing within the optimum reach of a diploma cadre.

OBJECTIVES:

- Appreciate the need of sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare hole basis system with shaft basis system.
- Select different types of fits and tolerance for various types of mating parts.
- Practice on CAD commands in making 2D Drawings.
- Draw assembled drawings of different types of joints and couplings using CAD.
- Draw assembled drawings of various types of machine elements and Tool assembly using CAD.

DETAILED SYLLABUS

4022340 - COMPUTER AIDED MACHINE AND TOOL DRAWING PRACTICAL

Contents: Theory

Unit	Name of the Topic	Hours
I	**INTRODUCTION TO CAD SOFTWARE** Introduction – History of CAD – Applications – Advantages over manual drafting – Hardware requirements – Software requirements – Windows desktop – CAD screen interface – menus – Tool bars – How to start CAD – How to execute command – types of co-ordinate systems – Absolute – Relative – Polar.	2
II	**DRAWING AIDS AND EDITING COMMANDS** Creating objects (2D) – Using draw commands – Line, Arc, Circle, Ellipse, Donut, Polygon, Point, Pline, Sketch, Trace – Creating 2D Solid. Creating text – Dtext, Mtext, Text styles – Mline, spline – Drawing with precision – O-snap options – drafting settings –limits – Units – drawing aids – Fill, Snap, Grid, Ortho lines – Function keys - Editing and modify commands – Object selection methods – Erasing object – Oops - Cancelling and undoing a command – Copy – Move – Array – Offset – Scale – Rotate – Mirror – Break – Trim – Extend – Explode. Divide – Measure – stretch – Lengthen – Changing properties – Color – line types –LT scale – Matching properties – Editing with grips – Pedit – Ddedit – Mledit.	4
III	**BASIC DIMENSIONING, HATCHING, BLOCKS AND VIEWS** Basic dimensioning – Editing dimensions – Dimension styles – Dimension system variables. Machine drawing with CAD. Creation of blocks – Wblock – inserting a block – Block attributes – Hatching –Pattern types – Boundary hatch – working with layers - Controlling the drawing display – Blipmode – View group commands – Zoom, redraw, regen, regenauto, pan, viewres – Real time zoom. Inquiry groups – calculating area – Distance – Time – Status of drawing – Using calculator.	5
IV	**ISOMETRIC DRAWING, PRINTING AND PLOTTING** Isometric drawing – Isometric projection – drawing iso circles – Dimensioning isometric objects. File commands – File Import and export – plotting drawing – external references – 3D fundamentals – 2D to 3D Conversion 3D Drawing: 3D Primitives-Extrude – Revolve-Slice-Section, Surface 3D Mesh-3D - Surface-3D Operation-Solid Editing	4
V	**CAD DRAWING PRACTICE** Detailed drawings of following machine parts are given to students to	65

	assemble and draw the sectional or plain elevations / plans / and side views with dimensioning and bill of materials using CAD Software	
	MACHINE DRAWING 1. Sleeve & Cotter joint 2. Screw Jack 3. Foot step bearing 4. Universal Coupling 5. Plummer Block 6. Machine Vice	**TOOL DRAWING** 7. Drill jig 8. Welding fixture 9. Press tool assembly- Blanking tool 10. Plastic moulding tool assembly- Injection moulding tool	

Reference Books:

1) Inside AutoCAD - D. Raker and H. Rice - BPB Publications, NewDelhi
2) Engineering Drawing and Graphics + AutoCAD – K.Venugopal, - New Age International Publications
3) CAD/CAM/CIM - P. Radhakrishnan, S. Subramaniyan and V.Raju - New Age International Publications.
4) AutoCAD 2002 with Applications - Sham Tickoo - Tata Mcgraw Hill.
5) Computer Graphics, Prentice – Donald Hearn, M. Pauline Baker - Hall of India Pvt. Limited, New Delhi.

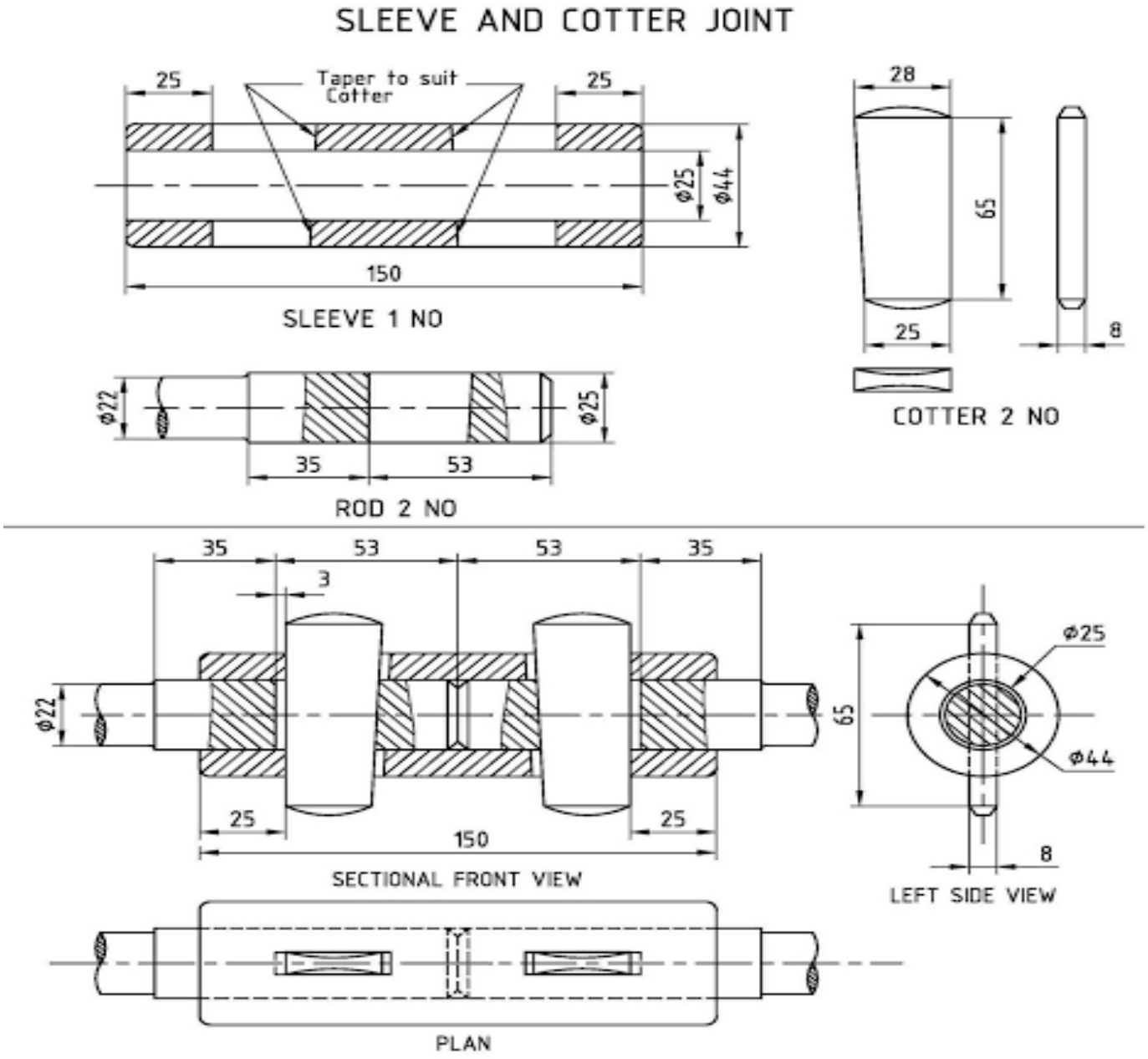
List Of Equipment's (for a batch of 30 students)

1. Personal computer (With latest processor to suit Auto CAD) – 30 No's
2. MS Windows OS – 30 No's
3. AutoCAD software (release 2000 or above) – 30 Users

MACHINE DRAWING

Exercise – 1 Sleeve & Cotter Joint

PART & ASSEMBLY DRAWING

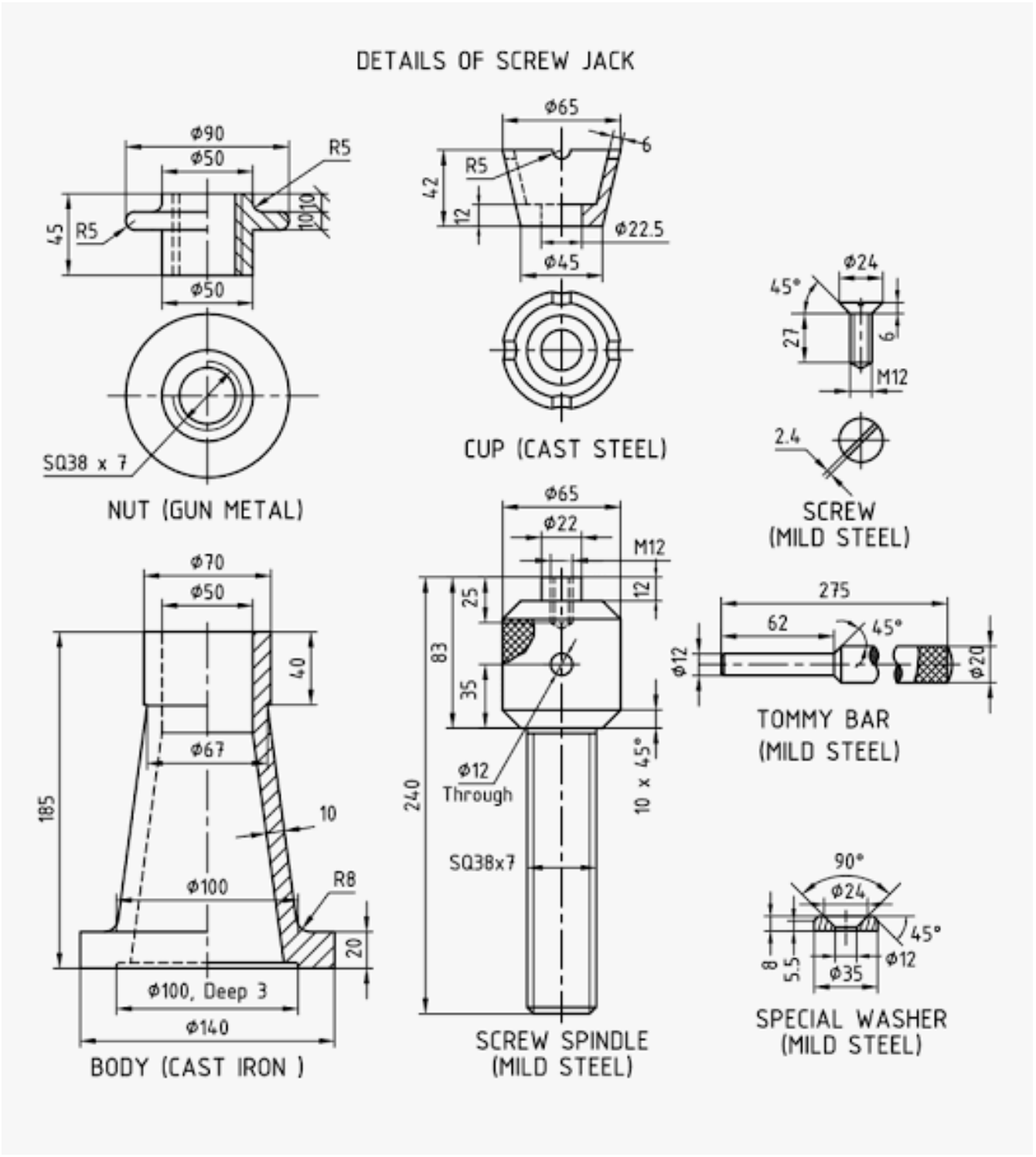


BILL OF MATERIALS

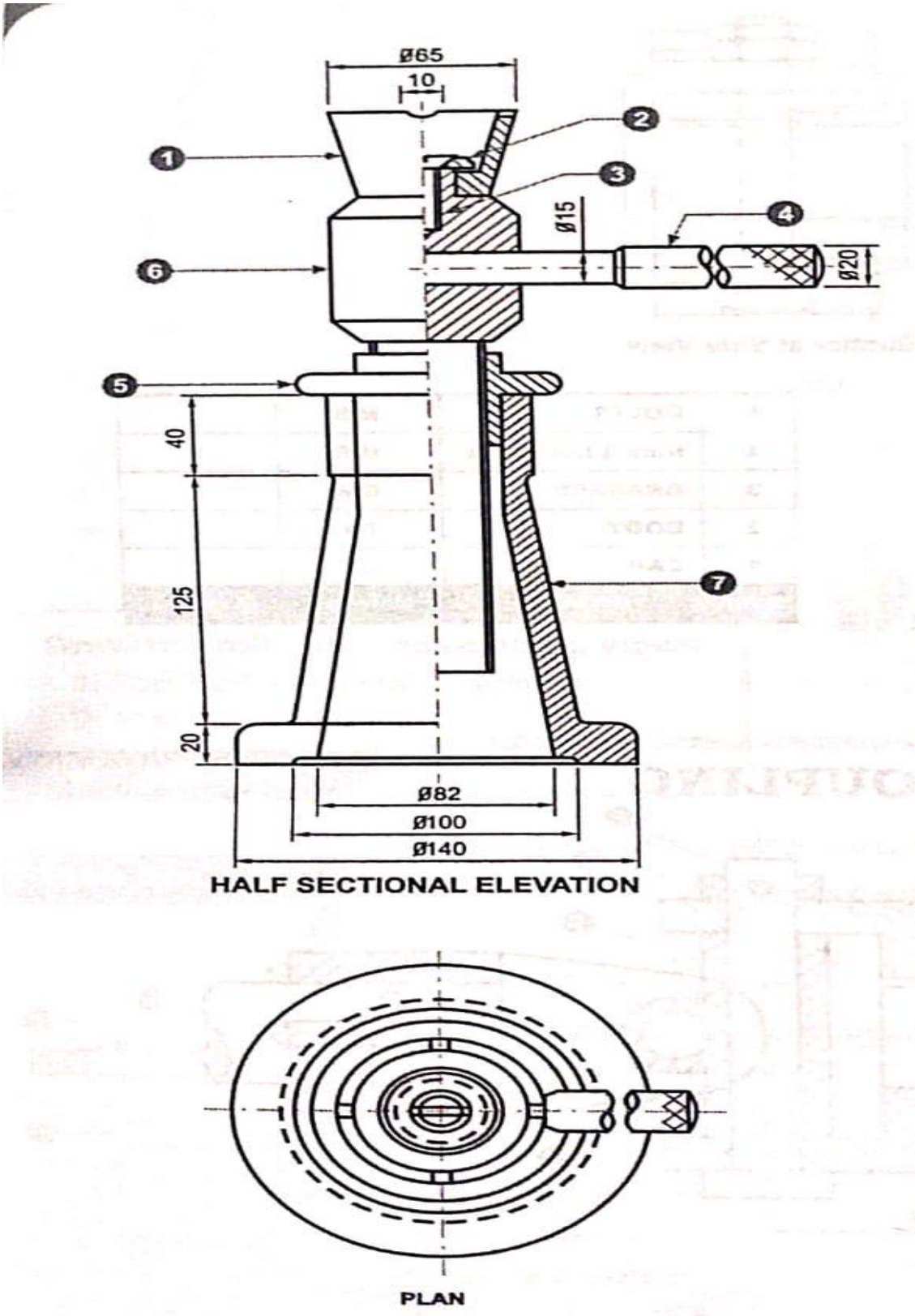
S.No.	PART NAME	MATERIAL	NO.OFF
1.	SLEEVE	MILD STEEL	1
2.	RODS	MILD STEEL	2
3.	COTTER	STEEL	2

Exercise – 2 Knuckle Joint

PART DRAWING

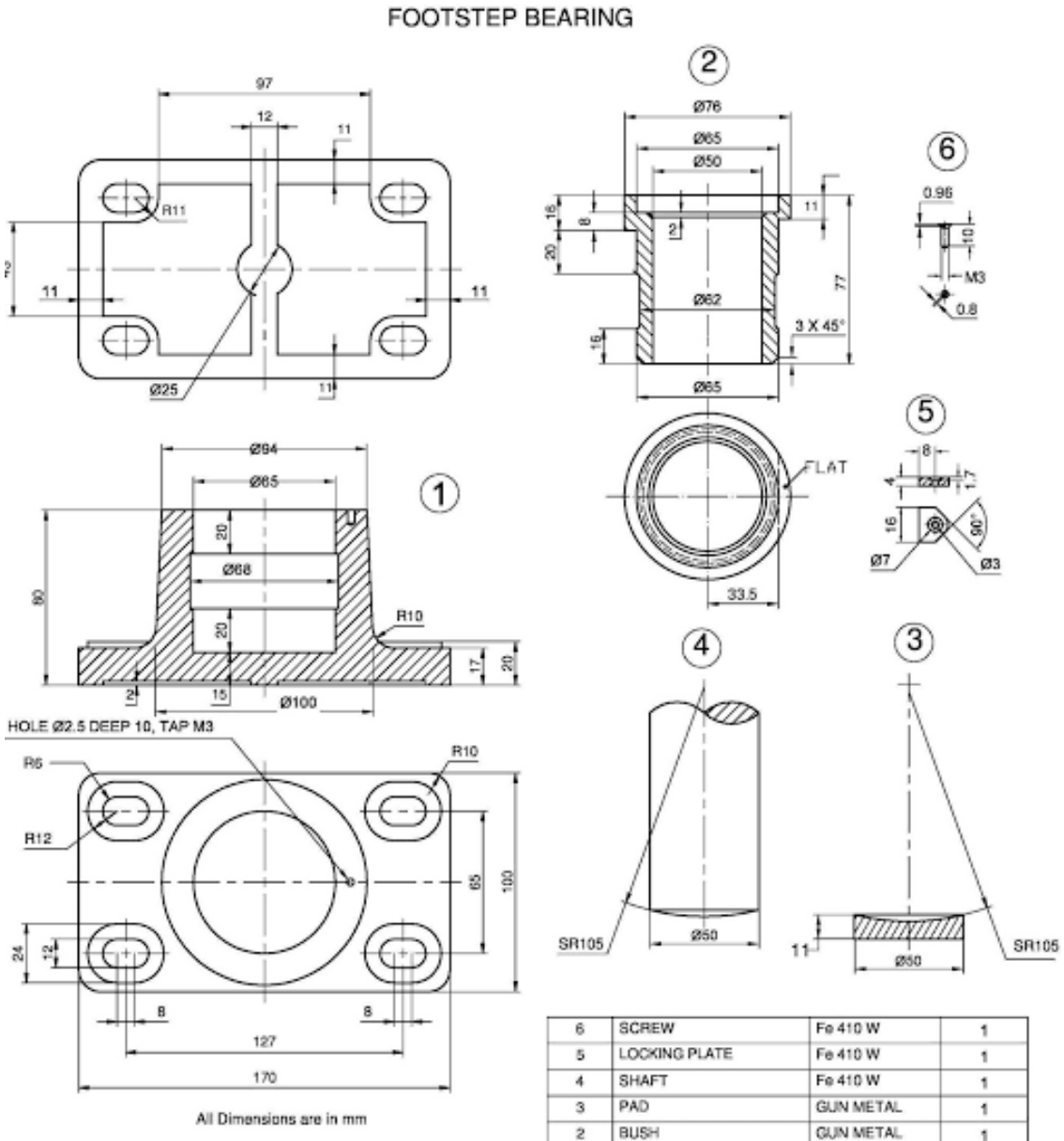


ASSEMBLY DRAWING



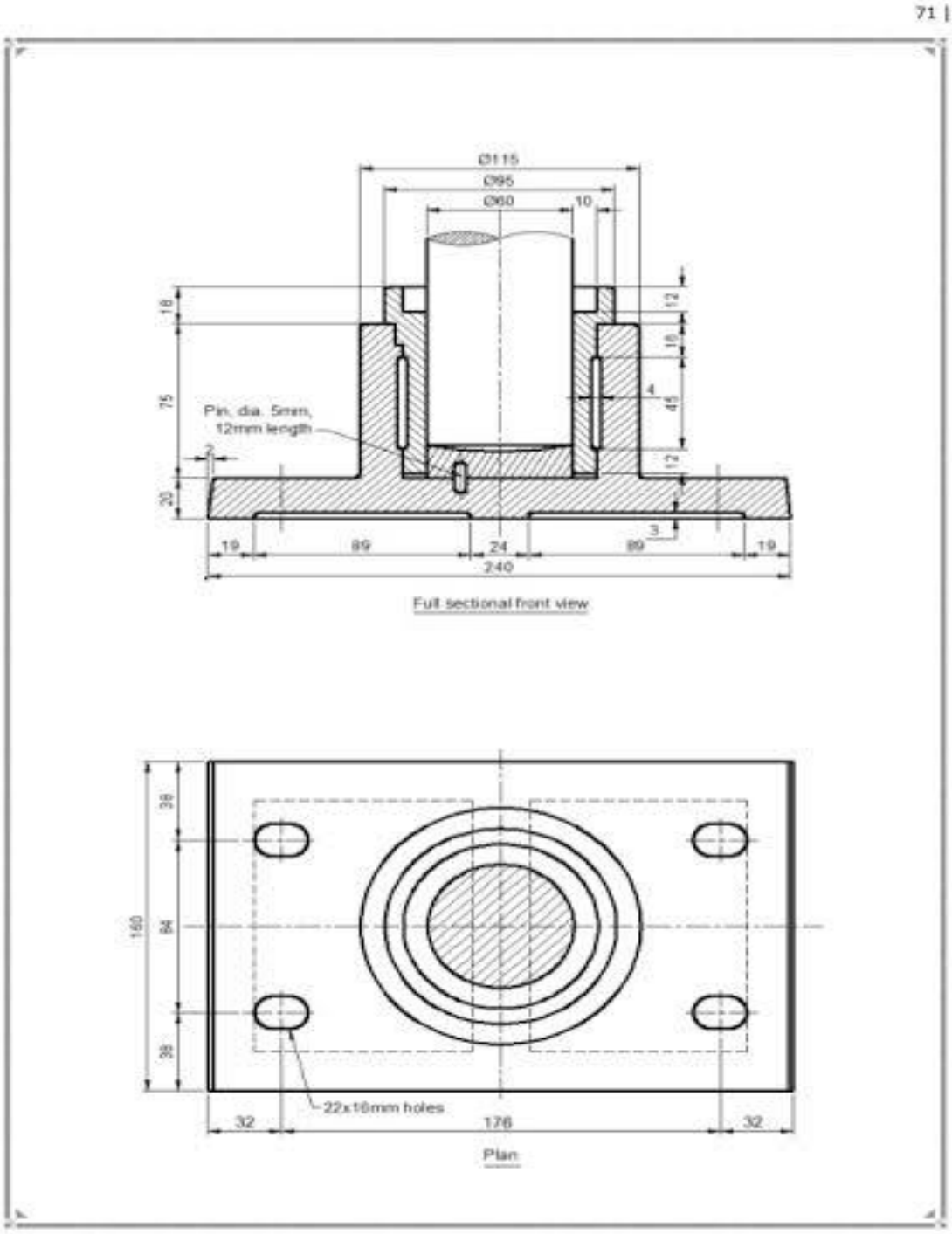
Exercise – 3 FOOT STEP BEARING

PART DRAWING



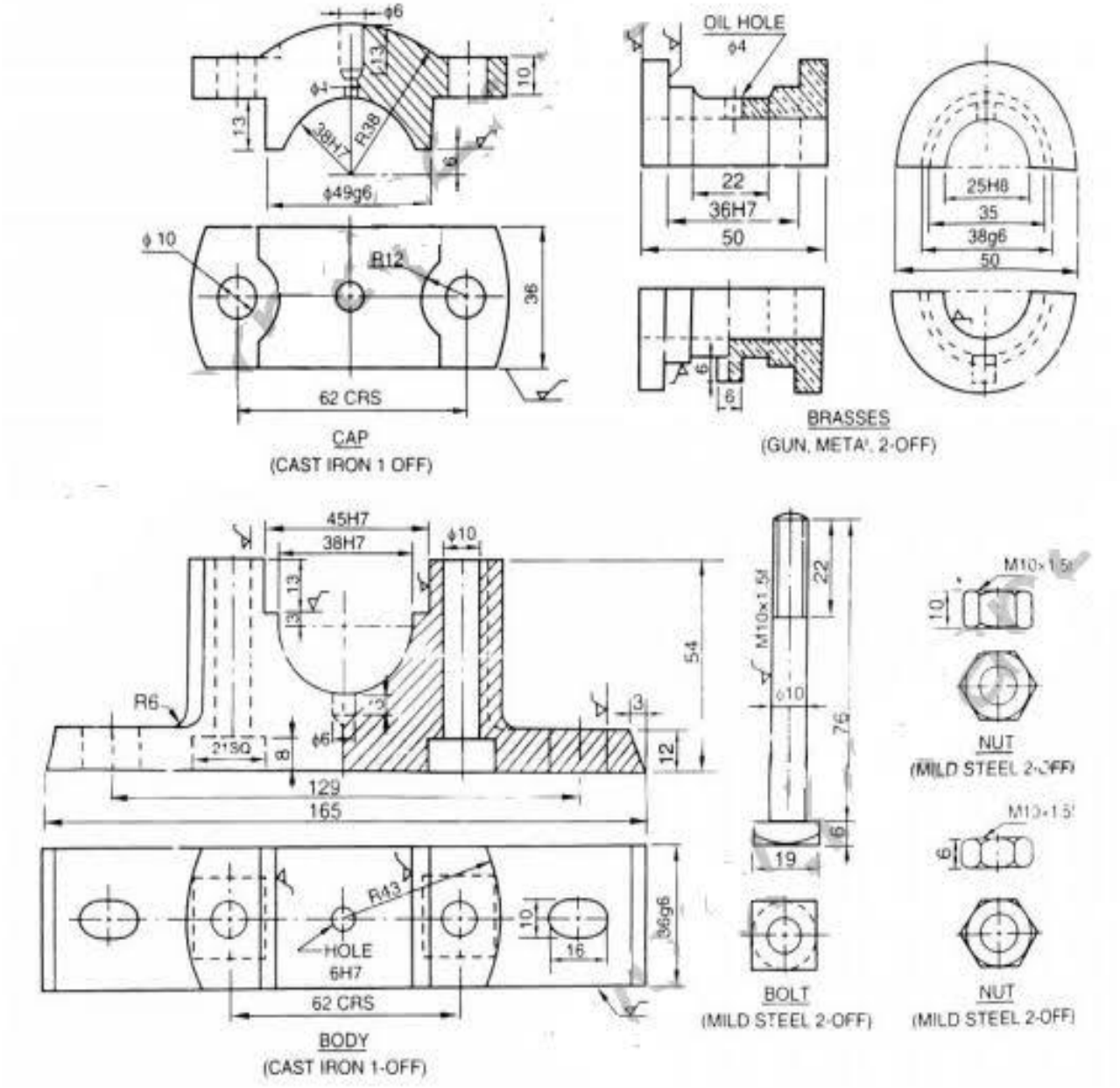
ITEM NO	DESCRIPTION	MATERIAL	NO OFF
6	SCREW	Fe 410 W	1
5	LOCKING PLATE	Fe 410 W	1
4	SHAFT	Fe 410 W	1
3	PAD	GUN METAL	1
2	BUSH	GUN METAL	1
1	SUPPORTING BRACKET	CAST IRON	1

ASSEMBLY DRAWING

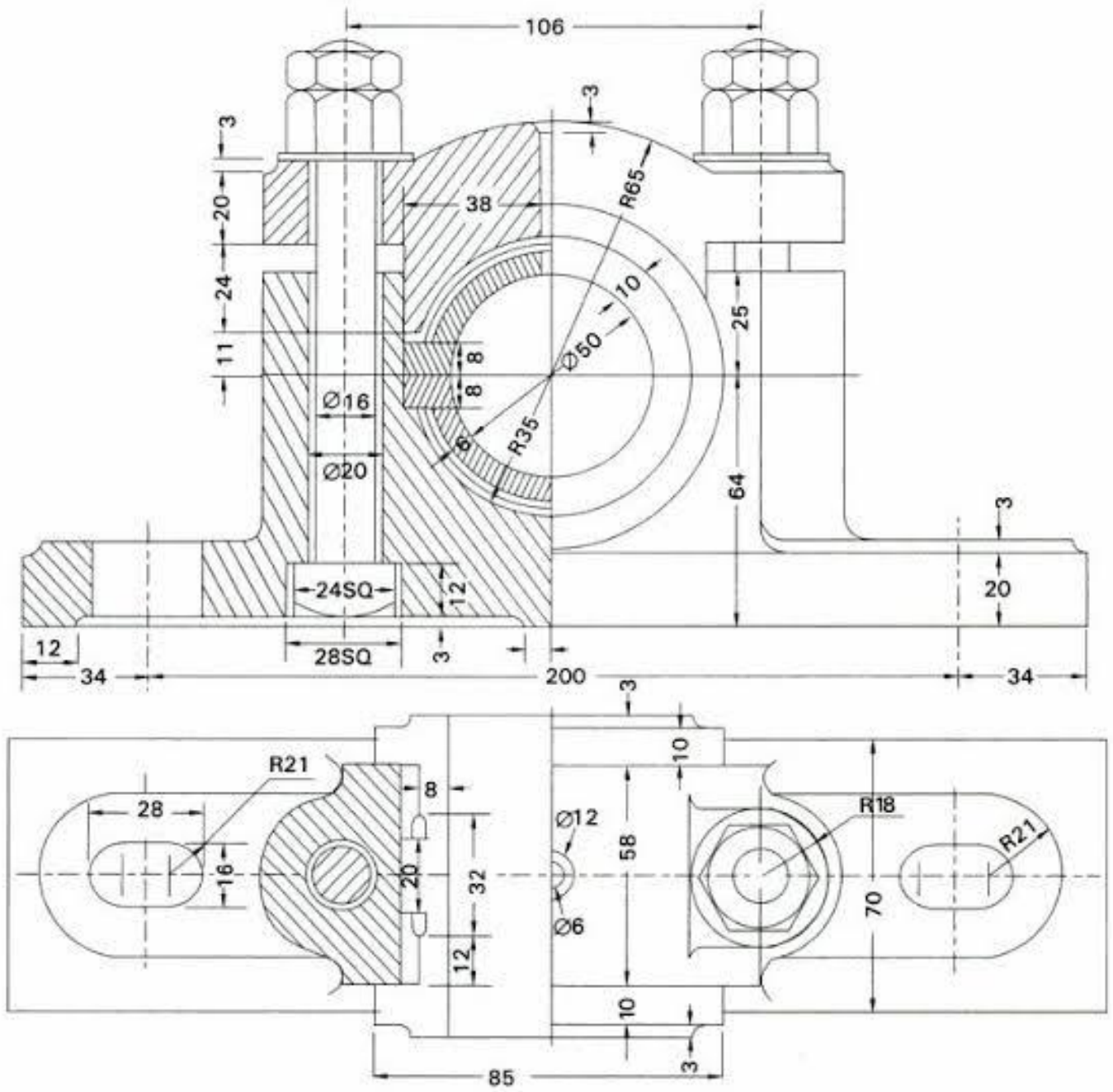


Exercise – 4 PLUMMER BLOCK

PART DRAWING

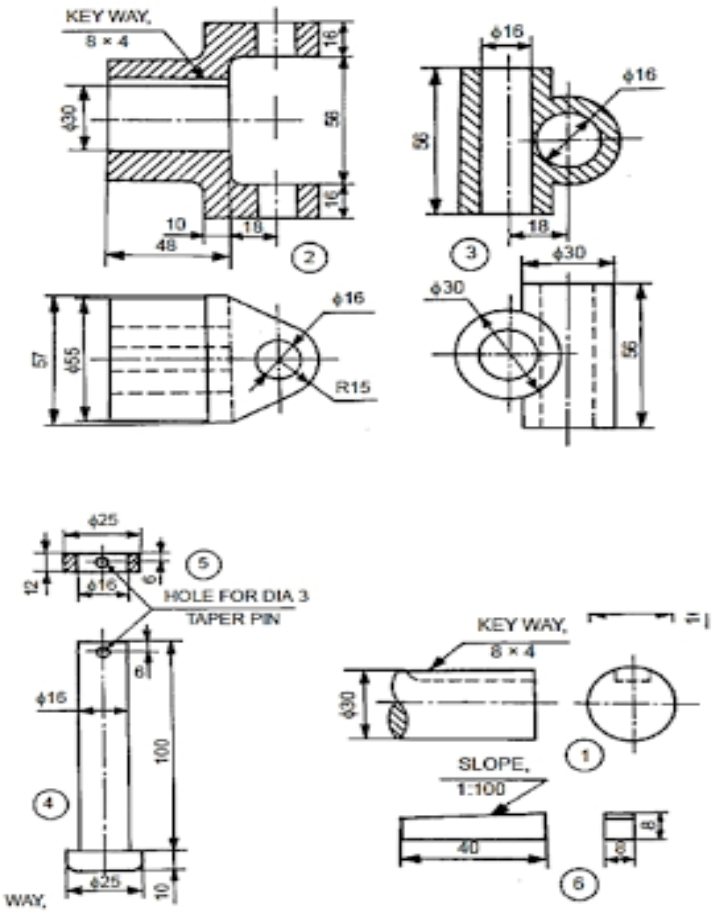


ASSEMBLY DRAWING



Exercise – 5 Universal Coupling

PART DRAWING

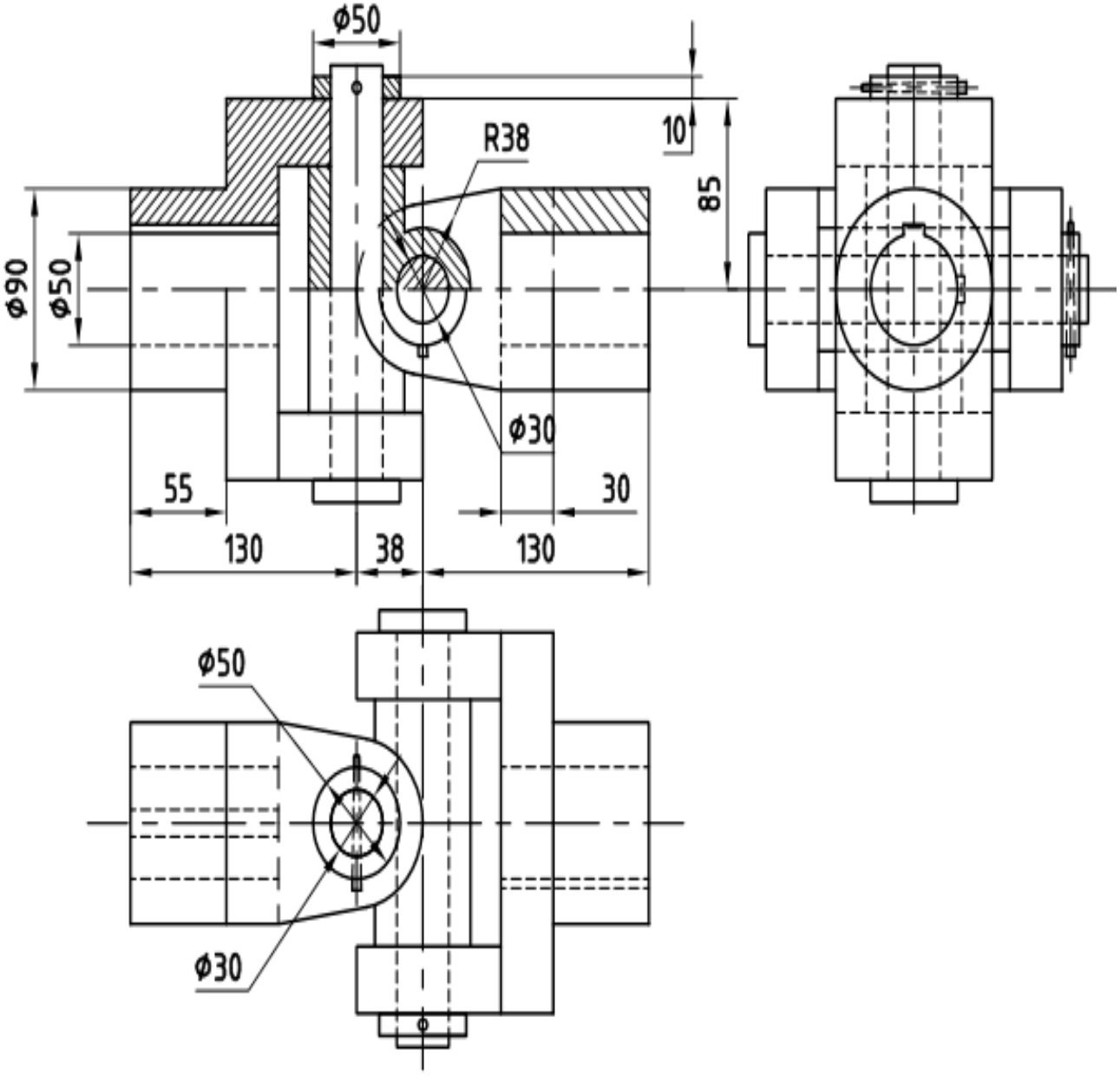


Parts list

Sl. No.	Name	Matl.	Qty.
1	Shaft	MS	2
2	Fork	FS	2
3	Central block	FS	1
4	Pin	MS	2
5	Collar	MS	2
6	Key	MS	2

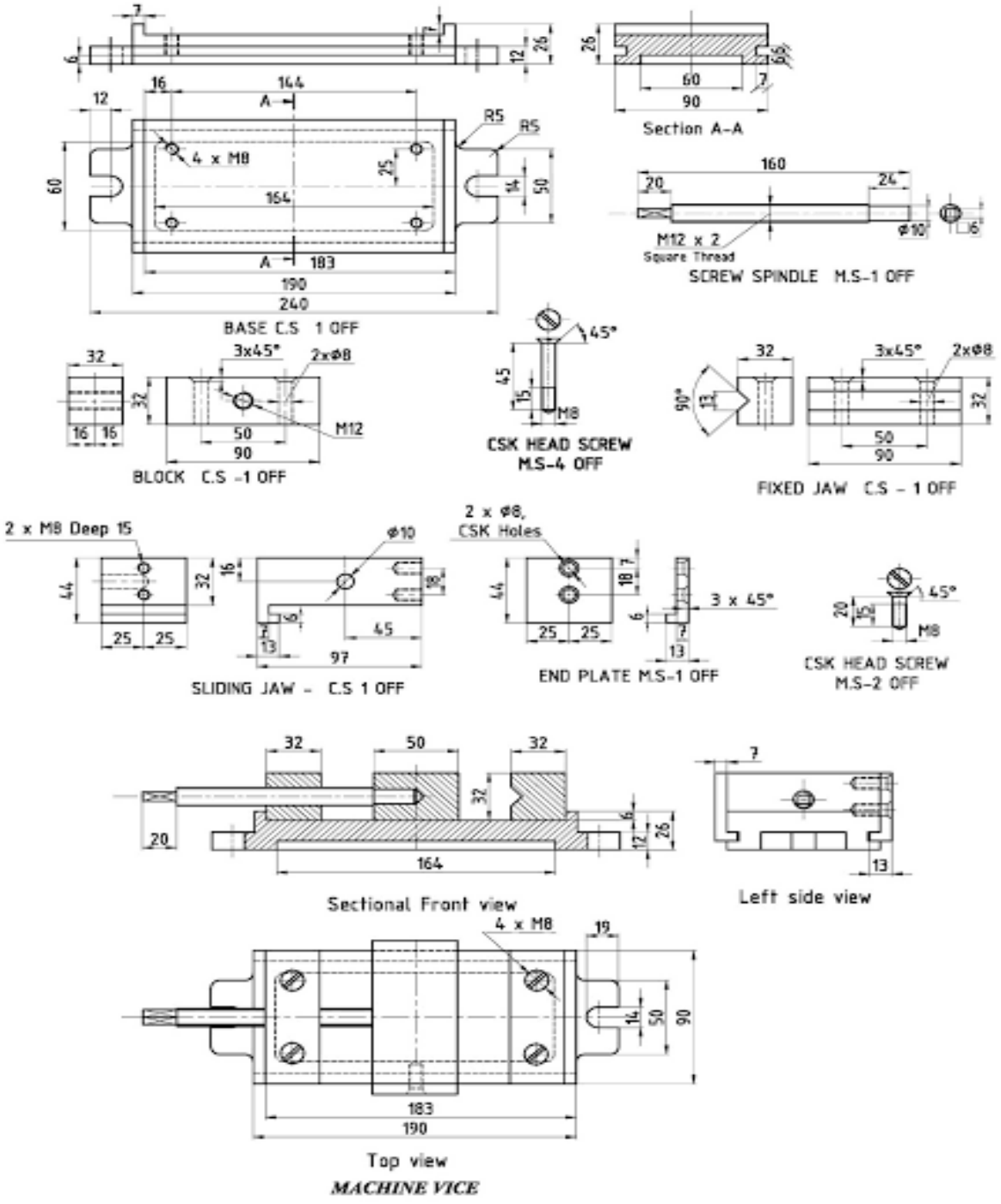
Fig. 2: Details of a Universal Coupling

ASSEMBLY DRAWING

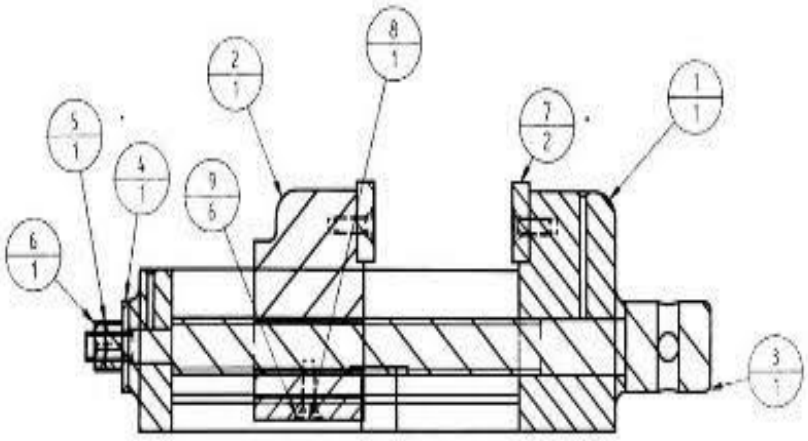


Exercise – 6 Machine Vice

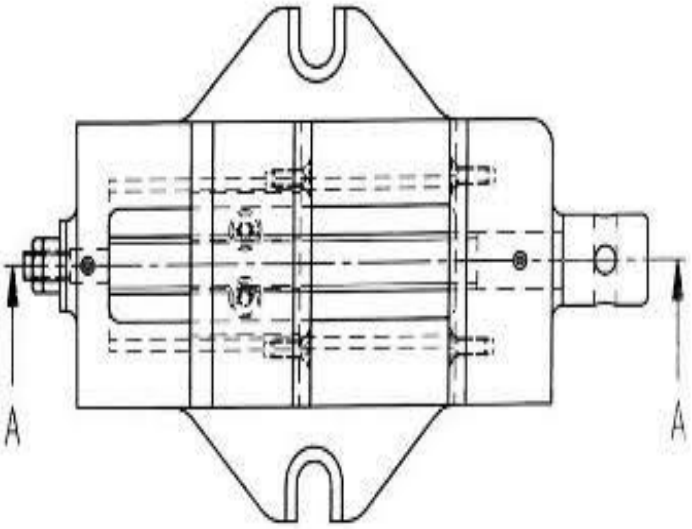
PART DRAWING



ASSEMBLY DRAWING



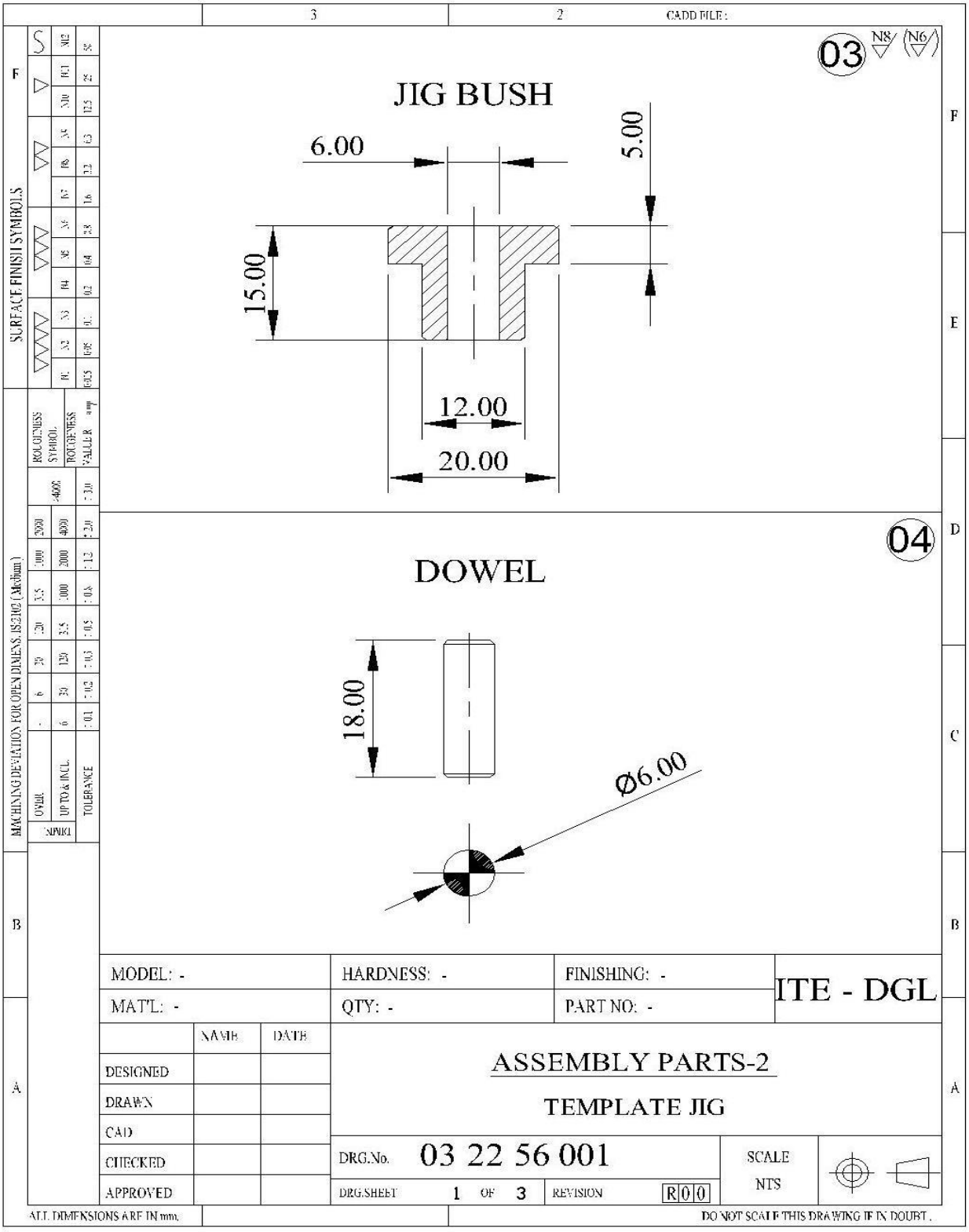
SECTION A-A

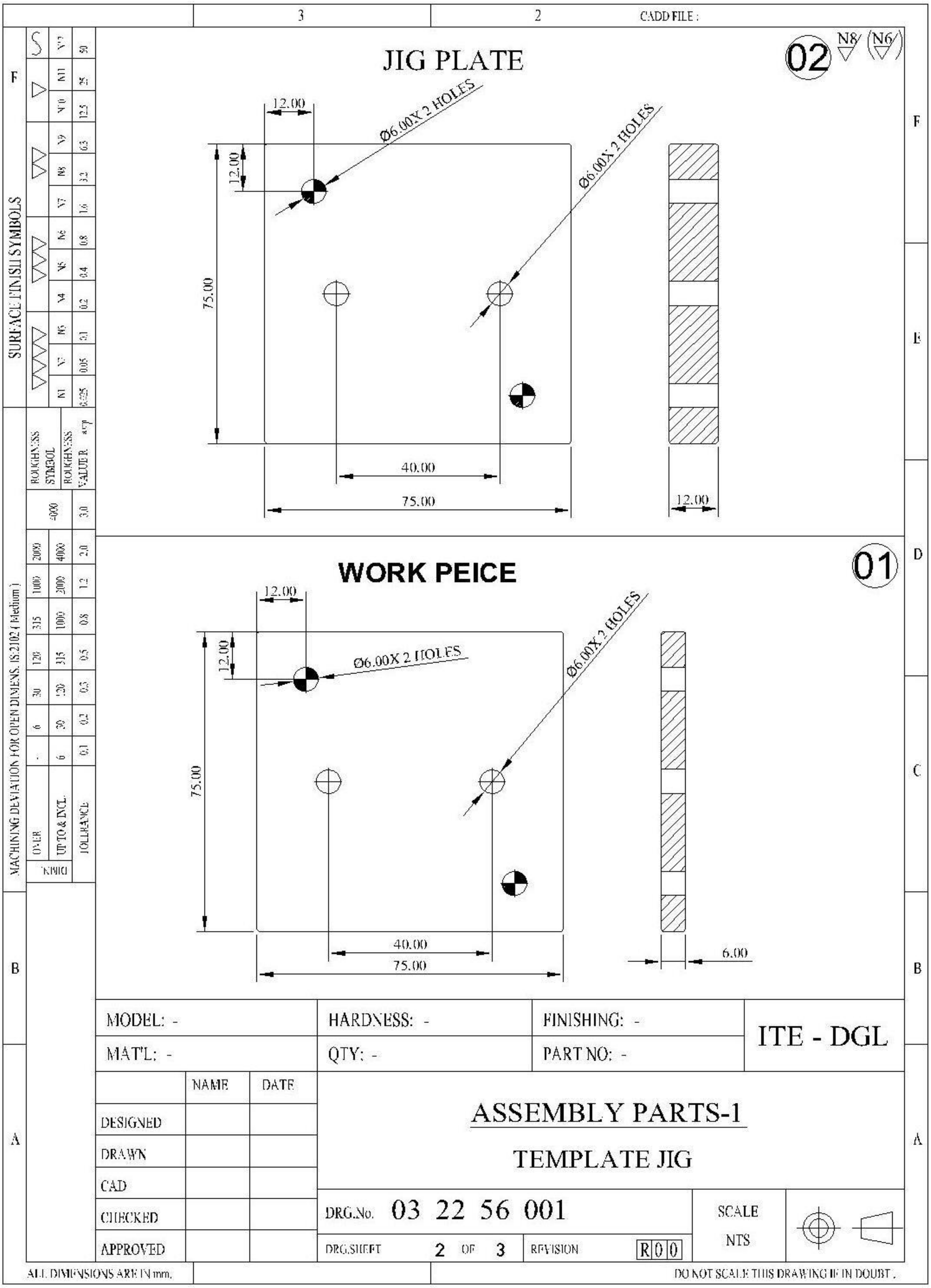


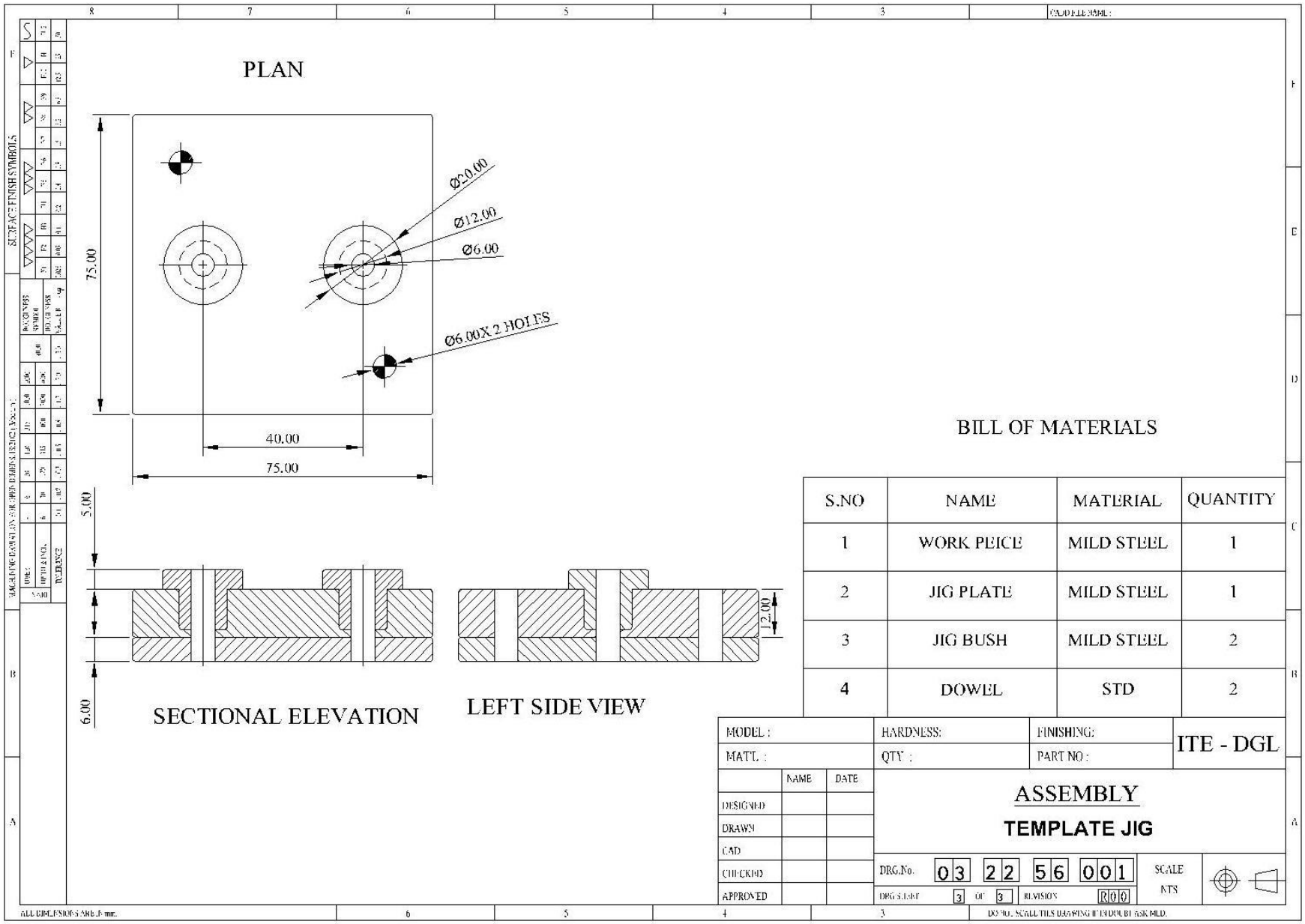
MACHINE VICE

Item Number	Title	Quantity
1	body of vice	1
2	movable jaw	1
3	screw rod	1
4	washer	1
5	nut	1
6	lock nut	1
7	jaw grip	2
8	clamping plate	1
9	screw m6	6

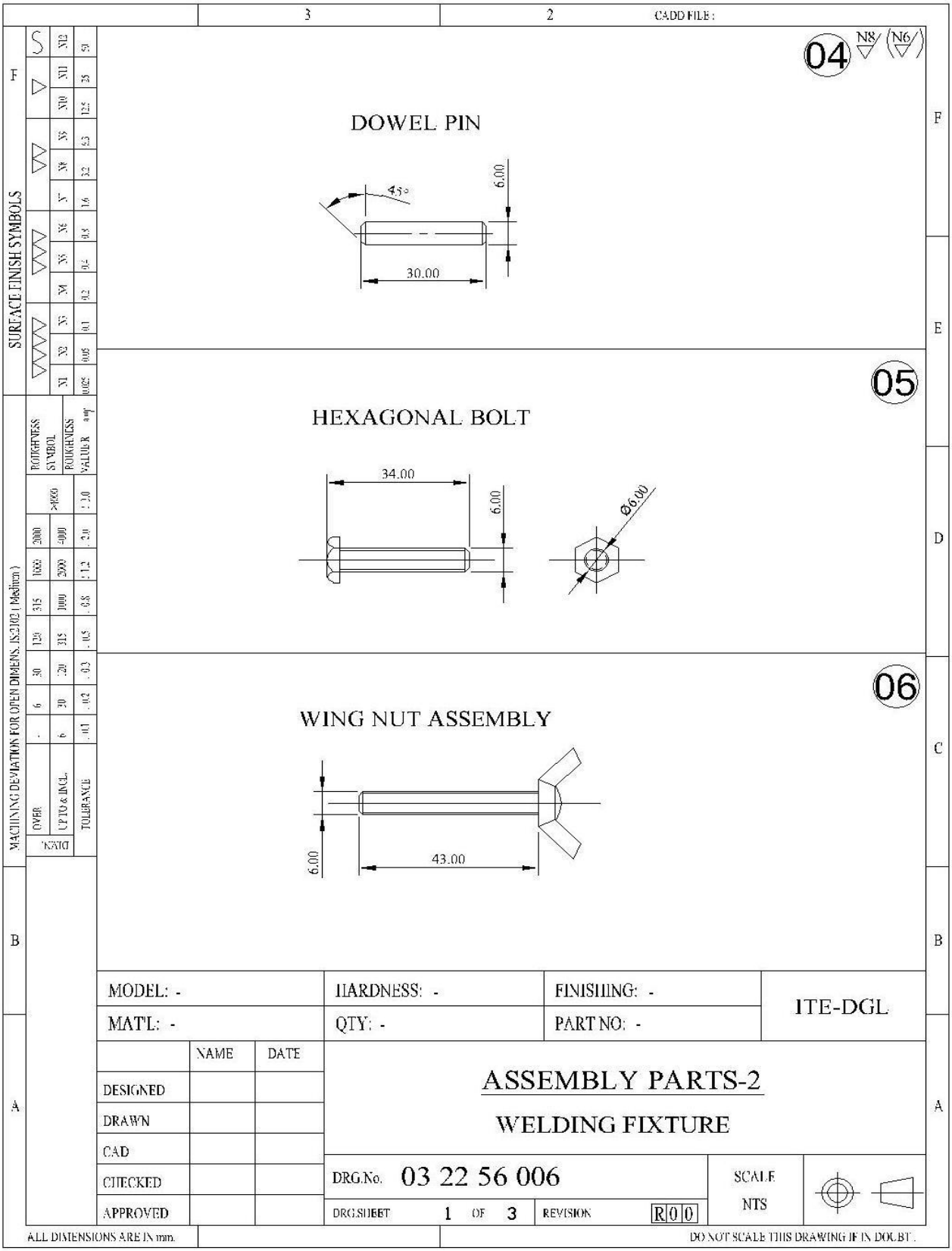
Exercise – 7 Drill Jig(Template Jig)

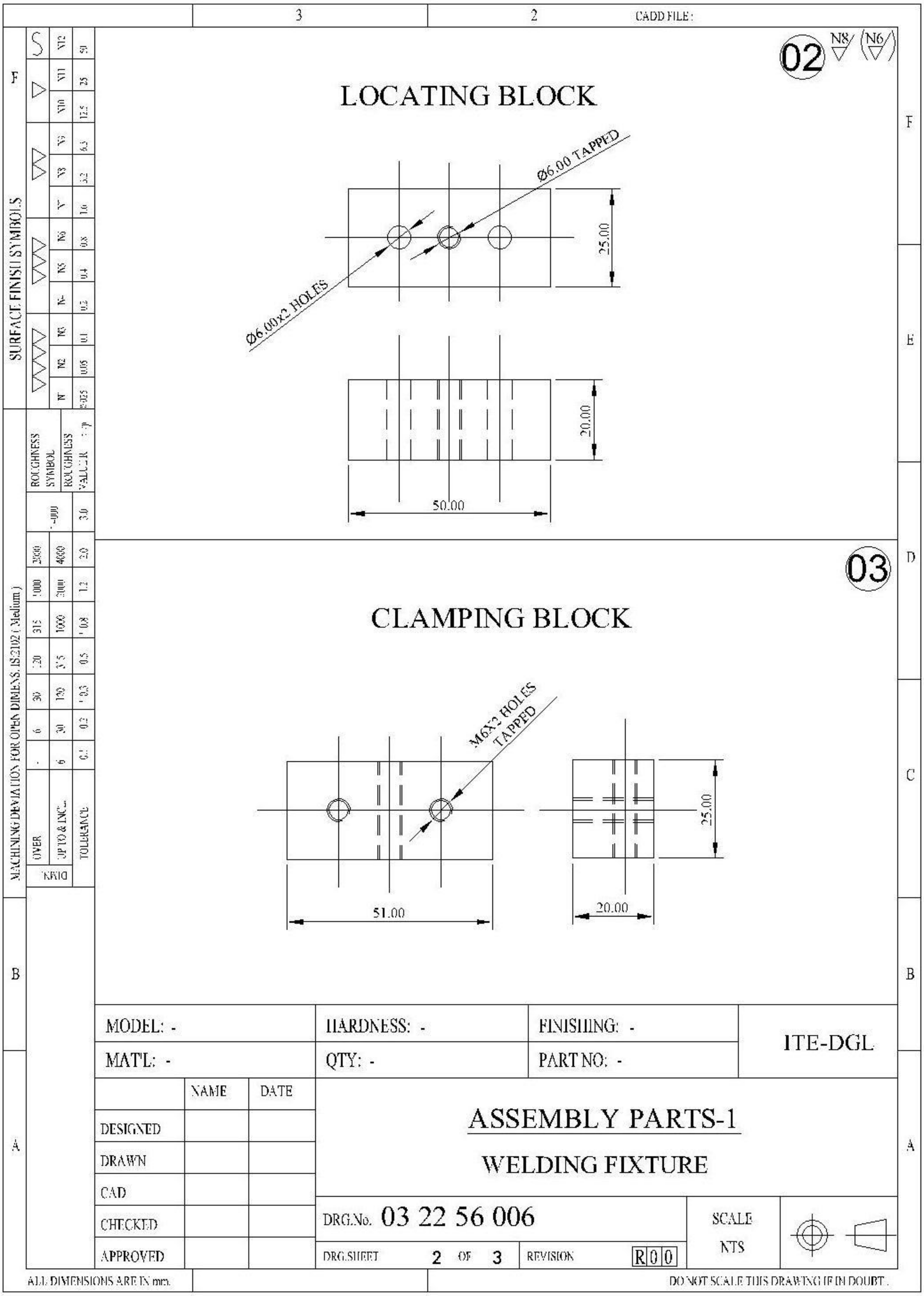



CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
JIG PLATE
02
N8 (N6)
12.00
Ø6.00X 2 HOLES
Ø6.00X 2 HOLES
12.00
75.00
40.00
75.00
12.00
WORK PEICE
01
12.00
Ø6.00X 2 HOLES
Ø6.00X 2 HOLES
12.00
75.00
40.00
75.00
6.00
MODEL: -
HARDNESS: -
FINISHING: -
ITE - DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
TEMPLATE JIG
DRG.No. 03 22 56 001
SCALE
NTS
DRG.SHEET 2 OF 3
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

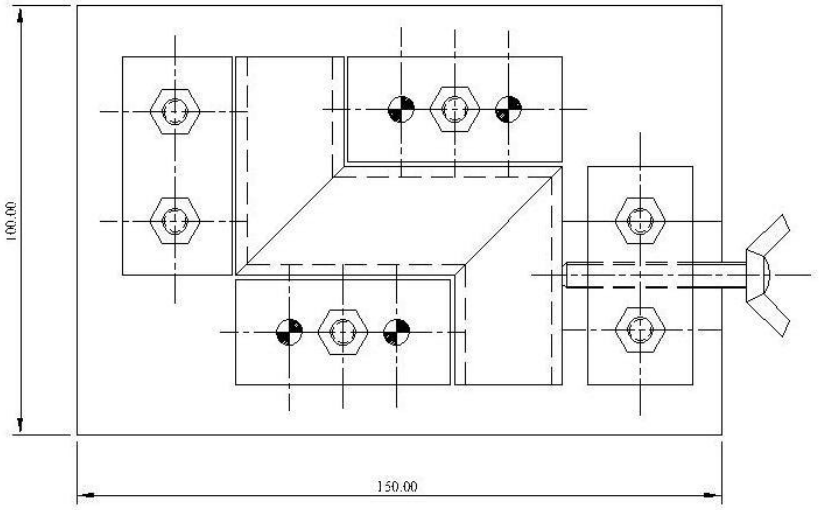

PLAN
Ø20.00
Ø12.00
Ø6.00
Ø6.00X 2 HOLES
75.00
40.00
75.00
5.00
6.00
12.00
SECTIONAL ELEVATION
LEFT SIDE VIEW
BILL OF MATERIALS
S.NO | NAME | MATERIAL | QUANTITY
1 | WORK PEICE | MILD STEEL | 1
2 | JIG PLATE | MILD STEEL | 1
3 | JIG BUSH | MILD STEEL | 2
4 | DOWEL | STD | 2
MODEL :
HARDNESS:
FINISHING:
ITE - DGL
MATL :
QTY :
PART NO :
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY
TEMPLATE JIG
DRG.No. 03 22 56 001
SCALE NTS
DRG SHEET 3 OF 3
REVISION R00

Exercise –8 Welding Fixture

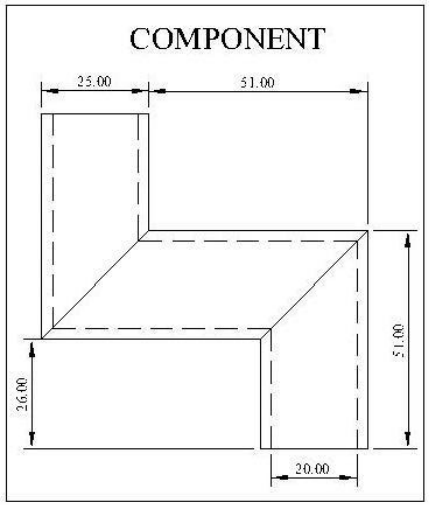



CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
LOCATING BLOCK
Ø6.00 TAPPED
Ø6.00x2 HOLES
25.00
20.00
50.00
CLAMPING BLOCK
M6X2 HOLES TAPPED
25.00
51.00
20.00
MODEL: -
HARDNESS: -
FINISHING: -
ITE-DGL
MATL: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
WELDING FIXTURE
DRG.No. 03 22 56 006
SCALE
NTS
DRG.SHEET 2 OF 3
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

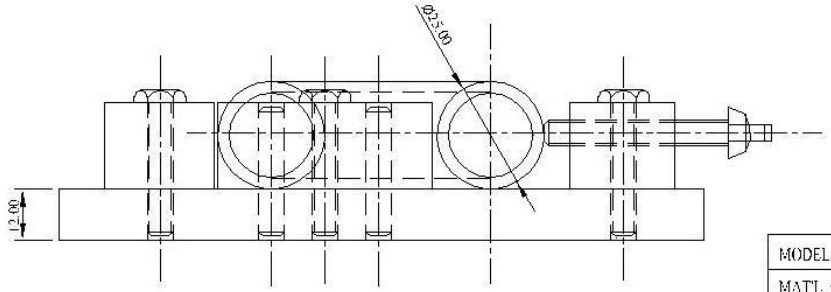
PLAN



COMPONENT



ELEVATION



BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QTY
6	WING NUT	STD	1
5	HEXAGONAL BOLT	STD	6
4	DOWEL PIN	STD	4
3	CLAMPING BLOCK	MILD STEEL	2
2	LOCATING BLOCK	MILD STEEL	2
1	COMPONENT	M.S PIPE	1

MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MAT'L :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY

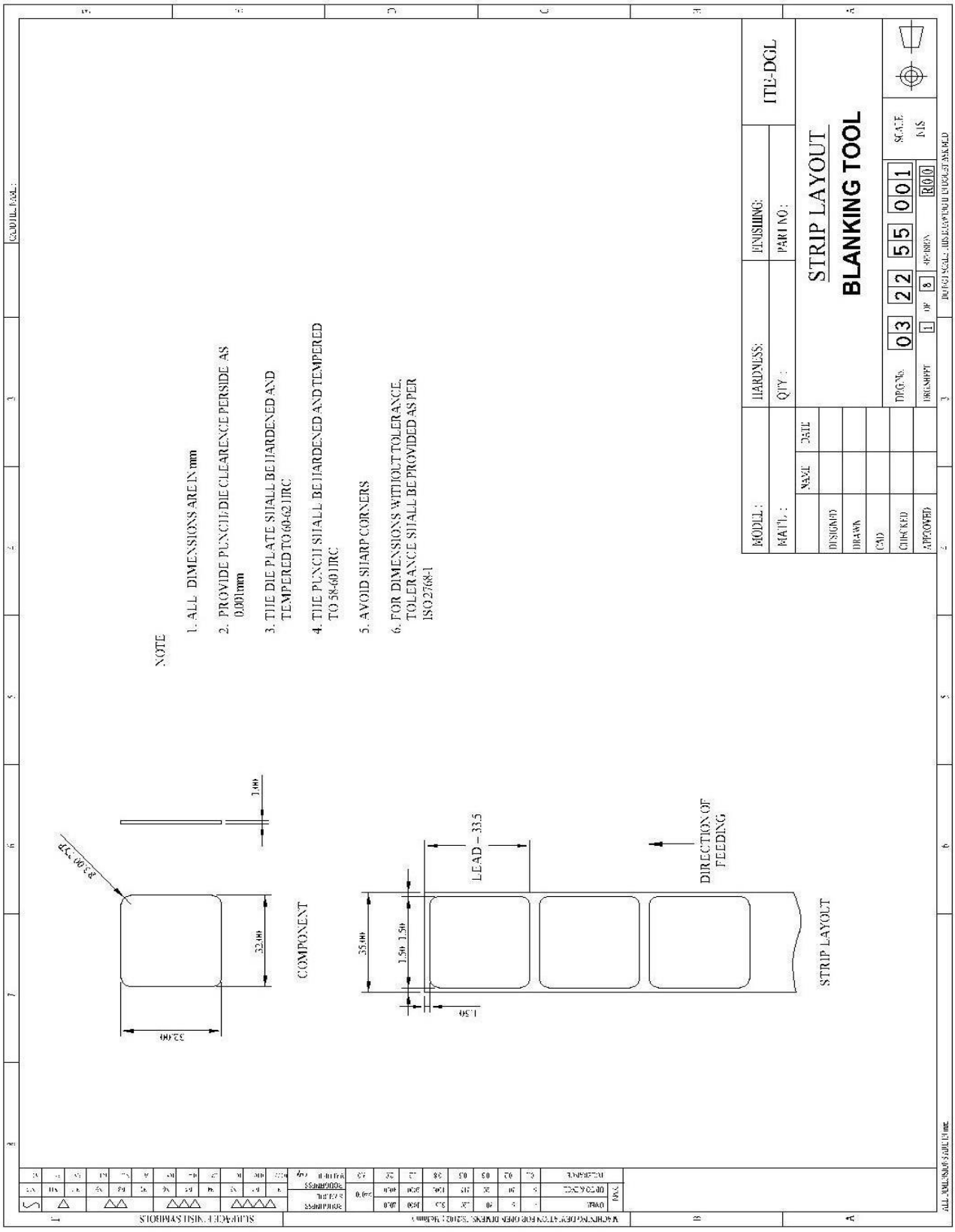
WELDING FIXTURE

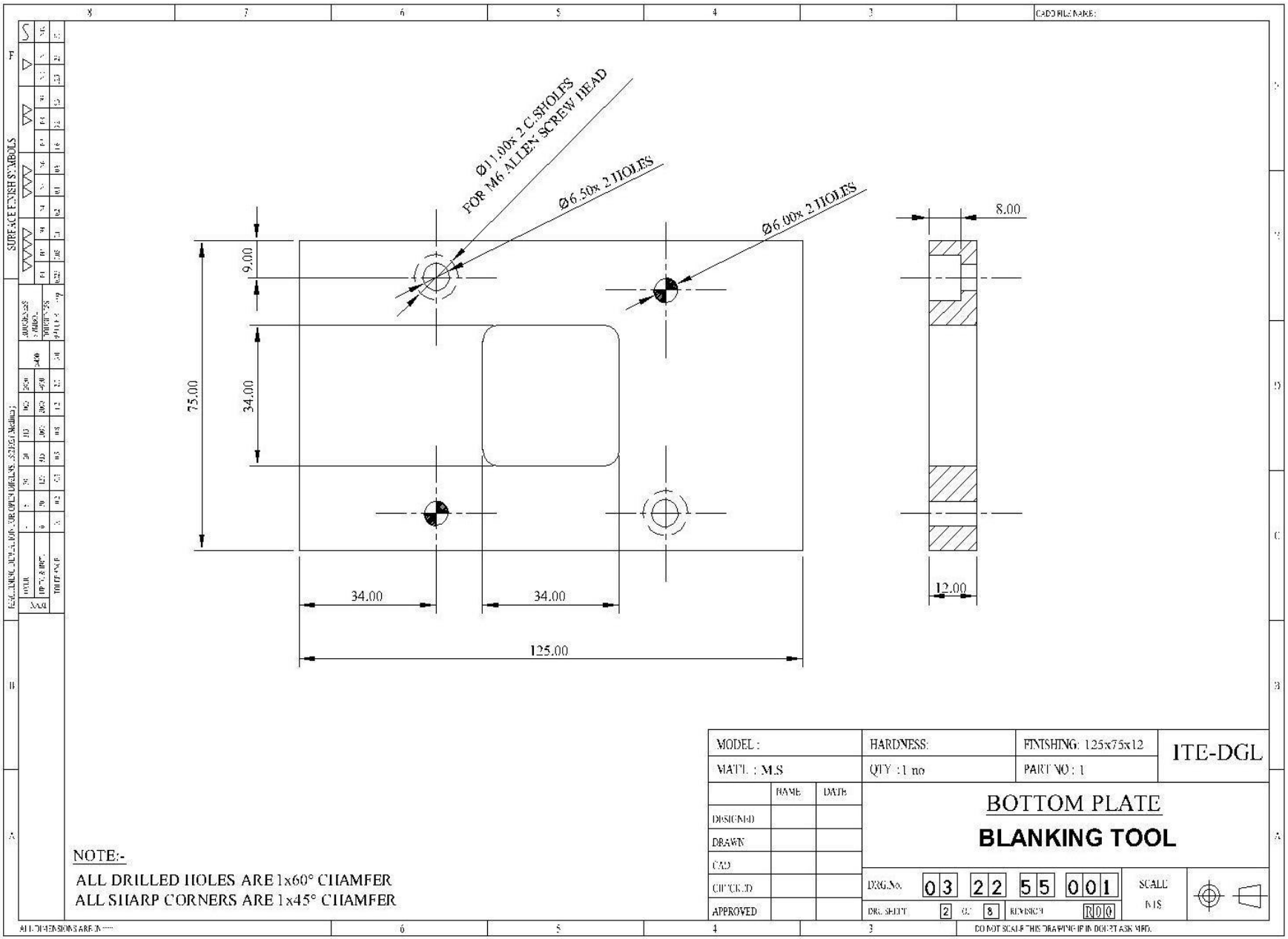
DRG.No. 03 22 56 006

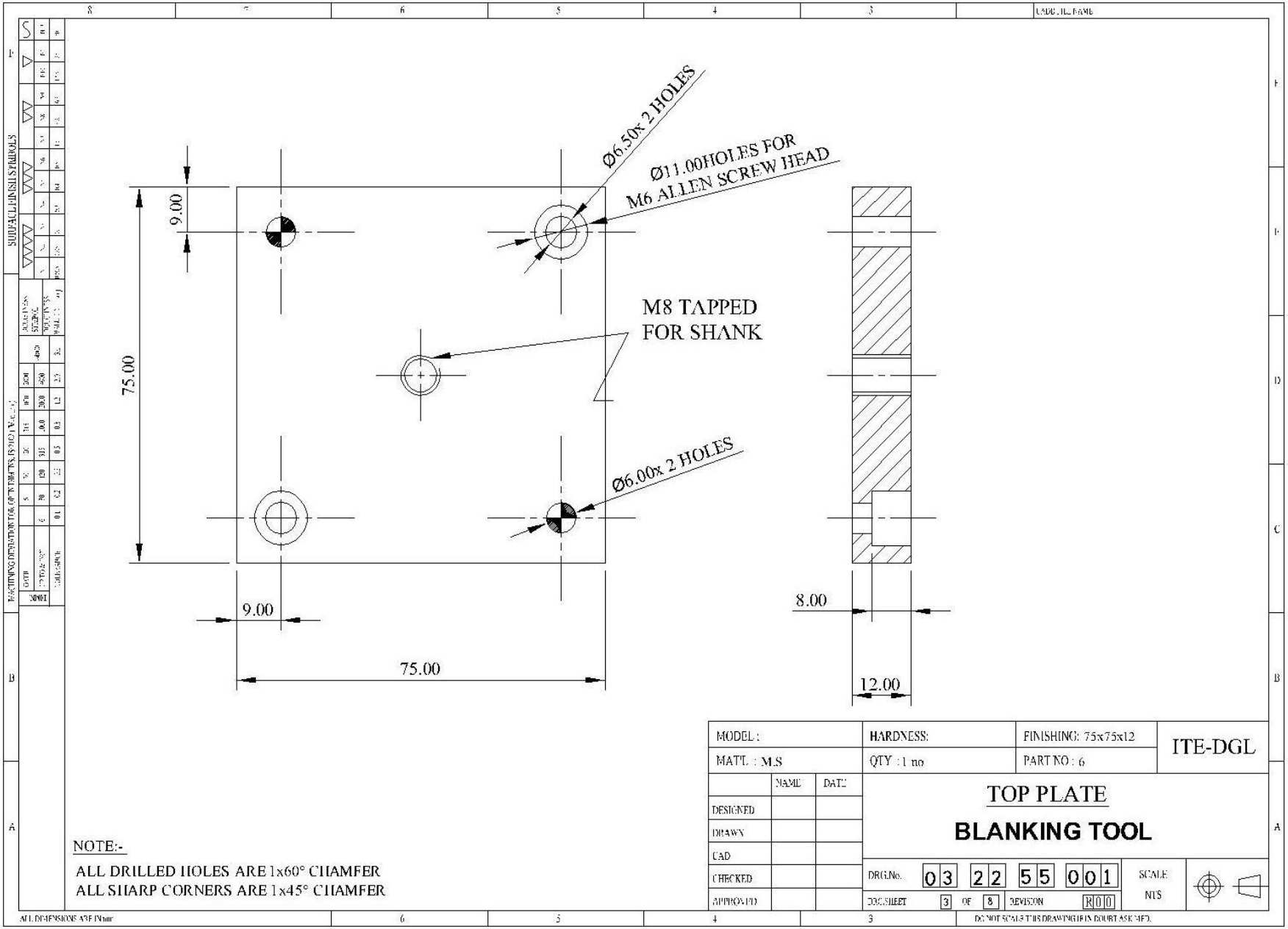
DRGSHEET 3 OF 3 REVISION R00

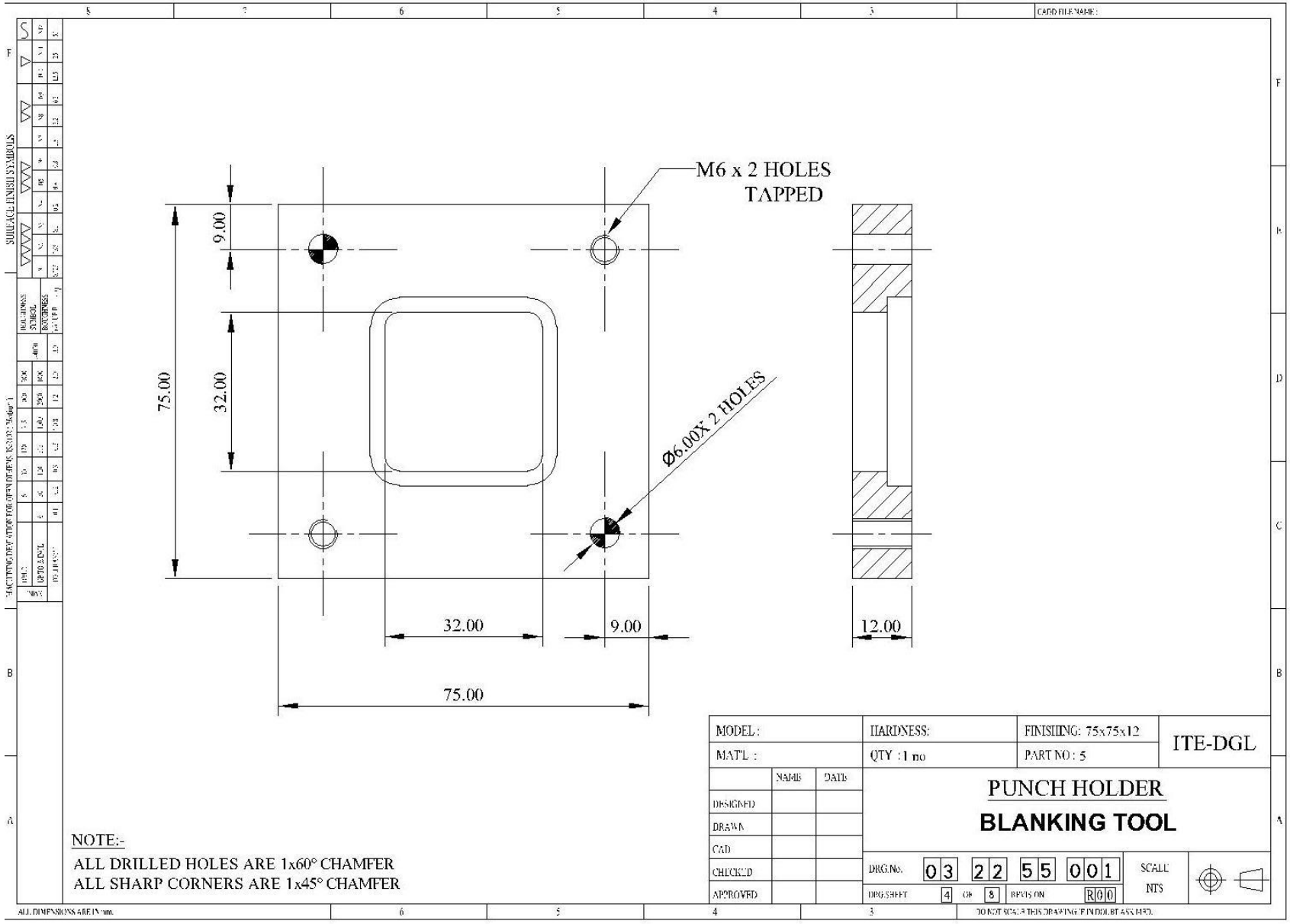
SCALE NTS

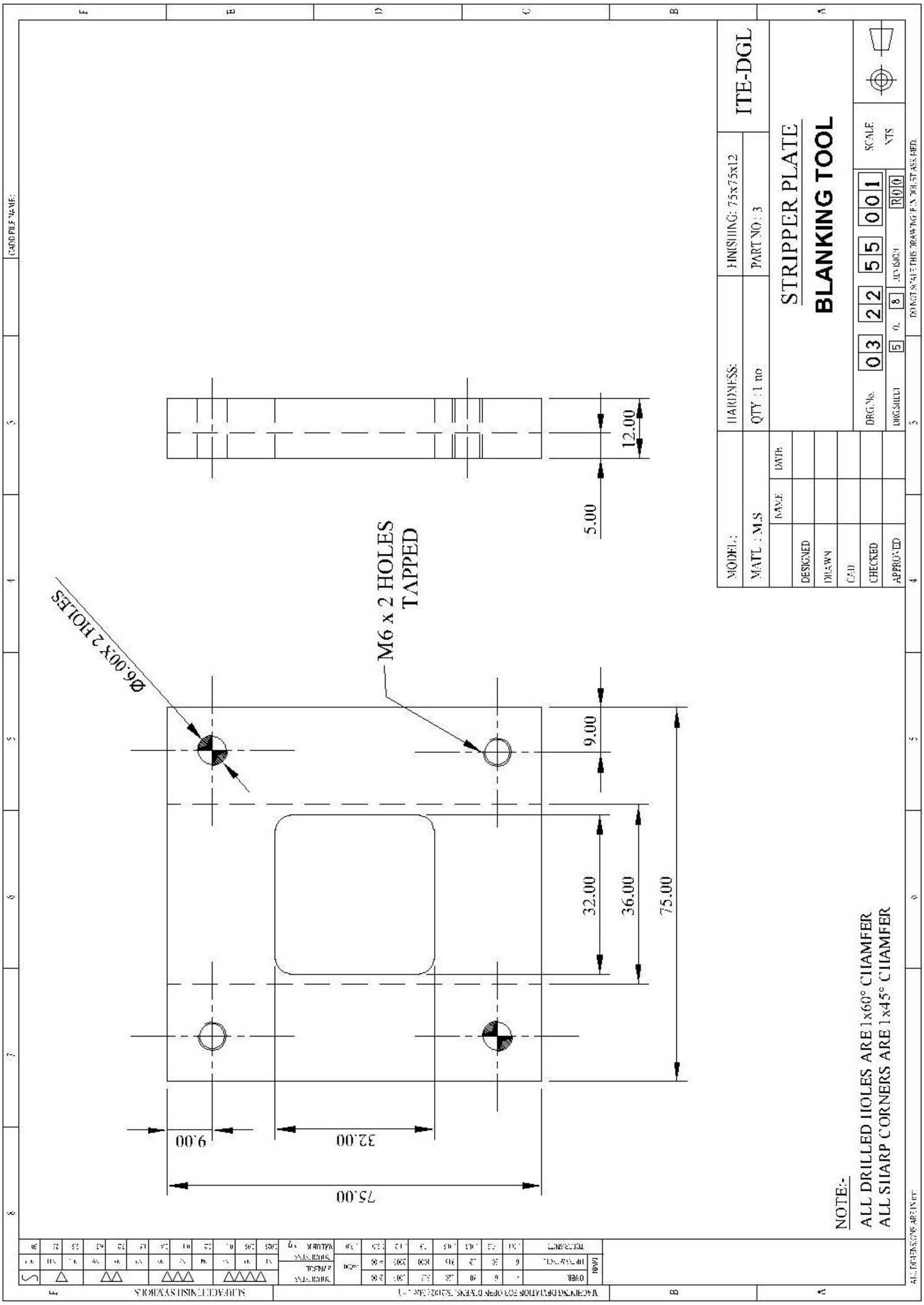
Exercise- 9 Blanking Tool – Drop through type

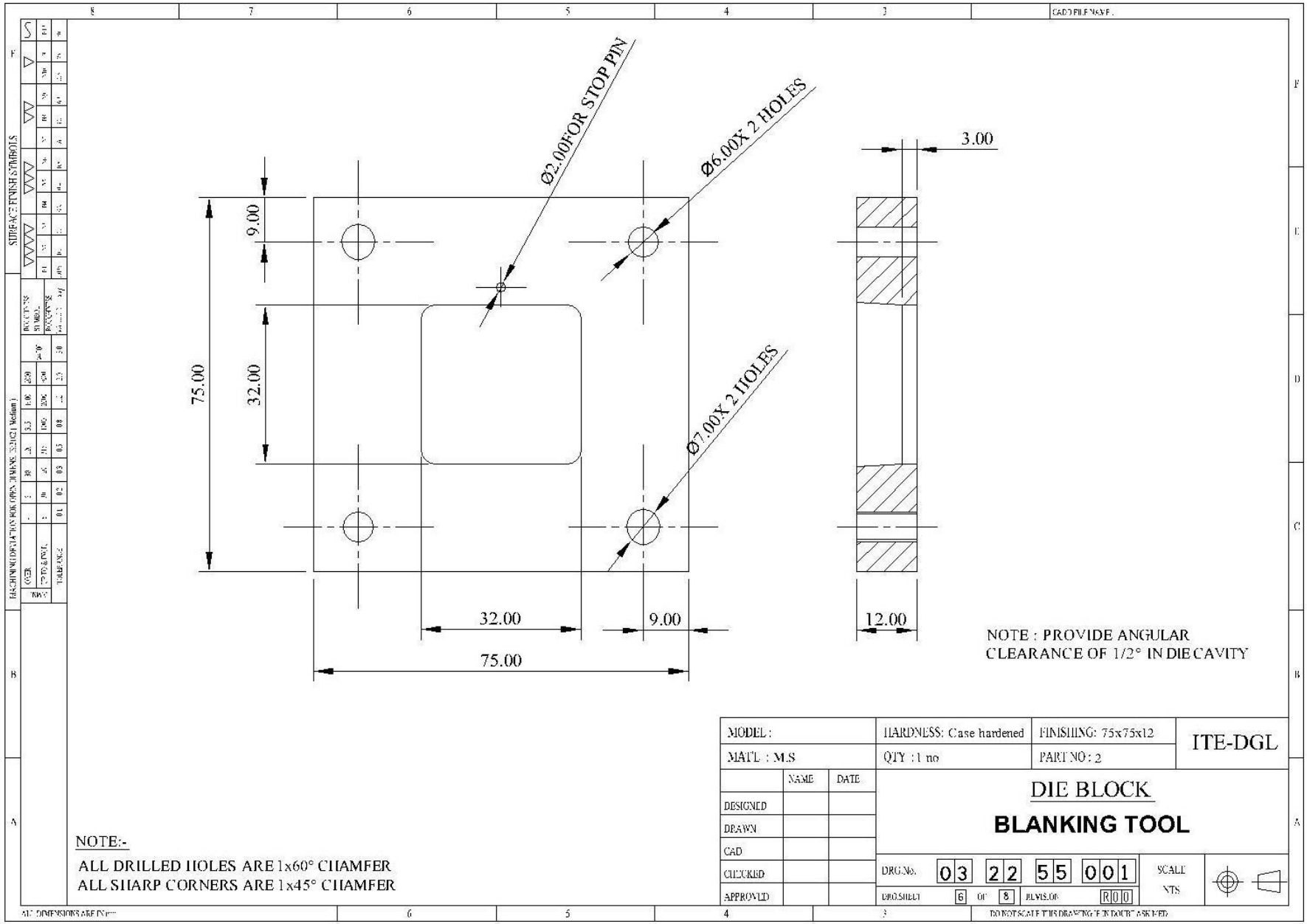


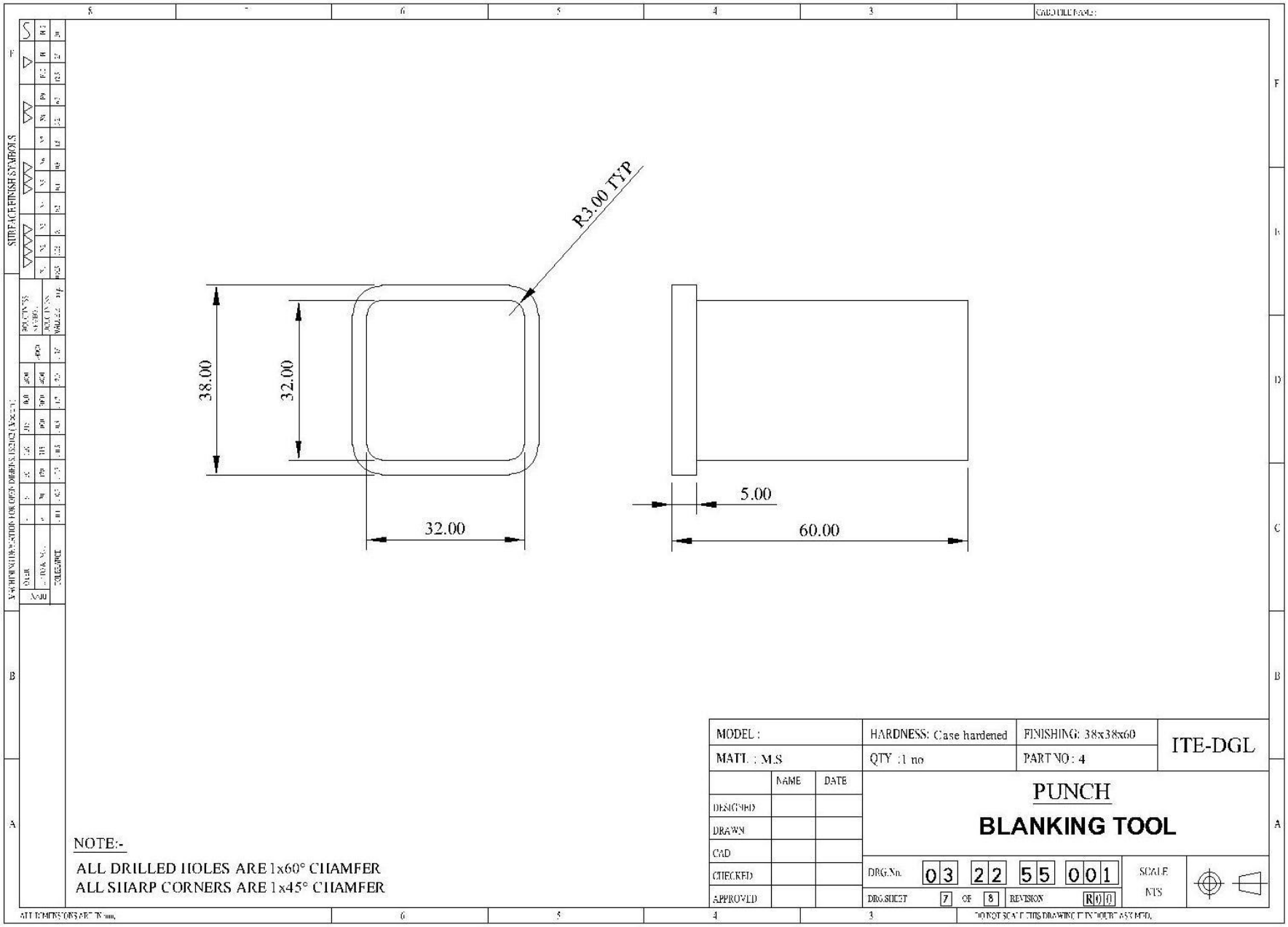

Ø11.00x 2 C'SHOLES
FOR M6 ALLEN SCREW HEAD
Ø6.50x 2 HOLES
Ø6.00x 2 HOLES
8.00
9.00
34.00
75.00
34.00
34.00
125.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 125x75x12
ITE-DGL
MATL : M.S
QTY : 1 no
PART NO : 1
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BOTTOM PLATE
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE: NTS
DRG. SHEET 2 OF 8
REVISION R00
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK MFG.


Ø6.50x 2 HOLES
Ø11.00HOLES FOR
M6 ALLEN SCREW HEAD
M8 TAPPED
FOR SHANK
Ø6.00x 2 HOLES
9.00
75.00
9.00
75.00
8.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 75x75x12
ITE-DGL
MATL : M.S
QTY : 1 no
PART NO : 6
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
TOP PLATE
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE NTS
DOC.SHEET 3 OF 8
REVISION R00
ALL DIMENSIONS ARE IN mm
DO NOT SCALE THIS DRAWING (IF IN DOUBT ASK ME).


M6 x 2 HOLES
TAPPED
9.00
75.00
32.00
Ø6.00X 2 HOLES
32.00
9.00
12.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 75x75x12
ITE-DGL
MAT'L :
QTY : 1 no
PART NO : 5
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
PUNCH HOLDER
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE NTS
DRG.SHEET 4 OF 8
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME.


ITE-DGL
FINISHING: 75x75x12
PART NO: 3
HARDNESS:
QTY: 1 no
MODEL:
MATL : M.S
STRIPPER PLATE
BLANKING TOOL
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
NAME
DATE
DRG.No. 03 22 55 001
SCALE
NTS
M6 x 2 HOLES TAPPED
Ø6.00X 2 HOLES
12.00
5.00
9.00
32.00
36.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

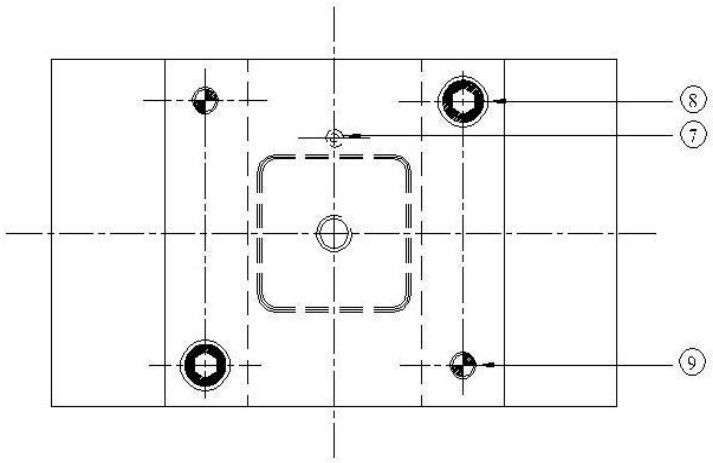

Ø2.00FOR STOP PIN
Ø6.00X 2 HOLES
Ø7.00X 2 HOLES
3.00
9.00
32.00
75.00
32.00
9.00
75.00
12.00
NOTE : PROVIDE ANGULAR
CLEARANCE OF 1/2° IN DIE CAVITY
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS: Case hardened
FINISHING: 75x75x12
ITE-DGL
MATL : M.S
QTY : 1 no
PART NO : 2
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DIE BLOCK
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE
NTS
DRG.SHEET 6 OF 8
REVIS.OF R00

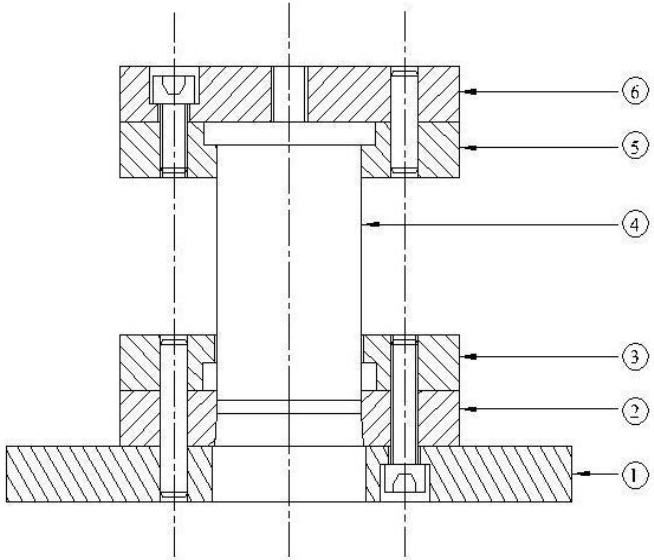


NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL :		HARDNESS: Case hardened	FINISHING: 38x38x60	ITE-DGL
MATL. : M.S		QTY :1 no	PART NO : 4	
	NAME	DATE	PUNCH	
DESIGNED			BLANKING TOOL	
DRAWN				
CAD				
CHECKED			DRG.No. 03 22 55 001	SCALE NTS
APPROVED			DRG.SHEET 7 OF 8 REVISION R0 0	





SECTIONAL ELEVATION

BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QTY
9	Ø6 DOWEL	STD	4
8	M6 ALLEN SCREW	STD	4
7	STOP PIN	STD	1
6	TOP PLATE	M.S	1
5	PUNCH HOLDER	M.S	1
4	BLANKING PUNCH	M.S (CASE HARDENED)	1
3	STRIPPER PLATE	M.S	1
2	DIE BLOCK	M.S (CASE HARDENED)	1
1	BOTTOM PLATE	M.S	1

MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY

BLANKING TOOL

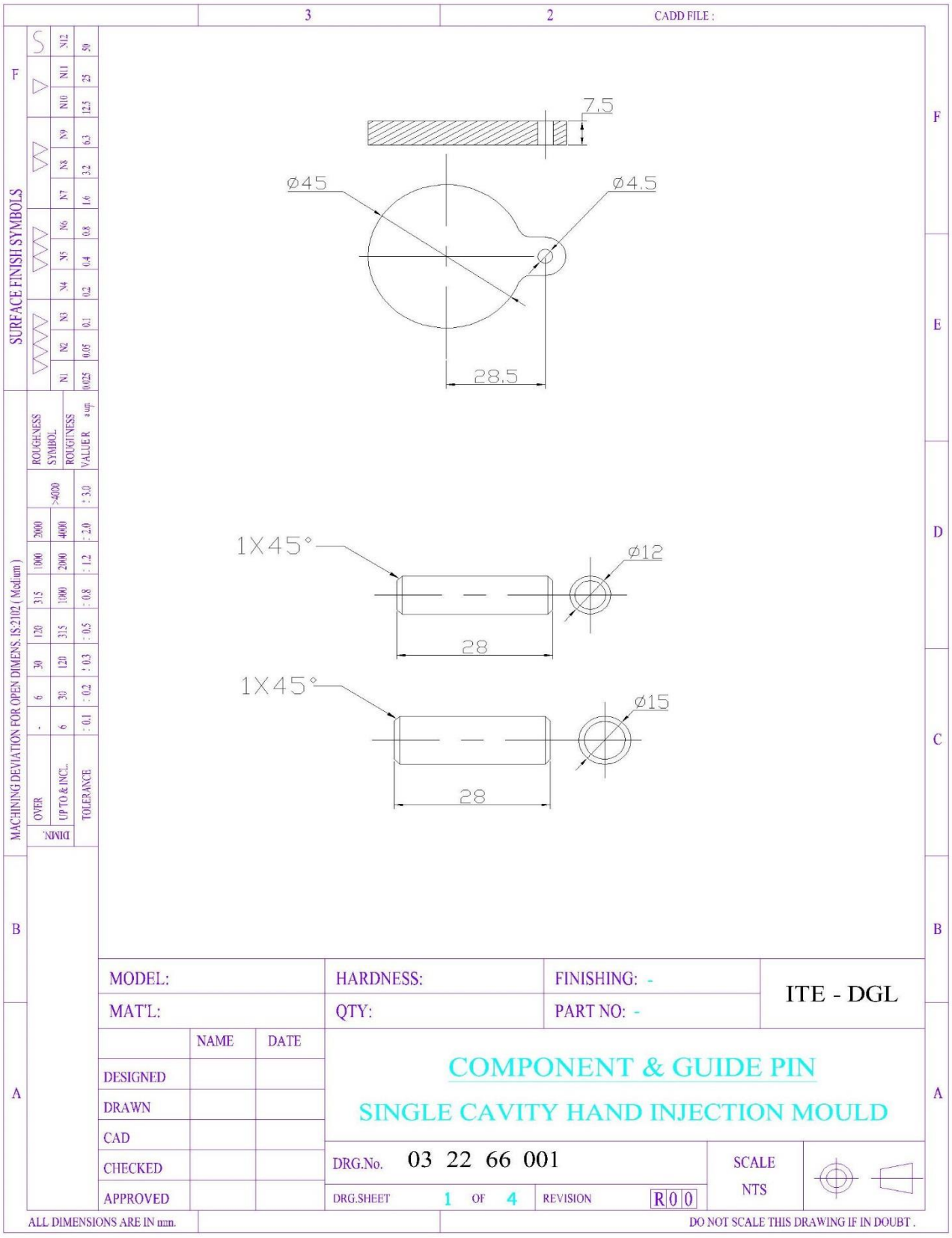
DRG.No. 03 22 55 001 | SCALE NTS | DRG.SHEET 8 OF 8 | REVISION R00

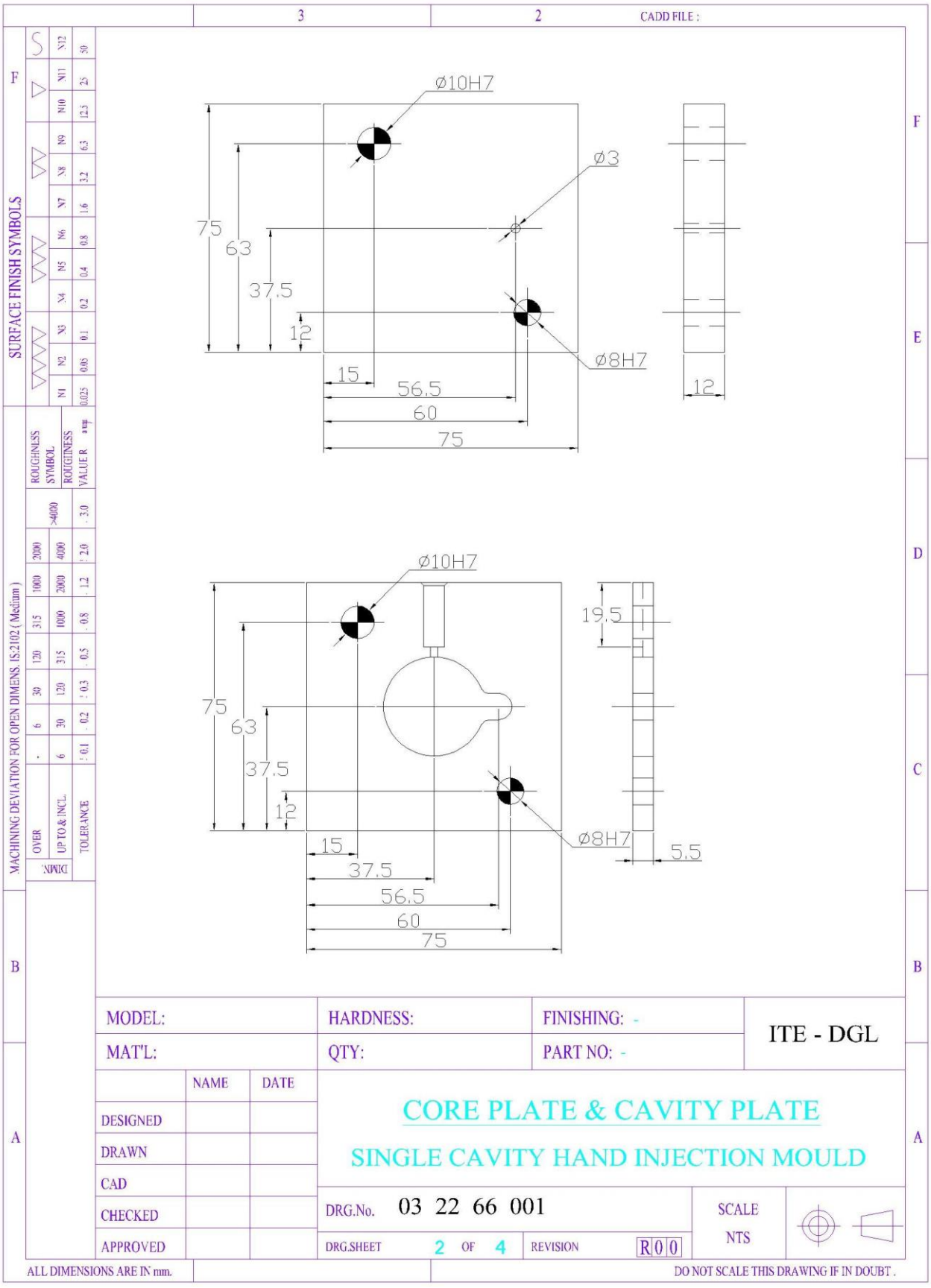
SURFACE FINISH SYMBOLS

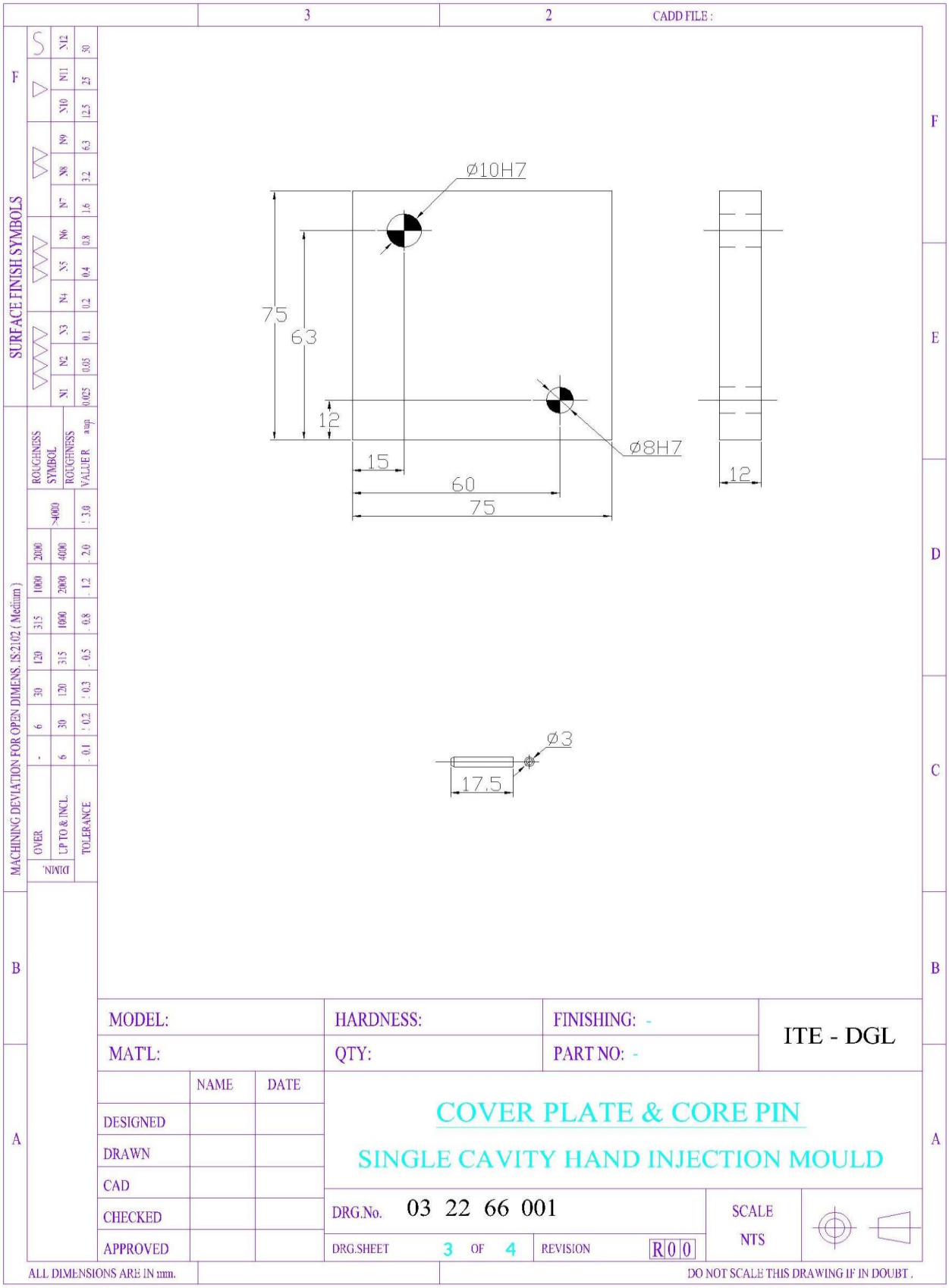
ALL DIMENSIONS ARE IN mm.

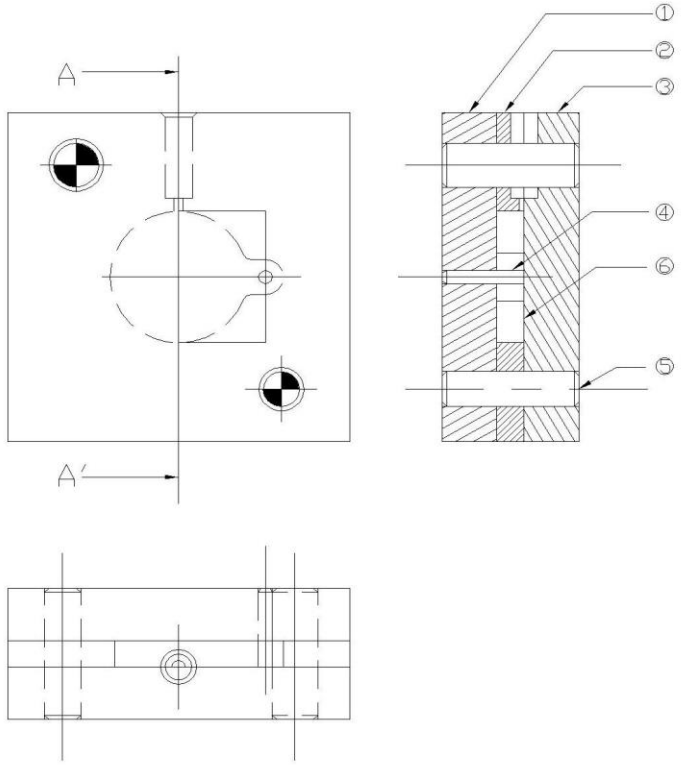
DO NOT SCALE THIS DRAWING IF PRODUCT ASKED.

Exercise –10 Single Cavity Injection Mould




3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a in µm
Ø10H7
Ø3
Ø8H7
75
63
37.5
12
15
56.5
60
75
19.5
5.5
MODEL:
HARDNESS:
FINISHING: -
MAT'L:
QTY:
PART NO: -
ITE - DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
CORE PLATE & CAVITY PLATE
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
DRG.SHEET 2 OF 4
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


3
2
CADD FILE :
SURFACE FINISH SYMBOLS
N12 50
N11 25
N10 12.5
N9 6.3
N8 3.2
N7 1.6
N6 0.8
N5 0.4
N4 0.2
N3 0.1
N2 0.05
N1 0.025
ROUGHENESS SYMBOL
ROUGHENESS VALUE R a μm
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
DIMEN. OVER UP TO & INCL. TOLERANCE
- 6 ± 0.1
6 30 ± 0.2
30 120 ± 0.3
120 315 ± 0.5
315 1000 ± 0.8
1000 2000 ± 1.2
2000 4000 ± 2.0
>4000 ± 3.0
Ø10H7
Ø8H7
75
63
12
15
60
75
12
Ø3
17.5
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
COVER PLATE & CORE PIN
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
SCALE NTS
DRG.SHEET 3 OF 4
REVISION R 0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .



BILL OF MATERIALS

SI.NO	PART NAME	MATERIAL	QUANTITY
1	CORE PLATE	MS	1
2	CAVITY PLATE	MS	1
3	COVER PLATE	MS	1
4	CORE PIN	STD	1
5	GUIDE PIN	STD	2
6	COMPONENT	HDPE	1

MODEL:	HARDNESS:	FINISHING: -	ITE - DGL
MAT'L:	QTY:	PART NO: -	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLED VIEW

SINGLE CAVITY HAND INJECTION MOULD

DRG.No. 03 22 66 001

SCALE NTS

DRG.SHEET 4 OF 4 REVISION R00

SURFACE FINISH SYMBOLS

ROUGHNESS SYMBOL													
	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	
ROUGHNESS VALUE R a um	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	

MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)

DIMN.														
OVER	-	6	30	120	315	1000	2000	4000	>4000					
UP TO & INCL.	6	30	120	315	1000	2000	4000							
TOLERANCE	0.1	0.2	0.3	0.5	0.8	1.2	2.0	3.0						

ALL DIMENSIONS ARE IN mm.

DO NOT SCALE THIS DRAWING IF IN DOUBT .

CADD FILE :

Board of Examination

Part A (I to IV units)

Answer any 10 two mark questions (10 x 2) = 20 Marks

Part B – V Unit

1. Assembled view of a given drawing (2 Views only) = 60(30+30) Marks
   a) Question from Machine drawing
   (or)
   b) Question from Tool Drawing
2. Bill of Materials, Dimensioning, Notes = 10 Marks

Viva voce = 10 Marks

Total **= 100 Marks**

Note to the examiner:

Part A

- Answer any 10 questions out of 15 questions.
- Fifteen questions should cover the complete syllabus (UNIT I to IV)

Part-B

- Answer should be evaluated from the print out for the Part-B questions
- Examiner should set the question paper to cover the complete syllabus of Unit-V.
- Examiner has to ask the student to answer any one question from the lot of 10 drawings with either or choice as detailed above.
- Examiner has to set the no. of questions minimum 10 , even one batch of students contains less than 10.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

III SEMESTER

2020 – 2021 onwards

4022350 – ENGINEERING METROLOGY PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME
(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022350

Semester : III

Subject Title : **ENGINEERING METROLOGY PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
ENGINEERING METROLOGY PRACTICAL	3	48	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

OBJECTIVES

- To practice linear and angular measurements
- To Use vernier caliper, vernier height gauge and micrometer
- To Use slip gauges to make standard dimensions
- To Measure angle of surface using sine bar
- To Use dial indicator to measure geometrical parameters
- To Demonstrate parallelism, squareness and circularity
- To Check the perpendicularity and squareness of a surface
- To Calibrate vernier caliper and micrometer using slip gauges

Detailed Syllabus

4022350 - ENGINEERING METROLOGY PRACTICAL

I. LINEAR MEASUREMENT:

1(a). Vernier caliper – Measuring the overall dimensions of a Die plate to an accuracy of 0.02 mm.

1(b). Micrometer – Measuring diameter and thickness of die components to an accuracy of one micron (0.001mm)

2(i). Vernier height gauge:- a) Measurement of height of the given work piece

b) Marking the given dimensions on the work piece.

c) Transferring measurements from one job to another.

2(ii). Vernier Depth gauge – Measuring the depth of blind holes in the give work piece.

3(a). Screw thread micrometer – Measuring the root dia of the given screw thread

3(b). Measurement of pitch of screw threads using screw pitch gauges.

3(c). Measurement of effective dia of screw thread using three wire method.

4. Measurement of Internal dia of the given die set bush using Inside Micrometer to an accuracy of one micron.

5. Slip Gauges – Building up the given required dimensions and measuring or marking or setting Go and No Go sizes in adjustable gap gauges, to an accuracy of 0.5 micron.

6. Measuring the chordal thickness of the gear teeth using the gear tooth vernier.

II. ANGULAR MEASUREMENT:

7. Measurement of angles using universal bevel protractor to an accuracy of 5'.

8. Using combination set i) Measure angle in the given component with protractor head

ii) Find or mark the center of the given cylindrical job using center head.

iii) Check and report the squareness of the given specimen using square head.

9. Measure the angle of the surface using Sine bar and Slip Gauges.

III. MEASUREMENT OF GEOMETRIC PARAMETERS AND CALIBRATION OF INSTRUMENTS:

10. Straightness – Measurement of concavity / convexity in a surface using Toolmaker's straight edge and feeler gauge.

11. Checking the parallelism of two planes using dial indicator.

12. Testing circularity of die set pillars using v-block and dial indicators.

13. Measurement of Run-out on
    i) External cylindrical surface
    ii) External conical surface using dial gauge
    iii) Checking of Perpendicularity of drill head guide
    iv) Checking of squareness of clamping surface of table to its axis.
14. Measurement of axial slip using dial indicators.
15. Calibration and adjusting of micrometers/ Vernier caliper using slip gauges

SCHEME OF EXAMINATION:

	Duration	Max. Marks
I) Part – A		
a) Linear Measurement		
or	1 ½ Hrs.	45
b) Angular Measurement		
II) Part – B		
c) Measurement of Geometrical Parameters & calibration.	1 ½ Hrs.	45
III) Viva – Voce		10
	Total	**100**

SCHEME OF VALUATION:

Observation / Reading	-	20 marks
Tabulation / Formula	-	10 marks
Calculation & Result	-	15 marks

Details of The Equipment's (for a batch of 30 students)

NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)
YEAR	SECOND
SEMESTER	III
NAME OF THE LABORATORY	4022350 ENGINEERING METROLOGY PRACTICAL

S.NO	LIST OF THE EQUIPMENTS	QUANTITY REQUIRED
1	Vernier caliper 0-150mm	6
2	Micrometer 0-25mm	6
3	Vernier height gauge 0-300mm	2
4	Vernier depth gauge 150mm	2
5	Screw thread micrometer	1
6	Inside micrometer 25-50 mm	6
7	Slip gauges	2
8	Gear tooth vernier	2
9	Universal bevel protractor	3
10	Combination set	1
11	Sine bar 200mm	1
12	Tool makers straight edge	2
13	Feeler gauge	2
14	Dial test indicator with magnetic stand	3
15	V-block	1
16	Surface plate	1
17	Spirit level	2
18	Go & No Go gauges set	1

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

III SEMESTER

2020 – 2021 onwards

4022360 – MANUFACTURING TECHNOLOGY PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME
(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022360

Semester : III

Subject Title : **MANUFACTURING TECHNOLOGY PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 16 weeks

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MANUFACTURING TECHNOLOGY PRACTICAL	5	80	25	100*	100	3hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

OBJECTIVES:

- Identify the parts of a centre lathe & Drilling machine
- Identify the work holding devices
- Set the tools for various operations
- Operate the lathe and Machine a component using lathe
- Operate the Drilling machine and produce different sizes of holes.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

1. Lathe
Syllabus

1. Introduction of safety in operation machines.
2. Introduction to lathe and its parts.
3. Introduction to work holding devices and tool holding devices used in Lathe
4. Types of tools used in lathe work
5. Types of measuring instruments and their uses.
6. Setting of work and tools.
7. Operation done in lathe
8. Practice on a lathe
9. Introduction of work holding and tool holding devices used in drilling machine
10. Drilling, Tapping, Counter Boring, Countersinking and Reaming

Exercises :

1. Plain turning
2. Step turning
3. Taper turning
4. Thread cutting
5. Knurling
6. Bushing
7. Eccentric Turning
8. Drilling
9. Tapping
10. Counter Boring
11. Countersinking
12. Reaming

Lathe Works

Manufacture and estimate the cost of the following exercises by assuming the suitable raw material for the final size of the components.

BOARD EXAMINATION

Note of the Faculty : Last job of the raw material(MS Rod Ø32x77mm and MS Rod Ø25x77mm) to be retained in student wise or batch wise (Maximum Two Students per batch).This may be verifiable at the time of Board Practical Examination by the external examiner

Board Examination-Question Paper Pattern

1. Two questions should be asked in such way that one from Lathe and one from drilling
2. Dimensions can be altered with the consent of External Examiner

MODEL QUESTION PAPER

1. Machine the component as per the given sketch 60 Marks
   Any one of the exercises in Lathe

2. Make the component as per the given sketch 30 Marks
   Any one of the exercises in Drilling

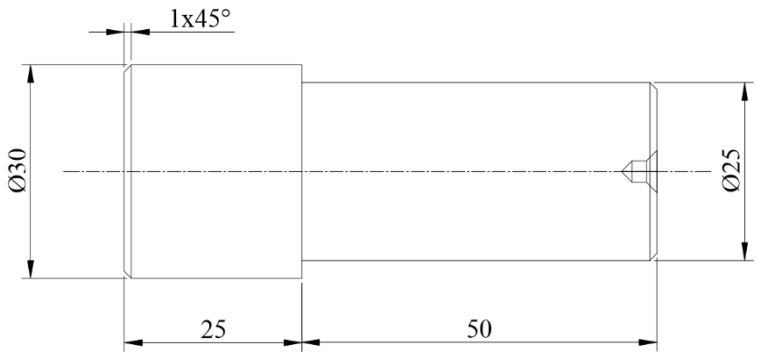
DETAILED ALLOCATION OF MARKS

Lathe Work	**-**	**60 Marks**	
	Preparation	-	10
	Dimensions	-	40
	Finishing	-	10
Drilling	**-**	**30 Marks**	
	Marking	-	15
	Finishing	-	15
	Viva – Voce	-	10 Marks
Total	**-**	**100 Marks**	

Any one of the exercise from Drilling

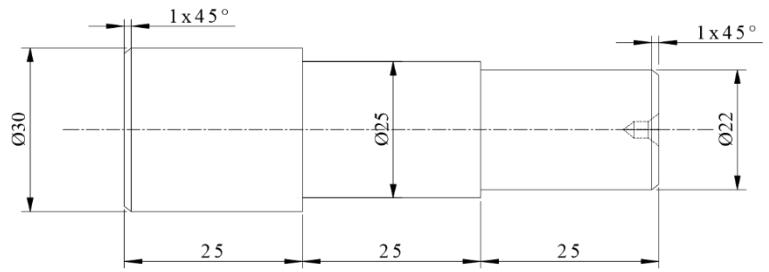
Exercise No:1 –Plain turning .

Raw Material: MS Rod Ø32x77mm



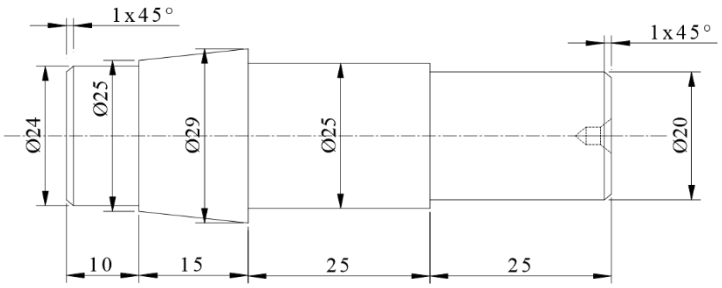
Exercise No:2-Step turning

Raw Material: Exercise No:1



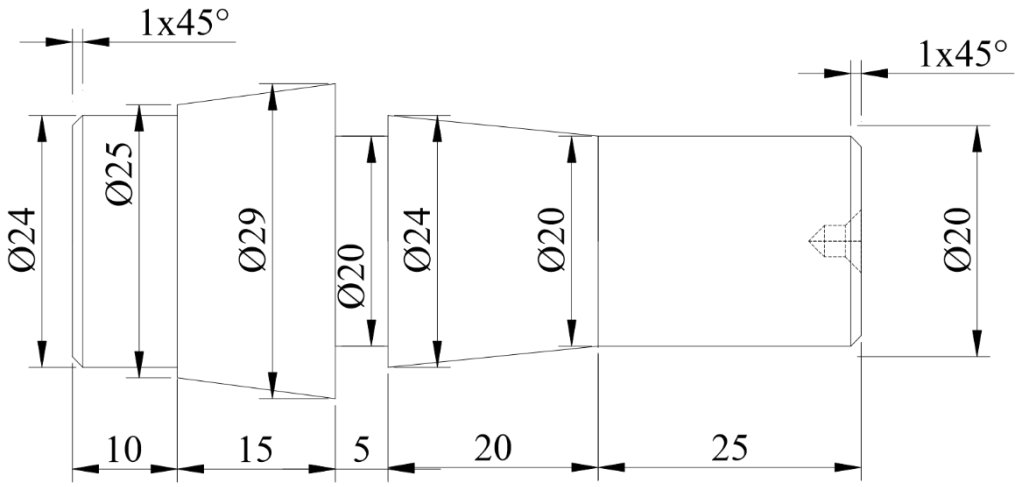
Exercise No:3-Step and taper turning

Raw Material: Exercise No:2



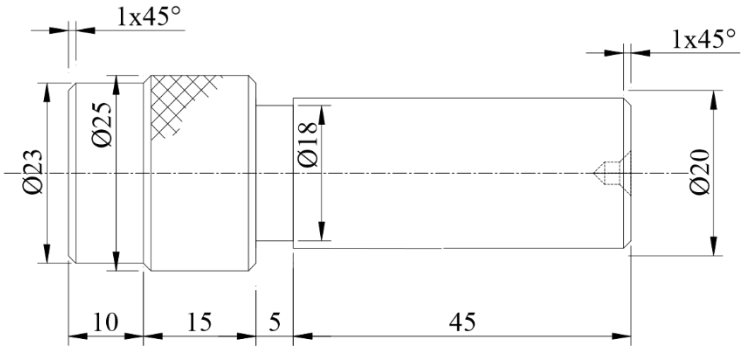
Exercise No: 4 -Step and taper turning

Raw Material: Exercise No: 3



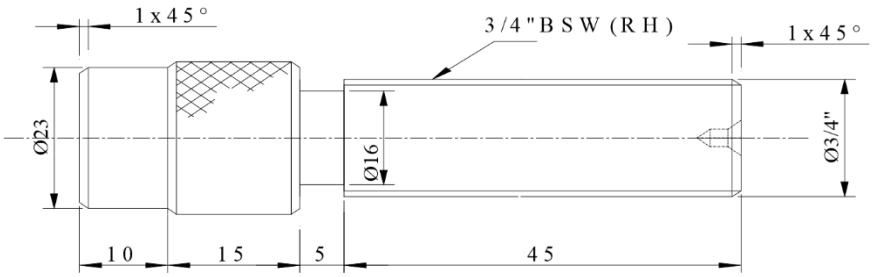
Exercise No: 5 Knurling and step turning

Raw Material: Exercise No:4



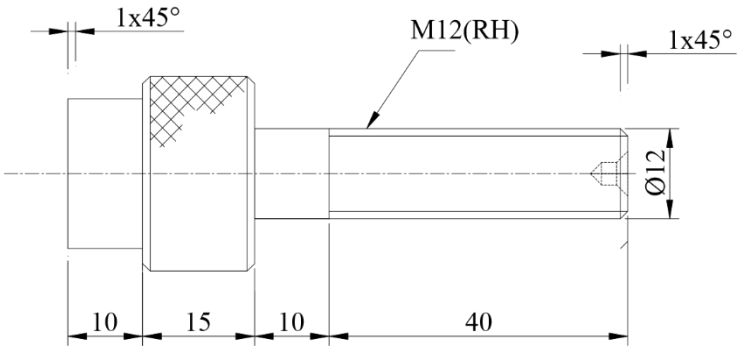
Exercise No:6 BSW Thread cutting

Raw Material: Exercise No:5



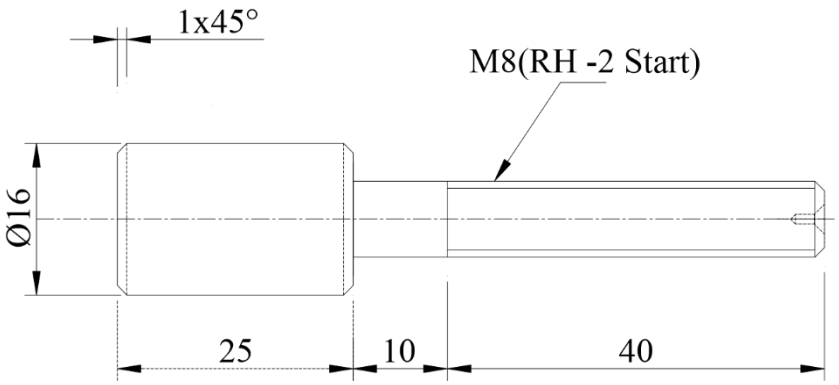
Exercise No:7 – Metric thread cutting

Raw Material: Exercise No:6



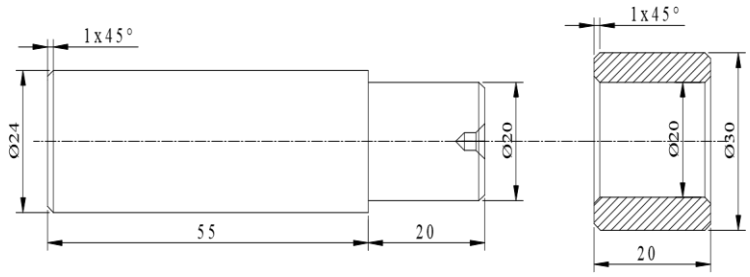
Exercise No:8- Metric thread cutting

Raw Material: Exercise No:7



Exercise No: 9 -Shaft and bush mating

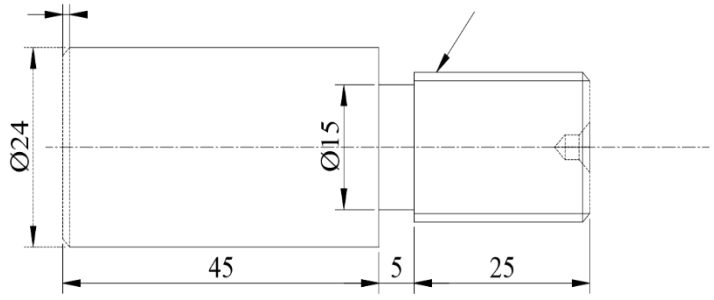
Raw Material: MS Rod Ø25x77mm and Ø32x30mm



Exercise No: 10- Thread cutting

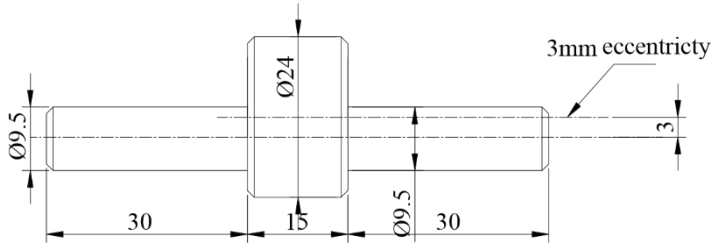
Raw Material: Exercise No:9

1x45°M20(RH)(OR)3/4"BSW



Exercise No:11-Eccentric Turning

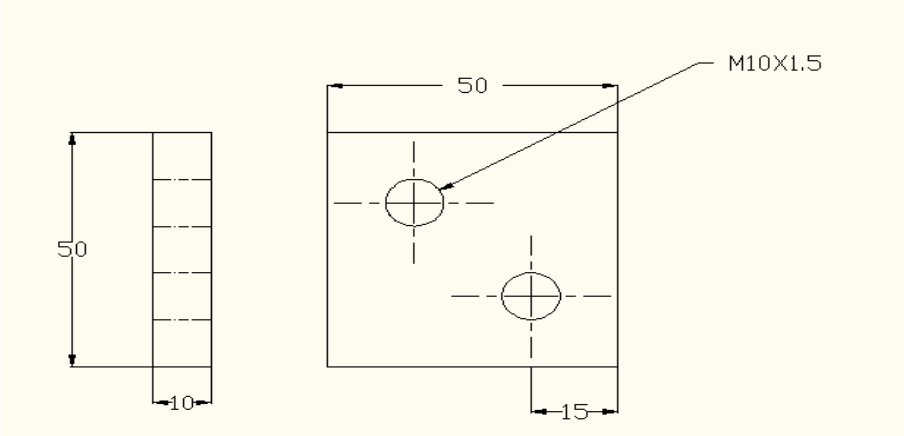
Raw Material: Exercise No:10



Make the following jobs using drilling machine.

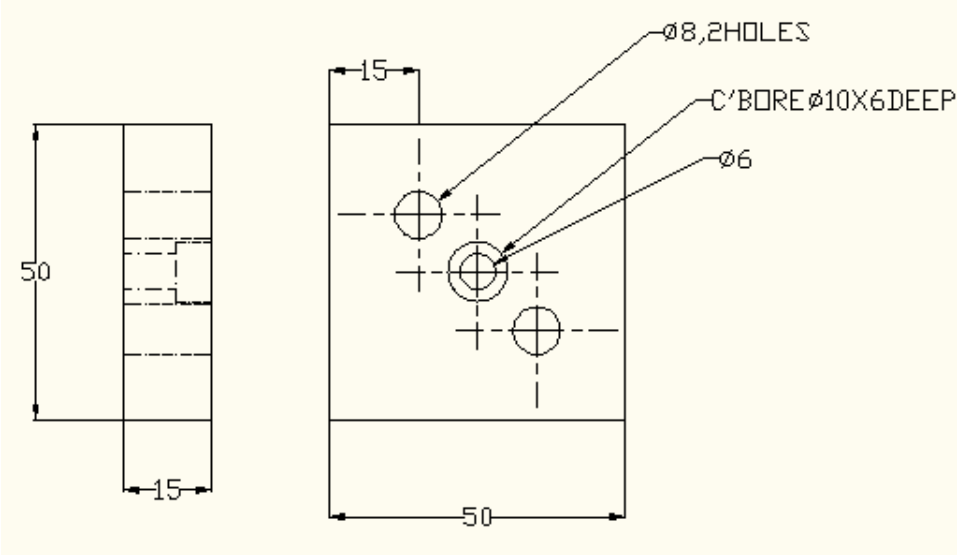
Exercise No:1 Drilling & Tapping

Raw material 50mm X 50mm X 10 mm thick M.S. Flat



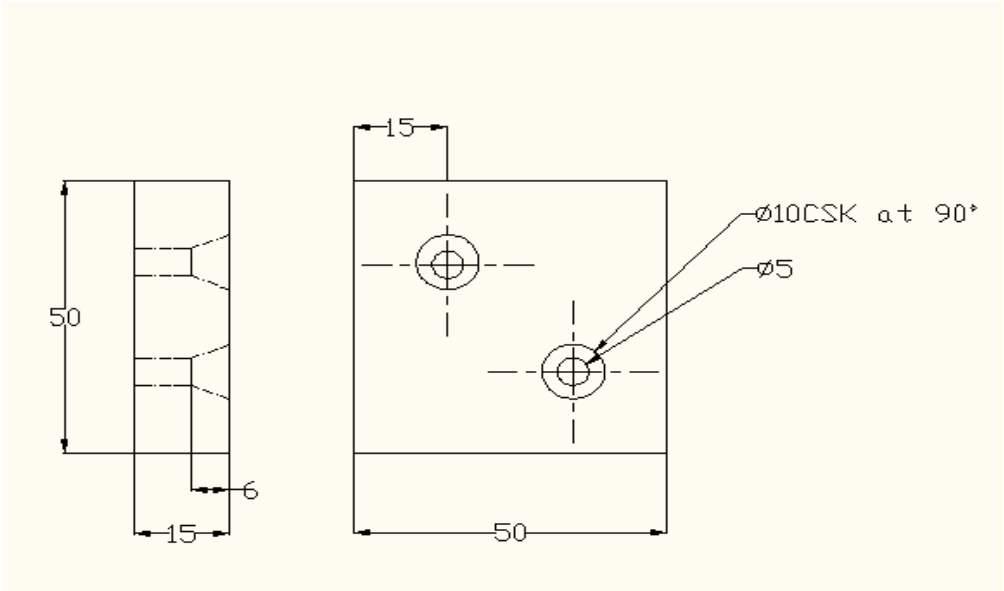
Exercise No:2 Drilling & Counter boring

Raw material 50mm X 50mm X 15 mm thick M.S. Flat



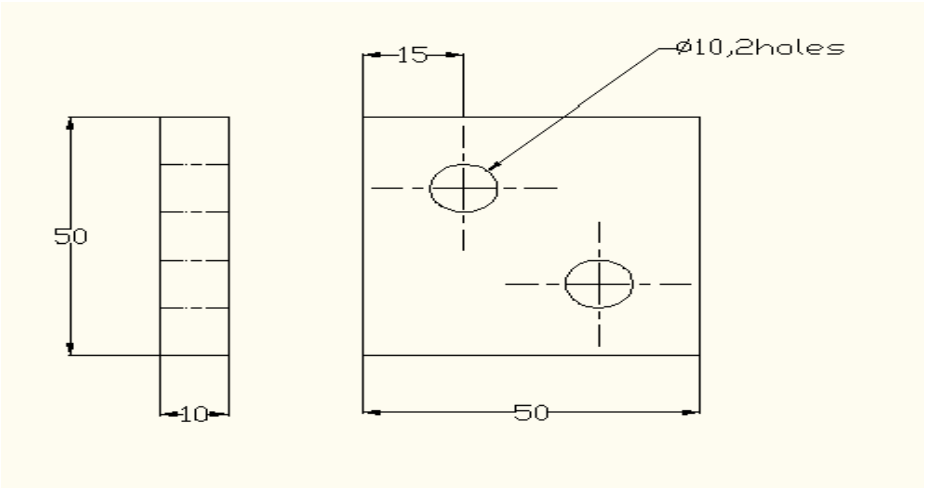
Exercise No :3 Drilling & Counter sinking

Raw material 50mm X 50mm X 15 mm thick M.S. Flat



Exercise No:4 Drilling and Reaming

Raw material 50mm X 50mm X 10 mm thick M.S. Flat



List of Equipment's (for a batch of 30 students)

Turning:

1. Center Lathe 4 ½ ' Bed length	-	15 No's
2. 4 Jaw / 3 Jaw Chucks	-	required Numbers
3. Chuck key (10 mm x 10 mm size)	-	15 No's
4. Box spanner	-	15 No's
5. Cutting Tool H.S.S ¼ '' X ¼ '' X 4 '' long	-	15 No's
6. Pitch gauge	-	5 Nos
7. Vernier Caliper (0-25 and 25-50)	-	5 nos each
8. Micrometer, Inside and Outside(0-25 and 25-50)	-	5 each
9. Vernier Height Gauge(300mm)	-	1 no
10. Snap gauge	-	1 set
11. Gear tooth Vernier	-	1 No
12. Parallel Block	-	2 Nos
13. Steel Rule (0-150)	-	15 Nos.
14. Outside and Inside Calipers	-	15 Nos. each
15. Thread gauge	-	5 Nos.
16. Bevel Protractor	-	1 No
17. Jenny Caliper	-	5 Nos.
18. Dial Gauge with Magnetic Stand	-	5 Nos.
19. Marking Gauge	-	10 Nos.
20. Safety Glass	-	15 Nos.

Drilling:

1. Upright drilling machine	-	2 Nos.
2. Radial drilling machine	-	1 No.
3. Drill bit & Tap set	-	Sufficient quantity
4. Reaming bit	-	Sufficient quantity
5. Counter sinking bit	-	Sufficient quantity
6. Counter boring bit	-	Sufficient quantity
7. Plug gauges	-	Sufficient quantity
8. Vernier Height Gauge	-	1 No.
9. Surface plate	-	2 Nos.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

III SEMESTER

2020 – 2021 onwards

4022370 – BASIC ENGINEERING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022370

Semester : III

Subject Title : **BASIC ENGINEERING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 16 weeks

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
BASIC ENGINEERING PRACTICAL	4	64	25	100*	100	3hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

OBJECTIVES:

- Identify the tools and equipment's used in Foundry & welding
- Prepare sand moulds for different patterns.
- Perform welding operation to make different types of joints.
- Identify the different welding defects.
- Appreciate the safety practices used in welding
- Study of two and four stroke engine and its parts
- performance test on two and four stroke engines

1. Foundry (25 Hrs)

Syllabus

1. Introduction of tools and equipment's
2. Types of patterns
3. Types of sand
4. Preparation of sand moulds
5. Furnaces – crucible furnace and tilting furnace
6. Core sands, preparation of cores

Exercises :

Preparation of sand mould:

1. Solid pattern
    a. Stepped pulley
    b. Bearing top
    c. Gear Wheel
    d. T-pipe
2. Split pattern
    a. Bent Pipe
    b. Tumbles
3. Loose Piece Pattern – Dove tail
4. Cylindrical core making
5. Melting and casting – (not for Examination, only for class exercises)

2. Welding (18 Hrs)

Syllabus

1. Introduction of Safety in welding shop
2. Introduction to hand tools and equipment's
3. Arc and gas welding equipment's
4. Types of joints

Exercises :

1. **Arc welding**
    - Lap joint (Material : 25 mm x 3mm Ms flat)
    - Butt joint (Material : 25mm x 6mm Ms flat)
    - T- joint (Material : 25mm x 3mm Ms flat)
    - Corner joint (Material : 25mm x 3mm Ms flat)
2. **Gas Welding**
    - Lap joint (Material : 25mm x 3mm Ms flat)
    - Butt joint (Material : 25mm x 6mm Ms flat)
3. **Gas cutting : Profile cutting**
4. **Spot welding – Lap joint (18/20swg)**
5. **Demonstration of Soldering and brazing**

3. Thermal Engineering Lab (15 Hrs)
Syllabus

1. Introduction of two stroke and four stroke engine and its parts.
2. Determine the valve and port timing diagram of SI and CI engine.
3. Analyse the influence of variations in TDC and BDC operation
4. Calculate the performance characteristics of SI and CI Engine

Exercises:

1. Construction of valve timing diagram for four stroke engine.
2. Construction of port timing diagram for two stroke engine.
3. IC engine performance test for four stroke SI engine
4. IC engine performance test for four stroke CI engine

MODEL EXAM:7 Hrs

List Of Equipment's (for a batch of 30 students)

Welding:

1. Arc welding booth	- 2 No's with oil /air cooled Welding transformer with accessories
2. Gas welding unit (Oxygen and acetylene cylinder)	– 1 Set
3. Flux	– 500grams
4. Electrode 10 SWG	– 200 No's
5. Face shield	– 3 No's
6. Gas welding goggles	– 2 No's
7. Leather Glows 18''	– 4 Set
8. Flux chipping hammer	– 4 No's
9. Spot welding machine	- 1 No

Foundry:

1. Crucible furnace	-	1 No
2. Tilting furnace	-	1 No
3. Shovel	-	20 Nos
4. Rammer set	-	30 Nos
5. Slick	-	30 Nos
6. Strike-off bar	-	30 Nos
7. Riddle	-	15 Nos
8. Trowl	-	30 Nos
9. Lifter	-	30 Nos

10. Sprue pin - 60 Nos
11. Brush - 20 Nos
12. Vent rod - 30 Nos
13. Draw spike - 30 Nos
14. Gate cutter - 30 Nos
15. Cope box - 30 Nos
16. Drag box - 30 Nos
17. Core box - 10 Nos
18. Runner & riser - 60 Nos
19. Moulding board - 30 Nos
20. Patterns - 15 Nos each

Thermal Engineering Lab:

1. Two stroke petrol engine cut section model - 1 No
2. Four stroke diesel engine cut section model - 1 No
3. Four stroke petrol engine with belt /lamp load assembly - 1 No
4. Four stroke Diesel engine with belt /lamp load assembly - 1 No

Scheme of Examination:

For Board practical examination two exercises(ie one question from each chapter) should be asked in the any of following combination • Foundry & Welding Or • Welding & Thermal Lab Or • Thermal lab & Foundry	45X2=90marks
Viva Voce	10 marks
Total	100 marks

Scheme of Valuation:

Foundry	: Mould Preparation	- 30 marks
	Gate cutting	- 15 marks
Welding	: Weld run	- 30 marks
	Finish	- 15 marks
Thermal Engg Lab	: Observation/ Reading	- 30 marks
	Calculation	- 15 marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

N – SCHEME

IV SEMESTER

2020 – 2021 onwards

4022410 – ENGINEERING MATERIALS AND METALLURGY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022410

Semester : IV

Subject title : **ENGINEERING MATERIALS AND METALLURGY**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 16 weeks

SUBJECT	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
ENGINEERING MATERIALS AND METALLURGY	5	80	25	100*	100	3hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

TOPICS AND TIME ALLOCATION:

UNIT	TOPIC	TIME (Hrs)
I	Metallurgy and Material Structure	15
II	Phase diagrams and Iron Carbon equilibrium diagram	15
III	Heat Treatment and Properties of Engineering Materials	15
IV	Ferrous and Non – Ferrous Metals and their Alloys	14
V	Metallographic, Surface Treatment and Non Destructive Testing	14
	TEST & MODEL EXAMINATIONS	07
	Total	80

Rationale:-

The knowledge about the various types of Engineering Materials, their properties and applications are required for proper selection and use of materials in Tool Design and design of mechanical engineering components. Thorough understanding of the methods of heat treatment, their effect and applicability is essential to ensure the full service life of the tools and components. The knowledge on various metallographic and non destructive testing methods is necessary to verify the properties, condition and nature of various materials.

OBJECTIVES

The objective of this course is to make the Student:

- To know about the different types of material structure.
- To acquire knowledge on Deformation of Metals.
- To Understand the Phase Diagrams.
- To Understand and Use Iron – Carbon Equilibrium Diagram.
- To Study about various Heat Treatment Process.
- To Get Knowledge on Thermal & Magnetic properties of Materials.
- To know about Superconductivity.
- To study about various Ferrous & Non Ferrous Alloys.
- To understand the process of Non – Destructive Testing.

DETAILED SYLLABUS

4022410- ENGINEERING MATERIALS AND METALLURGY

Unit No.	NAME OF THE TOPICS	Hours
I	**METALLURGY AND MATERIAL STRUCTURE:** 1.1 **Crystalline Structure** Crystallography, crystal, single crystal, crystallization of metals, crystal symmetry, elements of symmetry, space lattice, unit cell, lattice parameters of unit cell, primitive cell, crystal structure, crystal system – cubic system, Tetragonal system, Hexagonal or trigonal system, orthorhombic system, monoclinic system, triclinic system. Miller Indices, Crystal directions, coordinate number, atomic radius, number of atoms per unit cell, density of crystal material. Material structure –Face centered cubic (FCC), Body centered cubic (BCC), Hexagonal close-packed (HCP). **1.2Bonding in solids** Primary bonds – Metallic bond, Ionic bond, Covalent bond. Imperfections in metal crystals- types of defect- point defect, line defect, surface defect, volume defect, effect of imperfection on metal properties **1.3Deformation of metals:** Elastic deformation, plastic deformation, elastic after effect. Deformation by slip, ideal plastic body. Plastic deformation of a single crystal – slip, twinning. cold working and effect of cold working on metals. Hot working of metals, advantages and disadvantages of hot working.	**7** **4** **4**
II	**PHASE DIAGRAMS AND IRON CARBON EQUILIBRIUM DIAGRAM:** **2.1 Phase Diagrams:** Solid solution – types of solid solution- substitutional and interstitial solid solution- solid solution alloy – System, Phase, Component, Degree of freedom or variance of the system. Phase rule, Cooling curves – cooling curve of pure metal, solidification or crystallization of metal, cooling curve of eutectic type alloy. Construction of equilibrium diagrams, Interpretation of equilibrium diagrams. Types of phase diagrams – Eutectic system, Peritectic system, Eutectoid system, Peritectoid system. Iron-Carbon system – allotropy of iron, micro constituents of iron and steel, Iron-iron carbide equilibrium diagram, critical temperatures, effect of alloying elements on Fe-Fe_3C diagram. **2.2 Heat Treatment and Transformation Diagram:** Purpose of Heat Treatment, Heat treatment cycle, Time-Temperature-Transformation	**8** **7**

	(TTT) diagram – importance of T.T.T diagram, steps to construct T.T.T diagram, T.T.T diagram for eutectoid steel, T.T.T diagram and cooling curves.	
III	**HEAT TREATMENT, PROPERTIES OF ENGINEERING MATERIALS:** **3.1 Heat Treatment of Steel:** Annealing – stress relief annealing, Process annealing, spheroidise annealing, Full annealing. Normalizing, Hardening – process, quenching medium, hardenability, end quench hardenability test. Tempering – low temperature tempering, medium temperature tempering, High temperature tempering, Temper brittleness, Austempering, Martempering. Case hardening – carburising – pack carburising, liquid carburising, gas carburising. Nitriding, cyaniding, carbonitriding. Surface hardening – flame hardening, induction hardening. **3.2 Properties of Engineering Materials:** Introduction, Mechanical properties of Materials – Strength, Elasticity, Plasticity, Ductility, Malleability, stiffness, toughness, brittleness, hardness, wear resistance, machinability, castability, weldability, fatigue strength, creep. Thermal Properties – Introduction, Heat capacity, Expansion, conductivity, Thermal stress. Magnetic Properties – Introduction, Diamagnetism, Para Magnetism, and Ferromagnetism, Influence of Temperature on Magnetic Behavior. Superconductivity.	**8** **7**
IV	**FERROUS AND NON – FERROUS METALS AND THEIR ALLOYS:** **4.1 Ferrous Metals & its Alloys:** Pig Iron – classification, properties and applications, Wrought Iron – composition, properties and uses. Cast Iron – Introduction, classification, effects of alloying elements on the structure of cast iron. Designation system of Cast Iron as per BIS. Composition, Mechanical properties, applications of Grey cast iron, Spheroidal graphite cast iron, Malleable cast iron .Steels – Classification of steel, Effects of alloying elements in steel. Composition, Mechanical properties, applications of low carbon steel, medium carbon steel and high carbon steel. HSS , Tool steel, Stainless steel - Composition ,Mechanical properties and applications **4.2 Non – Ferrous Metals & its Alloys:** Aluminum & its alloys – types, properties and applications. Designation system of aluminum and its alloys as per BIS .Copper & its Alloys – Types , Brass, Gunmetal – Composition, properties & applications, Zinc – Composition , properties & applications.	**7** **7**

V	**Metallography, Surface Treatment and Non Destructive Testing** **5.1 Metallography:** Metallurgical microscope – Preparation of specimen, micro and macro examination. Study of micro structure of Ferrous and Non Ferrous metals. Modern techniques of material studies – electron microscope, photoelectron spectroscopy. **5.2 Surface Treatment:** Mechanical cleaning and finishing – Vibratory finishing, wire brush cleaning, buffing and electro polishing. Chemical cleaning – Vapour degreasing, solvent cleaning, alkaline cleaning, ultrasonic cleaning, acid pickling. Surface coatings – Electroplating, painting, powder coating, blackening, vacuum Metalizing, Physical vapour deposition, chemical vapour deposition. **5.3 Non Destructive Testing:** Magnetic particle inspection, X-Ray inspection, Gamma radiography, Ultrasonic Inspection, Electrical methods, Damping test, Non-magnetic methods of crack detection.	**5** **5** **4**
	TEST & MODEL EXAMINATIONS	**07**

Text Books:

1. Dr . O.P.Khanna , Material science and Metallurgy, Dhanpat Rai & Sons
2. Material Science and Engineering ,William .D.Callister JR , Sixth Edition

References Books

1. ASM Hand book, Vol.1, ASM International, Materials Park, Ohio, U.S.A,
2. S.K.Hajra Choudhury and A.K.Hajra Choudhury, Elements of Workshop Technology, Media Promoters and publishers pvt. Ltd

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

IV SEMESTER

2020 – 2021 onwards

4022420 – FLUID POWER AND THERMAL ENGINEERING

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022420

Semester : IV

Subject Title : **FLUID POWER AND THERMAL ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 16 weeks

SUBJECT	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
FLUID POWER AND THERMAL ENGINEERING	5	80	25	100*	100	3hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Time allocation

UNIT	TOPIC	TIME (Hrs)
I	PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS	15
II	PNEUMATIC SYSTEM	14
III	HYDRAULIC SYSTEM	14
IV	THERMODYNAMICS ,INTERNAL COMBUSTION ENGINES & HEAT EXCHANGERS	15
V	E- VEHICLES	15
	TEST & MODEL EXAMINATIONS	07
	Total	80

RATIONALE:

The growth of Engineering and Technology is associated with fluid power applications and heat & work transfer. Low cost Automation using Pneumatics and Hydraulic machines and presses are very common in Automobile and Die casting industries. Hence studying the fundamentals of Pneumatics, Hydraulics and Heat transfer facilitates better understanding of their applications in the area of Tool & Die Making and widens the employment opportunities.

OBJECTIVES

At the end of the study of this subject the student will be able to:

- Define the properties of fluids
- Explain the working of pressure measuring devices
- Appreciate the use of fluid power
- Explain the working of pneumatic system and its elements
- Explain the working of Hydraulic system and its elements
- Compare Pneumatic system with Hydraulic system
- Design fluid power circuits for industrial applications
- Explain the concept and types of thermodynamic systems
- Explain the working of IC engines & heat exchangers
- Concept of E vehicle, drives and its importance
- Objectives of E V policy & recycling Ecosystem

DETAILED SYLLABUS

4022420 - FLUID POWER AND THERMAL ENGINEERING

Contents: Theory

UNIT NO	NAME OF THE TOPIC	Hrs
I	**PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS** Fluid-Definition-Classification of fluids-Ideal and real fluids-Newtonian and non-Newtonian-Properties of fluids-Density, Specific weight, Specific volume, Specific gravity, Compressibility, Viscosity, Surface tension and capillarity. Pressure-Unit of pressure-Pressure head-Atmospheric pressure-Gauge pressure and Absolute pressure-Problems-Pascal's law-Proof-Applications of Pascal's law-Hydraulic press, Hydraulic jack. Pressure Measurement -Piezometer tube-Simple U-tube manometer-differential U- tube manometer-Inverted differential U-tube manometer-Micro manometer-Inclined tube micro manometer-Problems-Mechanical Pressure gauge-Bourdan tube pressure gauge-Diaphragm pressure gauge-Dead weight pressure gauge.	**7** **8**
II	**PNEUMATIC SYSTEM** Pneumatic system and its elements-Filter, Pressure regulator, Lubricator unit-Pressure control value-3/2 DCV, 5/2DCV, and 5/3DCV-Check value- Flow control value-Throttle value-Shuttle valve-Quick exhaust valve-Time delay value-Pneumatic actuators-Single acting cylinder, Double acting cylinder, Air motor, ISO symbols of Pneumatic components. Pneumatic Circuits-Direct operation of single acting cylinder-Operation of double acting cylinder-Operation of double acting cylinder with metering-in control-Operation of double acting cylinder with metering-out control-Use of shuttle valve in pneumatic circuit-Use of quick exhaust valve in pneumatic circuits-Automatic operation of double acting cylinder-Merits and Demerits of pneumatic system-Applications.	**7** **7**
III	**HYDRAULIC SYSTEM** Hydraulic system and its elements-Merits, Demerits and applications of hydraulic system. Hydraulic pumps-types-positive displacement pumps and non - positive displacement pumps -Gear pumps-External gear and internal gear type-vane pump-Axial piston pump and Radial piston pump-Hydraulic cylinders and Hydraulic motors - ISO symbols for hydraulic components -pressure relief valve-Directional control valves-3/2DCV,4/2DCV,4/3DCV.	**2** **5**

	Hydraulic accumulator and its uses-Types-Gravity type accumulator, spring loaded accumulator, Gas loaded accumulator-Pressure intensifier. Hydraulic circuits-Operation of double acting cylinder using metering-in control and metering out control-Operation of Hydraulic motor using metering-in and metering out- control Hydraulic circuit using sequence valves and counter balance valves - Hydraulic circuit for shaping machine, surface grinding machine and Milling machine. Comparison of Hydraulic system and Pneumatic system.	**2** **5**
IV	**THERMODYNAMICS** Thermodynamic system-Types-Closed system, Open system and isolated system-Property and state of a system-Intensive and Extensive properties - Thermodynamic process-Cycle-Point and Path functions-Law of conservation of energy-Thermodynamic equilibrium- laws of thermodynamics. Laws of perfect gases- -Equation of state-Universal gas constant-Relationship between the specific heats and gas constants. **INTERNAL COMBUSTION ENGINES** Introduction to IC Engines-Classification-Working of four stroke cycle petrol and diesel engines-Merits & Demerits-Working of two stroke cycle petrol and diesel engines-Merits & Demerits-Comparison of four stroke and two stroke engines. **HEAT EXCHANGERS** Heat transfer in engineering –Modes of heat transfer-Conduction, Convection and Radiation. Heat transfer by conduction-Fourier law of heat conduction-Thermal conductivity of engineering materials-Heat conduction through plane wall-Heat conduction through composite wall-Simple problems. Newton's law of cooling-Stefan Boltzmann law of radiation. Heat exchanger-types, parallel flow heat exchanger, counter flow heat exchangers-Application of heat exchangers.	**6** **3** **6**

V	**E-VEHICLES** Environmental impact and history: Air pollution – Petroleum resources – History of Electric vehicles -History of Fuel Cell Vehicles Battery Electric Vehicle (BEV) – Fuel Cell Electric Vehicle (FCEV) – Description.	**4**
	Electric Vehicles: Configurations of Electric Vehicle – Performance of Electric Vehicles – Tractive Effort in Normal Driving – energy consumption. Hybrid Electric Vehicles: Concept of Hybrid electric drive trains – Architecture of Hybrid Electric Drive trains. Electric Propulsion Systems: Drive Systems: DC motor drives - Principle of operation – Induction Motor drives - Basic operation principles Energy Storages: Electrochemical Batteries – Battery Technologies – Lead Acid Batteries – Nickel Based Batteries – Lithium Based Batteries – Charging system – DC charging – Wireless charging	**7**
	Tamilnadu E-vehicle Policy 2019: Vehicle Population in Tamilnadu – Need of EV Policy – Advantage of EV Eco system – Scope and Applicability of EV Policy – Objectives of EV Policy – Policy Measures Recycling Ecosystem – Battery and EVs.	**4**
	TEST & MODEL EXAMINATIONS	**07**

Text Books:

1. Sundaramurthy, Fluid Mechanics and Fluid Power, Narayana publications.
2. Nag.P.K., Engineering Thermodynamics, Tata Mc Graw Hill.
3. R.Srinivasan, Hydraulic and Pneumatic controls, Vijay Nicole Imprints PVT.LTD, second edition, Chennai.
4. Modern electric, Hybrid electric & Fuel cells vehicles –Mehrdad ehsani ,Yimin Gao, Stefano Longo & Kambiz Ebrahimi.

Reference Books:

1. Khurmi.R.S, A Test book of Hydraulics, Fluid Mechanics and Hydraulic Machines, S Chand & CO.
2. Khurmi R.S and Gupta.K, A Text book of Thermal Engineering, S Chand & CO.
3. Ballaney.B.L., Applied Thermodynamics , Khanna publishers.
4. Bansal.R.K, Fluid Mechanics and Hydraulic Machines .
5. Electric Vehicles and the end ICE age-Anupam Singh.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

IV SEMESTER

2020 – 2021 onwards

4022430 – TOOL ROOM SPECIAL MACHINES

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL&DIE)

Subject Code : 4022430

Semester : IV

Subject Title : **TOOL ROOM SPECIAL MACHINES**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
TOOL ROOM SPECIAL MACHINES	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Cutting Tools and Mechanics of Metal Cutting	15
II	Boring, Jig Boring, Jig grinding, Tool and Cutter Grinder and Cylindrical Grinder	14
III	Milling Machines and Gear Generation Processes	14
IV	CNC Machine and its Components	15
V	Un-Conventional Machining	15
Test & Model Examinations		07
Total		**80**

RATIONALE:

Globalization and technological advances making tremendous growth in industrial activities, which in turn needs tool and die makers for most of the engineering products manufacturing industries. To meet out such demand and to sustain we have to explore the knowledge about tool room special machines covering the various operations and skill set required for the development of nation and its people.

OBJECTIVES:.

At the end of the study of this subject the student will be able to:

- Describe the different forces in orthogonal and oblique cutting
- Estimate the forces in metal cutting operations
- Describe about various cutting tool materials
- Explain the cutting force measurement principles
- Compare the properties of different cutting fluids
- Describe about jig boring and jig grinding
- Explain about tool and cutter grinder
- Explain the milling machine principles, types and its various operations
- Explain the various gear generation processes
- Explain the principle of operation of various un-conventional machining processes
- Appreciate the use of un-conventional machining processes.
- Distinguish between EDM and Wire-cut EDM machine operation
- Describe about various types of CNC machines, operations and its components.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Cutting Tools and Mechanics of Metal Cutting** **Chapter: 1.1:**Cutting tools-properties of cutting tool materials-cutting tool materials; High carbon steels, high speed steel, carbides, ceramics. types of cutting tools **Chapter: 1.2:** Types of metal cutting – orthogonal and oblique cutting- chip formation – continuous, discontinuous, built-up edge – shear angle. Tool signature – importance cutting forces in orthogonal cutting – metal removal rate [MRR] – tool life; Taylor's life equation, factors influence in tool life. measurement of cutting force – tool dynamometer – types of tool dynamometer – machinability – machinability index – factors affecting machinability – cutting fluids – properties of cutting fluids – selection of cutting fluids – selection of cutting fluids	**5** **10**
II	**Boring, Jig Boring, Jig grinding, Tool and Cutter Grinder and Cylindrical Grinder** **Chapter: 2.1:**Boring and jig boring -Boring machines- horizontal and vertical types- fine boring machines- boring tools jig boring machine- measuring system- hole location procedure- deep hole boring **Chapter: 2.2:Jig grinding** Introduction- construction- operation techniques- setting up and clamping- wheel travel- wheel selection- wheel dressing. optical profile grinding- basic principle and operations **Chapter: 2.3:Tool and cutter grinder** Introduction- selection of cutter-grinding wheels- shape, abrasive grain size and bond, direction of rotation- tooth rest, types, parts of universal tool and cutter grinder, clearance, width of land- producing of clearance angle **Chapter: 2.4:Cylindrical Grinding Machine** Centre Type Cylindrical Grinding Machine – Centre less Grinding Machine – Through feed Grinding – In feed Grinding	**3** **3** **5** **3**
III	**Milling Machines and Gear Generation Processes** **Chapter: 3.1:**Milling machines; Types-specification of milling machines- principles of operation of column and knee type and universal milling machine- work and tool holding devices; Arbor, spring collet, adapter –	**7**

	milling cutters; cylindrical milling cutter, slitting cutter ,side milling cutter, angle milling cutter, T-slot milling cutter, woodruff milling cutter, fly cutter-nomenclature of cylindrical milling cutter-milling process; conventional milling and climb milling-milling operations-milling attachments. **Chapter: 3.2:Generation process** Gear shaper- gear hobbling- principle of operation only gear finishing processes- gear burnishing- gear shaving- gear grinding and gear lapping- gear materials; cast iron, steel, alloy steels brass, bronze, aluminum ,nylons	**7**
IV	**CNC Machine and its Components** **Chapter: 4.1:CNC machines**; Numerical control- definition- working principle of a CNC system- features of CNC machines- advantages of CNC machines- difference between NC and CNC- construction and working principle of turning principle- construction and working principle of machining centre- machine axes conventions turning centre and machining centre. **Chapter: 4.2:Components of CNC machine**; slide ways- requirement-types- friction slide ways and antifriction slide ways- linear motion bearings-recirculation ball screw- ATC- tool magazine – feedback devices- linear and rotary transducers- encoders- in process probing- tool material- tool inserts.	**8** **7**
V	**Un-Conventional Machining** **Chapter: 5.1:Un- conventional Machining Processes:** Construction, working and applications of ultrasonic machining- chemical machining-electro chemical grinding- plasma arc machining- LASER machining-advantages- disadvantage,- Electron Beam Machining – Abrasive Jet Machining **Chapter: 5.2:Electrical discharge machining:** Introduction- principle of spark erosion and requirements of dielectric fluid- layout of spark machining system, EDM machine- tool materials – electrical circuits in EDM- metal removal rate- mean current- operation parameters and typical values and toll wear- reasons- classification and types. EDM process characteristic-advantages and disadvantages of EDM process- wire-cut EDM,CNC Wire-cut EDM for machining punch and die cavities.	**7** **8**
	TEST & MODEL EXAMINATION	**07**

TEXT BOOKS

1. Hajra choudhry, “Work shop Technology", Vol. II, Media Promoters and Publishers Pvt. Ltd.
2. Chapman.WAJ., “Work shop Technology", Vol. II & III, ELBS

REFERENCE BOOKS :

1. Paul De Garmo.E., & Others, "Materials and Processes in Manufacturing", Macmillan Publishing Company
2. Jain & Gupta, Production Technology, Khanna Publishers, 2-B, North Market, Naisarak, new Delhi
3. MOORE AND VICTORY, “ Holes, Contour And Surfaces”
4. HMT, “Production Technology”
5. BATTACHARYA, “Workshop Technology”, P.C.SHARMA, “A Text Book of Production Engineering”, S.Chand & Co

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

IV SEMESTER

2020 – 2021 onwards

4022440 – Forging Dies, Die Casting Dies and Die Maintenance

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022440

Semester : IV

Subject Title : **FORGING DIES, DIE CASTING DIES AND DIE MAINTENANCE**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester**:** 16weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
FORGING DIES, DIE CASTING DIES AND DIE MAINTENANCE	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours:

Unit. No.	TOPIC	TIME (Hrs.)
I	Forging Process and Forging Machines	15
II	Design Of Drop Forging, Press Forging and Machine Forging Dies	15
III	Die Casting Materials , Machines, Die Materials And Treatments	14
IV	Die Casting Die Design, Defects And Finishing Of Die Casting Dies	15
V	Die Maintenance	14
	TEST & MODEL EXAMINATIONS	07
	Total	80

RATIONALE:

Development and use of Forging & Die casting products is high in industries and requires more knowledge on Forging dies and Die Casting Dies and understand of its processes and the operations. This subject will develop the basic knowledge on Forging and Die casting Dies with the process and the basic operations.

OBJECTIVES:

- Explain the fundamentals of forgings, and forging processes.
- Compare the different types of forging
- Design Drop Forging dies.
- Design press forging and Machine forging dies.
- Explain the basics of Die casting process.
- Explain the working of die casting machines.
- Design die casting die
- State the characteristics of the die steel
- Explain the causes and remedies of die casting defects.
- Practice on estimation and costing of dies
- Estimate the cost of dies
- Understand the necessity & importance of die maintenance

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**FORGING PROCESS AND FORGING MACHINES** **Introduction to Forgings:** Uses and advantages of forgings, forged parts Vs cast parts, Forging Temperatures, annealing of forgings, forging properties. forge ability and forgeable metals	4
	Forging processes: Hot-working and cold-working – Advantages – comparison – hot-working operations: rolling, forging, smith forging, drop forging, upset forging press forging – roll forging – Roll die forging, , skew rolling, ring rolling - power required calculations for rolling and forging operations. Forging dies– drop hammers- board hammers, air lift hammers, power drop hammers, capacity of drop hammers. Press forging – Mechanical forging presses, Hydraulic press. Comparison of press forging Vs hammer forging. Machine or upset forgings. Heat treatment of forged parts	7
	Heating devices–Box or batch type furnaces, rotary hearth furnaces, continuous or conveyor furnaces, induction furnaces, resistance furnaces. Open fire and stock fire.	4
II	**DESIGN OF DROP FORGING, PRESS FORGING AND MACHINE FORGING DIES** **DROP FORGING DIE DESIGN:** Hammer dies for preparatory work – fullering dies – edging dies – flattening dies – Drawing down dies – bending die. Essential features of forging dies – generous radii, parting line position, flash gutter, webs and panels, draft, air vents. Flash areas and gutters in finishing dies. Elements of multi impression die block, effect of grain flow.	6
	PRESS FORGING DIES: Rating of forging press, steps in press forging dies, design of press forgings, design of press forging dies.	3
	MACHINE FORGING DIES:- General characteristics, techniques used in making these forgings, machine forging description and range,	3

	machine forging tools and operation, design of dies for forging machines Laws governing forging machine die design, Examples of forgings produced on forging machines, forging defects – causes and remedies. **FORGING DIE BLOCKS AND DIES**: Materials and grade of die blocks, applications of various grades of steel used for die blocks and dies-Die insert-Re-sinking of dies- IS code for tool and die steels	**3**
III	**DIE CASTING MATERIALS , MACHINES, DIE MATERIALS AND TREATMENTS** **DIE CASTING MATERIALS:** Types of die casting alloys –metallurgy, melting & casting procedure and application of zinc based die casting alloys, Aluminum base alloys, Magnesium base alloys, magnesium base alloys, Copper base alloys, Lead base alloys and Tin base alloys. **DIE CASTING MACHINES:** Plunger machine, air machine, modern cold chamber machines. Die locking methods, injection systems, automatic cycle control, and interlock and safety devices in die casting machines. Operation of hot chamber and cold chamber die casting machines. Machine specifications, process parameters and their effect on product quality. Effect of die casting machine on the process – accumulator pressure, injection line pressure, intensification, plunger diameter, locking force, mode of injection, plunger diameter, casting cycle, lubrication. **DIE MATERIALS AND TREATMENTS:** Characteristics of Tool and Die steels – Choosing of Tool Steels – Heat treatment of die steels – Tool steel production methods – Die surface coatings and treatments – wrought low carbon steels and Cast irons – Nonferrous and nonmetallic die materials.	**4** **6** **4**
IV	**DIE CASTING DIE DESIGN, DEFECTS AND FINISHING OF DIE CASTING DIES** **DIE CASTING DIE DESIGN:** Flow system – Importance, metal flow systems in die casting dies, goose neck, nozzle, sprue, runners systems, shock absorbers, gate, gate area, gate velocity, air vent, overflow, determination of gate area. Procedure to calculate runner and	**6**

	gating dimensions using PQ^2 diagram, calculating runner and gating dimensions without PQ^2 diagram. Consideration of specification of die casting machines. Ejection systems – need and working of ejection system, Types of ejection system – sleeve, ring, blade **DIE CASTING DEFECTS:** Definition, causes and remedies of defects – Shrink holes, Gas holes, Segregation, Shrink cracks, Porosity, Cold shuts, Flow lines & Blooms, Foliations, Hard spots, Surface draws and Depressions, Soldering, sink mark and excessive flash. **FINISHING OF DIE CASTING DIES:** Trimming and piercing of die casting dies- comparison die casting dies with other products	**6** **3**
V	**DIE MAINTENANCE** **Good Maintenance Practice –** Good grinding practice – Stress relieving cutting tools – shimming die components – ball lock punches and die buttons. **Die maintenance documentation and tracking** – Die maintenance team – Systematic die maintenance system – Request for maintenance form – Continuous improvement. **Effective Die Maintenance Program Strategy –** Understanding The Die Maintenance Facility – Addressing Production- Scheduling Programs – Planning Die Maintenance – Tracking The Cost Of Maintenance And Down Time **Trouble Shooting Large Panel Stamping Dies** – Die Bolting – Nitrogen Pressure Systems – Systematic Approach To Die Tryout – Draw Beads – Double Action Press Operations – Dirt Problems – Forming Ribs And Embossments – Knockout Bars.	**3** **3** **4** **4**
	TEST & MODEL EXAMINATIONS	**07**

Text books:

1. S.K.Hajra Choudhury and A.K.Hajra Choudhury, Elements of Workshop Technology, Media Promoters and publishers pvt. Ltd
2. Ivana Suchy, Hand book of Die Design, McGraw-Hill Book company, Second edition

Reference Books:-

1. Meswani., and R.H.Dattani, Design and Manufacture of forging dies
2. Kamenshichikov, S.Koltun and V.Naumov, Forging Practice, MIR publishers.
3. J.C.Sharman, Drop, Press and Machine Forgings, The machinery publishing co ltd.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR
N – SCHEME

IV SEMESTER

2020 – 2021 onwards

4022450 – MECHANICAL MATERIAL TESTING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022450

Semester : IV

Subject title : **MECHANICAL MATERIAL TESTING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MECHANICAL MATERIAL TESTING PRACTICAL	4	64	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

OBJECTIVES

The objective of this course is to make the Student:

- Able to determine various strengths of Different Materials.
- To calculate the Young's modulus and Shear modulus of the given material.
- To conduct Bend Test using the given specimen.
- To differentiate hardness and toughness of the given Ductile and Brittle Materials.
- To detect cracks on the given specimen
- To handle Rockwell & Brinell hardness tester to determine the Hardness of the given material.
- To observe the microstructure of ferrous and nonferrous metal using metallurgical microscope.

DETAILED SYLLABUS

Part – A (30 Hrs)

1. Estimation of Tensile Strength of the ductile material –Mild steel
2. Estimation of Tensile Strength of Brittle material - Cast Iron
3. Estimation of compressive Strength of the following materials
   a) Ductile material (Mild Steel or Al)
   b) Brittle material (Cast Iron or Bronze)
4. Estimation of shear strength of Mild steel specimen under (i) Single shear and (ii) Double shear condition
5. Estimation of Toughness of mild steel specimen using (i) Izod impact test (ii) Charpy impact test
6. Torsion test on mild steel – relation between torque and angle of twist, determination of shear modulus and determination of elastic constants for mild steel.
7. Determination of stiffness, modulus of rigidity, strain energy stored and shear stress by load deflection method on the coil springs.
8. Determination of Young's modulus of steel by deflection test.
9. Determine the ductility of the given specimen using Bend Test.

Part – B (27 Hrs)

10. Determination of hardness of Mild steel, copper, aluminum using Rockwell hardness tester
11. Determination of hardness of OHNS and HCHCr using Rockwell harness tester.
12. Determination of hardness of Mild steel, copper, aluminum using Brinell hardness tester
13. Determination of hardness of OHNS and HCHCr using Brinell hardness tester.
14. Study of Metallurgical microscope and grain structures.
15. Preparation of specimen for study of micro structure of ferrous metals
16. Examine the micro structure of metal samples (i) Ferrous and (ii) Non- Ferrous.
17. Detection of Cracks in casting using Detection methods.
    i. Visual Inspection and ring test
    ii. Die penetrant test
18. Detection of Cracks in casting using Magnetic particle test

MODEL EXAM – 7 Hrs

SCHEME OF EXAMINATION:

Part -A (1½ Hours) : 45 marks

Part -B (1½ Hours) : 45 marks

Viva-Voce : 10 marks

Total : 100 marks

SCHEME OF VALUATION:

Observation / Reading - 15 marks

Tabulation / Formula - 15 marks

Calculation & Result - 15 marks

Details Of The Equipment's (for a batch of 30 students)

NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)
YEAR	SECOND
SEMESTER	IV
NAME OF THE LABORATORY	32245 MECHANICAL MATERIAL TESTING PRACTICAL

S.NO	LIST OF THE EQUIPMENTS	QUANTITY REQUIRED
1	Universal Testing Machine (UTM)	1
2	Rockwell Hardness Testing machine	1
3	Torsion testing machine	1
4	Defection testing machine	1
5	Impact test machine	1
6	Torsion testing arrangement	1
7	Shear testing machine	1
8	Brinell hardness testing machine	1
9	Metallurgical microscope	2
10	Metallurgical specimens	1set
11	Double disk polishing machine	1
12	Electromagnetic crack detector with its accessories	1

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

IV SEMESTER

2020 – 2021 onwards

4022460 – HYDRAULICS AND PNEUMATICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022460

Semester : IV

Subject Title : **HYDRAULICS AND PNEUMATICS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 16 weeks

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
HYDRAULICS AND PNEUMATICS PRACTICAL	3	48	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Objectives:

- Study Pneumatic system and its functioning
- Study Hydraulic system and its functioning
- Control operation of cylinders using metering in and metering out control
- Design and operate application oriented pneumatics circuits
- Design and operate application oriented hydraulic circuits
- Use special purpose valves such as shuttle valve and quick exhaust valve
- Compare the functioning of pneumatic and hydraulic systems
- Trouble shoot in pneumatic and hydraulic circuits

Note:

The students should be trained in Pneumatics and Hydraulics and all exercises should be completed. The students should maintain a Record Note book and submit the bonafide record for Board Practical Examination. Examination has to be conducted in Pneumatics and Hydraulics lab.

List of exercises in Pneumatic System: (24 Hrs)

1. Study of Pneumatic System and its elements.
2. Direct operation of a Single Acting Cylinder.
3. Direct operation of a Double Acting Cylinder.
4. Operation of a Single Acting Cylinder controlled from two different positions using Shuttle Valve.
5. Operation of a Double Acting Cylinder with quick return using quick exhaust valve.
6. Controlling the speed of a Double Acting Cylinder using metering –in and metering – out controls.
7. Automatic operation of a Double Acting Cylinder in single cycle using limit switch and memory valve.
8. Design a pneumatic circuit for operating a jack ,Brake, Clamps, push & move parts**.(one circuit design is to be asked compulsory for end examination with a maximum of 10 marks)**

List of exercises in Hydraulic System (21 Hrs)

1. Study of hydraulic System and its elements.
2. Direct operation of a Double Acting Cylinder.
3. Direct operation of a Hydraulic motor.
4. Controlling the speed of a Double Acting Cylinder using metering-in and metering-out type control.
5. Controlling the speed of hydraulic motor using metering-in and metering-out control
6. Sequencing of two cylinders using Sequence Valve.
7. Design a hydraulic circuit for operating a hydraulic press, jack, milling machine table movement**. (one circuit design is to be asked compulsory for end examination with a maximum of 10 marks)**

MODEL EXAM: 3 Hrs

Scheme of Evaluation

Pneumatics (45 marks)	Any one exercise (Ex No 2-7) & Circuit Design (Ex No 8) (Compulsory)	Procedure Circuit Diagram Execution Circuit Design & Procedure	5 marks 20 marks 10 marks 10 marks
Hydraulics (45 marks)	Any one exercise (Ex 2-6) & Circuit Design (Ex No 7) (Compulsory)	Procedure Circuit Diagram Execution Circuit Design & Procedure	5 marks 20 marks 10 marks 10 marks
Viva voce			10 marks
Total			100 marks

List of Equipment's (for a batch of 30 students)

1. Pneumatic system with necessary DCV, FCV and Actuators.
2. Hydraulic system with necessary DCV, FCV and Actuators.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR

N – SCHEME

IV SEMESTER

2020 – 2021 onwards

4022470 – TOOL ROOM SPECIAL MACHINES PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL&DIE)

Subject Code : 4022470

Semester : IV

Subject Title : **TOOL ROOM SPECIAL MACHINES PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
TOOL ROOM SPECIAL MACHINES PRACTICAL	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

OBJECTIVES:

- Identify a milling machine and its parts
- Identify a cylindrical grinder, surface grinder and tool and cutter grinder
- Identify Shaping machine and its parts
- Identify the tools and instruments
- Handle the different types of work holding devices
- Machine a component using different machine tools.
- Calculate the indexing for a work

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

Syllabus

1. Introduction to shaping machine and its parts
2. Introduction to milling machine and its parts.
3. Introduction to grinding machine and its parts
4. Introduction to work holding devices.
5. Types of cutter used in milling machine
6. Types of grinding wheels used in grinding machines
7. Setting of work, tools and cutters in shaping, milling and grinding machines
8. Operations performed in shaping, milling and grinding machine

EXERCISES:

1. Machine a cube by using shaping machine
2. Machine a square block from round rod using Milling machine
3. Machine a 'V' Block using Milling machine
4. Machine Groove cuts using Vertical Milling machine
5. Grind a plain surface using surface Grinder
6. Grind a cylindrical surface using Cylindrical Grinding machine
7. Grind a Progressive type Plug gauge using Cylindrical Grinding machine
8. Machine a Spur Gear using milling machine by Simple Indexing
9. Machine a Helical Gear using milling machine.
10. Grind a Facing Tool using Tool and Cutter Grinder

BOARD EXAMINATION

Note to the faculty :- Last job of the raw material (MS Rod Ø32x33mm, MS Rod Ø25x98mm and 13x13x75 mm MS square rod) to be retain in student wise or batch wise(not more than 2 students)

This may be verifiable at the time of Board Practical Examination by the external examiner

DETAILED ALLOCATION OF MARKS

Milling / Grinding/Shaping	: 90 marks
Viva-voce	: 10 marks
Total	**: 100 marks**

Note: Sketches enclosed
Note **:** All dimensions are in mm

Board Examination-Question Paper Pattern

One Experiment should be carried out given in the question paper(1x90=90)

- Procedure - 10marks
- Calculation -10 marks
- Dimensioning – 40 marks
- Finish - 30 Marks

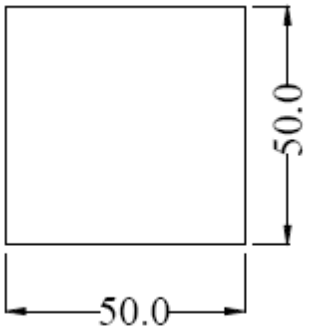
Viva – Voce - 10 Marks

Total – 100 Marks

1.To machine the component in a given raw material as per the sketch attached

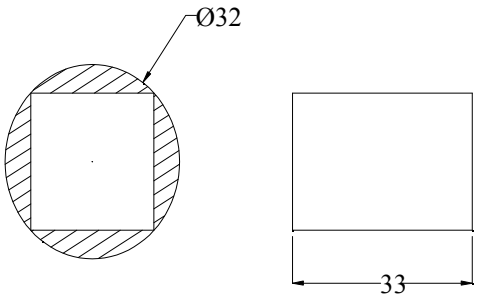
Note : Attach the sketch with the question paper

EXERCISE NO: 1 SHAPING A PLAIN SURFACE
MANUFACTURE A SQUARE BLOCK USING SHAPING MACHINE.
Raw material size: 52 mm CI (or) MS cube



ALL DIMENSIONS ARE IN mm

EXERCISE NO: 2 MANUFACTURE A MAXIMUM SIZE SQUARE BLOCK FROM GIVEN ROUND ROD USING MILLING MACHINE.
RAW MATERIAL SIZE: Ø32X33 mm MS ROUND



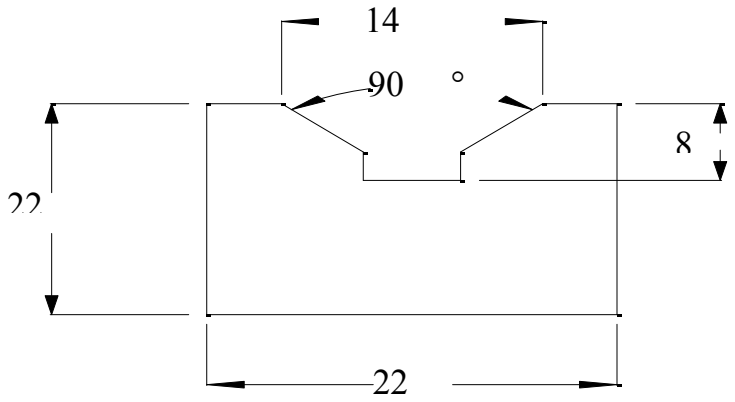
ALL

DIMENSIONS ARE IN mm

EXERCISE NO : 3

MACHINE A V BLOCK BY USING MILLING MACHINE

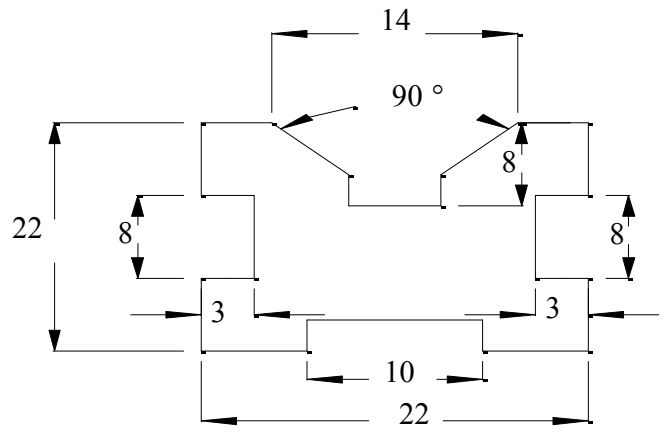
RAW MATERIAL SIZE:22 X33



EXERCISE NO:4 GROOVE MILLING

MACHINE THE REQUIRED GROOVES BY USING VERTICAL MILLING MACHINE

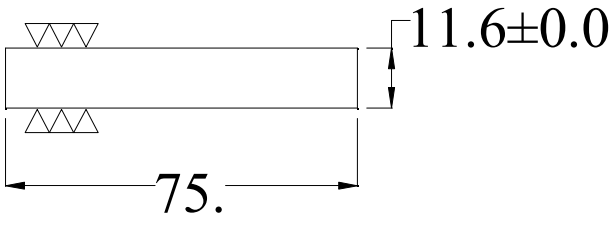
RAW MATERIAL SIZE:22X33



EXERCISE NO:5 SURFACE GRINDING

GRIND THE PLAIN SURFACE TO AN ACCURACY OF 0.01mm BY USING SURFACE GRINDING MACHINE.

RAW MATERIAL SIZE:75X50X12 mm MS

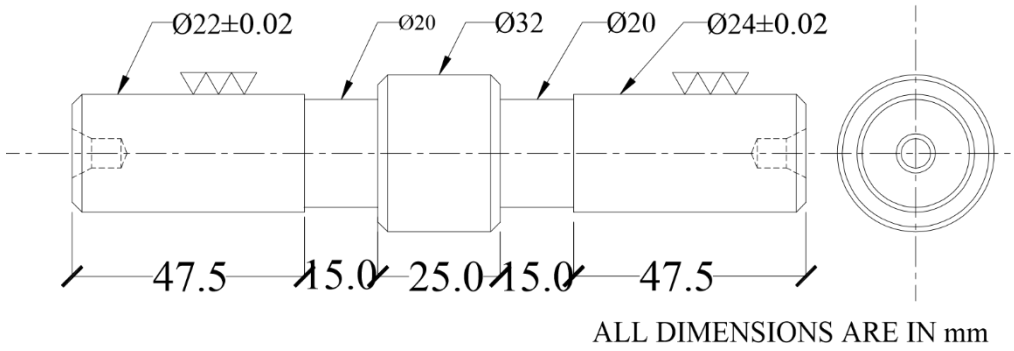


FLAT

EXERCISENO:6 CYLINDRICAL GRINDING

GRIND THE CYLINDRICAL COMPONENT TO AN ACCURACY OF 0.02MM BY USING CYLINDRICAL GRINDING MACHINE

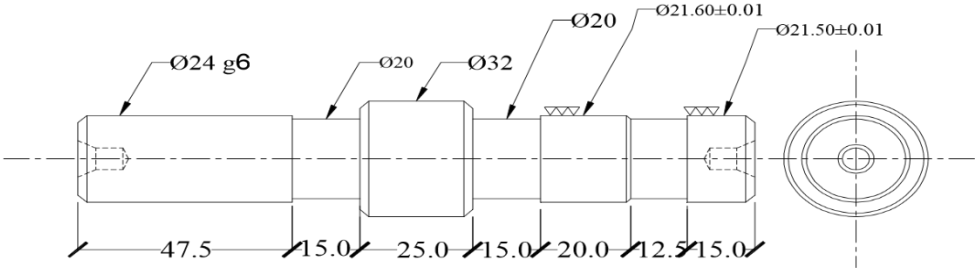
RAW MATERIAL SIZE:Ø32X150 MM MS POLISH ROD



EXERCISE NO:7 CYLINDRICAL GRINDING

MANUFACTURE A PROGRESSIVE TYPE PLUG GAUGE BY USING CYLINDRICAL GRINDING

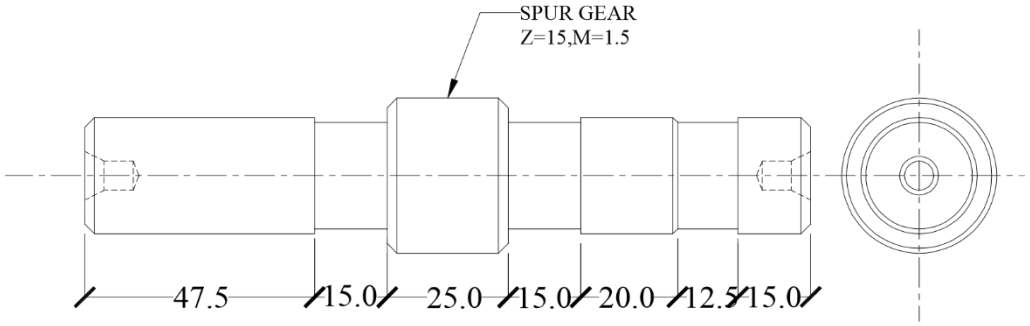
RAW MATERIAL SIZE:FINISHED WORKPIECE OF EX.NO:6



EXERCISE NO:8 SPUR GEAR MILLING

MACHINE A SPUR GEAR BY USING MILLING MACHINE

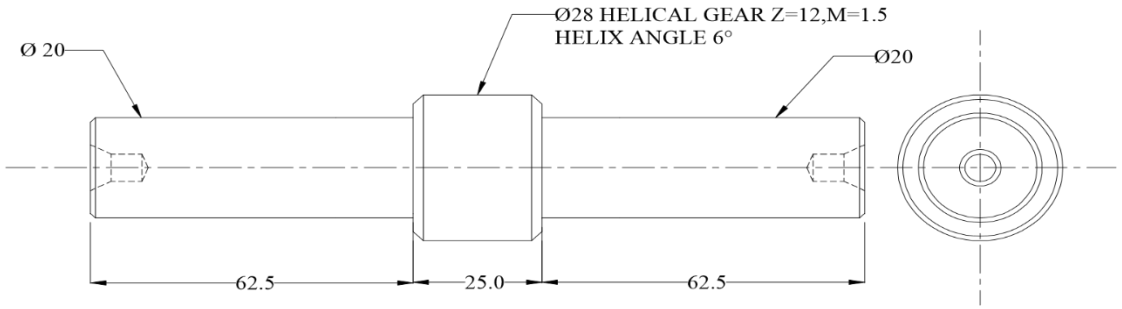
RAW MATERIAL SIZE:FINISHED WORKPIECE OF EX.NO:7



EXERCISE NO:9 HELICAL GEAR MILLING

MACHINE A HELICAL GEAR BY USING MILLING MACHINE

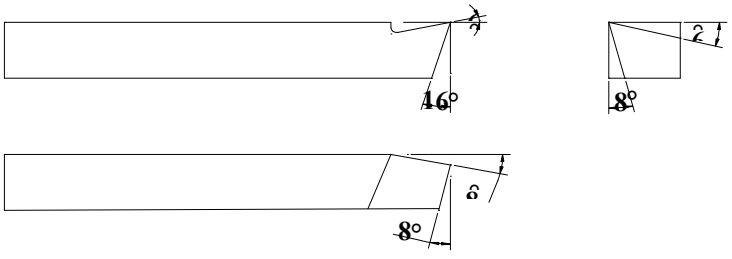
RAW MATERIAL SIZE:FINISHED WORKPIECE OF EX.NO:6



EXERCISE NO:10- FACING TOOL (TOOL AND CUTTER GRINDER)

TOOL AND CUTTER GRINDING

RAW MATERIAL:13 x13x 75



List of Equipment's (for a batch of 30 students)

1. Vertical milling machine/ vertical milling attachment in Universal Milling Machine 2 No's
2. Universal Milling Machine with indexing head- 2 Nos
3. Surface Grinding Machine (Horizontal) – 1 No
4. Cylindrical Grinding machine – 1 No
5. Tool and Cutter grinder – 1 No
6. Shaping machine –1 no

EQUIPMENT'S & TOOLS:

1. Milling Cutter (2 Module cutter) & accessories – complete sets
2. Milling Machine Handle and required accessories – 2 sets
3. Grinding wheel OD 150 mm , ID 1''(AA-65, K5, V8) – 2 No's
4. Grinding wheel OD 300 mm , ID 150mm(AA-56, K5, V8) – 1 No

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4022510 – JIGS, FIXTURES AND GAUGES

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022510

Semester : V

Subject Title : **JIGS, FIXTURES AND GAUGES**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
JIGS, FIXTURES AND GUAGES	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

TOPICS AND ALLOCATION OF HOURS:

Unit No	Topics	Time Hours
Unit – I	Basics of Work Holding Devices	14
Unit – II	Clamping and Tool Guiding Elements	15
Unit – III	Principles of Jig Design	15
Unit – IV	Principles of Fixture Design	15
Unit – V	Gauges	14
	TEST & MODEL EXAMINATIONS	07
	Total	**80**

Rationale:-

In the present competitive environment, elimination of non-productive time in the processes is essential to improve productivity. For improving the productivity in the engineering industries various types of production tools Viz., Jigs, Fixtures, Gauges etc., are employed wherever necessary /possible. Hence thorough knowledge on the principles, construction and working principle of various Work holding devices and gauges is absolutely essential.

OBJECTIVES

- Identify the Difference between Jig & Fixtures
- Study the plane of movements
- Explain possible freedom of movement of job in a jig, fixtures
- Study locating of work piece in a jig, fixture
- To understand the construction of various types of Jigs and Fixtures
- Explain mounting of jig on a machine tool
- Explain mounting of fixtures on the machine tool
- To understand the construction of various types of gauges

DETAILED SYLLABUS

4022510 JIGS, FIXTURES AND GUAGES

Contents: Theory

Unit No.	Name of the Topic	Hours
I	**BASICS OF WORKHOLDING DEVICES:** **Work holding Concepts –** Basic Work holders, work holder purpose and function, General Considerations	2
	Jigs and Fixtures – Introduction – Definition – Difference between Jigs and Fixtures – Advantages of Jigs and Fixtures.	2
	Locating and supporting principles - Location types, Degrees of freedom - 12 degrees of freedom. Location methods - 6 points location principle (or) 3-2-1 principle of location, concentric and Radial methods – Basic rules, position and number of locators, Redundant locators, Locational Tolerances, Fool proofing.	5
	Locator Types : External – Fixed locators, Integral locators, Commercial pin, Assembled locators, Pins, V Type, locating nests. Adjustable locators, Sight locators. Internal – Machined internal, Relieved, Diamond pins, Floating locating pin, conical locators, self-adjusting locators, spring locating pins. Spring stop buttons. Chip and burr problems	5
II	**CLAMPING AND TOOL GUIDING ELEMENTS**: **CLAMPING**: Clamping principles – Tool forces, clamping forces, positioning clamps. Rigid Vs Elastic work holders. Types of Clamps – Strap clamp, screw clamp, cam action clamps, Toggle action clamps, wedge action clamps, latch clamps, rack and pinion clamps, specialty clamps. Chucks – Operations, Nomenclature. Lathe chucks – Solid Arbors and Mandrels. Split collet and bushing work holders, axial location, self-actuating wedge cam and wedge roller work holders. VISES – Special jaws, independent jaws. Non-Mechanical Clamping – Magnetic chucks, vacuum chucking,	8

	Electrostatic chuck. Power Clamping – Hydraulic and Pneumatic clamping. Multiple part clamping. **TOOL GUIDING ELEMENTS:** **Drill jig bushings and liners –** Selection, Bushing / liner installation, interference fit, chip clearance, accuracy and life. **Types of bushes –** Head less press fit bushes, Headed press fit bushes, Slip renewable and Slip fixed renewable bushings / liners, Headless press fit liners, Headed press fit liners, Oil groove bushings, Gun drill bushings, Special bushings. Bushings and liners for polymers, castable and soft material tooling. Template bushings, Rotary bushings. Drill bushing tips and accessories. Drill bush material and manufacture.	**7**
III	**PRINCIPLES OF JIG DESIGN** **Introduction** – General considerations – Machine considerations – Process considerations. Basic requirements of Drill jigs. **TYPES OF JIGS –** Template drill jigs, Plate jigs, Universal jigs, Leaf jig, Channel and Tumble box jigs, Indexing Jigs, Boring jigs, – Post jig – Pot jig. Miscellaneous drill jigs – Wooden drill jigs, Polymer Drill Jigs, modified vises, collet fixtures, self-centering vises. Jig design Example – Plate Jig design example	**5** **10**
IV	**PRINCIPLES OF FIXTURE DESIGN** **Introduction:** General Considerations, fixture cost, production capabilities, Production process, part considerations. **Types of fixtures** – Milling fixture, Lathe fixture, Grinding fixture, Broaching fixture, Assemble fixture, Inspection fixture, Boring fixture, Indexing fixture, welding fixture and sawing fixture. **Basic Design Characteristics that apply to** – Milling fixture, Lathe fixture, Grinding fixture, Boring fixture, Broaching fixture, welding fixture and sawing fixtures. **Fixture Design -** Standard fixture mounting, Relationship between fixture and cutting tool, Tool positioning, Relationship to locators, Cutter-setting devices, Step by step approach to fixture design. Fixture design	**2** **3** **3** **7**

	Example – Plain Milling fixture. Fixture design for numerically controlled machine Tools	
V	**GAUGES** Introduction – limit gauges –Taylor's principle of limit gauging – Application of limit gauges – Gauging principles – Allocation of Gauge Tolerance – Bilateral system, Unilateral system, Gauge wear allowance, Gauge materials, Gauging policy. Types of Gauges – Commercial Gauges – Screw pitch gauges, plug gauges, Ring gauges, Snap gauges, Flush pin gauges– IS specifications for gauges – Design of plug and Snap gauges.	**7** **7**
	TEST & MODEL EXAMINATIONS	**07**

Text Books:-

1. Cyril Donaldson, Tool Design, Special Indian Edition, 2012, Tata Mc Graw Hill
2. P.C.Sharma ,A Text Book of Production Engineering, , 2013, S.Chand & Co
3. P.H.Joshi ,Jigs & Fixtures
4. G.K.Vijayaraghavan, Design of Jigs,Fixtures and Press Tools, Suchitra publications

References:-

1. Edward Hoffman ,Jig & Fixture design
2. Roop Lal ,Jig & Fixtures design
3. W boyes,Handbook of Jig & Fixture Design
4. Elanchezhian C ,Design of Jigs, Fixtures & Press tool

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4022520– PRESS TOOLS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME
(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022520

Semester : V

Subject Title : **PRESS TOOLS**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
PRESS TOOLS	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Time allocation

UNIT	TOPIC	TIME (Hrs)
I	Press working fundamentals, operations, and machinery	15
II	Press & Press Tool Accessories And Types Of Die Construction	15
III	Bending And Forming Dies	14
IV	Drawing Dies And Dies For Secondary Operations	14
V	Advanced Press Tool Applications and Trouble shooting	15
	TEST & MODEL EXAMINATIONS	07
	Total	80

Rationale:

Modern development of sheet metal industries require more understanding of production of sheet metal products and the machinery and tools involved in the production of the sheet metal products. This subject Press Tools will develop the basic knowledge on the essentials of the production of sheet metal products, the machinery and Tools involved in its production.

OBJECTIVES

The objective of this course is to make the Student:

- To understand the fundamentals of press working, to be familiar with the various press working operations and machines.
- To learn the safety in press working operations.
- To be familiar with the various press and press tool accessories
- To learn about the different types of Die construction.
- To know the various bending, forming and other miscellaneous press working operations.
- To learn about the construction and operation of the different bending dies.
- To be familiar with the various drawing and other related processes
- To know the construction and operating principle of drawing and combination dies.
- To know the basic concepts and the advantages of fine blanking process
- To learn the construction and working principle of various fine blanking dies.
- To learn about the concepts of SMED and quick die changes and its advantages in bringing down the press set up time.
- To learn to trouble shoot in various press tools.
- To be familiar with the specialised press tool applications.

DETAILED SYLLABUS

Contents: Theory

UNIT NO	Name of the Topic	Hours
I	**PRESS WORKING FUNDAMENTALS, OPERATIONS, AND MACHINERY** **Press working operations-** Shearing, cutting off, parting, blanking, Punching, piercing, slotting, perforating, Notching, semi notching, lancing, parting, Trimming , slitting, shaving. Safety in press working. **Press working mechanism: Presses according to their functions –** energy producing press, force producing presses, stroke controlled presses. Press according to their energy supply – Mechanical, hydraulic, Pneumatic, electromagnetic presses. Presses according to their construction – Solid or gap frame, open back inclinable, knee frame, horning, open end or end wheel. Press according to their operation – Single action, double action, triple action, multi slide press. Press actuating mechanisms. **Parts of press, press operating parameters –** Tonnage, shut height, stroke, shut height adjustment, strokes per minute, die space. Clearance, cutting terminology, stages of cutting, penetration, burr. Effects of clearance variation – Secondary shear, large clearance, clearance selection, cutting characteristic – Dish distortion, spacing distortion, typical wear. **Forces for cutting sheet metal –** Cutting with square faces, cutting with shear, shear on punch, slug bending force, shear on die steel, stripping force.	**4** **6** **5**
II	**PRESS & PRESS TOOL ACCESSORIES AND TYPES OF DIE CONSTRUCTION** **Mechanical handling devices: Feeding and reeling mechanisms for** coiled sheet metal – Reels and cradles (de-coiler), roll feeds and its types, hitch feeds. Feeding mechanism for individual parts – Hopper feeds, dial feeds, chutes, slides, magazine feeds, step feeds, special feeds.	**7**

	Ejection mechanism – Gravity, air, kicker, lifter, shovel, mechanical hand, ejection by next part. Transfer mechanisms – Conveyors, shuttle, turnover, turnaround, stacker, rails. **Types of die construction: - Cut** off, drop through, return type, compound, combination, continental, sub press, follow die, progressive die, transfer die, shuttle die. Function and nomenclature of die components: - Die, die set, die plate, punch, stripper plate, die spring, rubber keeper, stripper bolt, solid stripper, knockout plate, hold down plate, pad plate, blank holder, pressure pin. Types of stock stop. Attachment components – Dowel, screw, key. Miscellaneous components – Heal, stop block, bolster plate, backing plate, pilot, gauges, insert, cams, hinges and rockers. Commercially available die components – Die sets, die set attachment devices, punches, die buttons, retainers, springs, fluid springs, die cushion and its types.	**8**
III	**BENDING AND FORMING DIES:-** **Bending of sheet metal –** Bending theory, neutral axis, metal movement, spring back, methods of overcoming spring back. Bending Operations – Bending, flanging, hemming, curling, seaming, and corrugating. Types of Bending dies (construction and working principle) – V bending and its types, edge bending, u bending. Bending operations done using press brake. **Forming operations –** Embossing, bulging, crimping, tube forming. Miscellaneous press working operations – slugging, restrike or spank, extrude (holes), coining, hot trimming, cold trimming of die castings and plastic mouldings, riveting, burnishing or sizing, Ironing. Forming dies – Construction and working principle of solid form dies, pad form dies, curling dies, embossing dies, coining dies, swaging dies, bulging dies. Assembly dies - Riveting, tab stake, upset stake, crimping.	**7** **7**

IV	**DRAWING DIES AND DIES FOR SECONDARY OPERATIONS** **Drawing operations –** Shallow drawing, deep drawing. Analysis of cup drawing: - Stages of drawing - Bending, straightening, friction, compression, tension, stretch forming. Variables of drawing - Bending and straightening variables, friction variables, compression variables, stretch forming variables, analysis of draw speed. **Draw dies &its construction and working principle** – Conventional draw die, redrawing die, reverse re drawing die, drawing of square or rectangular shapes. Drawing with flexible tooling – Marform process, Hydro form process, Hydro dynamic process, Verson- wheel on process. Draw die details – Blank holders, blank holding pressure and its importance, air vents, drawing inserts, draw beads. Drawing defects, causes and remedies. **Dies for secondary operations: -** Construction and working principle of – Semi piercing dies, shear form dies, dies for formed contours, notching die, shaving die, side piercing die.	**5** **6** **3**
V	**FINE BLANKING TOOL AND SPECIALISED PRESS TOOL APPLICATIONS, PRESS TOOL MAINTANANCE.** **Fine blanking basics:** Definition and Applications of fine blanking, Working principle of fine blanking tool, V Ring – function of V ring, Dimensions of V ring. Comparison of fine blanking with blanking. Strip width and margin calculations, Calculation of press, Fixing minimum distance from die aperture. Factors affecting Tool life. Importance of punch and die radius. Materials suitable for fine blanking, work hardening during fine blanking, steel, copper and copper alloys, aluminum and aluminum alloys **Fine Blanking Machines:** Working principle – Ram movement, Drive systems-Mechanical drives, hydraulic drives, Machine force, Ring indenter force, counter force. **Fine blanking tools:** Different types of tools – Compound die tooling system with sliding punch, compound die tooling with fixed punch. Clearance calculation – Importance of clearance	**5** **2** **2**

	Specialized Press Tool Applications: Construction, advantage and applications of advanced multistage tooling, unit tooling, angular piercing tools, CNC turret press. Principle or Quick Die Change (QDC) – need and advantages. Single Minute Exchange of Dies (SMED) – concept need and advantages.	**2**
	Factors Affecting Tool Service Life: Introduction, Elements of Tool performance, Procedure for investigation of tool failure, Trouble shooting in press tools, effect of heat treatment on service life of tools.	**2**
	Maintenance and Recondition of press tools – Blanking tool – Progressive Tool – Compound tool – wear and reconditioning of press tools components. Causes of tool and die failure, types of failures.	**2**
	TEST & MODEL EXAMINATIONS	**07**

Text Books:

1. Donald F. Eary., Edward A. Reed, Techniques of Press working sheet metal, Prentice-Hall,Inc., Second Edition
2. Donaldson, Tool Design, Tata McGraw-hill Book Company
3. D.Eugene ostergaard, Advanced die making, McGraw-Hill Book company

References:-

1. Dr.John G.Nee, Fundamentals of Tool Design, Society of Manufacturing Engineers, Fourth Edition
2. ASTME National Book Committee, McGraw-hill Book Company
3. J.R.Paquin, Die design fundamentals, Industrial Press Inc
4. D.Eugene ostergaard, Basic die making, McGraw-hill Book Company

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4020531 – COMPUTER INTEGRATED MANUFACTURING

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING(TOOL & DIE)

Subject Code : 4020531

Semester : V

Subject Title : **COMPUTER INTEGRATED MANUFACTURING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
COMPUTER INTEGRATED MANUFACTURING	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Computer Aided Design	15
II	Computer Aided Manufacturing	14
III	CNC programming	16
IV	FMS, AGV, AS/RS, Robotics	14
V	Advanced concepts of CIM	14
	TEST & MODEL EXAMINATIONS	7
	Total	**80**

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of Computer Aided Design and Manufacturing. They are able to operate CNC machines and write part program. They are able to understand the advanced concepts adopted in automated industries.

OBJECTIVES:

- Acquire knowledge in the field of Computer aided Design
- Explain the various concepts of Computer Aided manufacturing
- Write part program for manufacturing components in CNC machines
- Explain the concepts of automatic material handling and storage systems and robotics
- Explain the advanced concepts of CIM

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Computer Aided Design** Computer Aided Design: Introduction – definition – Shigley's design process – CAD activities – benefits of CAD - CAD software packages – point plotting, drawing of lines, Bresenham's circle algorithm, Transformations: 2D & 3D transformations – translation, scaling, rotation and concatenation. Geometric modelling: Techniques - Wire frame modelling – applications – advantages and disadvantages. Surface modelling – types of surfaces – applications – advantages and disadvantages – Solid modelling – entities – advantages and disadvantages – Boolean operations - Boundary representation – Constructive Solid Geometry – Comparison. Graphics standard: Definition – Need - GKS –IGES – DXF. Finite Element Analysis: Introduction – Development - Basic steps – Advantages.	**6** **6** **3**
II	**Computer Aided Manufacturing** CAM – Definition - functions of CAM – benefits of CAM. Introduction of CIM	**3**

	– concept of CIM - evolution of CIM – CIM wheel – Benefits – integrated CAD/CAM. Group technology: Part families - Parts classification and coding - coding structure – Opitz system, MICLASS system and CODE System. Process Planning: Introduction – Computer Assisted Process Planning (CAPP) – Types of CAPP - Variant type, Generative type – advantages of CAPP. Production Planning and Control (PPC): Definition – objectives - Computer Integrated Production management system – Master Production Schedule (MPS) – Capacity Planning – Materials Requirement Planning (MRP) – Manufacturing Resources Planning (MRP-II) – Shop Floor Control system (SFC) - Just In Time manufacturing philosophy (JIT) - Introduction to Enterprise Resources Planning (ERP).	**6** **5**
III	**CNC Programming** NC in CAM, tooling for CNC – ISO designation for tooling – CNC operating system. Programming for CNC machining –part program - Manual part programming - coordinate system – Datum points: machine zero, work zero, tool zero - reference points - NC dimensioning – G codes and M codes – linear interpolation and circular interpolation - CNC program procedure - sub-program – canned cycles - stock removal – thread cutting – mirroring – drilling cycle – pocketing. Rapid prototyping: Classification – subtractive – additive – advantages and applications – materials – Virtual machining.	**16**
IV	**FMS, AGV, AS/RS, Robotics** FMS: Introduction – FMS components – FMS layouts – Types of FMS: Flexible Manufacturing Cell (FMC) – Flexible Turning Cell (FTC) – Flexible Transfer Line (FTL) – Flexible Machining System (FMS) – benefits of FMS - introduction to intelligent manufacturing system. Material handling in CIM environment: Types – AGV: Introduction – AGV - working principle – types – benefits. AS/RS – working principle –types – benefits. Robotics: Definition – robot configurations – basic robot motion – robot programming method – robotic sensors – end effectors – mechanical	**5** **3** **6**

	grippers – vacuum grippers – robot programming concepts - Industrial applications of Robot: Characteristics - material transfer and loading – welding - spray coating - assembly and inspection.	
V	**Advanced Concepts Of CIM** Concurrent Engineering: Definition – Sequential Vs Concurrent engineering – need of CE – benefits of CE. Quality Function Deployment (QFD): Definition – House of Quality (HOQ) – advantages – disadvantages. Steps in Failure Modes and Effects Analysis (FMEA) – Value Engineering (VE) – types of values – identification of poor value areas – techniques – benefits. Guide lines of Design for Manufacture and Assembly (DFMA). Product Development Cycle: Product Life Cycle - New product development processes. Augmented Reality (AR) – Introduction - concept – Applications.	**14**

REFERENCES BOOKS:

1. R.Radhakrishnan, and S.Subramanian, “CAD/CAM/CIM”, New Age International Pvt. Ltd.
2. Mikell P.Groover, and Emory Zimmers, “CAD/CAM”, Jr.Prentice Hall of India Pvt., Ltd.
3. Dr.P.N.Rao, “CAD/CAM Principles and Applications,”, Tata Mc Graw Hill Publishing Company Ltd.
4. Ibrahim Zeid, “Mastering CAD/CAM”, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
5. Mikell P. Groover, “Automation, Production Systems, and Computer-Integrated Manufacturing”, Pearson Education Asia.
6. Yoram Koren, “Computer control of manufacturing systems,”, McGraw Hill Book.
7. Chris Mcmahon and Jimmie Browne, “CAD/CAM – Principle Practice and Manufacturing Management”, Addision Wesley England, Second Edition,2000.
8. Dr.Sadhu Singh, “Computer Aided Design and Manufacturing,”, Khanna Publishers, NewDelhi, Second Edition,2000.
9. S.Kant Vajpayee, “Principles of Computer Integrated Manufacturing,”, Prentice Hall of India, 1999.
10. David Bed worth, “Computer Integrated Design and Manufacturing,”, TMH, 1998.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4020533 – MECHATRONICS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220 DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4020533

Semester : V

Subject Title : **MECHATRONICS**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
MECHATRONICS	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Introduction, Sensors & Transducers	15
II	Actuation systems	14
III	Basic system models, Input / Output systems	14
IV	Programmable Logic Controller	14
V	Design examples & advanced applications In Mechatronics	16
Test And Revision		7
Total		**80**

RATIONALE:

As per the latest requirements in the automation industries this enables to learn the various concepts of automation components. They are able to write program, and operate PLCs. They are able to select the electronic components for various industry applications.

OBJECTIVES:

- Explain the working of sensors and transducers
- Acquire knowledge about actuation systems
- Explain the system models and I/O systems
- Write program and operate PLCs
- Explain the applications of mechatronics

DETAILED SYLLABUS

4020533 MECHATRONICS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Introduction, Sensors & Transducers** Introduction – Systems – Measurement Systems – Control Systems – Microprocessor Based Controllers. Examples – Mechatronics approach. Measurement System terminology – Displacement, Position & Proximity Sensors – Velocity and Motion Sensors – Force Sensors – Fluid Pressure Sensors – Flow Sensors – Liquid Level Sensors – Temperature Sensors – Light Sensors – Selection of Sensors – Calibration of sensors.	15
II	**Actuation Systems** Mechanical Actuation Systems – Types of motion – Freedom and constraints – Loading – Gear Trains – Pawl & Ratchet – Belt & Chain drive – Bearing – Selection – Ball & Roller bearings – Mechanical aspects of motor selection. Electrical Actuation Systems – Switches & Relays – Solenoids – D.C Motors – A.C. Motors – Stepper Motors – Specification and control of stepper motors – Servomotors: D.C Servomotor and A.C Servomotor.	14

	Pneumatic & Hydraulic Systems – Power supplies – DCV – PCV – Cylinders – Rotary actuators.	
III	**Basic System Models, Input/Output Systems** Mathematical Model – Introduction to mathematical model – Mechanical System building blocks – Electrical System building blocks – Fluid System building blocks – Thermal System building blocks. System Model – Engineering Systems – Rotational – Translational Systems – Electro-Mechanical System – Hydro- Mechanical System. Interfacing – Input/Output ports – Interface requirements: Buffers, Handshaking, Polling and interrupts, Serial interfacing – Introduction to PIA – Serial communications interface – Example of interfacing of a seven-segment display with a decoder.	**14**
IV	**Programmable Logic Controller** Definition – Basic block diagram and structure of PLC – Input/Output processing – PLC Programming: Ladder diagram, logic functions, latching and sequencing – PLC mnemonics – Timers, internal relays and counters – Shift registers – Master and jump controls – Data handling – Analog input/output – Selection of PLC – sample ladder programs.	**14**
V	**Design Examples & Advanced Applications In Mechatronics** Design process stages – Traditional Vs Mechatronics designs – Possible design solutions: Timed switch, Wind- screen wiper motion, Bath room scale – Case studies of mechatronics systems: A pick-and-place robot, Car park barrier, Car engine management system, Automatic Camera and Automatic Washing Machine. Sensors for condition monitoring systems of production systems – Examples of monitoring methods: Vibration monitoring, Temperature monitoring, Wear behavior monitoring – Mechatronics control in automated manufacturing: Monitoring of manufacturing processes, On-line quality monitoring, Model-based systems, Hardware-in-the-loop simulation, Supervisory control in manufacturing inspection, Integration of heterogeneous systems.	**16**

REFERENCES BOOKS:

1. W.Bolton, “Mechatronics”, 2nd Edition 2001, Pearson Education, New Delhi.
2. R.K.Rajput, A Text Book of Mechatronics, 1st Edition 2007, S.Chand & Co. Ltd., New Delhi.
3. HMT, “Mechatronics”, 1st Edition 1998, Tata McGraw Hill, New Delhi.
4. Devdas Shetty & Kolk, “Mechatronics System Design”, 1st Reprint, 2001, PWS Publishing Co., Boston.
5. James H.Harter, “Electromechanics”, 1st Edition 2003, Prentice-Hall of India, New Delhi.
6. M.D.Singh & J.G.Joshi, “Mechatronics”, 1st Edition 2006, Prentice-Hall of India, New Delhi.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4020440 – PROCESS PLANNING AND QUALITY CONTROL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020440

Semester : V

Subject Title : **PROCESS PLANNING AND QUALITY CONTROL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
PROCESS PLANNING AND QUALITY CONTROL	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Process Planning and Selection	15
II	Basic concepts of Total Quality Management	14
III	TQM Tools	14
IV	Statistical Fundamentals & Charts	15
V	Lean Manufacturing Concepts	15
Test And Model Examinations		07
Total		**80**

RATIONALE:

In the product manufacturing the process selection and planning are important. Quality and customer satisfaction in every product and every activity is the order of the day. As there is a shift from quality control to quality management in all activities, the concept Total Quality Management and the pillars of TQM are to be given to Engineers, who are designing products and production systems.

OBJECTIVES:

- Understand the process planning.
- Study the process selection.
- Define quality and appreciate its signature.
- Explain the concept of TQM.
- Appreciate the use of principles of TQM to meet customer satisfaction.
- Solve problem using the Quality control tools.
- Apply Brainstorming and quality circle to solve problems.
- Use PDCA cycle for continuous improvement.
- Appreciate the benefits of implementing 5S concepts.
- Collect, classify and present the data.
- Determine the process capability of a manufacturing process.
- Practice on management planning tools.
- Use Bench Mark and JIT concepts.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Process Planning And Selection** **Chapter: 1.1:** **Production:** Types of Production – Mass production, batch production and job order production **Chapter: 1.2:** **Process Planning:** Introduction – concept – Information required to do processplanning – factors affecting process planning – process planningprocedure – Make (or) Buy decision using Break Even Analysis – simple problems. Manual process planning – Introduction ofAutomated process planning and generator process planning –Advantage of computer aided process planning – Principle of linebalancing – need for line balancing – Value Engineering –Definition – cost control Vs cost reduction – value analysis when todo – steps information needed – selection of product. **Chapter: 1.3:** **Process Selection:** Process selection – technological choice – specific componentchoice – Process flow choice – Factors affecting process selection– machine capacity – analysis of machine capacity – process andequipment selection procedure – Determination of man, machineand material requirements – simple problems – selection ofmaterial – jigs – fixtures etc. – Factors influencing choice of machinery – selection of machinery – simple problems –Preparation of operation planning sheet for simple components.	3 6 6
II	**Chapter: 2.1: Basic Concepts Of Total Quality Management** Quality-Definitions – Dimensions of quality – Brainstorming and itsobjectives – Introduction to TQM - Characteristics – Basic concepts – Elements - Pillars – Principles – Obstacles to TQMimplementation - Potential benefits of TQM - Quality council – duties – Responsibilities - Quality statements – Vision – Mission – Quality policy statements –	14

	Strategic planning – Seven steps tostrategic planning – Deming philosophy – Customer – Input / Output process model – Juran Trilogy - PDCA (Deming Wheel) cycle.	
III	**TQM Tools** **Chapter: 3.1:** **Seven tools of quality control (Q 7 tools):** Check sheet – Types of check sheet – Histogram – Cause and effect diagram – Pareto diagram – Stratification Analysis – Scatter diagram-Graph/run charts – Control charts – Construction of above diagrams.Quality circle – concept of quality circle – Organisation of Qualitycircle and objectives of Quality circle. Zero Defect Concepts. **Chapter: 3.2:** **Management Planning Tools (M 7 Tools)** Affinity diagram – Radar Diagram – Inter Relationship diagram (Inter Relationship diagram) – Tree diagram – Prioritization matrix – Matrix diagram – Decision tree – Arrow diagram – Matrix data analysis diagram – Construction of above diagrams.	14
IV	**Statistical Fundamentals And Control Charts** **Chapter: 4.1:** Types of Data – Collection of Data – Classification of Data – Tabular presentation of Data - Graphical representation of afrequency distribution – Comparison of Frequency distribution – Mean - Median – Mode – Comparison of measures of centraltendency - Introduction to measures of dispersion – Sample – sampling – Normal curve – Sigma – Concept of six sigma – Principles – Process- Problems. **Chapter: 4.2:** Control chart – Types of control charts – Control chart for variables – Construction of X bar and R charts – control limits Vs specification limits – Process capability – Method of doing process capability Analysis – Measures of process capability – Problems. Attributes – Control charts - P chart – np chart – c chart – u chart – Construction of above diagrams – Problems – Comparison between	7 8

	variable chart and Attribute chart.	
V	**Capter 5.1: Lean Manufacturing Concepts** 5S Concepts (SEIRI, SEITON, SEISO, SEIKETSU and SHITSUKE) – needs and objectives – effective implementation of 5S concepts in an organisation – Housekeeping – Kaizen – Kanban System.Bench marking - Objectives of bench marking – Types – Benchmarking process – Benefits of Bench marking – Pit falls of Benchmarking-Just In Time(JIT) concepts and its objectives – TotalProductive Maintenance(TPM) – Introduction, Objectives of TPM –steps in implementing TPM. – Overall Equipment Effectiveness(OEE)–Lean Six Sigma – Value Stream Mapping – DMAIC(Define, Measure, Analyse, Improve, Control) – DMADV (Define , Measure, Analyse, Design, Verify)	15

Reference Books:

1. Industrial Engineering & Management – O.P Khanna
2. Industrial Engineering & Production Management – Martand Telsang
3. Total Quality Management, Date H.Besterfiled, Pearson Education Asia.
4. Total Quality Management, V.Jayakumar, Lakshmi Publications.(reprint 2005)
5. Training manual on ISO 9001 : 2000 & TQM, Girdhar J.Gyani, Raj PublishingHouse, Second Edition 2001
6. Quality Management, Howard Cuitlow, Tata Mc Graw Hill, 1998
7. Production Engineering – P.C.Sharma.
8. Production and Costing – GBS Narang and V.Kumar
9. Mechanical Estimating and Costing – Banga & Sharma.
10. Total Quality Management, Oakiand.J.S. Butterworth Heinemann Ltd. Oxford1989.
11. Quality Management – Concepts and Tasks- Narayana.V and
12. Sreenivasan.N.S., New Age International 1996.
13. Total Quality Management for engineers, Zeiri. Wood Head Publishers. 1991.
14. Quality Planning and Analysis, Juran J.M and Frank M.Gryna Jr., TMH. India.1982
15. ISO 9001, Brain Rethry, Productivity and Quality Publications.
16. ISO 9001, Brain Rethry, Productivity and Quality Publishing Pvt. Ltd. 1993.
17. Quality Auditing D.Mills, Chapman and Hall, 1993.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4020561 – COMPUTER INTEGRATED MANUFACTURING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4020561

Semester : V

Subject Title : **COMPUTER INTEGRATED MANUFACTURING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
COMPUTER INTEGRATED MANUFACTURING PRACTICAL	4	64	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of Computer Integrated Manufacturing. They are able to write part program and able operate CNC lathe and Milling machines. They are able to understand the advanced concepts adopted in CIM.

OBJECTIVES:

- Acquire knowledge in the field of Computer Integrated Manufacturing
- Create 3D Solid models of machine components using modelling software
- Execute and perform machining operations in CNC Lathe and CNC Milling machines.

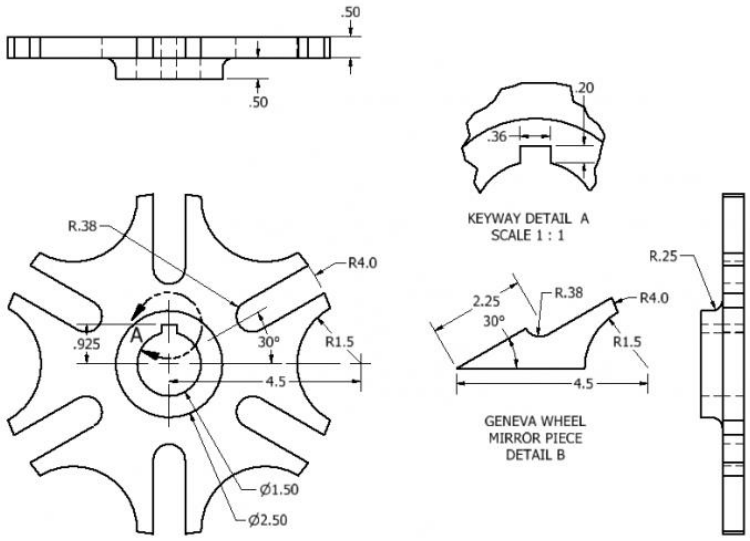
DETAILED SYLLABUS

Contents: Practical

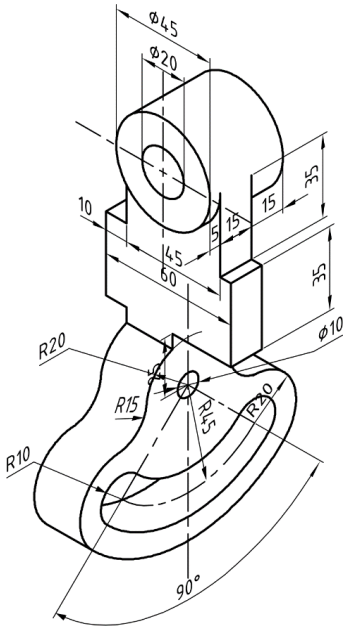
PART A: SOLID MODELLING

Introduction to Part modelling - Datum Plane – constraint – sketch – dimensioning – extrude – revolve – sweep – blend – protrusion – extrusion – rib – shell – hole – round – chamfer – copy – mirror – assembly – align – orient – drawing and detailing –creating assembly views

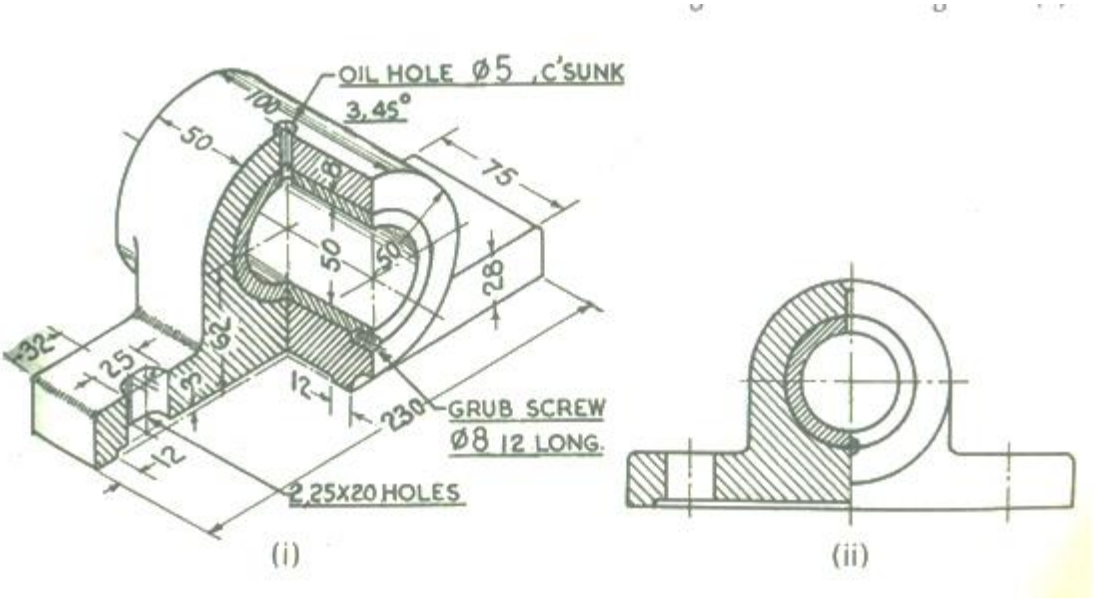
Exercise No. 1. Geneva Wheel



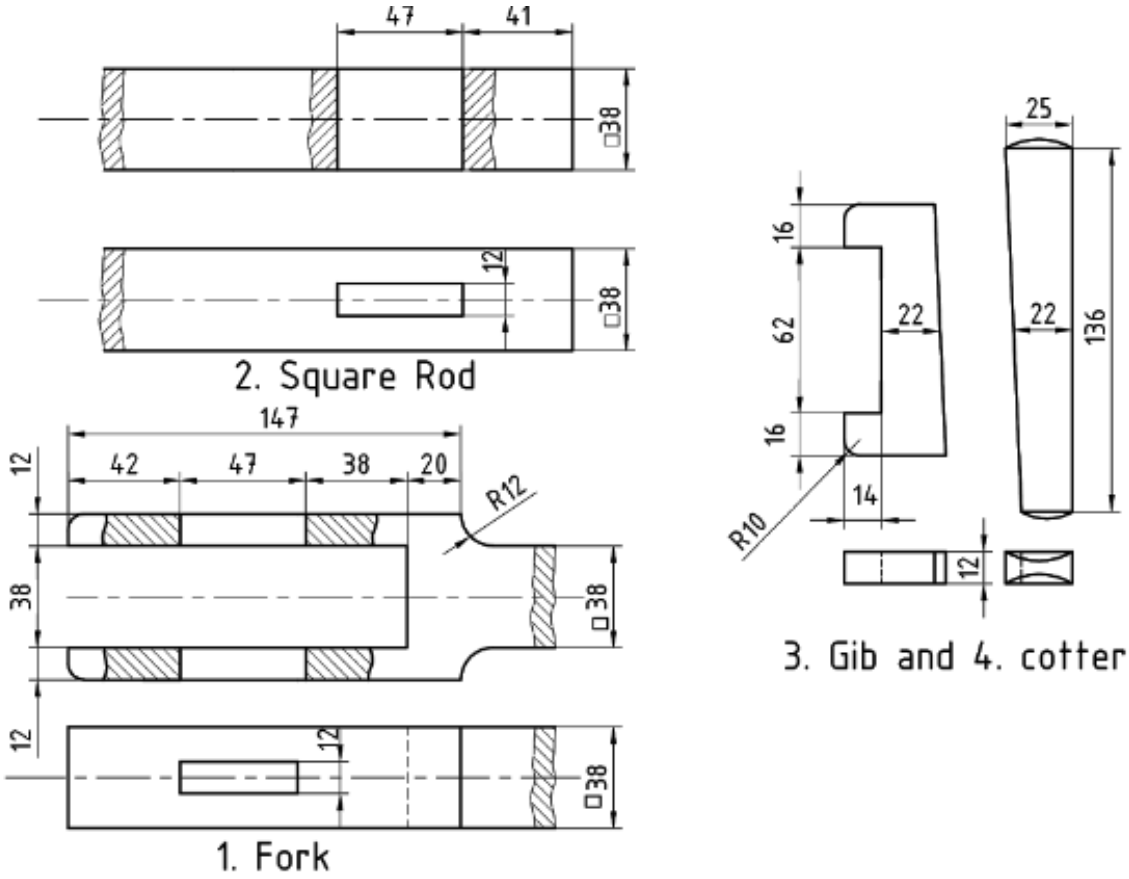
Exercise No. 2. Bearing Block



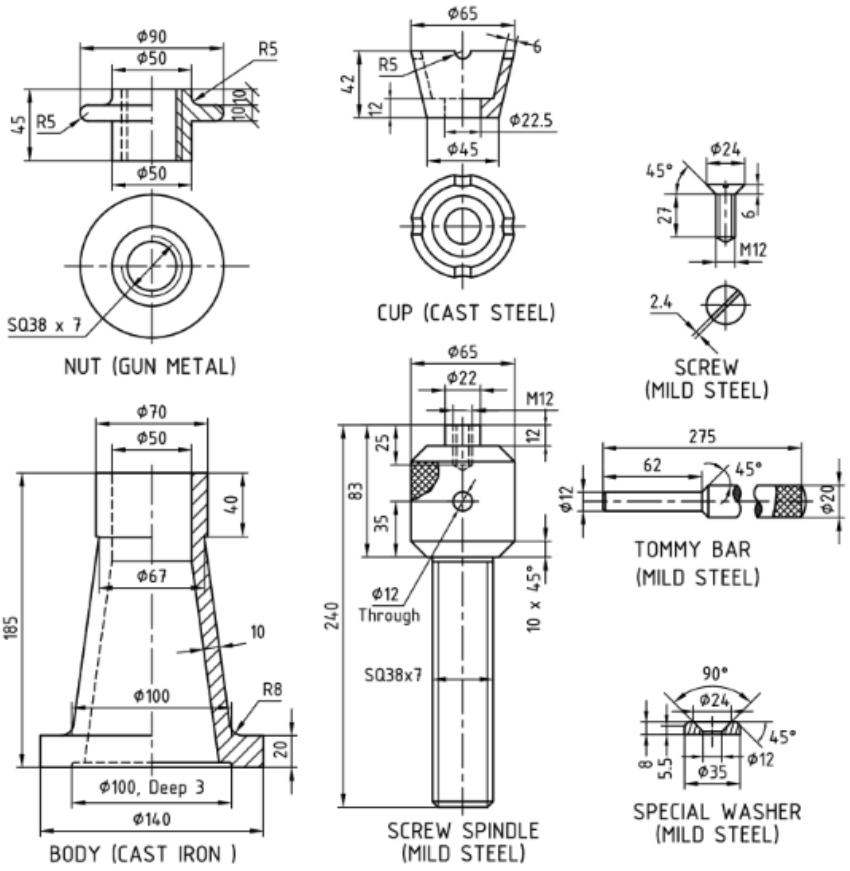
Exercise No. 3. Bushed bearing



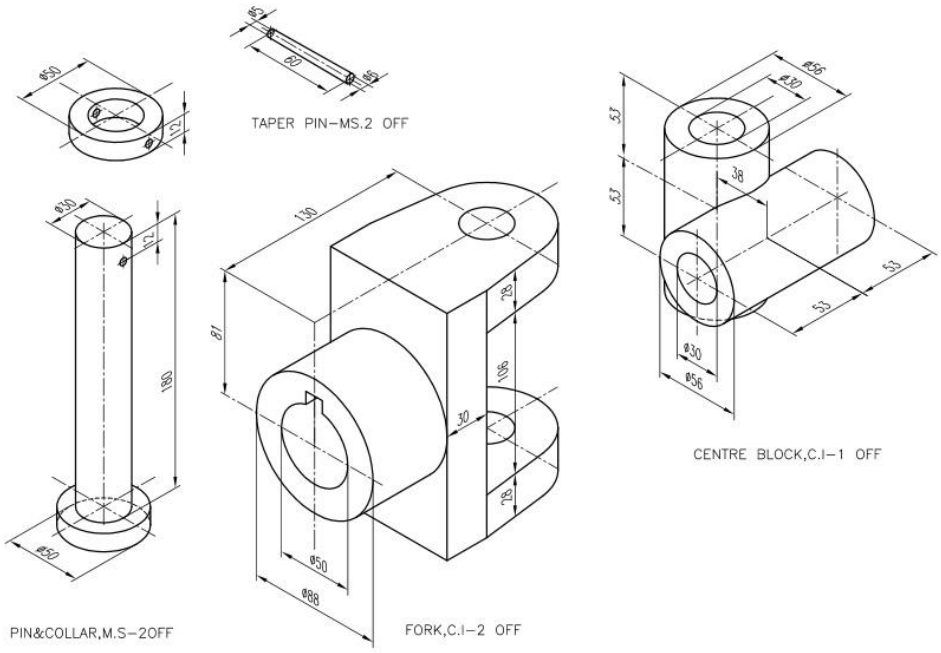
Exercise No. 4. Gib and Cotter joint



Exercise No. 5. Screw Jack



Exercise No. 6. Universal Coupling



Note: Print the orthographic view and sectional view from the above assembled 3D drawing.

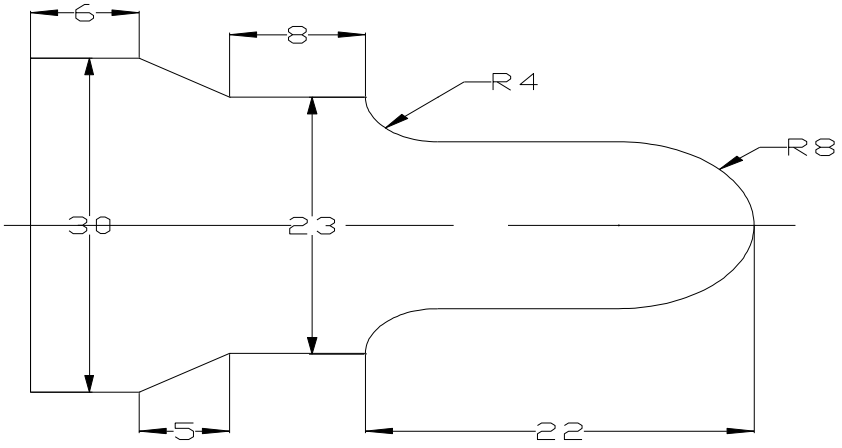
PART B: CNC Programming and Machining

Introduction: 1. Study of CNC lathe, milling. 2. Study of international standard codes: G-Codes and M-Codes 3. Format – Dimensioning methods. 4. Program writing – Turning simulator – Milling simulator, IS practice – commands menus. 5. Editing the program in the CNC machines. 6. Execute the program in the CNC machines.

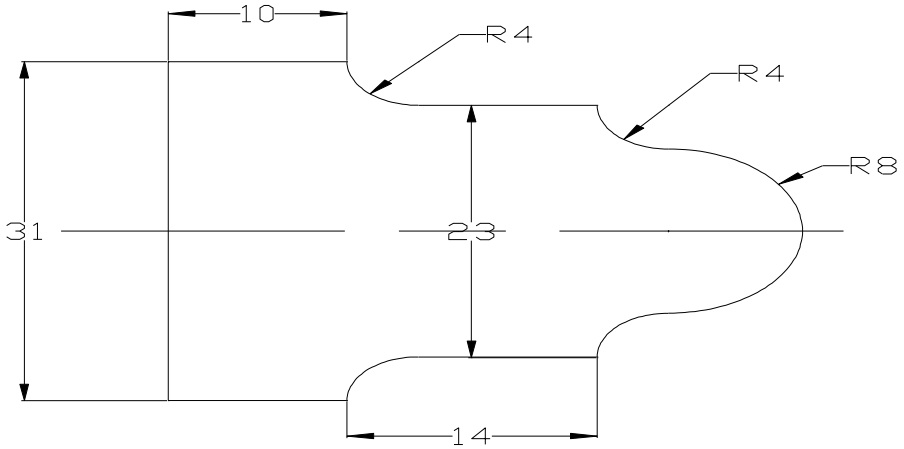
Exercises Note: Print the part program from the simulation software and make the component in the CNC machine.

CNC Turning Machine Material: M.S / Aluminium / Acrylic fibre / Plastic

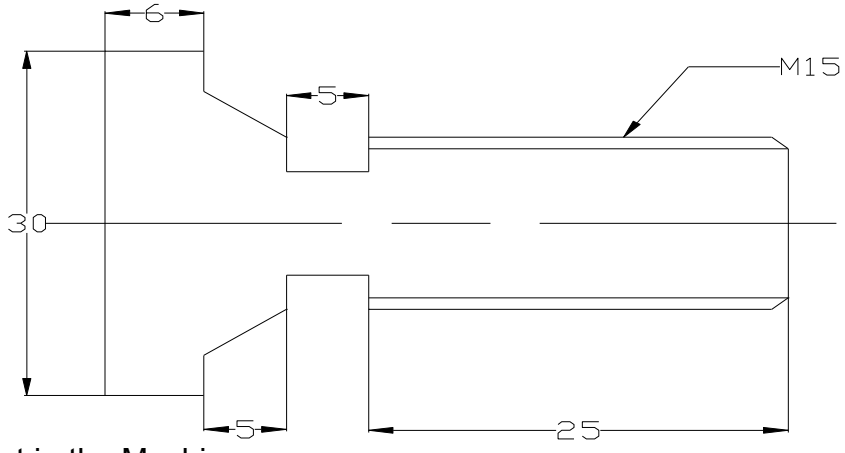
1. Using Linear and Circular interpolation - Create a part program and produce component in the Machine.



2. Using Stock removal cycle – Create a part program for multiple turning operations and produce component in the Machine.



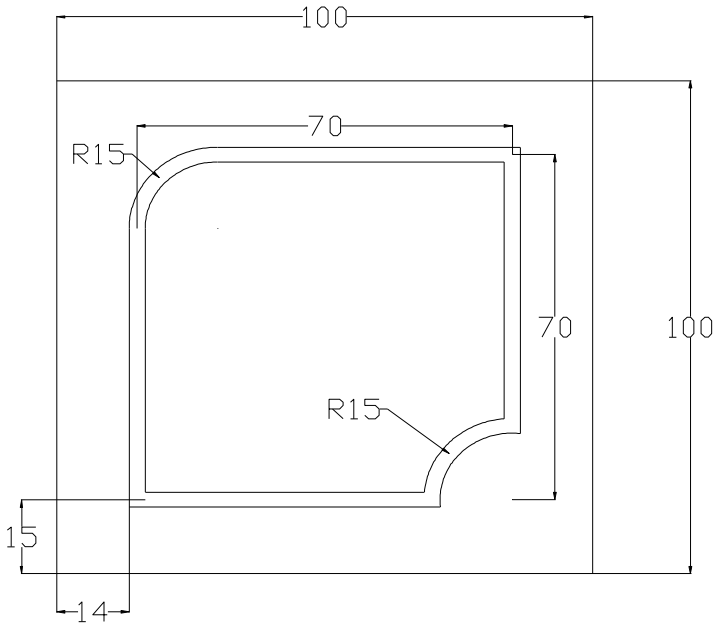
3. Using canned cycle - Create a part program for thread cutting, grooving and produce



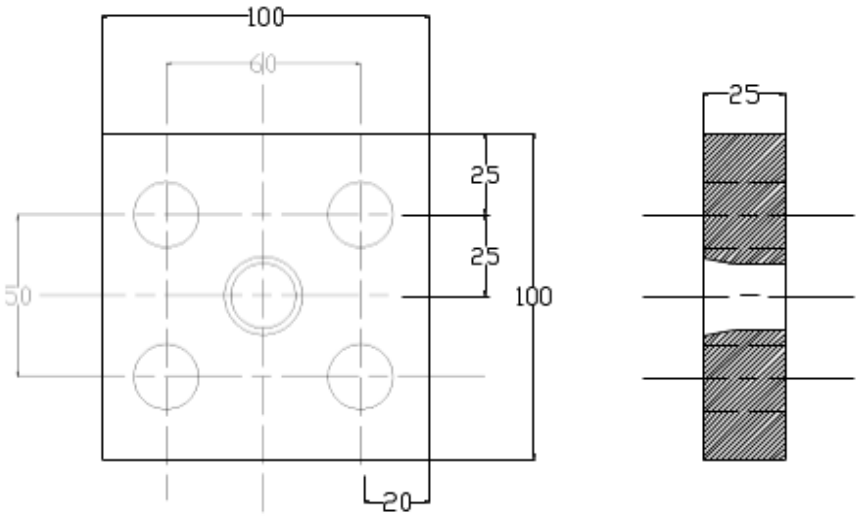
component in the Machine.

CNC Milling Machine Material: M.S / Aluminum / acrylic fibre / plastic

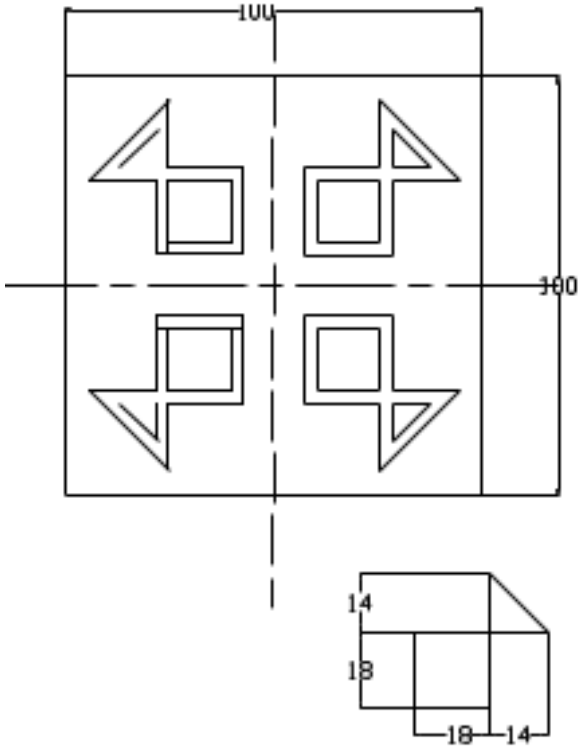
4. Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine.



5. Using canned cycle - Create a part program for drilling, tapping, counter sinking and produce component in the Machine.



6. Using subprogram - Create a part program and produce component in the Machine.



BOARD EXAMINATION

Note:

- All the exercises in both sections should be completed. Two exercises will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the exercises should be given in the question paper and students are allowed to select by a lot or question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Note: Part A – The given component drawing should be created and solid modelling after assembly should be printed and submitted along with the answer paper for evaluation by the external examiner.

Part B – The program for the given component should be written in the answer paper. The program should be entered in the CNC machine and the component should be submitted for evaluation by the external examiner. The machined component should be kept under the custody of examiner.

Allocation of marks for Board Examination

PART A: Solid Modelling

Creation of sketch	: 15
Modelling	: 25
Accuracy	: 5

PART B: CNC Programming

Program writing	: 15
Editing and Machining	: 25
Finish	: 5
Viva voce	: 10

Total Marks : 100

LIST OF EQUIPMENTS (for a batch of 30 students)

1. Personal computer - 30 Nos.
2. 3D Solid Modelling and Simulation software - Sufficient to the strength
3. CNC Lathe –2 Nos.
4. CNC Mill –2 Nos.
5. Consumables - Sufficient quantity
6. Laser / Inkjet Printer – 1 No.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4020563 – MECHATRONICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(implemented from the Academic year 2020-2021 onwards)

Course Name : 1220: Diploma in Mechanical Engineering (TOOL & DIE)

Subject Code : 4020563

Semester : V

Subject Title : **MECHATRONICS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
MECHATRONICS PRACTICAL	4	64	25	100*	100	3Hrs.

*Examinations will be conducted for 100 marks and it will be reduced for 75 marks for result

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of industrial automation. They are able to write ladder logic program and able operate PLCs. They are able to understand the advanced concepts adopted in industrial automation.

OBJECTIVES:

- Acquire knowledge in the field of mechatronics
- Explain the various components of electro pneumatics and electro hydraulics Handle PLC, HMI, SCADA and DCS components

DETAILED SYLLABUS

ELECTRO PNEUMATICS: Introduction to Electro Pneumatics -Applications of pneumatics - Pneumatic and electro pneumatic controllers - Components and assemblies in the electrical signal control section: Power supply unit - Push button and control switches - Sensors for measuring displacement and pressure - Relays and contactors. Electrically actuated directional control valves - Construction and mode of operation - Functions - Electrical connection of solenoid coils. Procedure for developing a control system.

ELECTRO HYDRAULICS: Basic principles of electro hydraulics - Function and use of electrohydraulic components - Production and interpretation of standard hydraulic and electrical circuit diagrams

PROCESS CONTROL INSTRUMENTATION: Process control - Types of processes – Structure of control system – Controllers - Digital controllers – Types of process control – ON/OFF Control – Analog control – Digital control. Data Acquisition System - Objectives of DAS - Types of DAS: Single channel DAS – Multichannel DAS – Computer based DAS. Data Loggers - Block diagram of Data Loggers – Control facilities in Data Logger – Uses of Data Logger - Different stages of Direct Digital Control.

SCADA - Fundamental principles of modern SCADA systems - SCADA hardware - SCADA software - Landlines for SCADA - SCADA and local area networks - Modem used in SCADA systems - Remote terminal units. Human Machine Interface – components of HMI.

Distributed Control System - Parts of DCS – Layered structure of DCS – Communication options in DCS.Variable Frequency Drives - Construction, Working, Operation, Applications and Specifications

Experiments

PART A

(ELECTRO PNEUMATICS)

1. Direct control of a 3/2 NC Single solenoid valve and a 3/2 NO Single solenoid valve
2. Direct control of a 5/2 single solenoid valve and a 5/2 double solenoid valve
3. Simple circuit using OR Logic and AND Logic
4. Limit switch and proximity switch application circuits

(ELECTRO HYDRAULICS)

1. Sorting device using double acting cylinder, directly actuated, manually

2. Component selection on conveyor belt using double acting cylinder and directly actuated, manually
3. Lifting station using single acting cylinder and directly actuated, manually
4. Door control using double acting cylinder and interlocking

PART B

PROCESS CONTROL INSTRUMENTATION

1. Wiring practice of HMI
2. Design of HMI screen
3. HMI Configuration and Interfacing with PLC and PC
4. Configuring Alarms in SCADA
5. Real time project development and interfacing with PLC
6. Monitoring & Control of Pneumatic System using HMI

BOARD EXAMINATION

Note:

1. All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.
2. All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
3. All regular students appearing for first attempt should submit record notebook for the examination.
4. The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
5. The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

ALLOCATIONOFMARKS

PART A: Electro Pneumatic circuit/Electro Hydraulic circuit (bylot):

Circuit diagram	:	15
Components connections & execution	:	20
Output	:	10

PARTB: Process Control Instrumentation

Circuit diagram	:	15

Execution &Programming	:	20
Output	:	10
Vivavoce	:	10
Total Marks	:	100

List of Equipment (for the batch of 30 students)

Electro Pneumatics:

1. Basic Pneumatic Trainer Kit with FRL Unit, Compressor and Accessories – 2 Nos
    - 3/2 NC Single Solenoid Valve - 2Nos
    - 3/2 NO Single Solenoid Valve - 2Nos
    - 5/2 Single Solenoid Valve - 2Nos
    - 5/2 Double Solenoid Valve - 2Nos
    - Limit Switch – 6 Nos
    - Proximity Sensor (Inductive, Capacitive & Optical) – Each 2 Nos
    - Single Acting Pneumatic Cylinder – 4 Nos
    - Double Acting Pneumatic Cylinder – 2 Nos
    - Power Supply Unit, Connecting Leads and Hoses – As per Requirements

Electro Hydraulics:

1. Basic Hydraulics Trainer Kit with Hydraulic Pump, Regulator and Hoses Accessories – 2 Nos
    - Double Acting Cylinder – 2 Nos
    - Single Acting Cylinder – 2 No
    - Manual Actuator Switch – 4 Nos
    - Material Sorting assembly set up – 1 No
    - Conveyor Assembly set up – 1 No
    - Lifting Station Assembly Set up – 1 No
    - Limit Switch - 4 Nos

Process Control Instrumentation:

- Programmable Logic Controller (PLC) with Software – 3 Nos
- Human Machine Interface (HMI) with Software - 3 Nos
- SCADA Software – 1 No or Integrated Software for PLC, HMI and SCADA)
- Personnel Computer – 3 Nos
- Water Tank Assembly set up with Level Sensor and Flow Controller (Actuator) to interface with PLC and HMI – 1 No

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4020540 – PROCESS AUTOMATION PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4020540

Semester : V

Subject Title : **PROCESS AUTOMATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
STRENGTH OF MATERIALS	4	64	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Design and operate pneumatic circuits.
- Design and operate fluid power circuits
- Use PLC system and its elements for process control
- Familiarize the working of function blocks in PLC
- Use ON-Delay timer to control a motor
- Use OFF-Delay timer to control a motor
- Use counter function block (Up counter and Down counter)
- Control the automatic operation of pneumatic cylinder using PLC
- Record of work to be prepared.

Exercises

PART A

Pneumatics Lab.

1. Direct operation of single and double acting cylinder.
2. Operation of double acting cylinder with quick exhaust valve.
3. Speed control of double acting cylinder using metering-in and metering-out circuits.
4. Automatic operation of double acting cylinder in single cycle - using limit switch.

Hydraulics Lab.

5. Direct operation of double acting cylinder.
6. Direct operation of hydraulic motor.
7. Speed control of double acting cylinder metering-in and metering-out control.

PART B

PLC Lab.

1. Direct operation of a motor using latching circuit.
2. Operation of a motor using 'AND' logic control.
3. Operation of a motor using 'OR' 'control.
4. On-Delay control of a motor and Off –Delay control of a motor.
5. Automatic operation of a Double acting cylinder-single cycle - forward, time delay, return.
6. Automatic operation of Double acting cylinder-Multi cycle.
7. Sequential operation of double acting cylinder and a motor.

BOARD EXAMINATION

Note:

- All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Detailled Allocation of Marks

Part A:		**45**
Procedure / Circuit diagram	10	
Identification of Components	15	
Connection and execution	20	
Part B:		**45**
Procedure / Circuit diagram	10	
Ladder diagram / Programming	25	
Execution	10	
Viva Voce		**10**
Total		**100**

LIST OF EQUIPMENTS (for a batch of 30 students)

1. Pneumatic Trainer Kit – 3Nos
   (All Cylinders, Control Valves, Limit switches and other accessories)
2. Hydraulics Trainer Kit – 2No.
   (All Cylinders, Control Valves, Limit switches and other accessories)
3. PLC kit – 3 Nos.
4. Computer with software – 10 Nos.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4022550 – JIGS AND FIXTURES PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022550

Semester : V

Subject Title : **JIGS AND FIXTURES PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

SUBJECT	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
JIGS AND FIXTURES PRACTICAL	5	80	25	100*	100	16 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

OBJECTIVES:

- Manufacture of template type drill jig
- Manufacture of Channel drill jig and indexing drill jig
- Manufacture of milling fixture
- Manufacture of inspection fixture
- Manufacture of welding fixture
- Use different machine tool in Manufacture of jigs and fixtures.

A. Manufacture of following Jigs

1. Template drill jig
2. Channel drill jig
3. Indexing drill jig

B. Manufacture of following Fixtures

4. Milling Fixture
5. Inspection Fixture
6. Welding Fixture

DETAILED SYLLABUS

Ex. No.	Name of the exercise	Time in Hours
1.	Manufacture of Template drill jig	14
2.	Manufacture of Channel drill jig	13
3.	Manufacture of Indexing drill jig	13
4.	Manufacture of Milling Fixture	14
5.	Manufacture of Inspection Fixture	13
6.	Manufacture of Welding Fixture	13
TOTAL		80

Note: -

1. Batch size should not be more than 5 students for class work.
2. For examination, exercise should be given to students individually and not in batches.
3. The examination duration is 16 hours.
4. Students should be trained in setting the Jig/Fixture on the machine tool, to make necessary adjustments, trial production using the tool fabricated by them and rectification of tool defects if any.
5. For Board examination any one of the above tool (sl no 1 to 6) is to be manufactured, fitted in the machine tool and trial production should be taken. The evaluation of the performance should be based on the component dimensions and finish obtained from the Jig / Fixture manufactured by the student during the 16 hours examination.

SCHEME OF EXAMINATION:

Manufacture of Jig / Fixture	-	50marks
Tool finish	-	20 marks
Component finish / accuracy	-	10 marks
Tool setting & trial production	-	10 Marks
Viva Voce	-	10 Marks
Total	**-**	**100 Marks**

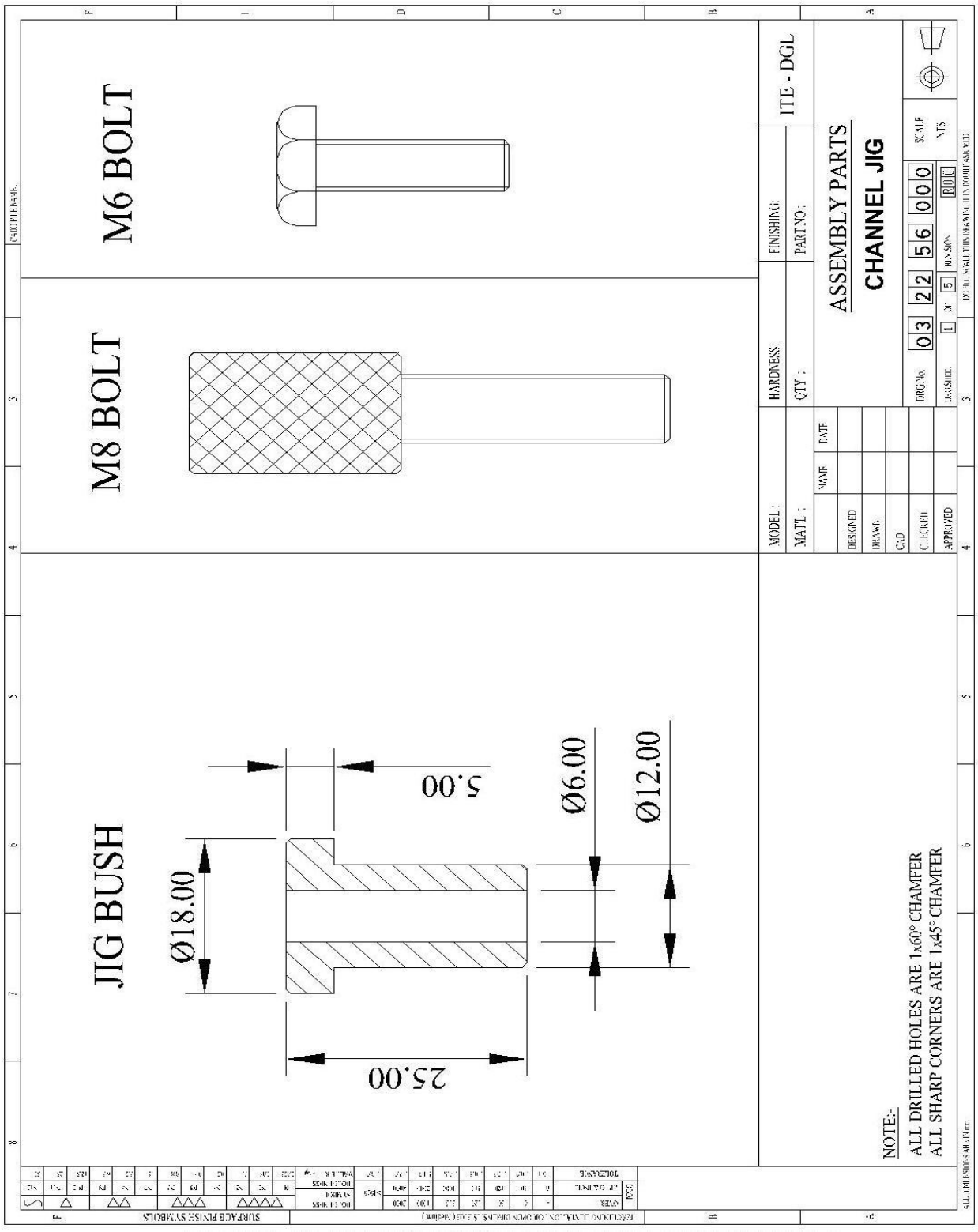
Details of The Equipment's (for a batch of 30 students)

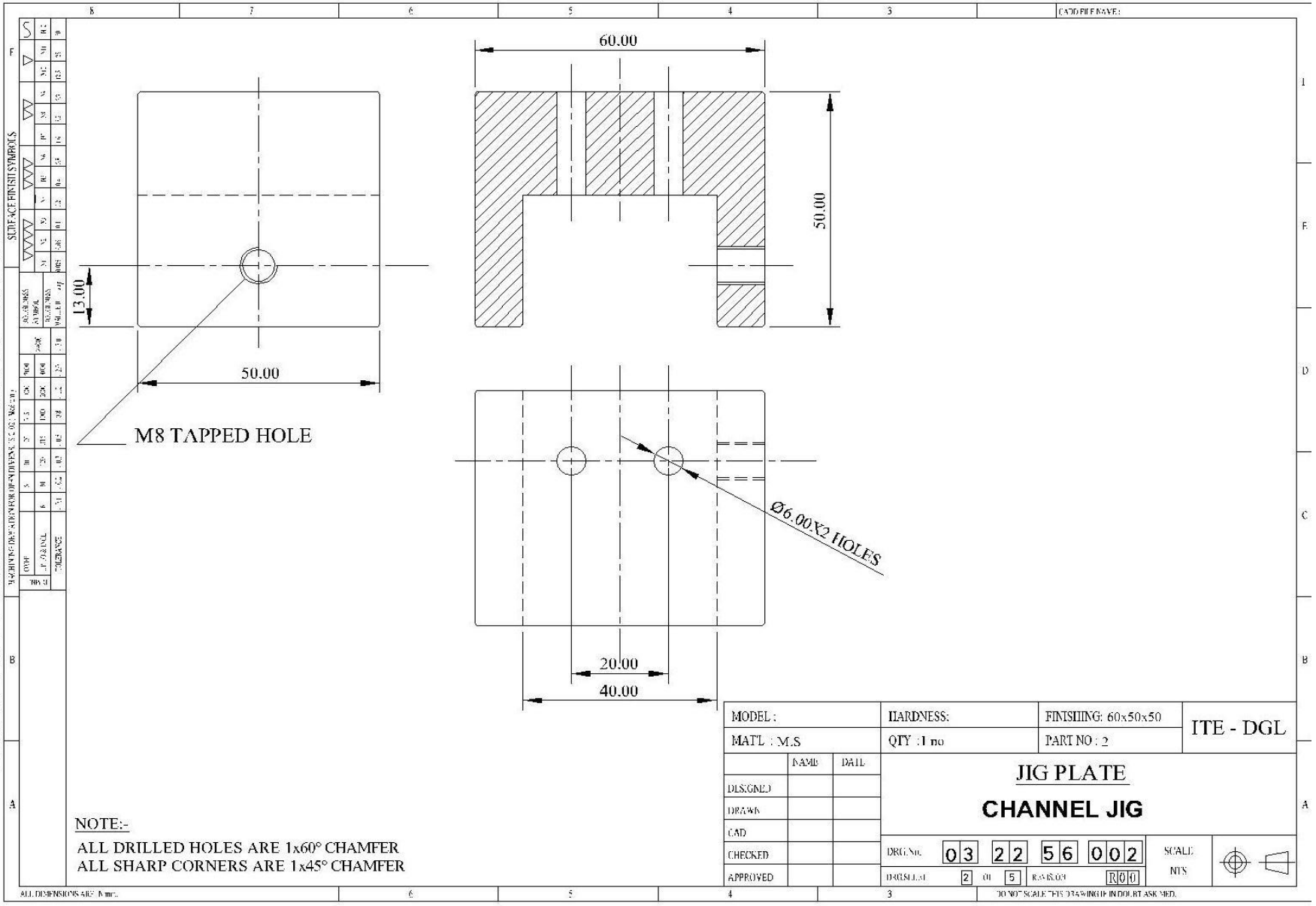
NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)	
YEAR	THIRD	
SEMESTER	V	
NAME OF THE LABORATORY	4022550 JIGS AND FIXTURES PRACTICAL	
S.N	**LIST OF THE EQUIPMENTS WITH SPECIFICATIONS REMARKS, IF ANY**	**QUANTITY REQUIRED**
1	Centre Lathe, 4 ½' bed length	5
2	Drilling machine	2
3	Shaping machine, stroke length 300mm	2
4	Vertical milling machine	2
5	Surface grinding machine	2
6	Bench vice	10
7	Fitting file set	10
8	Tap set	4
9	Surface plate	2
10	Vernier height gauge 0-250mm	2
11	Dial test indicator with magnetic stand	2
12	Angle plate	2
13.	Tool maker's straight edge – 150 mm	1
14.	Digital Micrometer – 0.-25mm range, 0.001mm least count	3

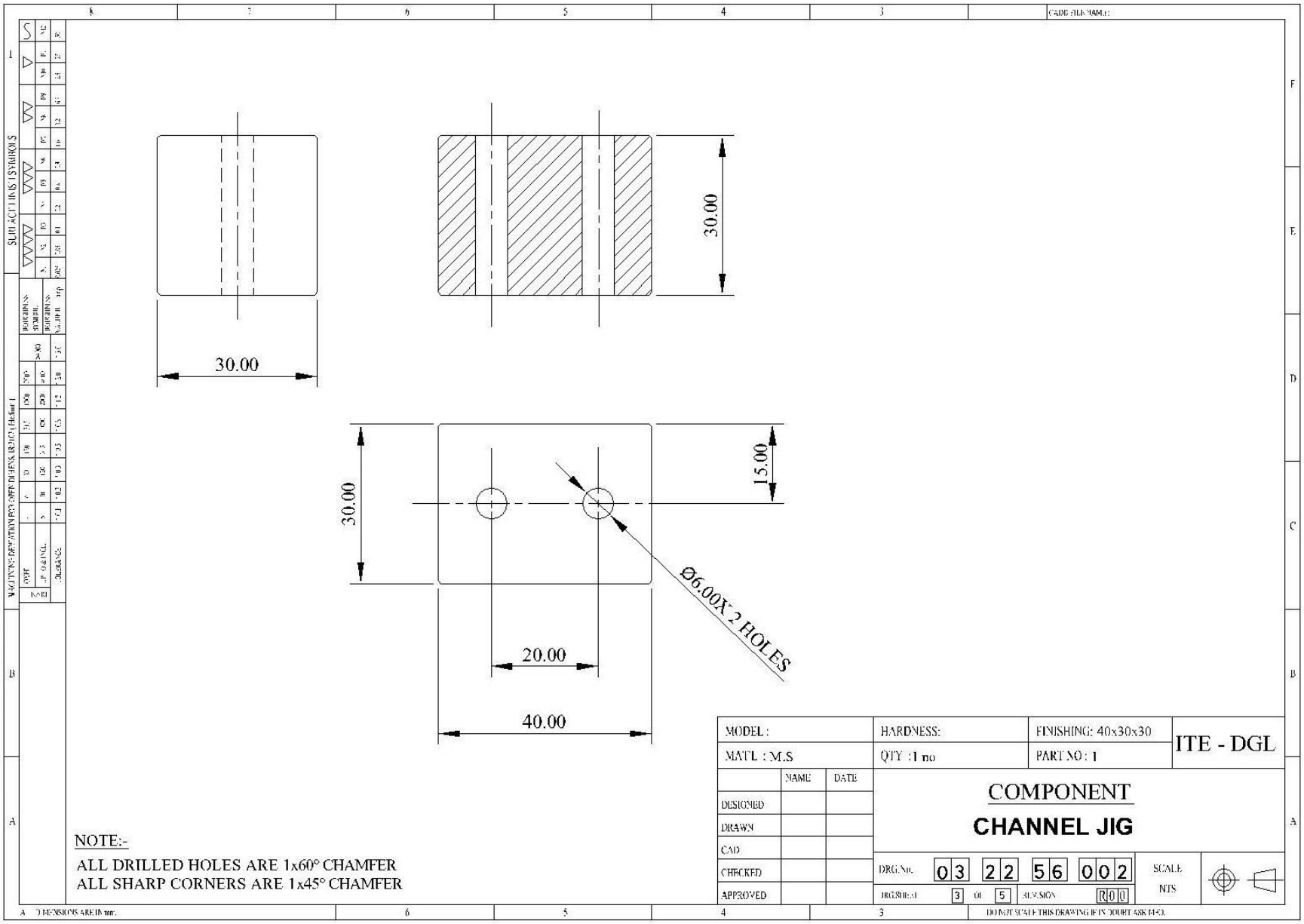
Exercise – I Template Jig

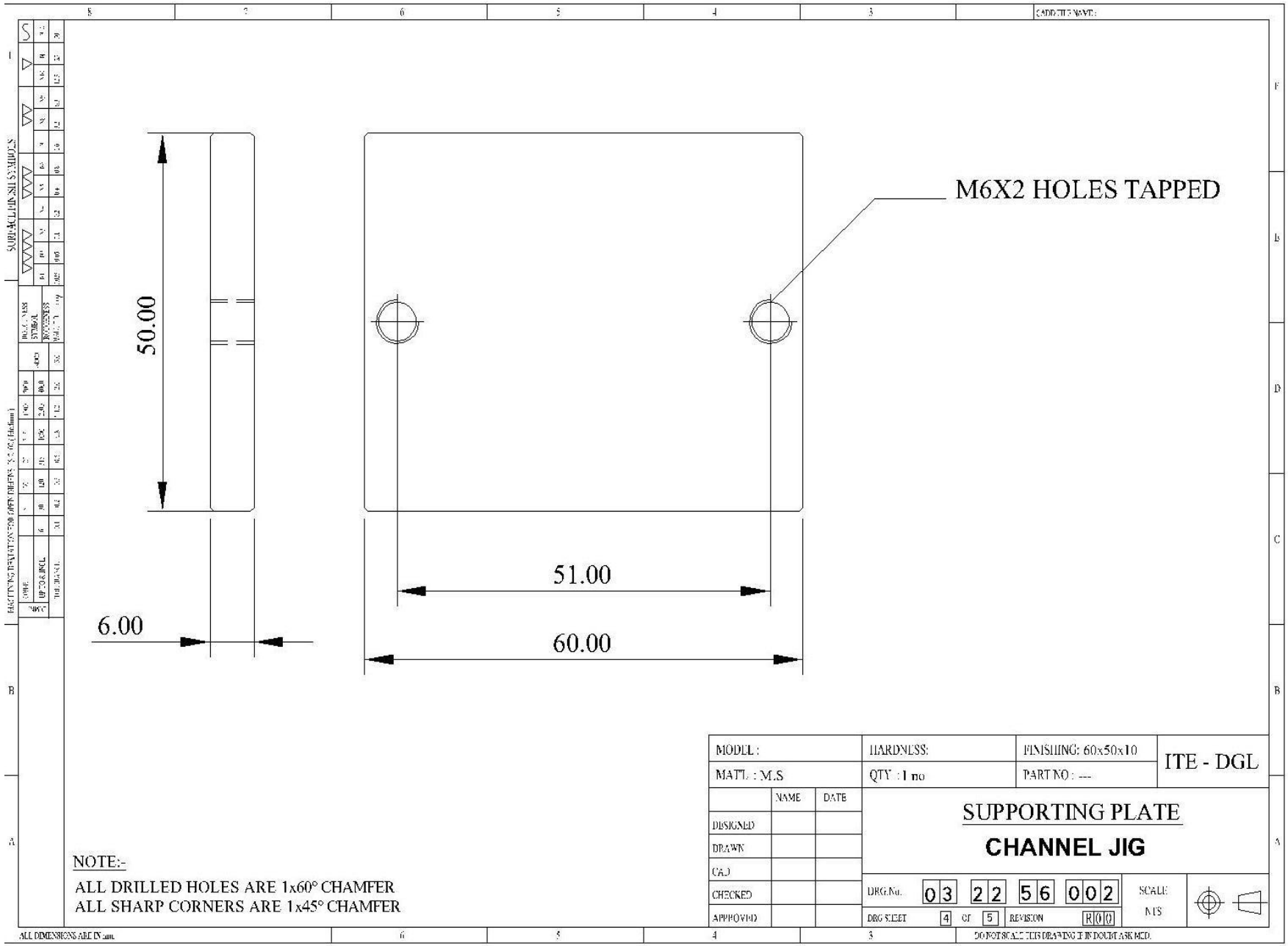
- Pl refer the sketches available in subject code:4022340 – Computer Aided Machine & Tool Drawing Exercise no.7

Exercise – II Channel Jig




60.00
50.00
13.00
50.00
M8 TAPPED HOLE
Ø6.00X2 HOLES
20.00
40.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 60x50x50
ITE - DGL
MAT'L : M.S
QTY : 1 no
PART NO : 2
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
JIG PLATE
CHANNEL JIG
DRG No. 03 22 56 002
SCALE NTS
SHEET 2 OF 5
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IN DOUBT ASK ME.


30.00
30.00
30.00
15.00
Ø6.00X 2 HOLES
20.00
40.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 40x30x30
ITE - DGL
MATL : M.S
QTY : 1 no
PART NO : 1
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
COMPONENT
CHANNEL JIG
DRG.No. 03 22 56 002
SCALE NTS
DRG.SHEET 3 OF 5
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME.



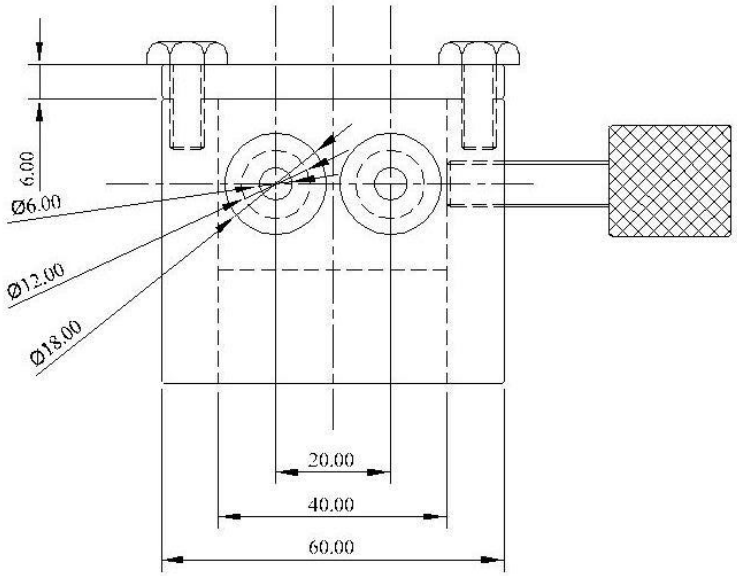
NOTE:-

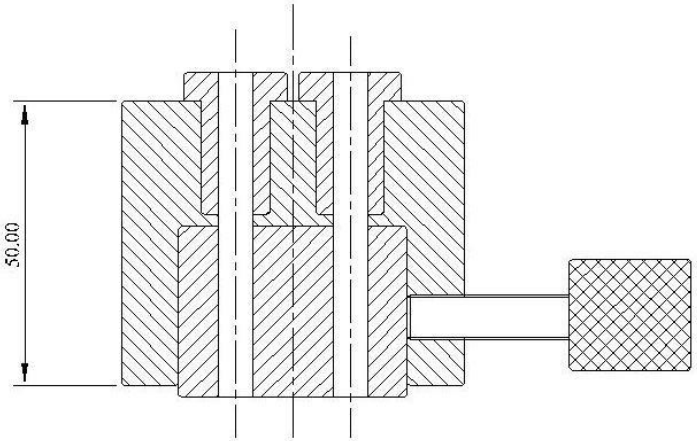
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL :		HARDNESS:	FINISHING: 60x50x10	ITE - DGL
MATL : M.S		QTY : 1 no	PART NO : ---	
	NAME	DATE	SUPPORTING PLATE	
DESIGNED			CHANNEL JIG	
DRAWN				
CAD				
CHECKED			DRG.No. 03 22 56 002	SCALE: NTS
APPROVED			DRG SHEET 4 OF 5 REVISION R00	

ALL DIMENSIONS ARE IN mm. DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME.

PLAN





SECTIONAL ELEVATION

BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QTY
5	M8 BOLTS	STD	2
4	M6 BOLTS	STD	2
3	JIG BUSH	M.S	2
2	JIG PLATE	M.S	1
1	WORK PIECE	M.S	1

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

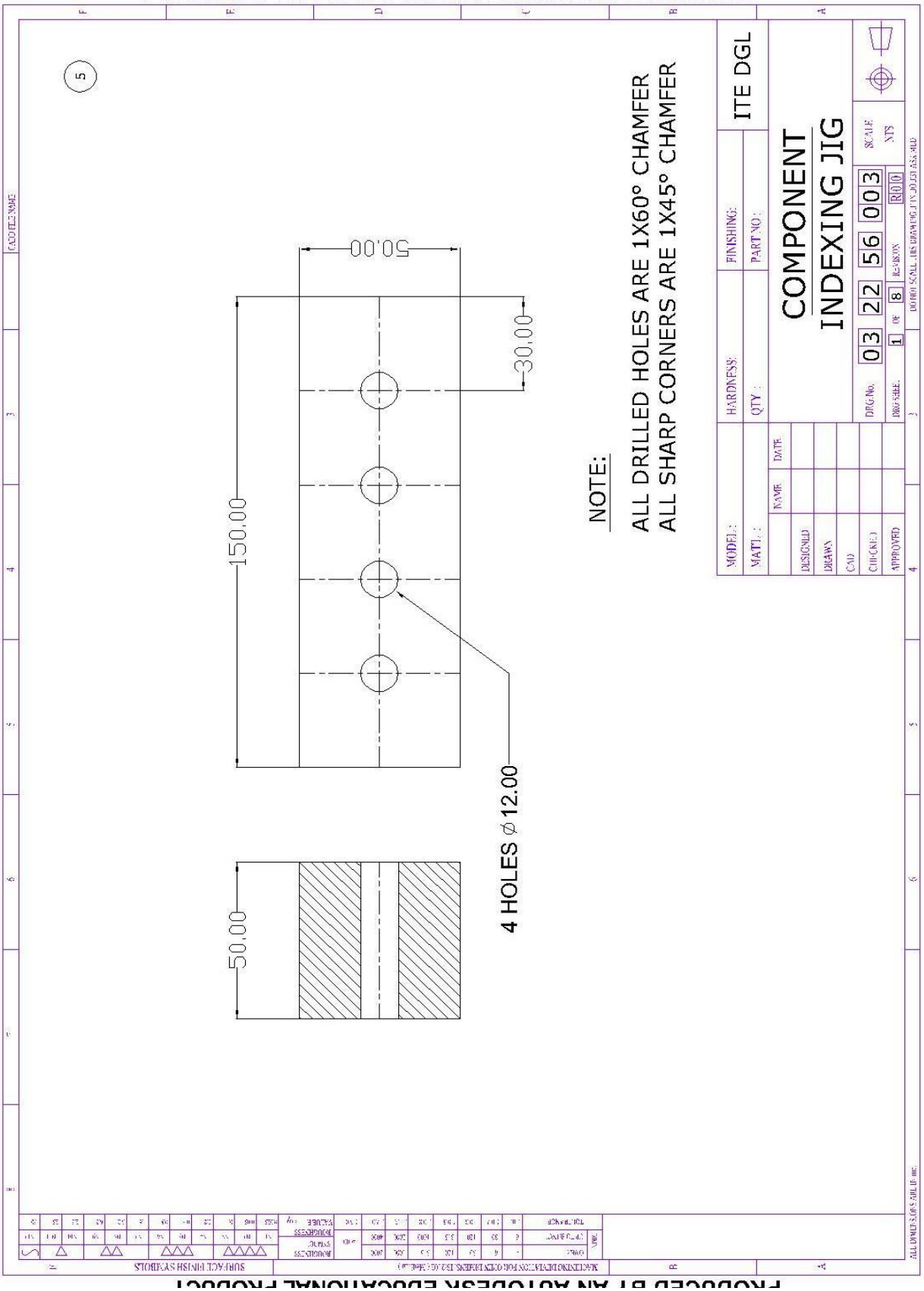
ASSEMBLY

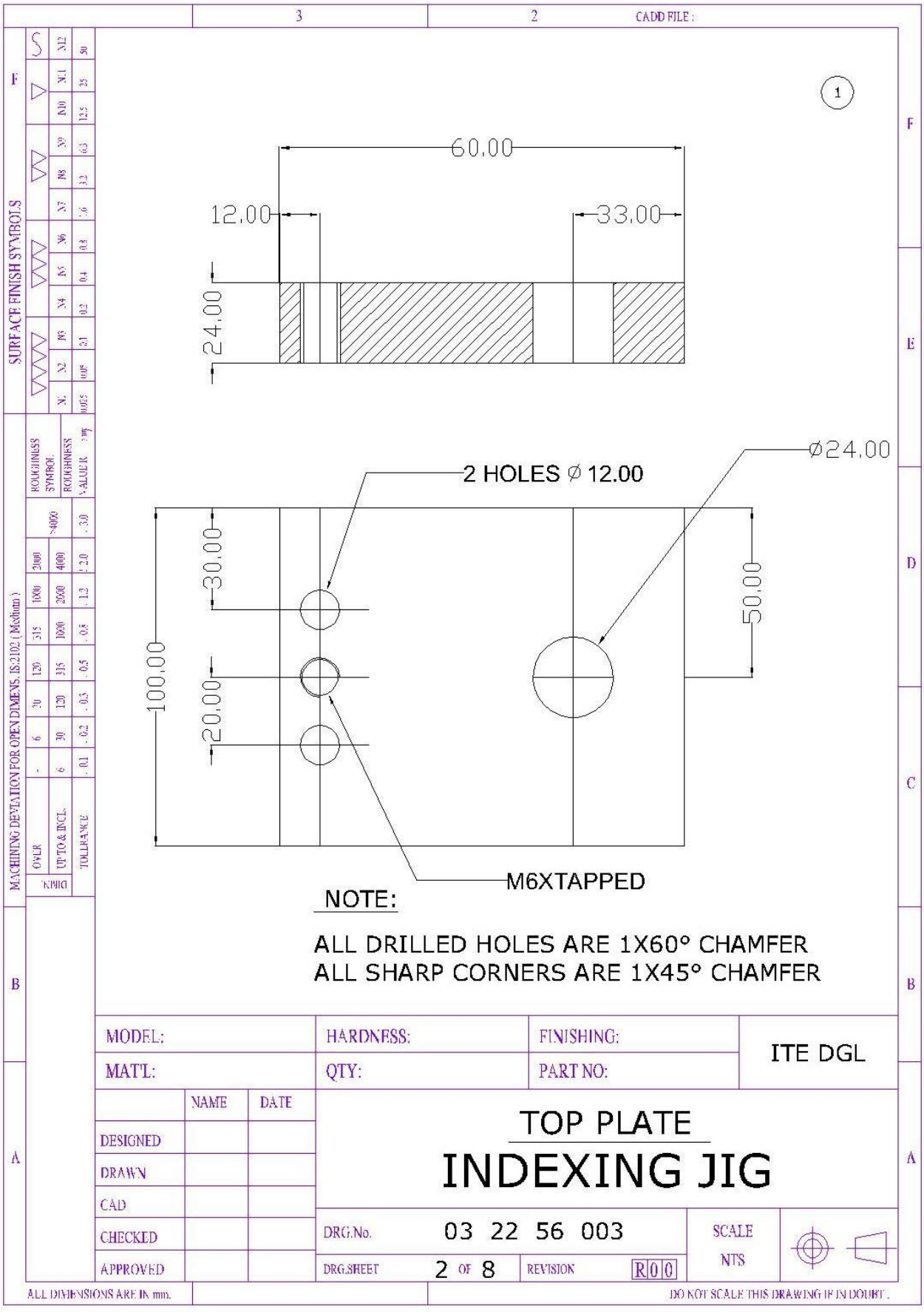
CHANNEL JIG

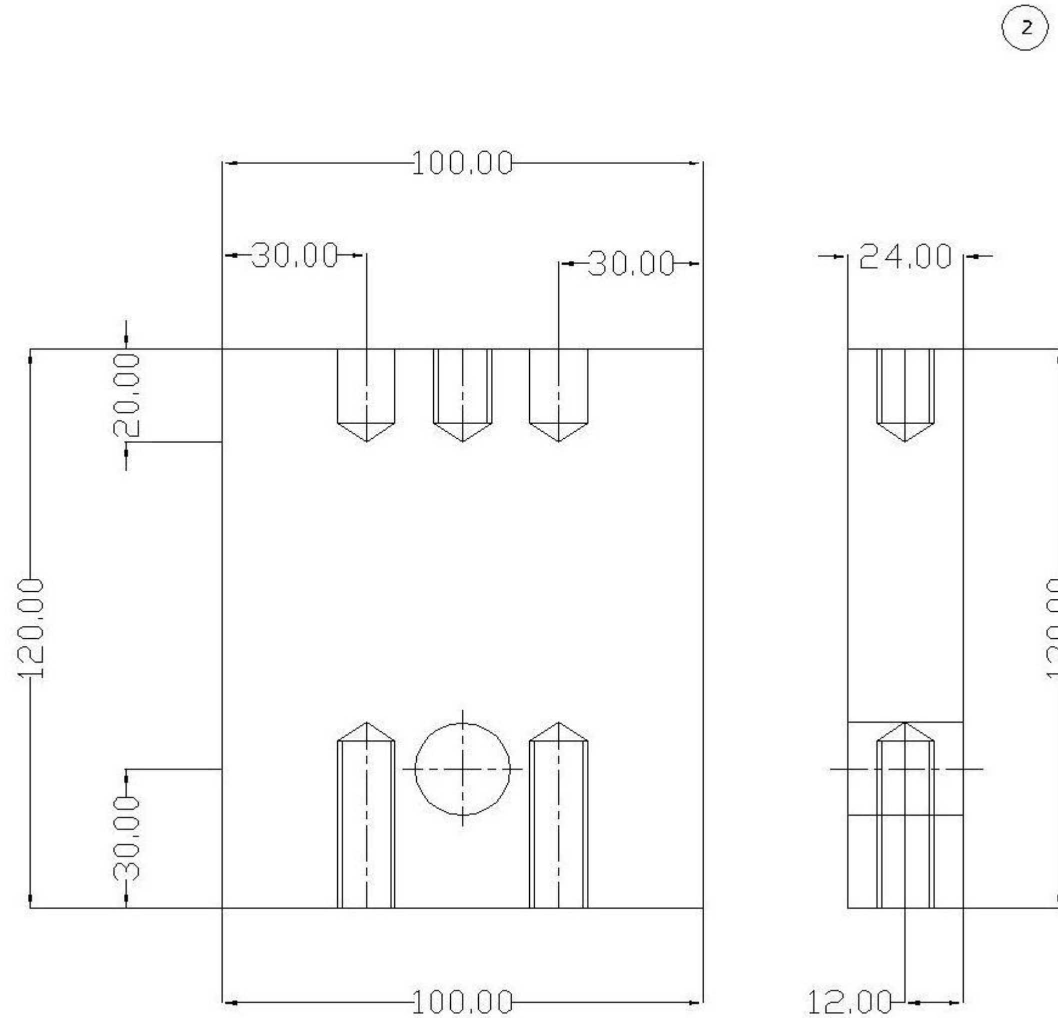
DRG No. 03 22 56 002 | SCALE NTS | SHEET 5 OF 5 | REVISION R00

ALL DIMENSIONS ARE IN mm | DO NOT SCALE THIS DRAWING UNLESS REQUESTED

Exercise – III Indexing Jig




CADD FILE :
1
60.00
12.00
33.00
24.00
2 HOLES ∅ 12.00
∅24.00
30.00
20.00
100.00
50.00
M6XTAPPED
NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL:
HARDNESS:
FINISHING:
ITE DGL
MATL:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
TOP PLATE
INDEXING JIG
DRG.No. 03 22 56 003
SCALE NTS
DRG.SHEET 2 OF 8
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.



NOTE:

ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER

MODEL:	HARDNESS:	FINISHING:	ITE DGL
MAT'L:	QTY:	PART NO:	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

SIDE PLATE
INDEXING JIG

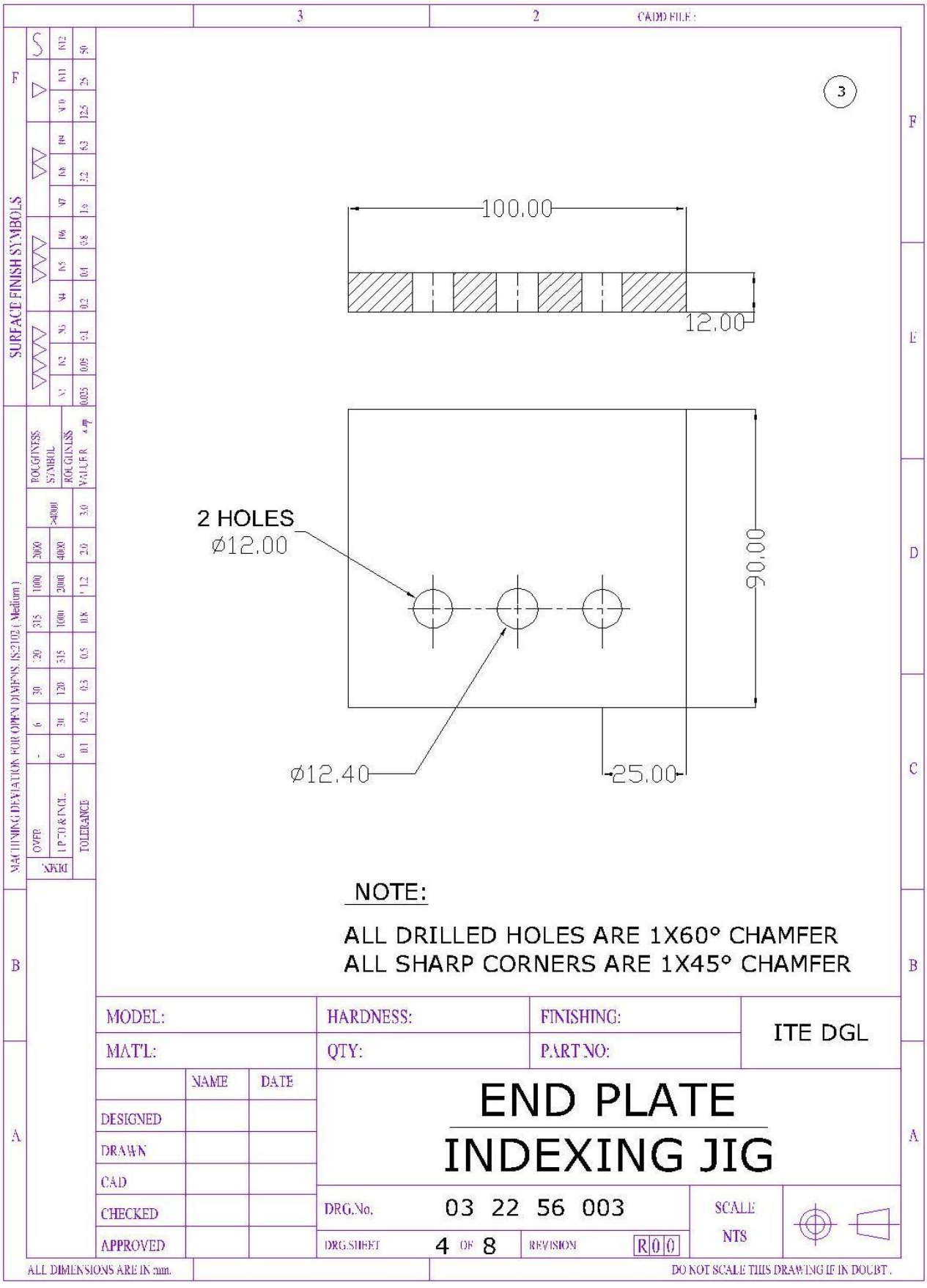
DRG.No. 03 22 56 003

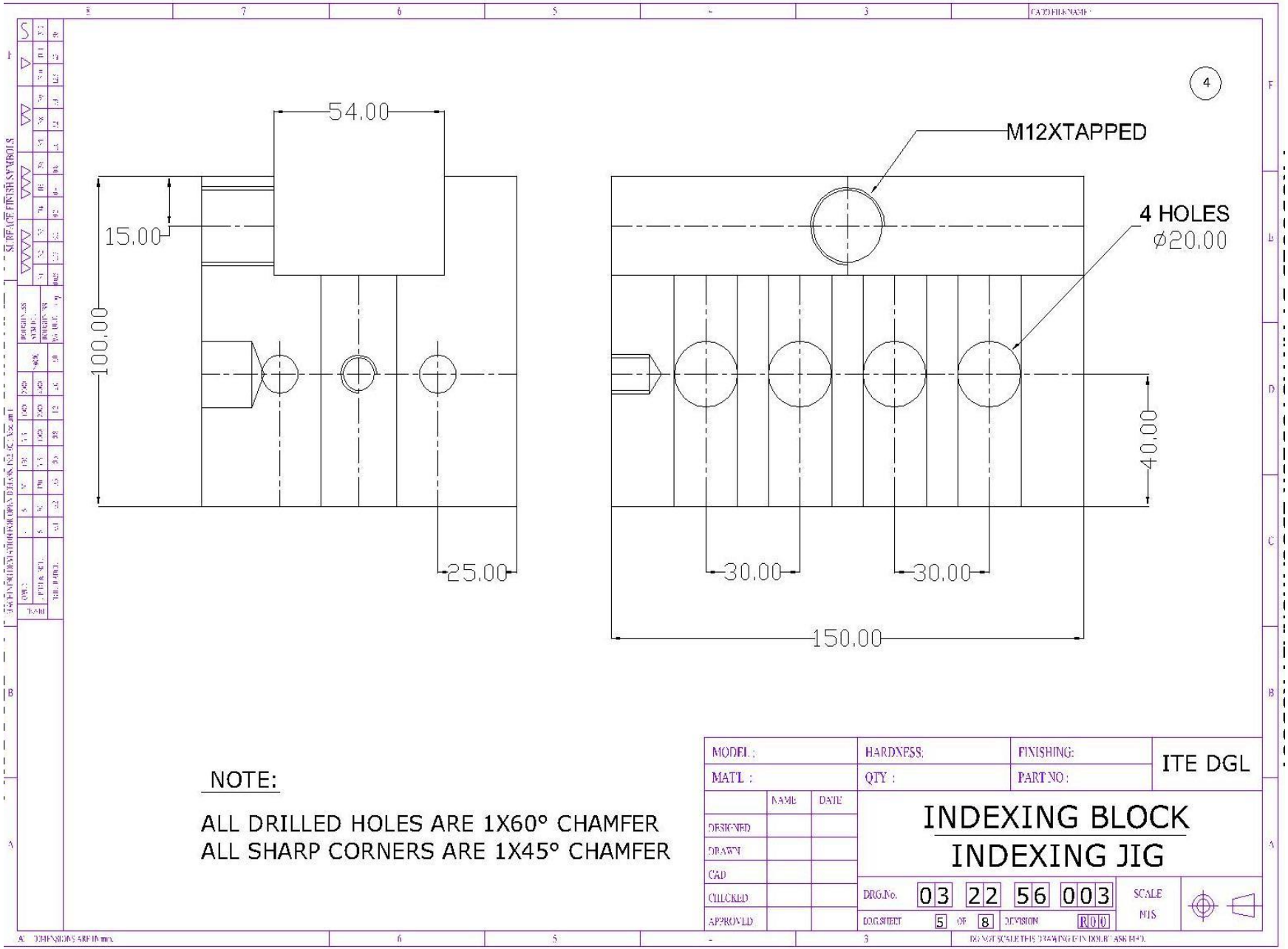
DRG.SHEET 3 OF 8 REVISION R00

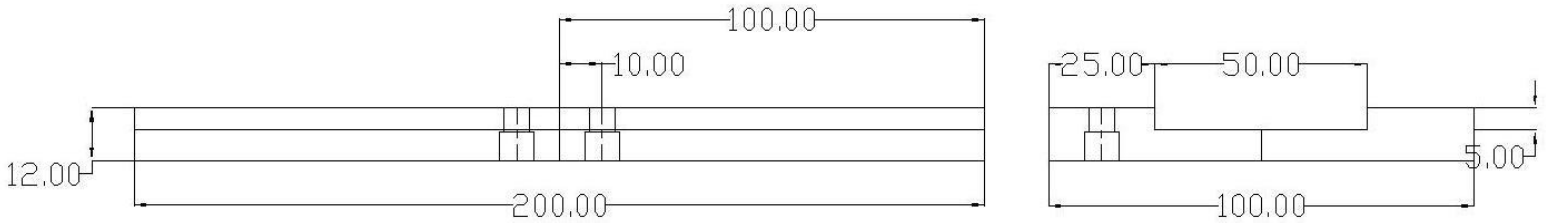
SCALE NTS

ALL DIMENSIONS ARE IN mm.

DO NOT SCALE THIS DRAWING IF IN DOUBT.


CADD FILE :
3
100.00
12.00
2 HOLES
Ø12.00
90.00
Ø12.40
25.00
NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
END PLATE
INDEXING JIG
DRG.No. 03 22 56 003
DRG.SHEET 4 OF 8
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. (IS:2102 (Medium)


4
54.00
15.00
100.00
25.00
M12XTAPPED
4 HOLES
Ø20.00
40.00
30.00
30.00
150.00
NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
MODEL :
HARDNESS:
FINISHING:
ITE DGL
MATL :
QTY :
PART NO :
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
INDEXING BLOCK
INDEXING JIG
DRG.No. 03 22 56 003
SCALE NTS
DOC.SHEET 5 OF 8
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME.



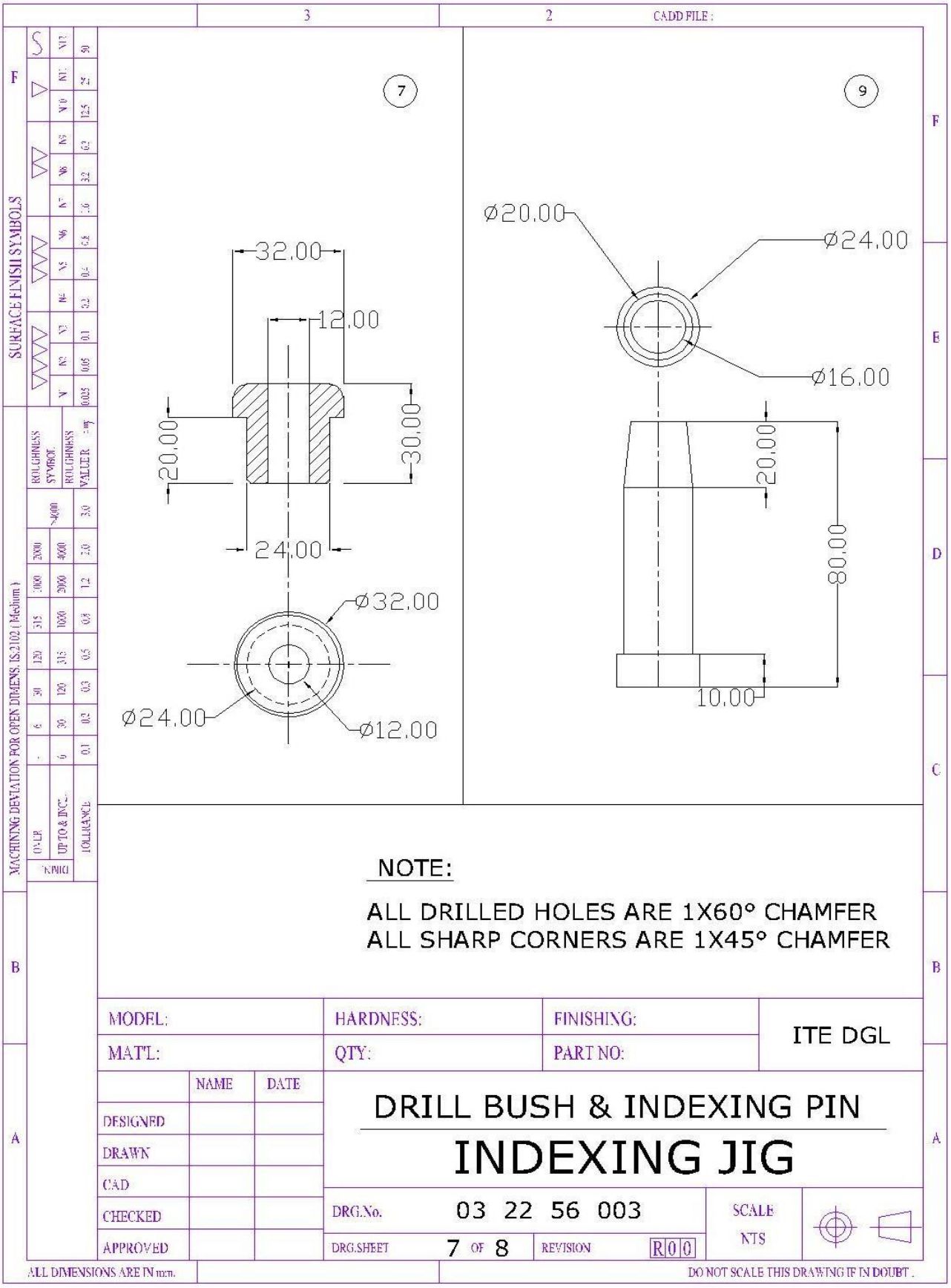
NOTE:

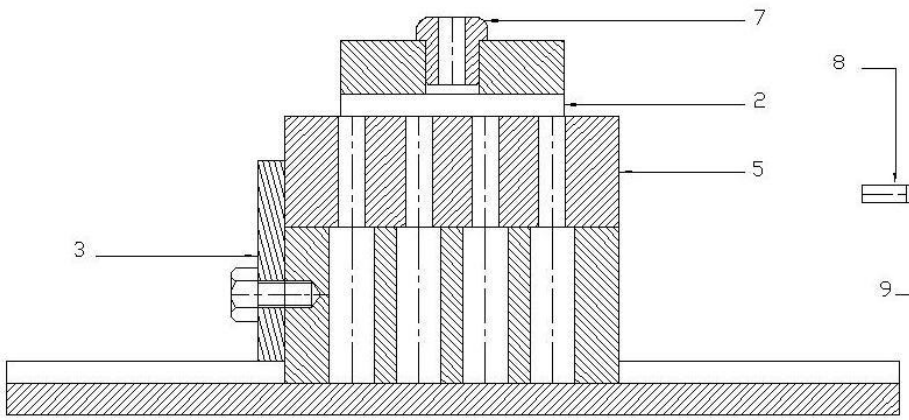
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER

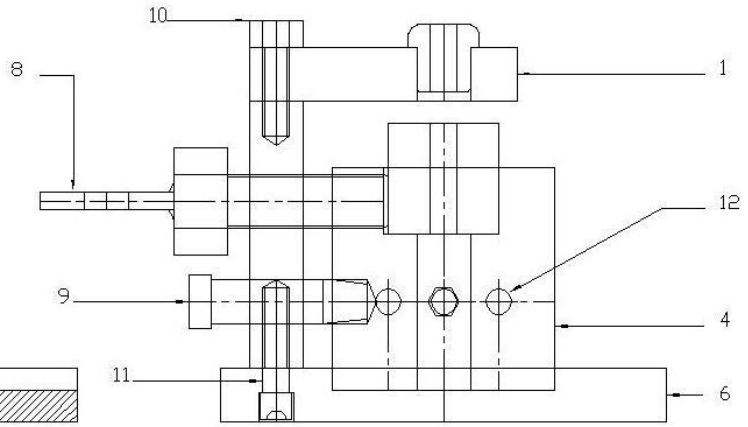
MODEL :		HARDNESS:	FINISHING:	ITE DGL
MATL :		QTY :	PART NO :	
	NAME	DATE		
DESIGNED				
DRAWN				
CAD				
CHECKED				
APPROVED				

BASE PLATE
INDEXING JIG

DRG.No. 03 22 56 003 | SCALE NTS
DRG SHEET 6 OF 8 | REVISION R00


3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE in µm
7
9
32.00
12.00
20.00
30.00
24.00
Ø32.00
Ø24.00
Ø12.00
Ø20.00
Ø24.00
Ø16.00
20.00
80.00
10.00
NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DRILL BUSH & INDEXING PIN
INDEXING JIG
DRG.No. 03 22 56 003
DRG.SHEET 7 OF 8
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .





SL.NO	PART NAME	MATERIAL	QUANTITY
12	ø6 DOWEL	STD	4
11	M6 ALLEN SECREW	STD	2
10	HEXOGONAL BOLT	STD	2
9	INDEXING PIN	MS	1
8	EYE BOLT	STD	1
7	DRILL BUSH	MS	1
6	BASE PLATE	MS	1
5	COMPONENT	MS	1
4	INDEXING BLOCK	MS	1
3	END PLATE	MS	1
2	SIDE PLATE	MS	1
1	TOP PLATE	MS	1

BILL OF MATERIALS

MODEL :		HARDNESS:	FINISHING:
MATL :		QTY :	PART NO :

ITE DGL

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

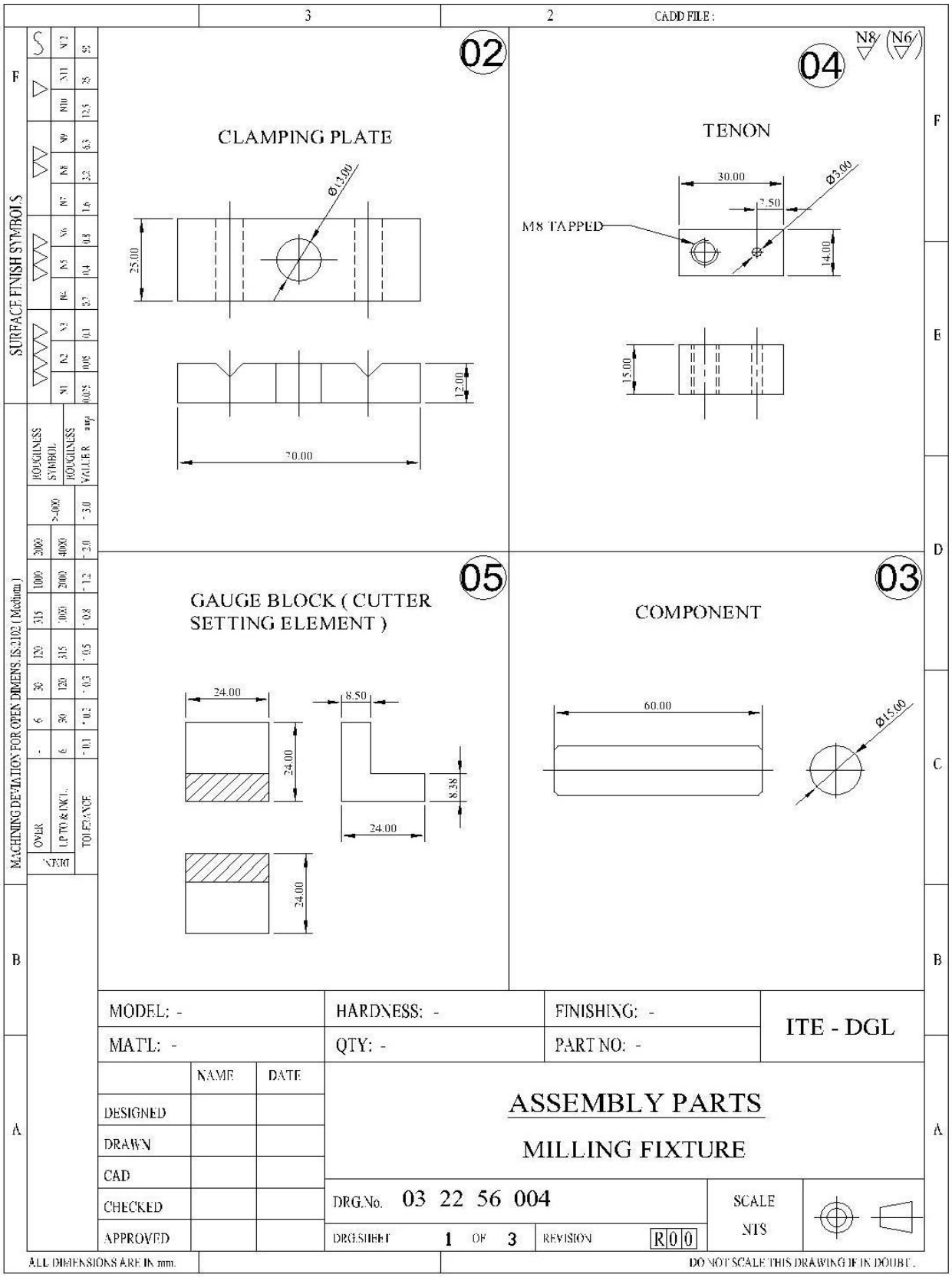
ASSEMBLY VIEW
INDEXING JIG

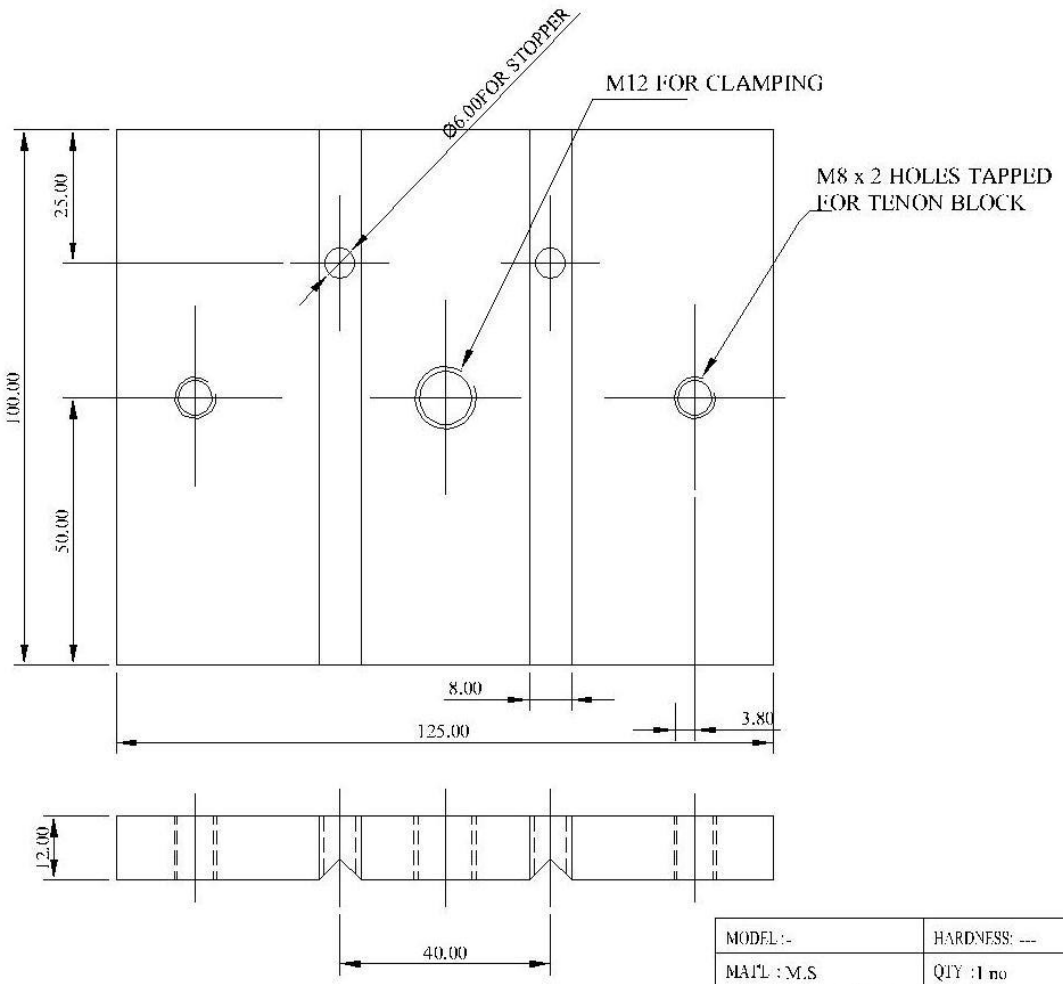
DRG.No. 03 22 56 003 | SCALE NTS

DRG SHEET 8 OF 8 | REVISION R00

ALL DIMENSIONS ARE IN mm.

Exercise – IV Milling Fixture





NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER

ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL :-	HARDNESS: ---	FINISHING: 125x100x12	ITE - DGL
MATL : M.S	QTY : 1 no	PART NO : 1	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

BASE PLATE

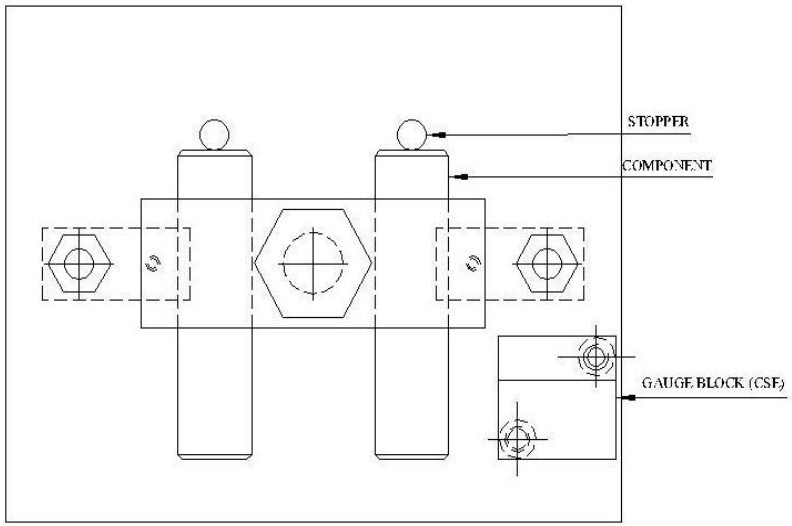
MILLING FIXTURE

DRG.No. 03 22 56 004 | SCALE: M.S

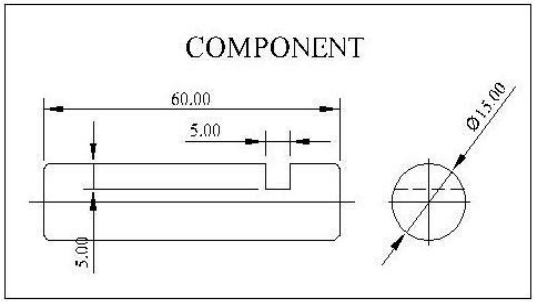
DRG.SHEET 2 OF 3 | REVISION R00

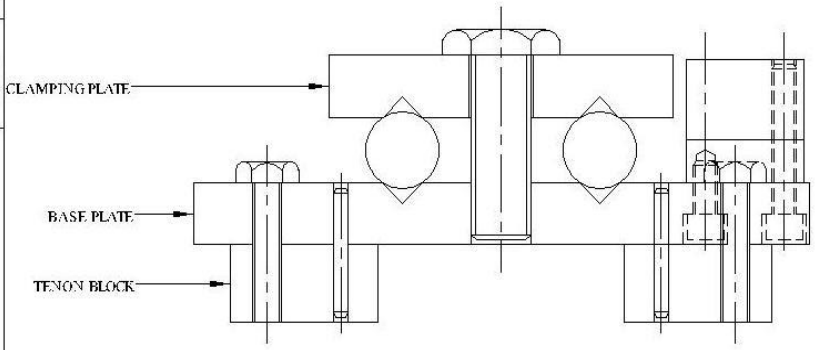
ALL DIMENSIONS ARE IN mm. DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME.

PLAN



COMPONENT





ELEVATION

BILL OF MATERIALS

S.NO	DESCRIPTION	MATERIAL	QUANTITY
10	M12 HEXAGONAL BOLT	STD	1
9	M6 HEXAGONAL BOLT	STD	2
8	M5 ALLEN SCREW	STD	2
7	Ø3 DOWEL	STD	2
6	STOPPER	MS	2
5	GAUGE BLOCK (CUTTER SETTING ELEMENT)	MS	1
4	TENON BLOCK	MS	2
3	COMPONENT	MS	2
2	CLAMPING PLATE	M.S	1
1	BASE PLATE	M.S	1

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL :	QTY :	PART NO :	

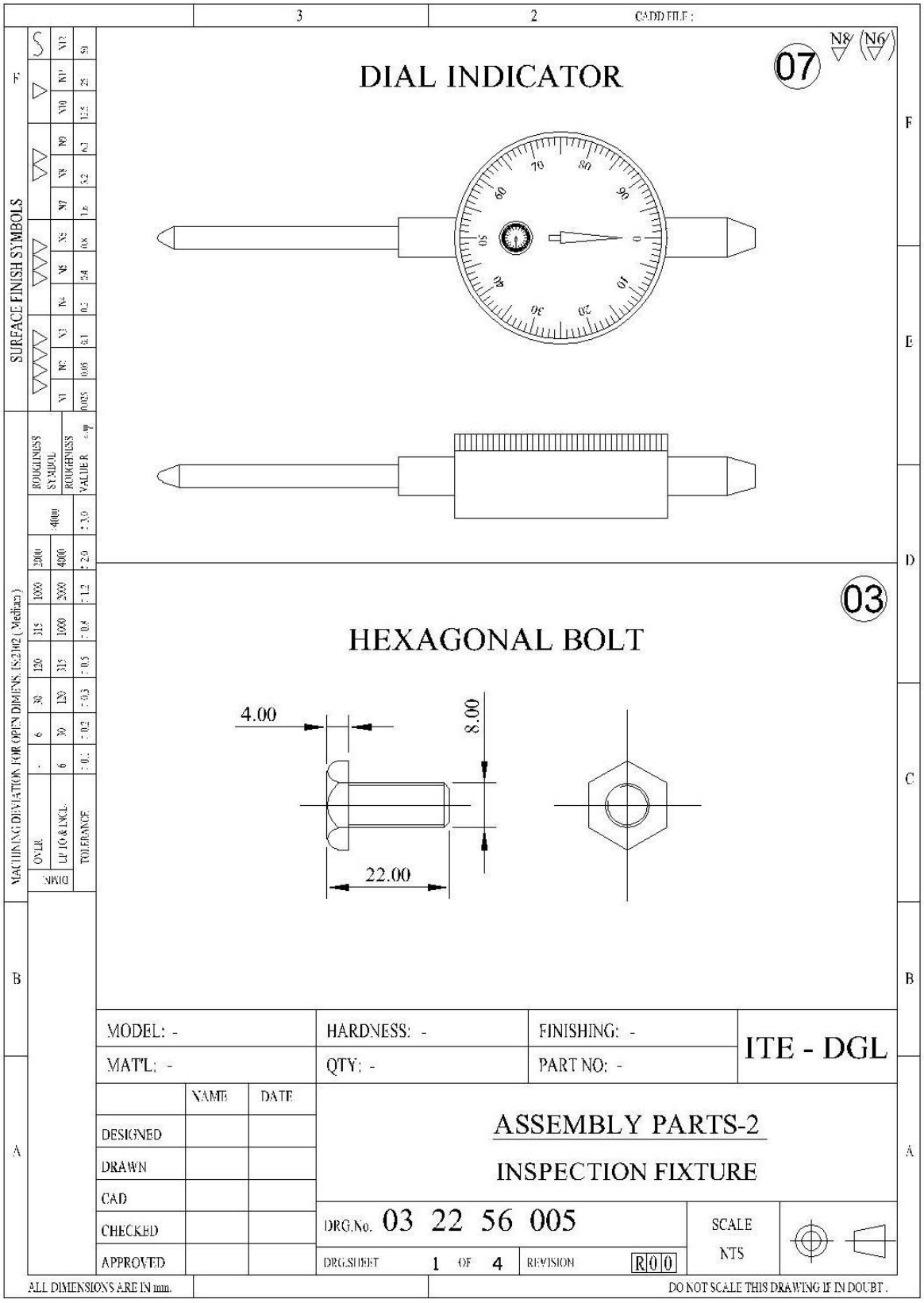
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

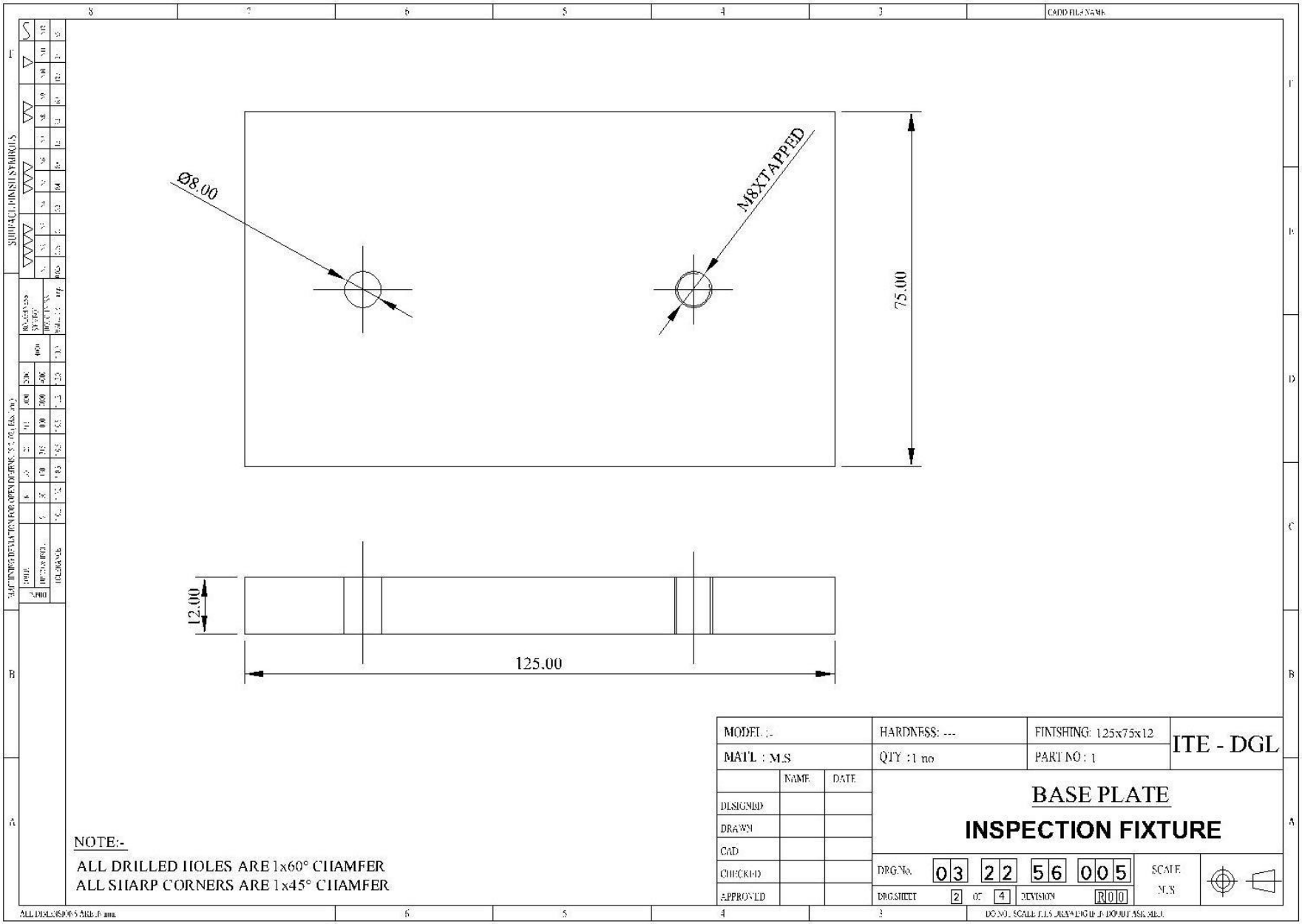
ASSEMBLY

MILLING FIXTURE

DRG No. 03 22 56 004 | SCALE NTS | DRG SHEET 3 OF 3 | REVISION R00

Exercise – V Inspection Fixture





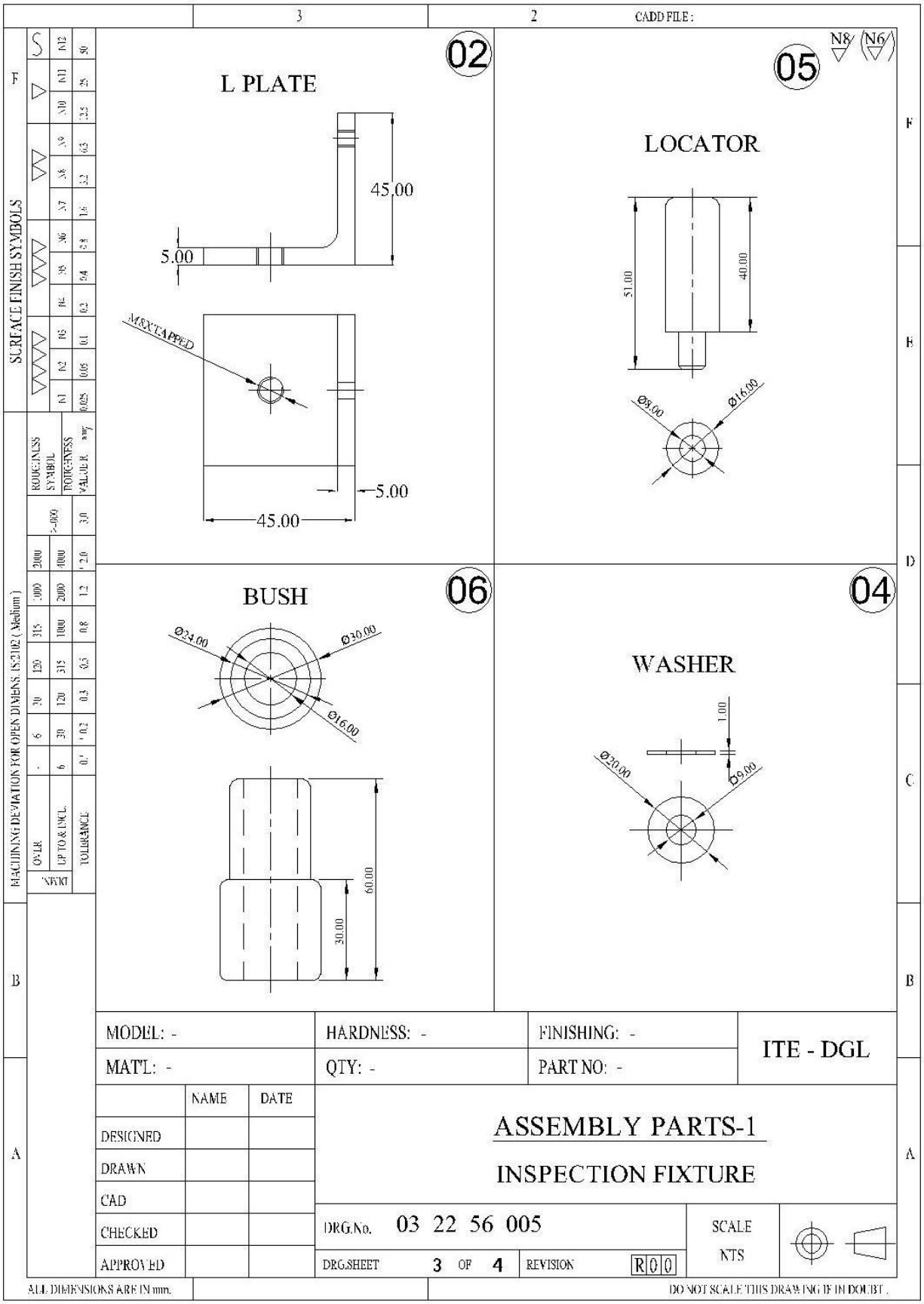
NOTE:-

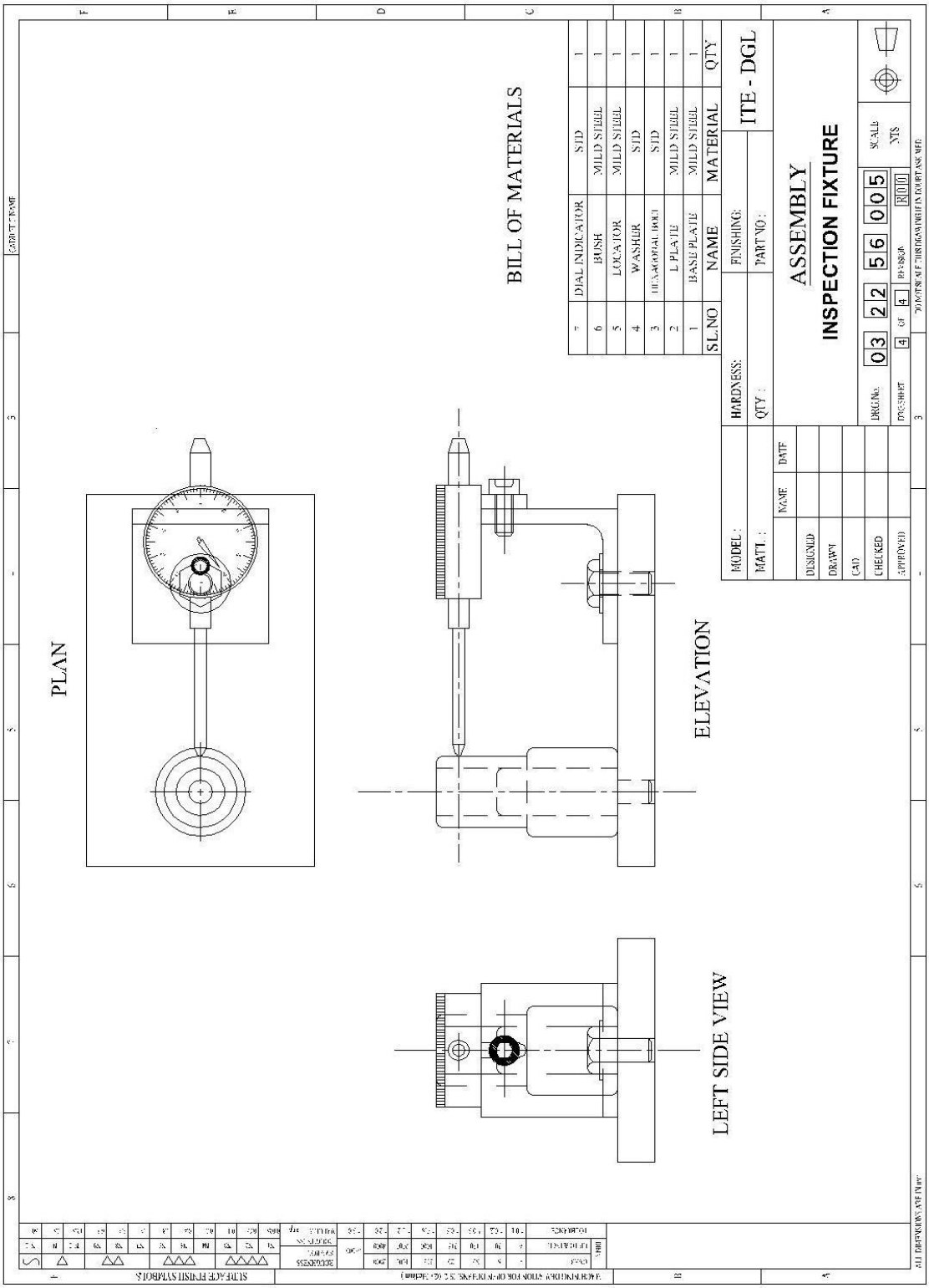
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL : -		HARDNESS: ---	FINISHING: 125x75x12	ITE - DGL
MATL : M.S		QTY : 1 no	PART NO : 1	
	NAME	DATE	BASE PLATE	
DESIGNED			INSPECTION FIXTURE	
DRAWN				
CAD				
CHECKED				
APPROVED				

DRG.No. 03 22 56 005 SCALE N.T.S

DRG.SHEET 2 OF 4 REVISION R00


3
2
CADD FILE :
02
L PLATE
45.00
5.00
M8XTAPPED
5.00
45.00
05
N8
N6
LOCATOR
51.00
40.00
Ø8.00
Ø16.00
06
BUSH
Ø24.00
Ø30.00
Ø16.00
60.00
30.00
04
WASHER
1.00
Ø30.00
Ø9.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE IN µmtr
TOLERANCE
UP TO & INCL.
OVER
MODEL: -
HARDNESS: -
FINISHING: -
MAT'L: -
QTY: -
PART NO: -
ITE - DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
INSPECTION FIXTURE
DRG.No. 03 22 56 005
SCALE NTS
DRG.SHEET 3 OF 4
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .



Exercise – VI Welding Fixture

- Pl refer the sketches available in subject code:4022340 – Computer Aided Machine & Tool Drawing Exercise no.8

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4022560 – PRESS TOOLS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022560

Semester : V

Subject Title : **PRESS TOOLS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
PRESS TOOLS PRACTICAL	5	80	25	100*	100	16 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

OBJECTIVES:

At the end of the practice, the students will be able to

- Manufacture press tool components as per the given drawing.
- Assemble the components manufactured.
- Set the tools manufactured in the OBI / gap frame / Fly press as per requirement.
- Adjust the shut height; operate the press to take trial production.
- Compare the result with the requirement and to do the necessary corrections if needed.

DETAILED SYLLABUS

Ex. No.	Name of the exercise	Time in Hours
1	Manufacture of Blanking Tool – Drop through type	16
2	Manufacture of Progressive Tool – Drop through type	16
3	Manufacture or Compound Tool	16
4	Manufacture of V Bending tool	16
5	Manufacture of drawing tool (single stage)	16
	TOTAL	80

Note:-

1. Batch size should not be more than 5 students for Practical classes.
2. For examination, exercise should be given to students individually and not in batches.
3. The examination duration is 16 hours.
4. Students should be trained in Press Setting, Tool setting, shut height Adjustment, trial production using the tool fabricated by them and rectification of tool defects if any.
5. For Board examination any one of the above tool (sl no 1 to 4) is to be fabricated by each student, fitted in the press and trial production should be taken. The evaluation of the performance should be based on the component dimensions and finish obtained from the tool fabricated by the student during the 16 hours examination.
6. For all the four exercises, the sketches are given and should be followed.

SCHEME OF EXAMINATION:

Manufacture of Tool	-	50 marks
Tool finish	-	20 marks
Component finish / accuracy	-	10 marks
Tool setting & trial production	-	10 Marks
Viva Voce	-	10 Marks
Total	**-**	**100 Marks**

Details of The Equipment's (for a batch of 30 students)

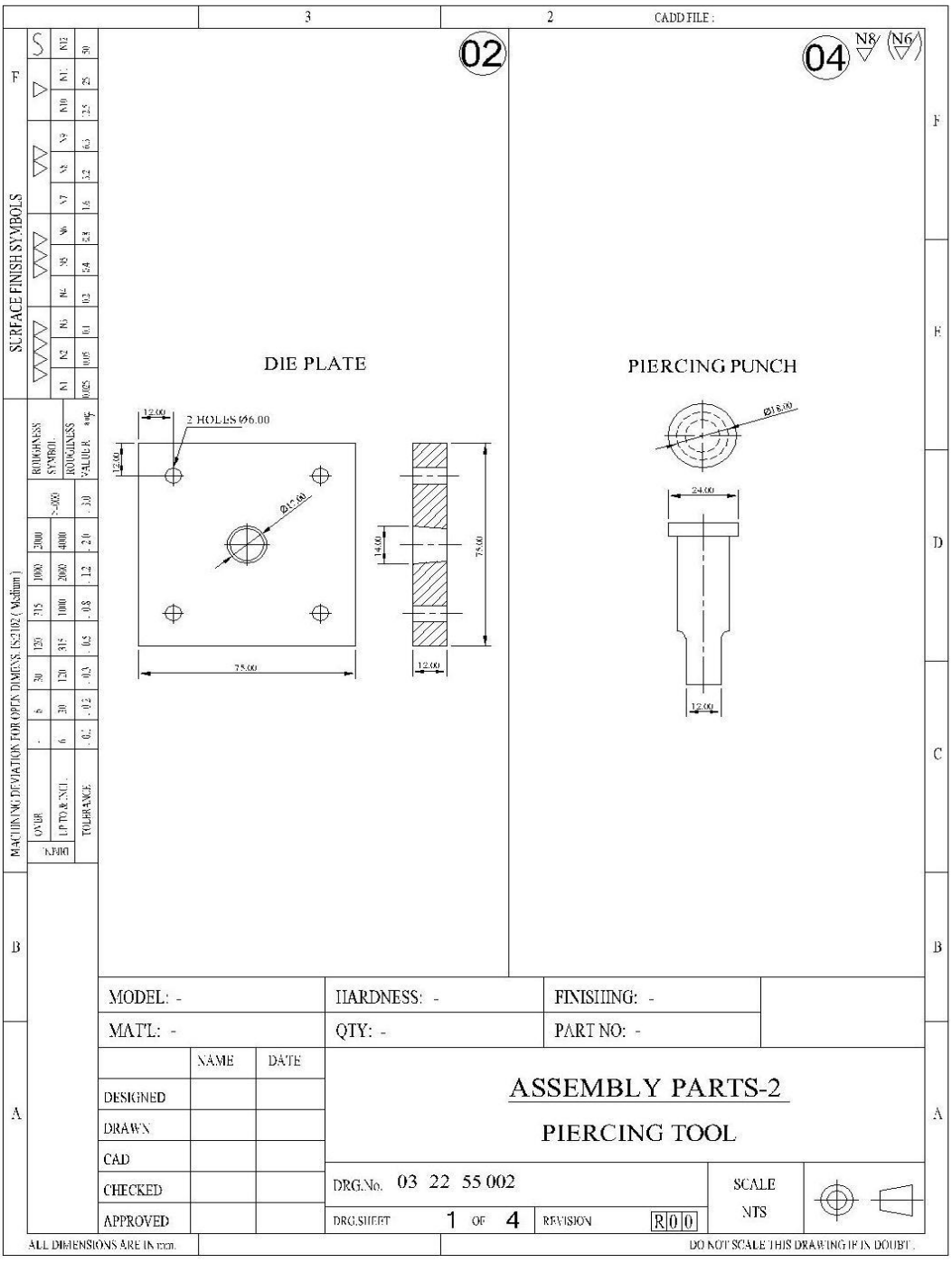
NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)
YEAR	THIRD
SEMESTER	V
NAME OF THE LABORATORY	4022560 PRESS TOOLS PRACTICAL

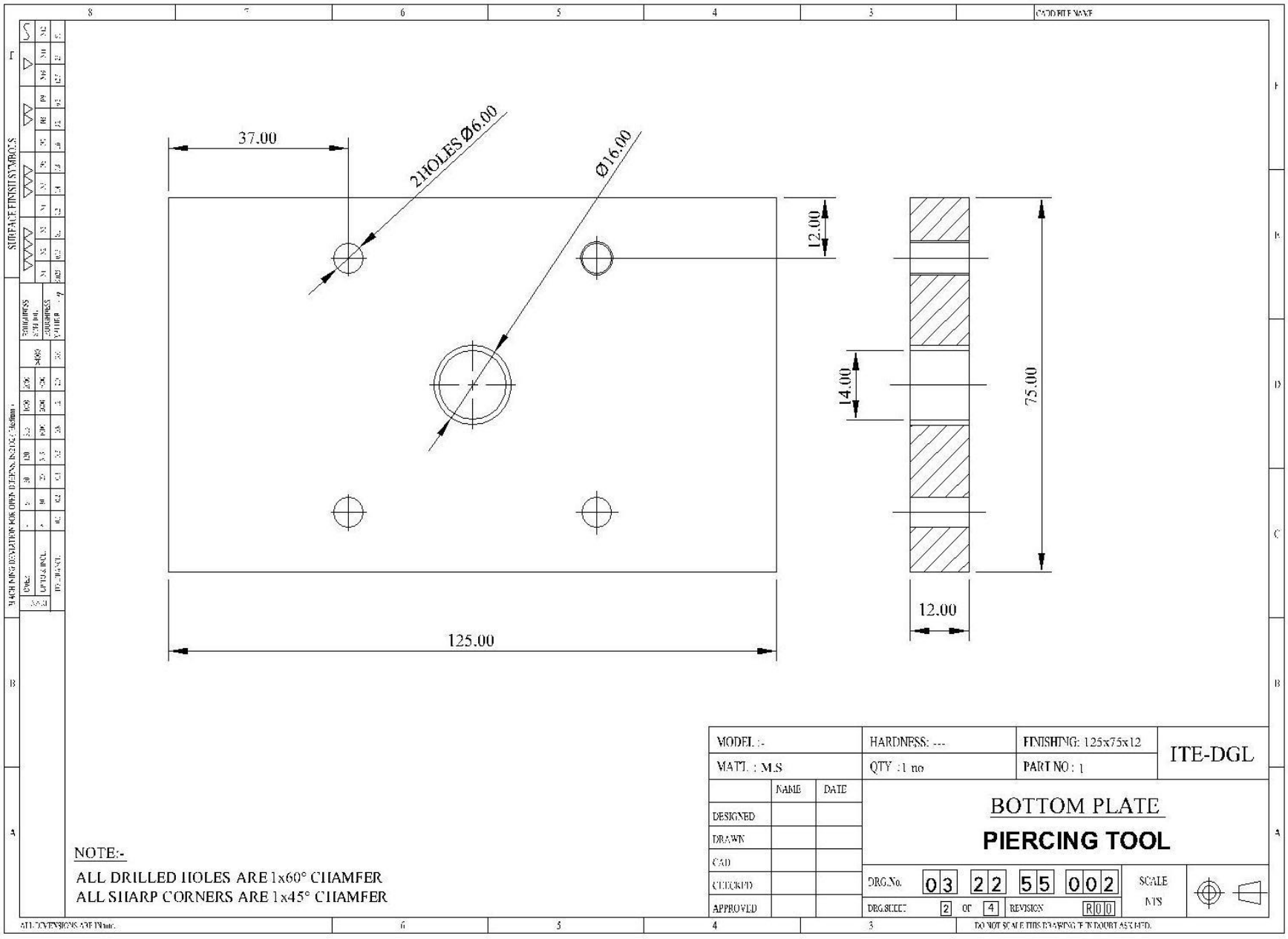
S.NO	**LIST OF THE EQUIPMENT'S WITH SPECIFICATIONS REMARKS IF ANY**	**QUANTITY REQUIRED**
1	Centre Lathe, 4 ½' bed length	5
2	Drilling machine	2
3	Shaping machine, stroke length 300mm	2
4	Vertical milling machine	2
5	Surface grinding machine	2
6	Bench vice	10
7	Fitting file set	10
8	Tap set	4
9	Surface plate	2
10	Vernier height gauge 0-250mm	2
11	Dial test indicator with magnetic stand	2
12	Angle plate	2
13	Mechanical power press (15tons- 100 tons)	1
14	Tool maker's straight edge – 150 mm	1
15	Digital Micrometer – 0.-25mm range, 0.001mm least count	3

Exercise-I Blanking Tool – Drop through type

- Pl refer the sketches available in the subject 4022340 Computer Aided Machine & Tool Drawing Exercise no.9

Exercise-II Piercing Tool

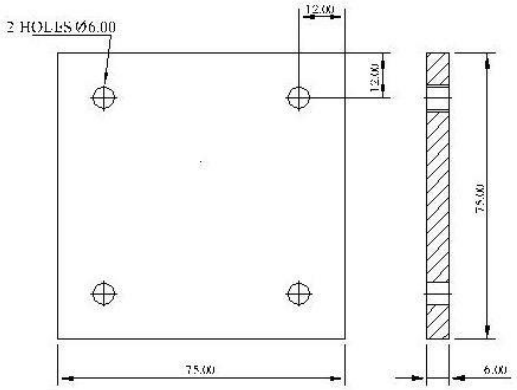



37.00
2HOLES Ø6.00
Ø16.00
12.00
14.00
75.00
12.00
125.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 125x75x12
ITE-DGL
MATT. : M.S
QTY :1 no
PART NO : 1
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BOTTOM PLATE
PIERCING TOOL
DRG.No. 03 22 55 002
SCALE
NTS
DRG.SHEET 2 OF 4
REVISION R0 0

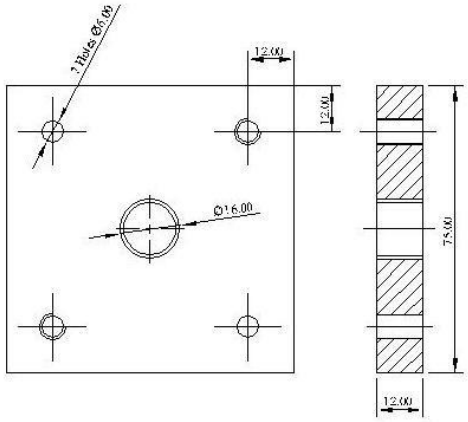
3 | 2 | CADD FILE :

06 N8 (N6)

BACKUP PLATE

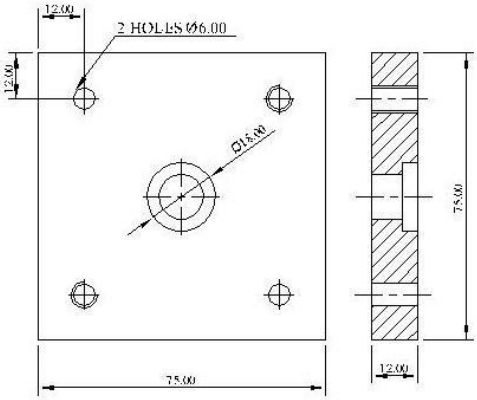


TOP PLATE



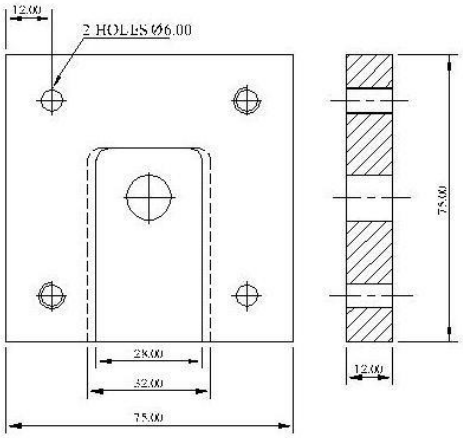
05

PUNCH HOLDER PLATE



03

STRIPPER PLATE



SURFACE FINISH SYMBOLS

ROUGHNESS SYMBOL	ROUGHNESS VALUE R a in µ	
N1	0.025	
N2	0.05	
N3	0.1	
N4	0.2	
N5	0.4	
N6	0.8	
N7	1.6	
N8	3.2	
N9	6.3	
N10	12.5	
N11	25	
N12	50	

MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)

DIMN.	OVER	UP TO & INCL.	TOLERANCE
	-	6	± 0.1
	6	30	± 0.2
	30	120	± 0.3
	120	315	± 0.5
	315	1000	± 0.8
	1000	2000	± 1.2
	2000	4000	± 2.0
	4000		± 3.0

MODEL: -	HARDNESS: -	FINISHING: -	ITE-DGL
MAT'L: -	QTY: -	PART NO: -	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY PARTS-1

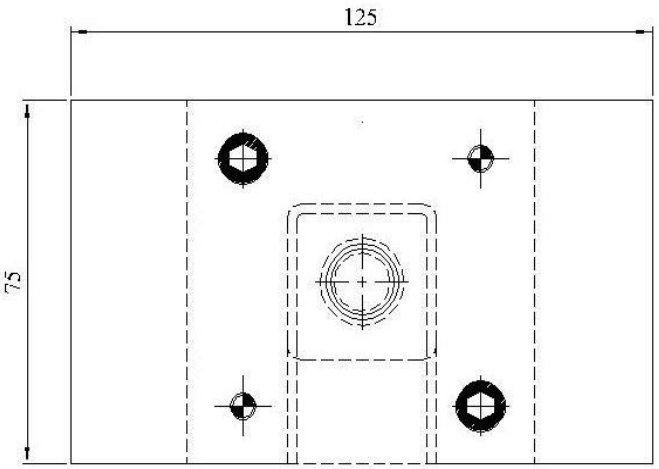
PIERCING TOOL

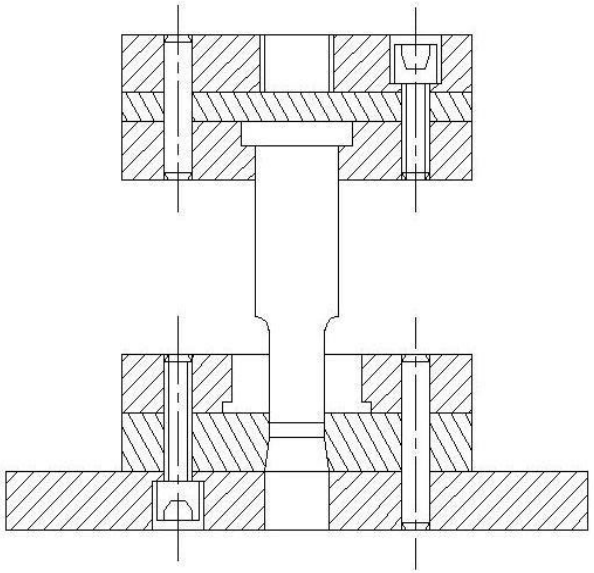
DRG.No. 03 22 55 002

SCALE NTS

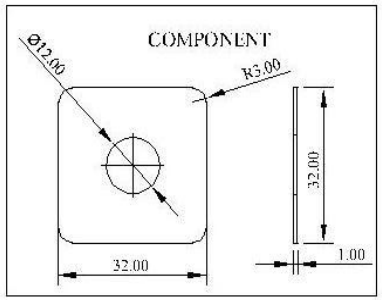
DRG.SHEET 3 OF 4 | REVISION R 0 0

ALL DIMENSIONS ARE IN mm. | DO NOT SCALE THIS DRAWING IF IN DOUBT.





NOTE:
1. ALL DIMENSIONS ARE IN mm.
2. THE PUNCH SHALL BE HARDENED AND TEMPERED TO 60-62 HRC.
3. THE DIE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC.
4. PROVIDE PUNCH AND DIE CLEARANCE PER SIDE 0.01 mm
5. AVOID SHARP CORNERS
6. FOR DIMENSIONS WITHOUT TOLERANCE, TOLERANCE SHALL BE GIVEN AS PER ISO-2678



BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QTY
9	Ø6 DOWEL	STD	4
8	M6 ALLEN SCREW	STD	4
7	STOP PIN	STD	1
6	TOP PLATE	M.S	1
5	PUNCH HOLDER	M.S	1
4	PIERCING PUNCH	M.S (CASE HAEDENED)	1
3	STRIPPER PLATE	M.S	1
2	DIE BLOCK	M.S (CASE HARDENED)	1
1	BOTTOM PLATE	M.S	1

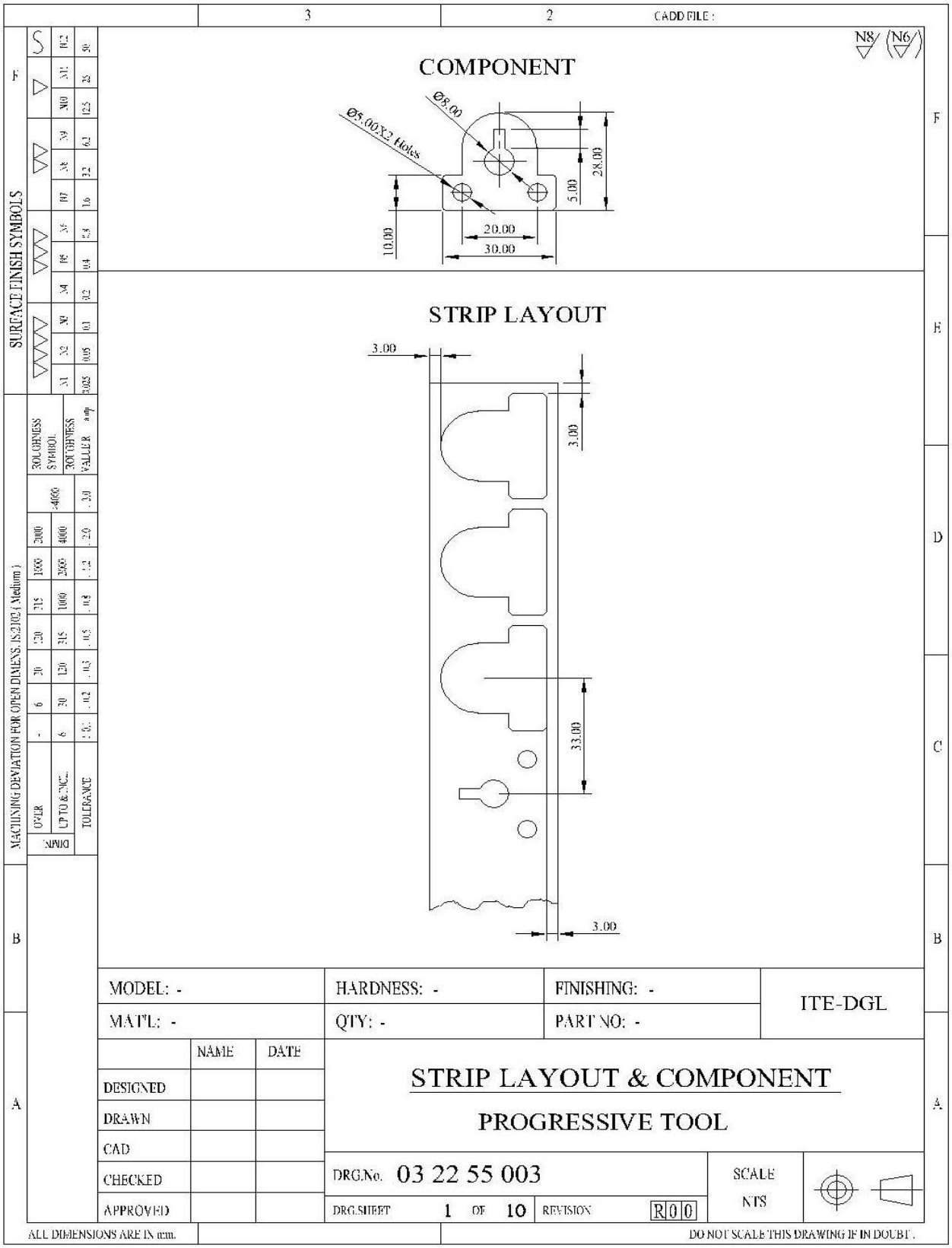
MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MATL :	QTY :	PART NO :	

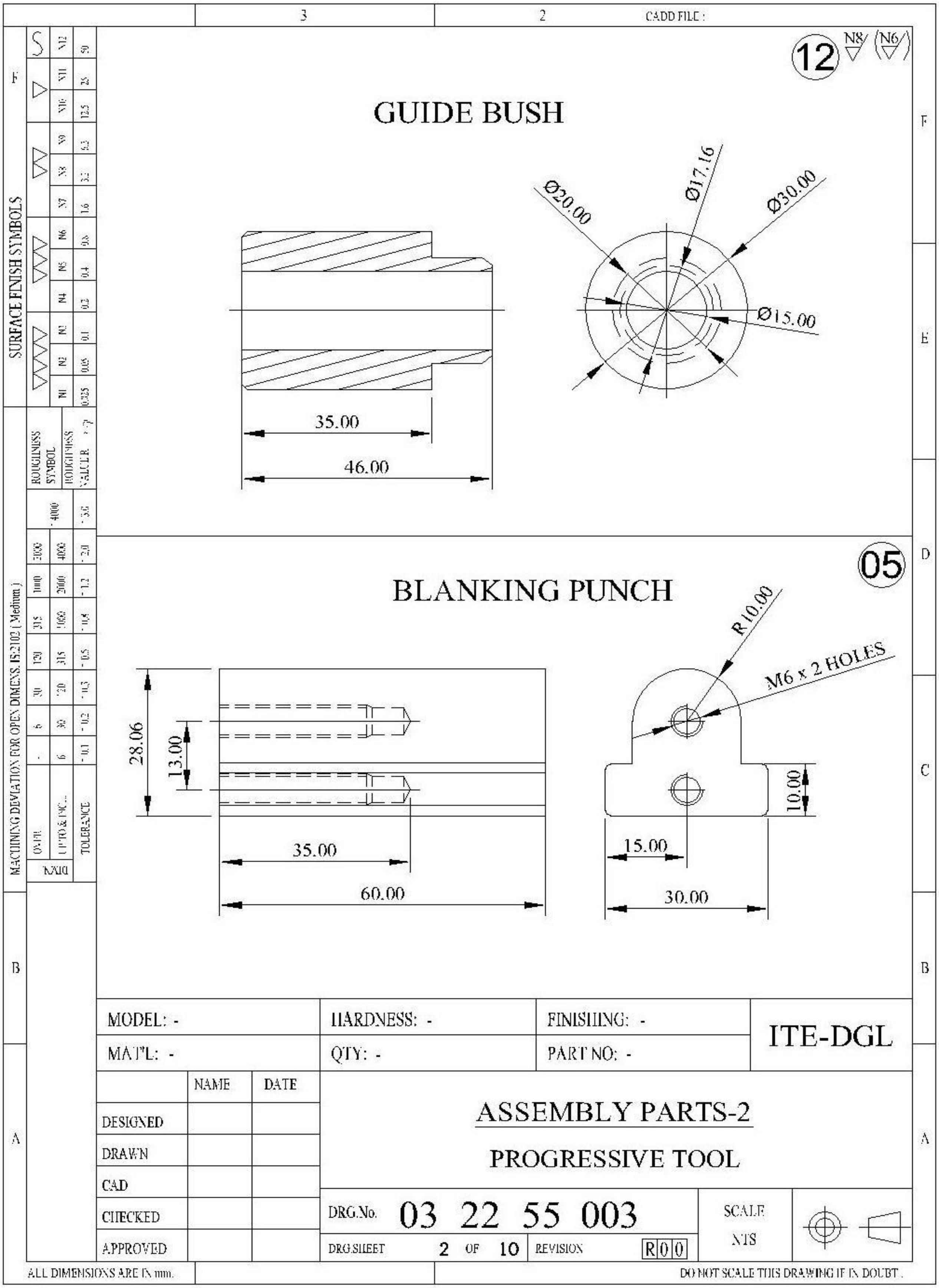
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

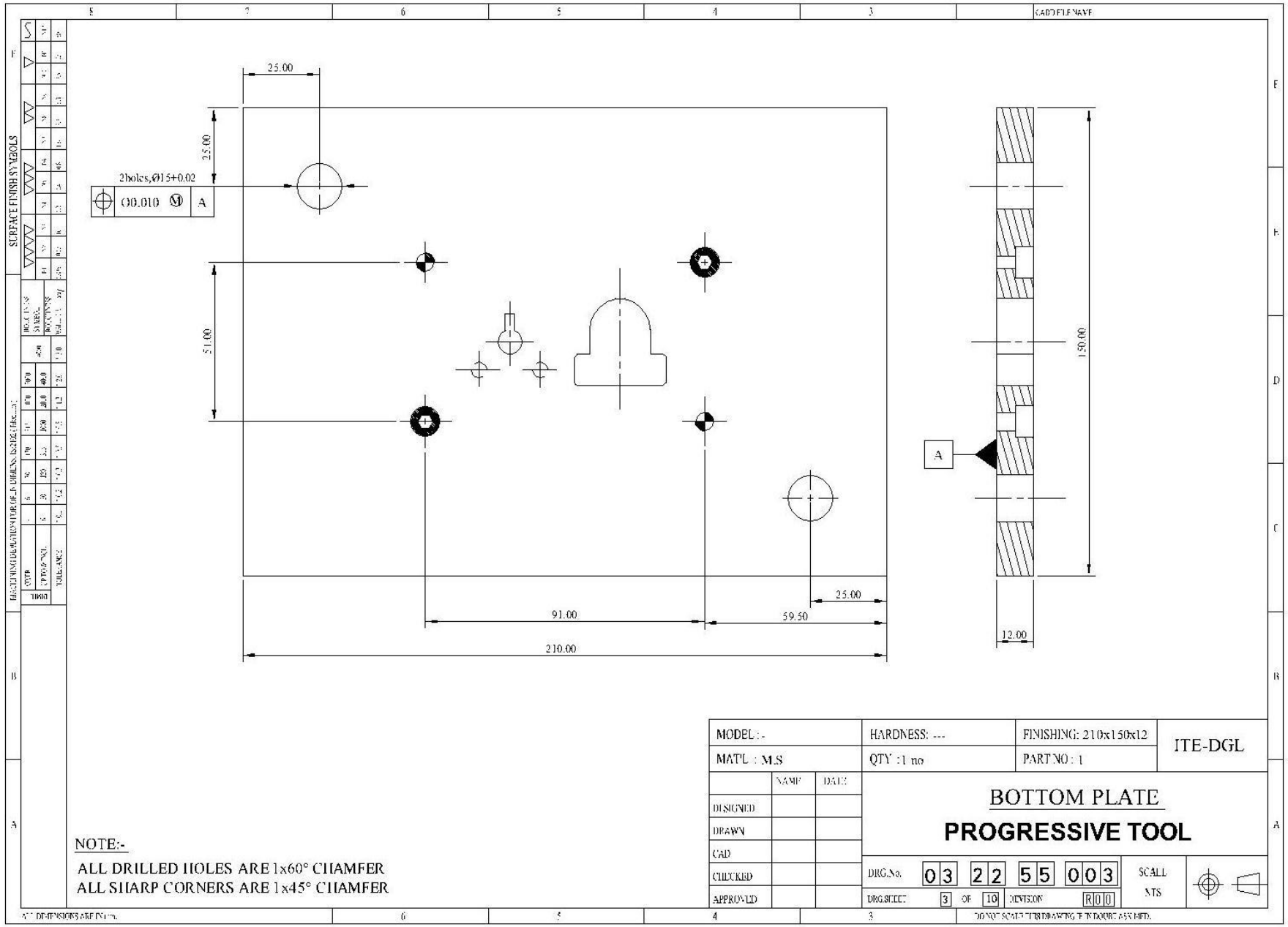
ASSEMBLY
PIERCING TOOL

DRG.No. 03 22 55 002 | SCALE NTS | DRG.SHEET 4 OF 4 | REVISION R00

Exercise – III Progressive Tool




CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
12
GUIDE BUSH
Ø20.00
Ø17.16
Ø30.00
Ø15.00
35.00
46.00
05
BLANKING PUNCH
R10.00
M6 x 2 HOLES
28.06
13.00
35.00
60.00
15.00
30.00
10.00
MODEL: -
HARDNESS: -
FINISHING: -
ITE-DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-2
PROGRESSIVE TOOL
DRG.No. 03 22 55 003
SCALE
NTS
DRG.SHEET 2 OF 10
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL : -	HARDNESS: ---	FINISHING: 210x150x12	ITE-DGL
MATL : M.S	QTY : 1 no	PART NO : 1	

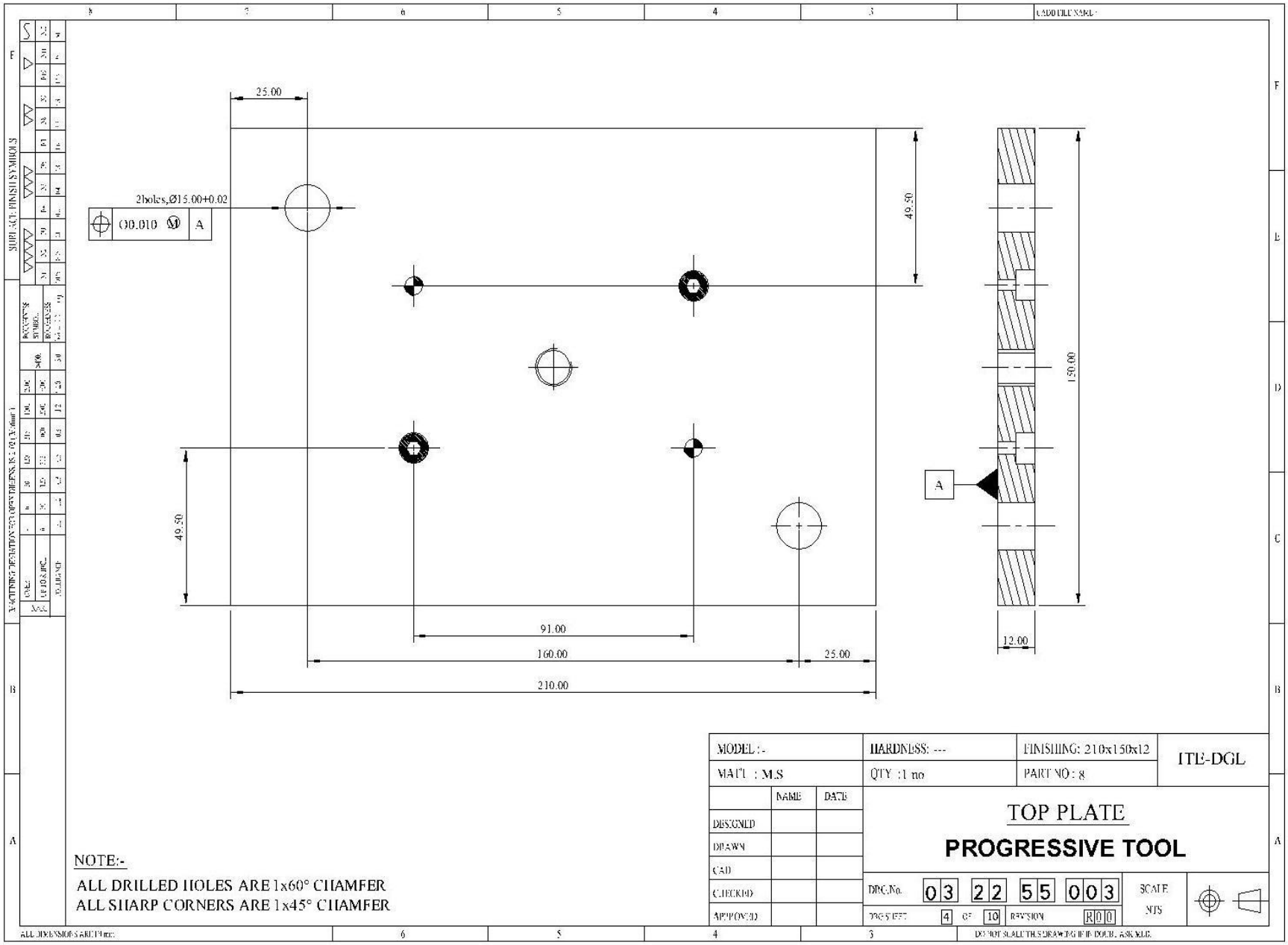
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

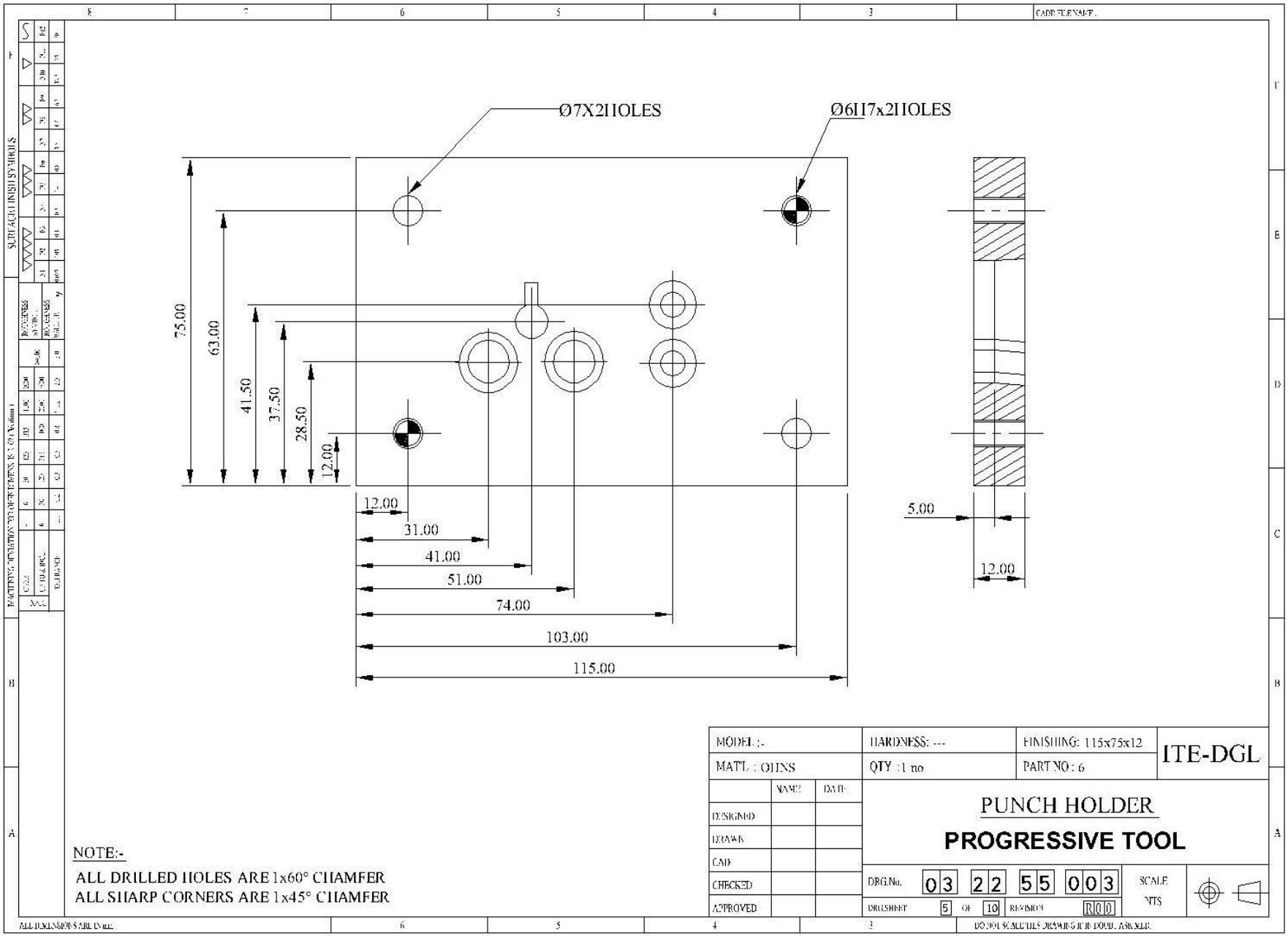
BOTTOM PLATE

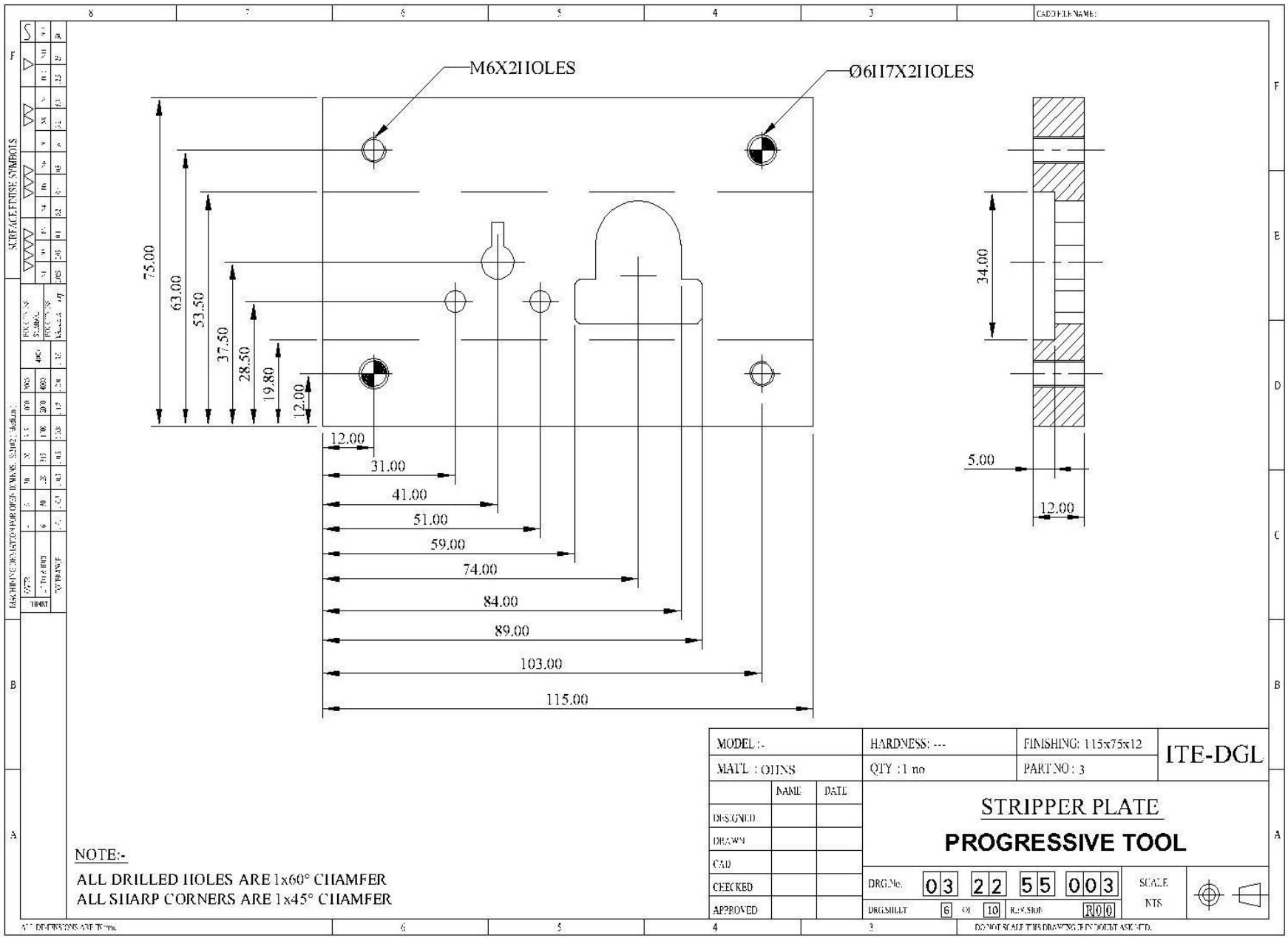
PROGRESSIVE TOOL

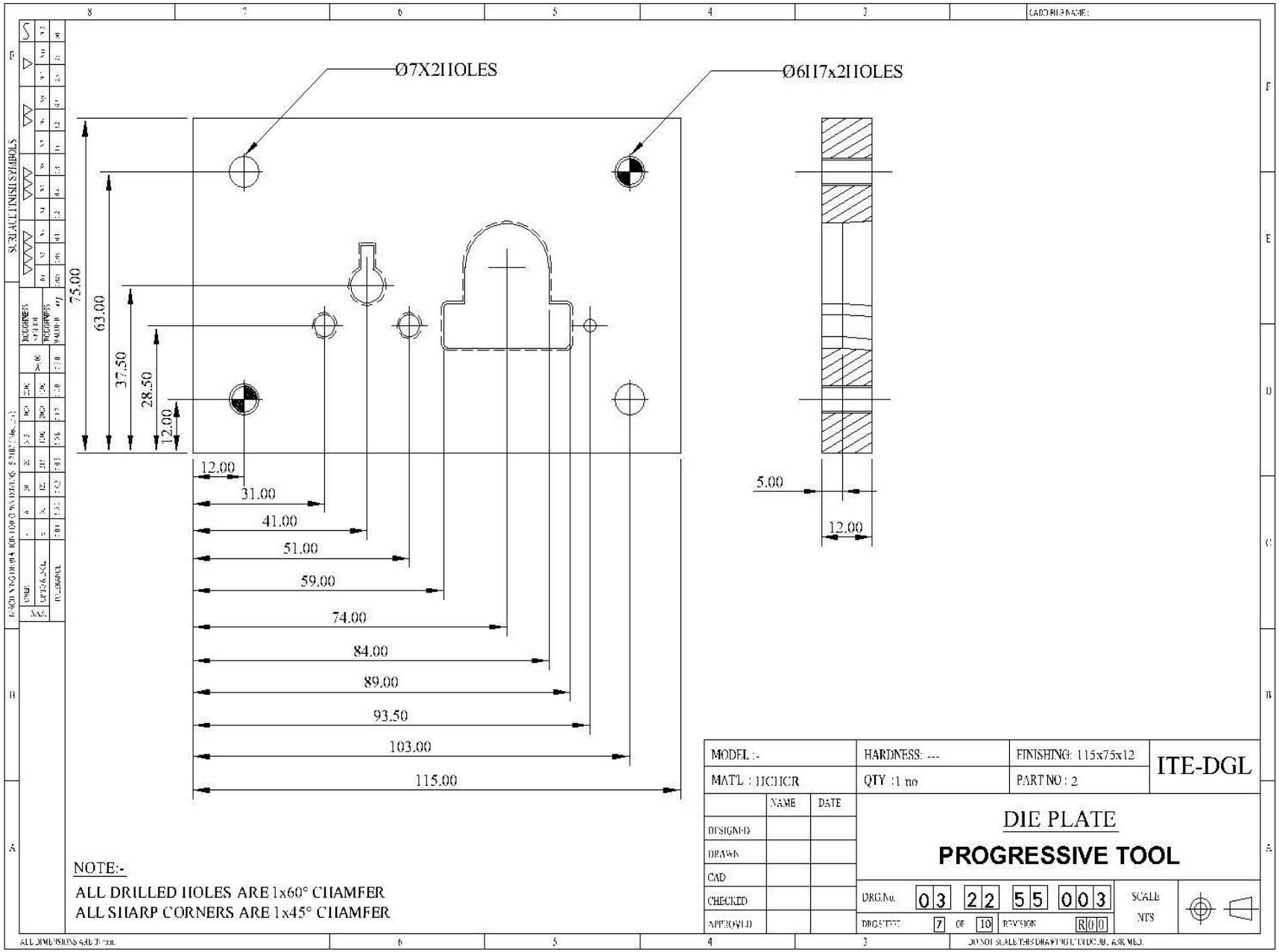
DRG.No. 03 22 55 003 SCALE NTS

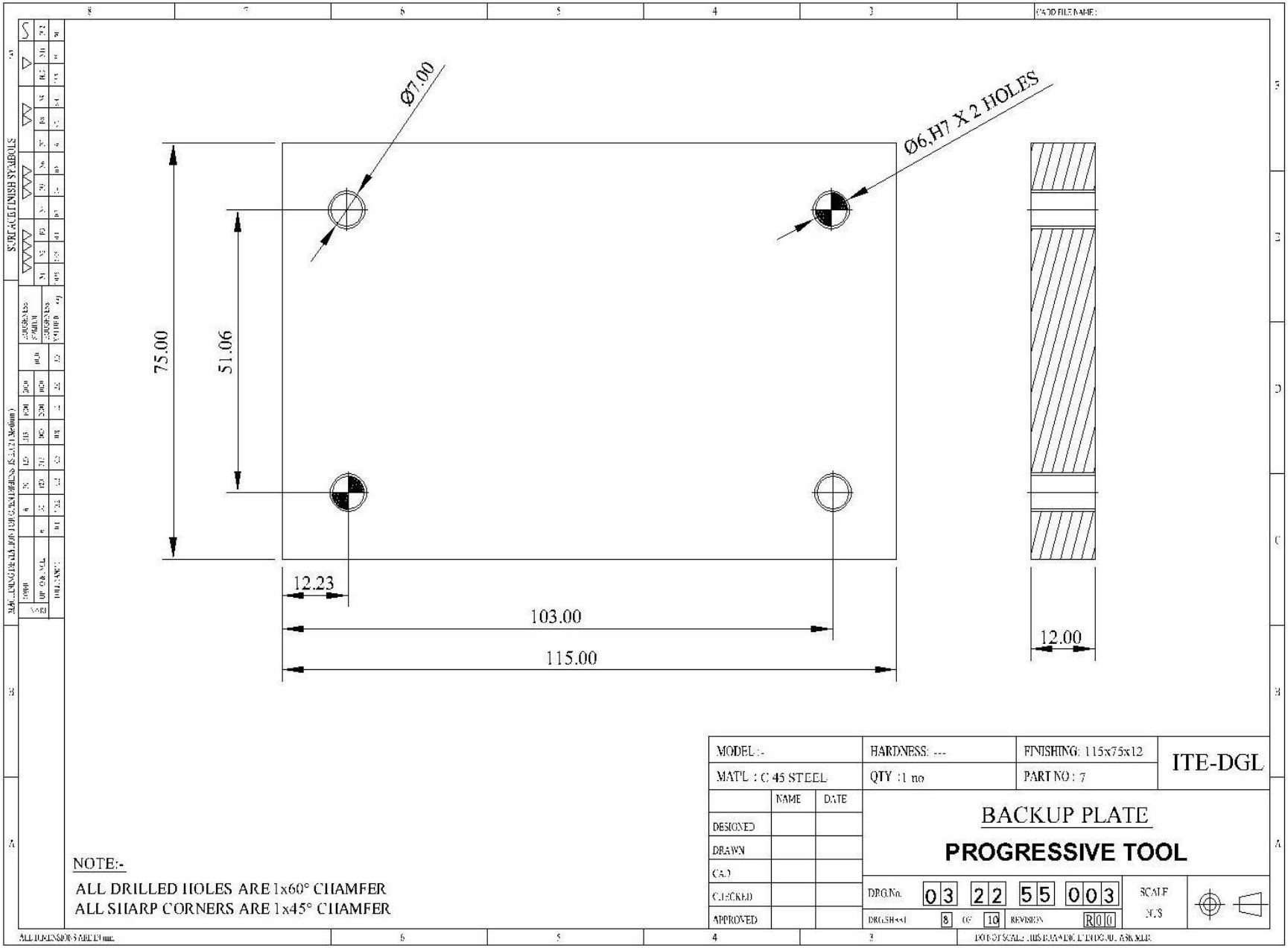
DRG.SHEET 3 OF 10 REVISION R0 0

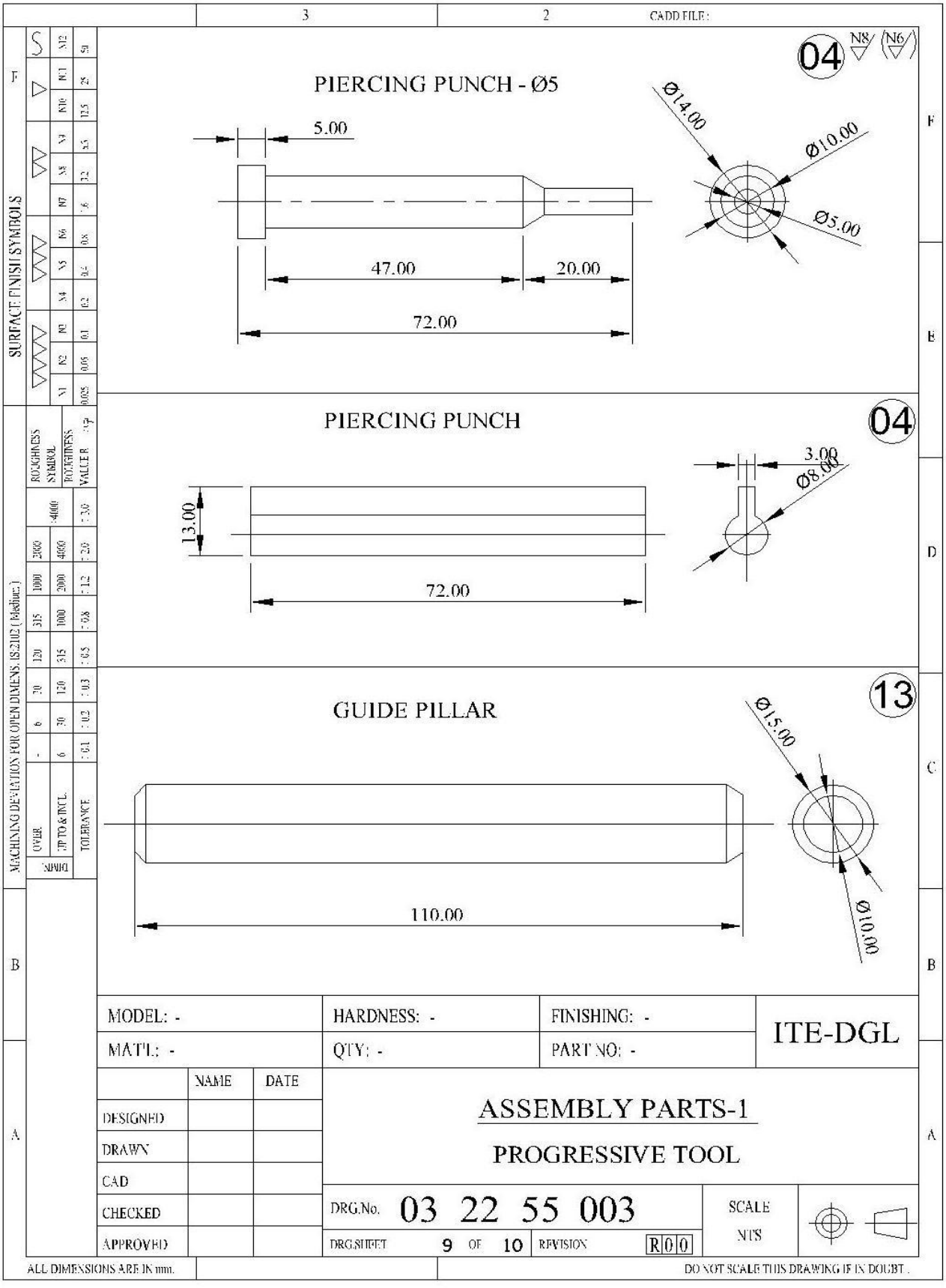

25.00
2holes,Ø15.00+0.02
Ø0.010 M A
49.50
49.50
150.00
A
91.00
160.00
25.00
210.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 210x150x12
ITE-DGL
MAT'L : M.S
QTY :1 no
PART NO : 8
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
TOP PLATE
PROGRESSIVE TOOL
DRG.No. 03 22 55 003
SCALE NTS
DRG SHEET 4 OF 10
REVISION R00

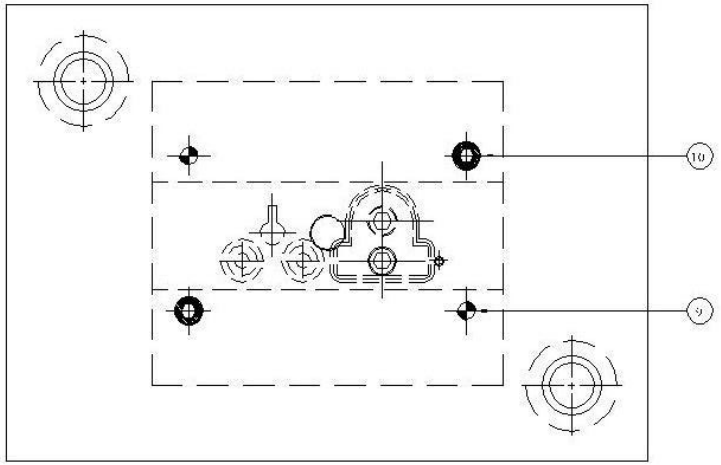

Ø7X2HOLES
Ø6H7x2HOLES
75.00
63.00
41.50
37.50
28.50
12.00
12.00
31.00
41.00
51.00
74.00
103.00
115.00
5.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 115x75x12
ITE-DGL
MATL : OHNS
QTY : 1 no
PART NO : 6
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
PUNCH HOLDER
PROGRESSIVE TOOL
DRG.No. 03 22 55 003
SCALE NTS
DRG SHEET 5 OF 10
REVISION R00

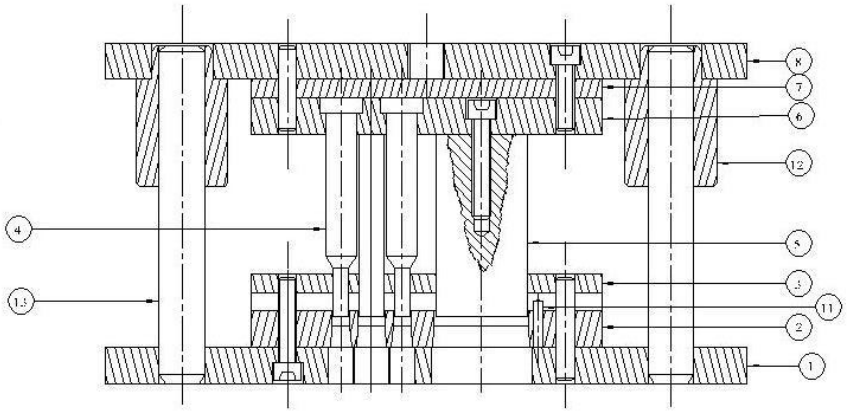

M6X2 11 HOLES
Ø6 11 7X2 11 HOLES
75.00
63.00
53.50
37.50
28.50
19.80
12.00
12.00
31.00
41.00
51.00
59.00
74.00
84.00
89.00
103.00
115.00
34.00
5.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 115x75x12
ITE-DGL
MATL : OHNS
QTY :1 no
PART NO : 3
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
STRIPPER PLATE
PROGRESSIVE TOOL
DRG.No. 03 22 55 003
SCALE NTS
DRG.SHEET 6 OF 10
R.EV.SION R00
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME.


Ø7X2HOLES
Ø6H7x2HOLES
75.00
63.00
37.50
28.50
12.00
12.00
31.00
41.00
51.00
59.00
74.00
84.00
89.00
93.50
103.00
115.00
5.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 115x75x12
ITE-DGL
MATL : HCHCR
QTY :1 no
PART NO : 2
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DIE PLATE
PROGRESSIVE TOOL
DRG.No. 03 22 55 003
SCALE NTS
DRG SHEET 7 OF 10
REVISION R00
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE MENTIONED.


Ø7.00
Ø6,H7 X 2 HOLES
75.00
51.06
12.23
103.00
115.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 115x75x12
ITE-DGL
MAT'L : C 45 STEEL
QTY : 1 no
PART NO : 7
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BACKUP PLATE
PROGRESSIVE TOOL
DRG.No. 03 22 55 003
SCALE NTS
DRGSHEET 8 OF 10
REVISION R00


CADD FILE :
04
N8
N6
PIERCING PUNCH - Ø5
5.00
47.00
20.00
72.00
Ø14.00
Ø10.00
Ø5.00
PIERCING PUNCH
04
13.00
72.00
3.00
Ø8.00
GUIDE PILLAR
13
110.00
Ø15.00
Ø10.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE Ra
MODEL: -
HARDNESS: -
FINISHING: -
MATL: -
QTY: -
PART NO: -
ITE-DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
PROGRESSIVE TOOL
DRG.No. 03 22 55 003
DRG.SHEET 9 OF 10
REVISION R00
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .





NOTE:

1.ALL DIMENSIONS ARE IN mm

2.PROVIDE PUNCH AND DIE CLEARANCE PROVIDE AS 0.01

3.THE PUNCH SHALL BE HARDENED AND TEMPERED AS 60-62 HRC

4.THE DIE PLATE SHALL BE HARDENED AS 60-62 HRC

5.AVOID SHARP CORNERS

6.FOR DIMENSIONS WITHOUT TOLERANCE SHALL BE PROVIDED AS ISO 2768-1

BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QUANTITY
13	GUIDE PILLAR	EN24 STEEL	2
12	GUIDE BUSH	EN24 STEEL	2
11	STOP PIN	STD	1
10	M6 ALLEN SCREW	STD	6
9	DOWEL PIN	STD	4
8	TOP PLATE	MILD STEEL	1
7	BACKUP PLATE	C45 STEEL	1
6	PUNCH HOLDER	OHNS	1
5	BLANKING PUNCH	A2 STEEL	1
4	PIERCING PUNCH	A2 STEEL	3
3	STRIPPER PLATE	OHNS	1
2	DIE PLATE	Heller	1
1	BOTTOM PLATE	MILD STEEL	1

MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY

PROGRESSIVE TOOL

DRG No. 03 22 55 003 | SCALE M/S

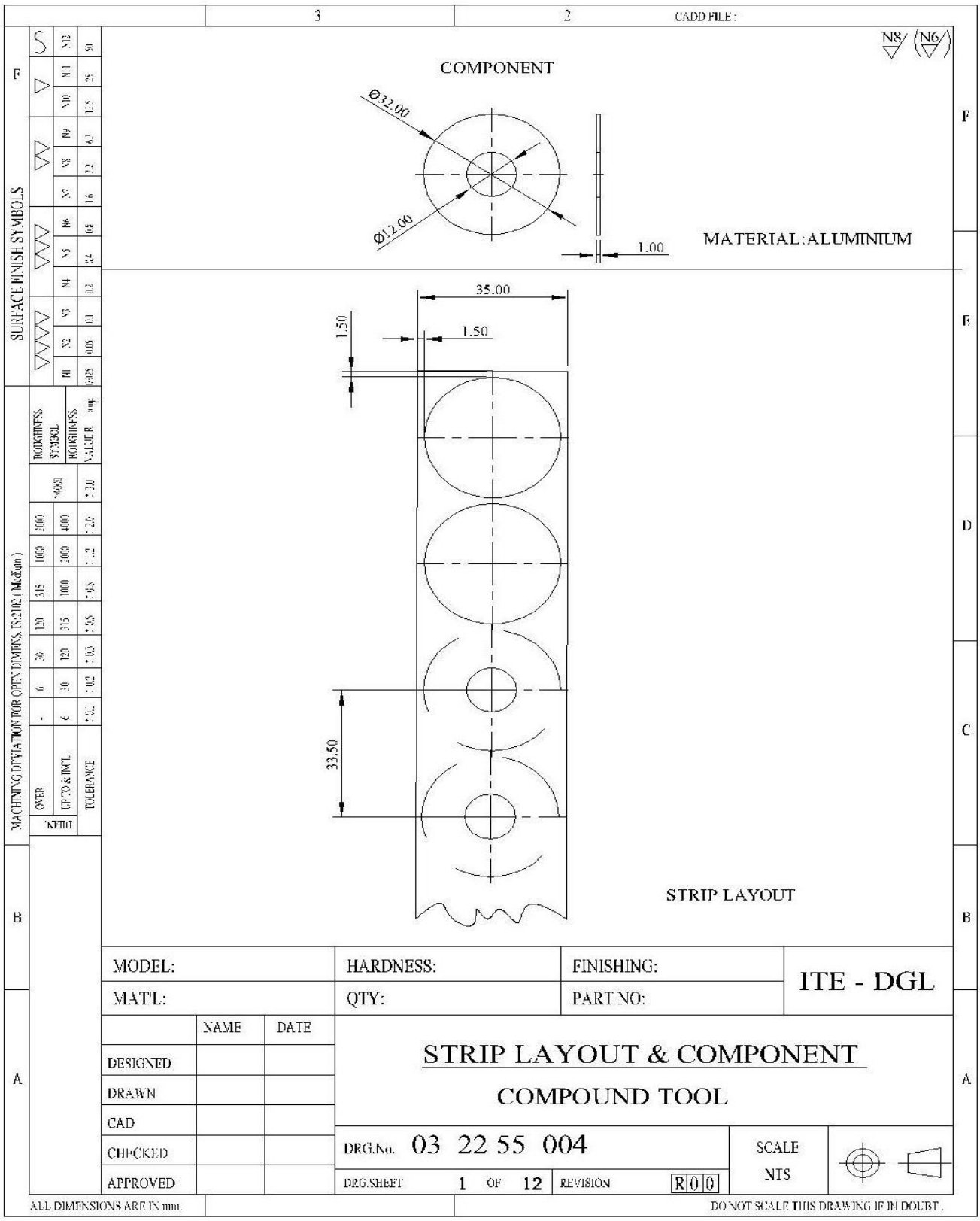
DRG SHEET 10 OF 10 | REVISION R0 0

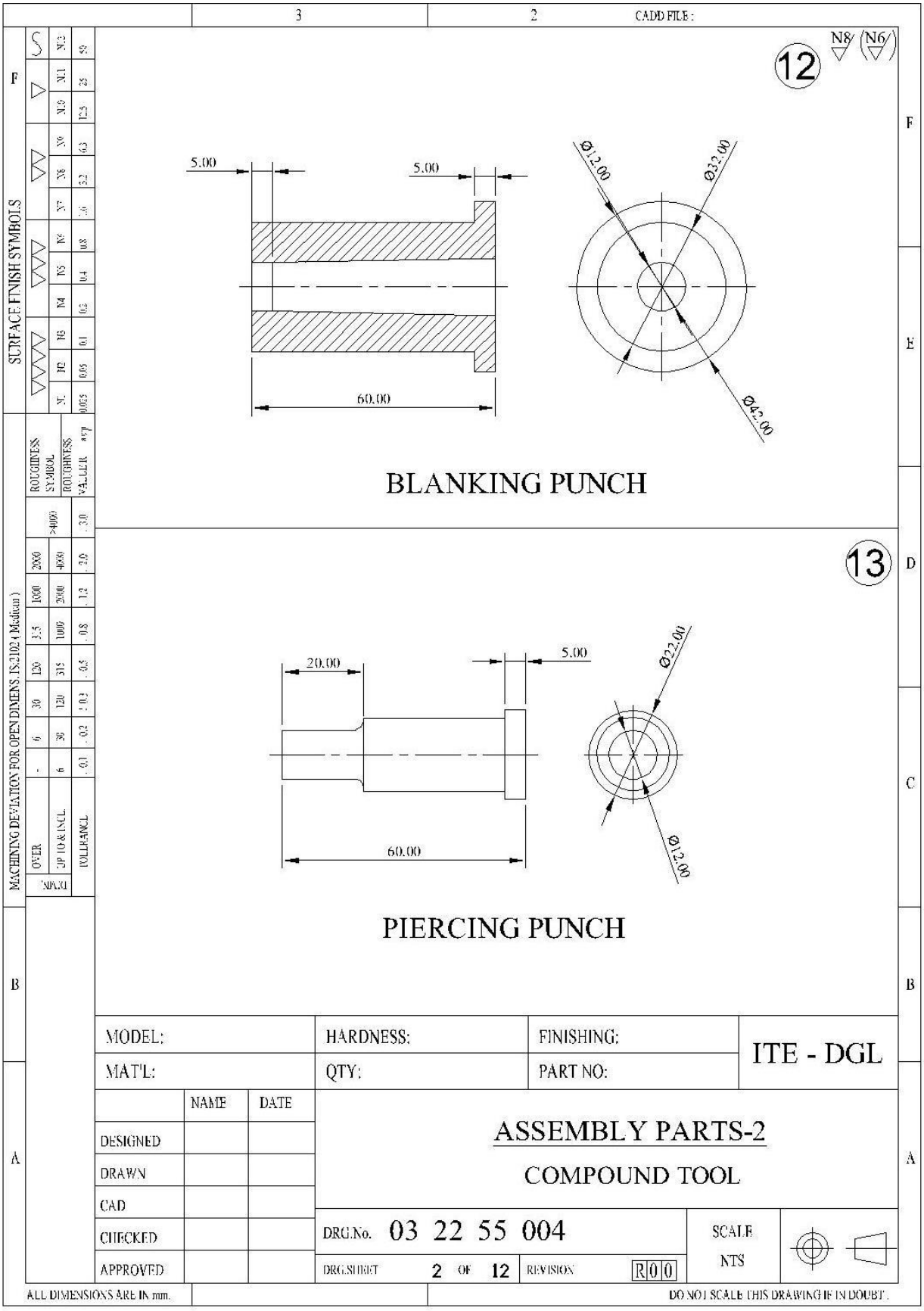
SURFACE FINISH SYMBOLS

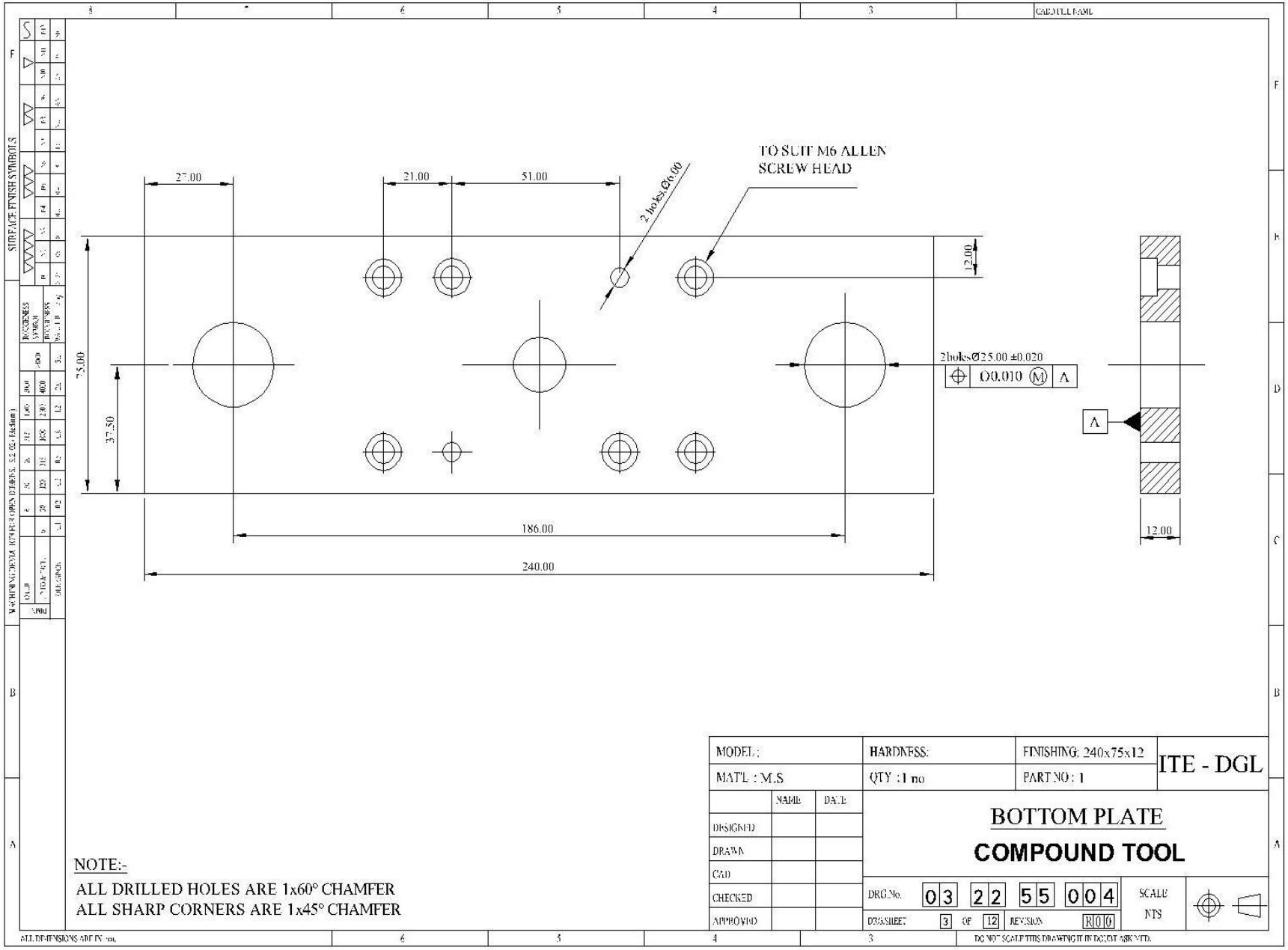
ALL DIMENSIONS ARE IN mm.

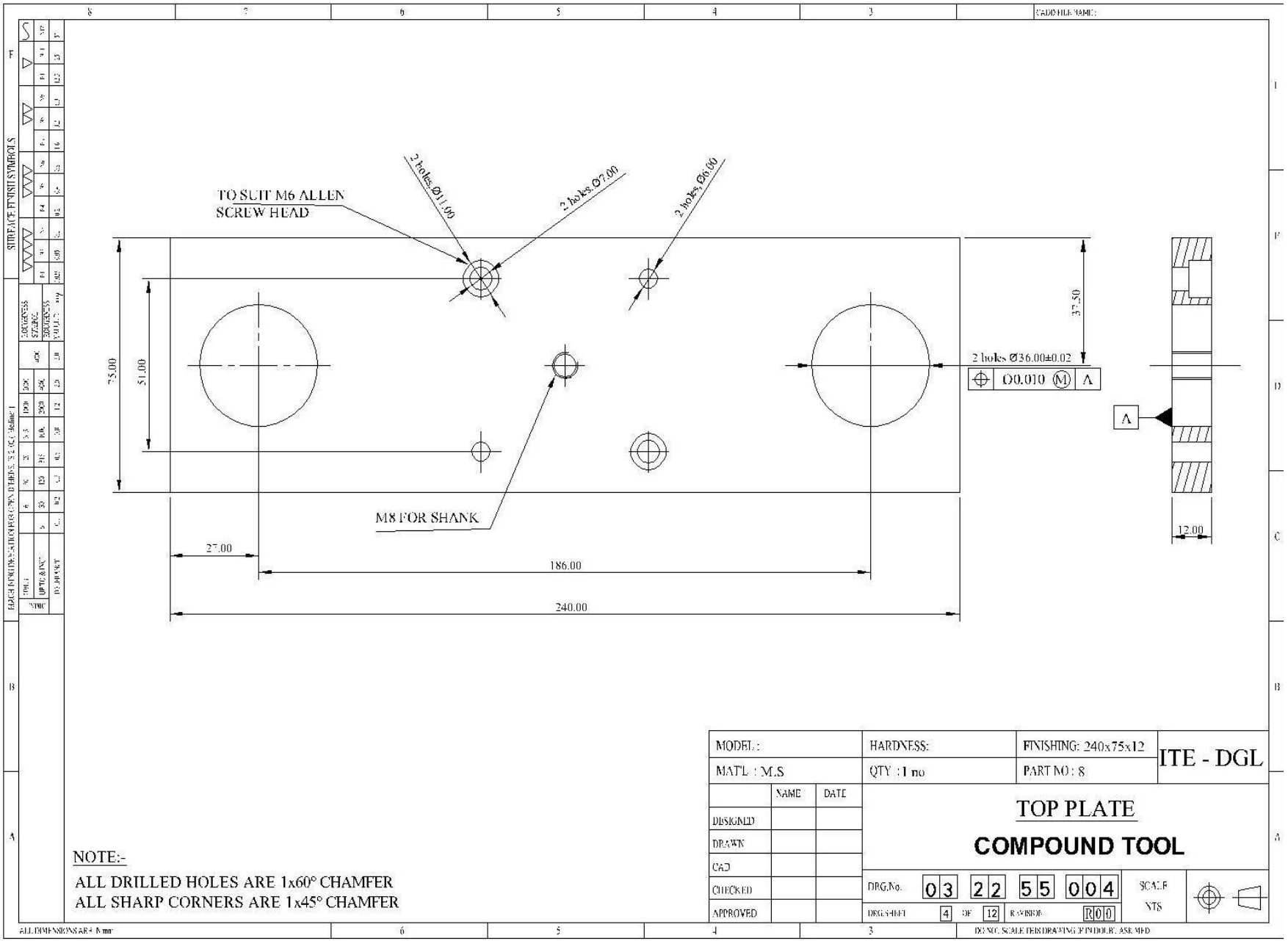
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME.

Exercise – IV Compound Tool




3
2
CADD FILE :
12
N8 (N6)
5.00
5.00
60.00
Ø12.00
Ø32.00
Ø42.00
BLANKING PUNCH
13
20.00
5.00
60.00
Ø22.00
Ø12.00
PIERCING PUNCH
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a µ
TOLERANCE
MODEL:
HARDNESS:
FINISHING:
ITE - DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-2
COMPOUND TOOL
DRG.No. 03 22 55 004
DRG.SHEET 2 OF 12
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.


TO SUIT M6 ALLEN
SCREW HEAD
27.00
21.00
51.00
2 holes Ø6.00
12.00
75.00
37.50
2holes Ø25.00 ±0.020
Ø0.010 M A
A
186.00
240.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 240x75x12
PART NO : 1
ITE - DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BOTTOM PLATE
COMPOUND TOOL
DRG.No. 03 22 55 004
SCALE NTS
DRG SHEET 3 OF 12
REVISION R0 0
SURFACE FINISH SYMBOLS
ROUGHNESS SYMBOLS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IT IS DIGITALLY MTD.



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL :	HARDNESS:	FINISHING: 240x75x12
MAT'L : M.S	QTY : 1 no	PART NO : 8

ITE - DGL

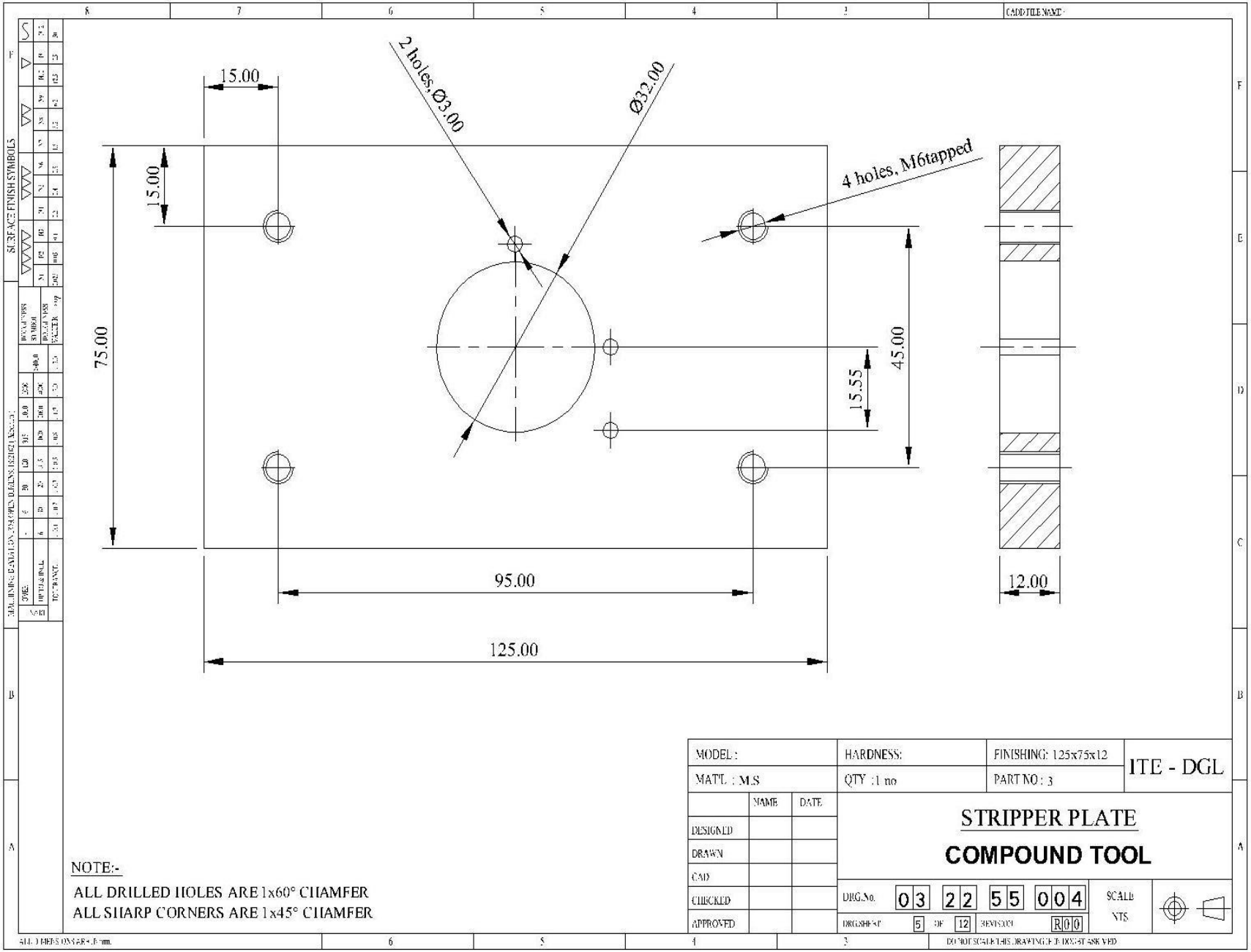
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

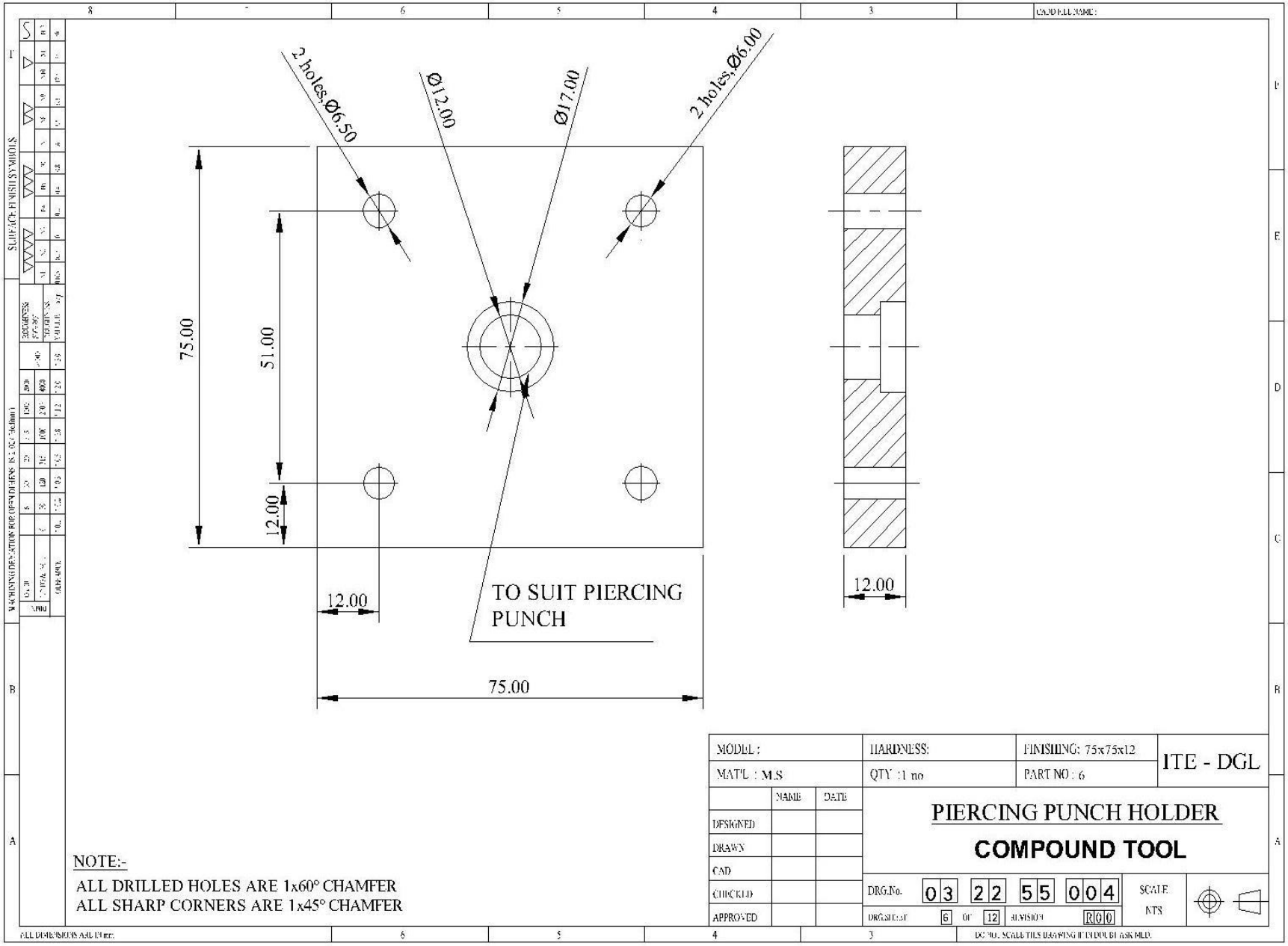
TOP PLATE

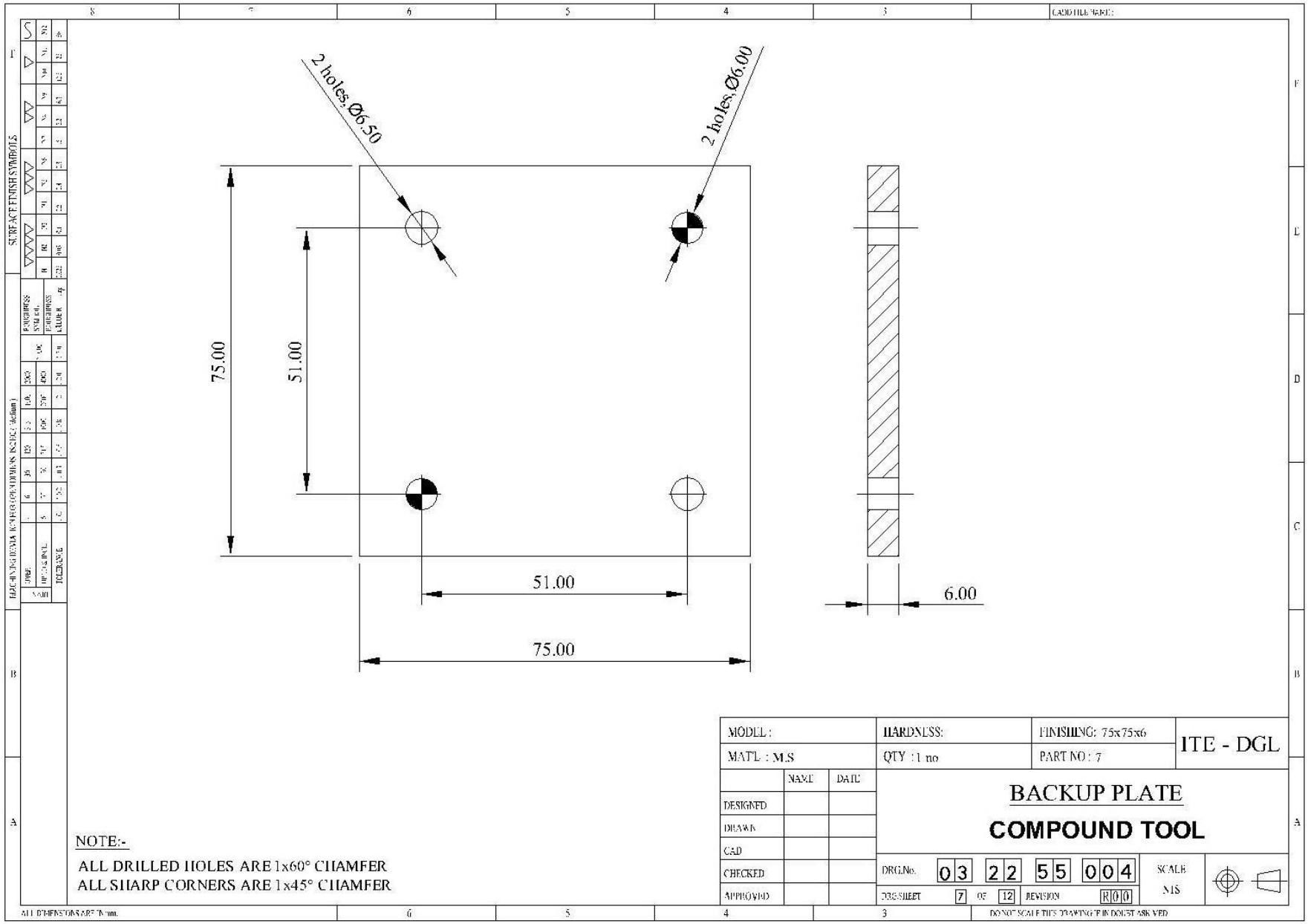
COMPOUND TOOL

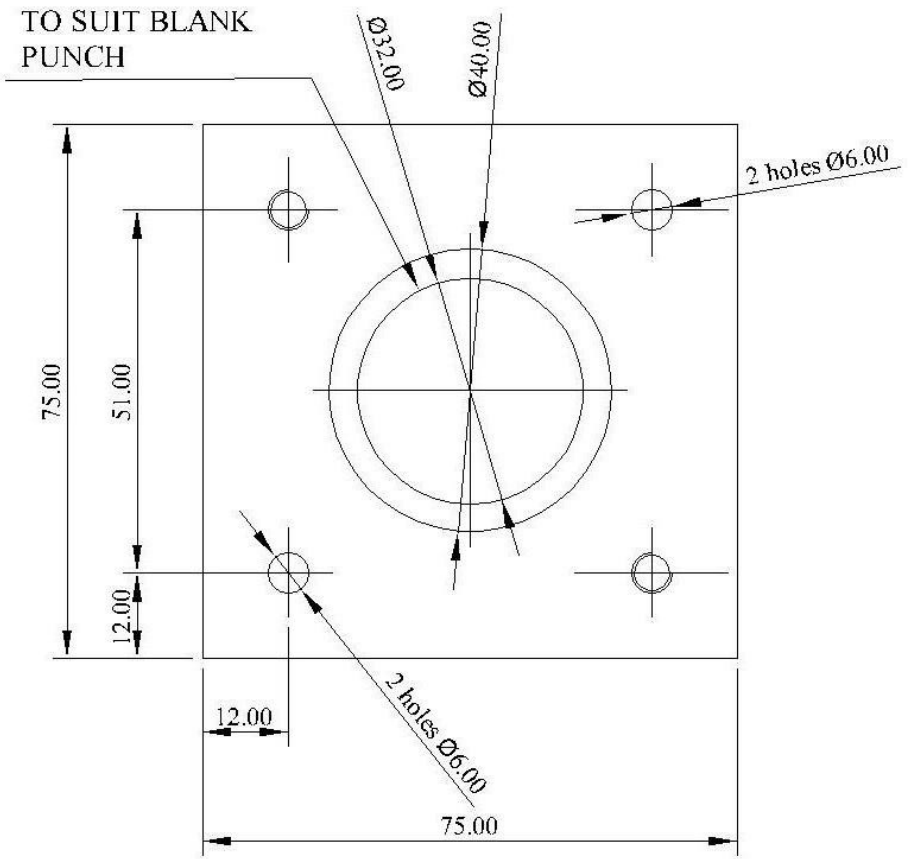
DRG.No. 03 22 55 004 | SCALE NTS

DRG SHEET 4 OF 12 | REVISION R00


15.00
2 holes, Ø3.00
Ø32.00
4 holes, M6tapped
15.00
75.00
45.00
15.55
95.00
12.00
125.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 125x75x12
ITE - DGL
MAT'L : M.S
QTY :1 no
PART NO : 3
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
STRIPPER PLATE
COMPOUND TOOL
DRG.No. 03 22 55 004
SCALE NTS
DRG SHEET 5 OF 12
REVISION R00


2 holes,Ø6.50
Ø12.00
Ø17.00
2 holes,Ø6.00
75.00
51.00
12.00
12.00
TO SUIT PIERCING PUNCH
75.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 75x75x12
ITE - DGL
MAT'L : M.S
QTY : 1 no
PART NO : 6
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
PIERCING PUNCH HOLDER
COMPOUND TOOL
DRG.No. 03 22 55 004
SCALE NTS
DRG.SHEET 6 OF 12
REVISION R00


2 holes,Ø6.50
2 holes,Ø6.00
75.00
51.00
51.00
75.00
6.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 75x75x6
ITE - DGL
MATL : M.S
QTY : 1 no
PART NO : 7
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BACKUP PLATE
COMPOUND TOOL
DRG.No. 03 22 55 004
DRG.SHEET 7 OF 12
REVISION R00
SCALE M.S
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK VED



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL :	HARDNESS:	FINISHING: 75x75x12
MATL : M.S	QTY : 1 no	PART NO : 2

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

BLANK PUNCH HOLDER PLATE

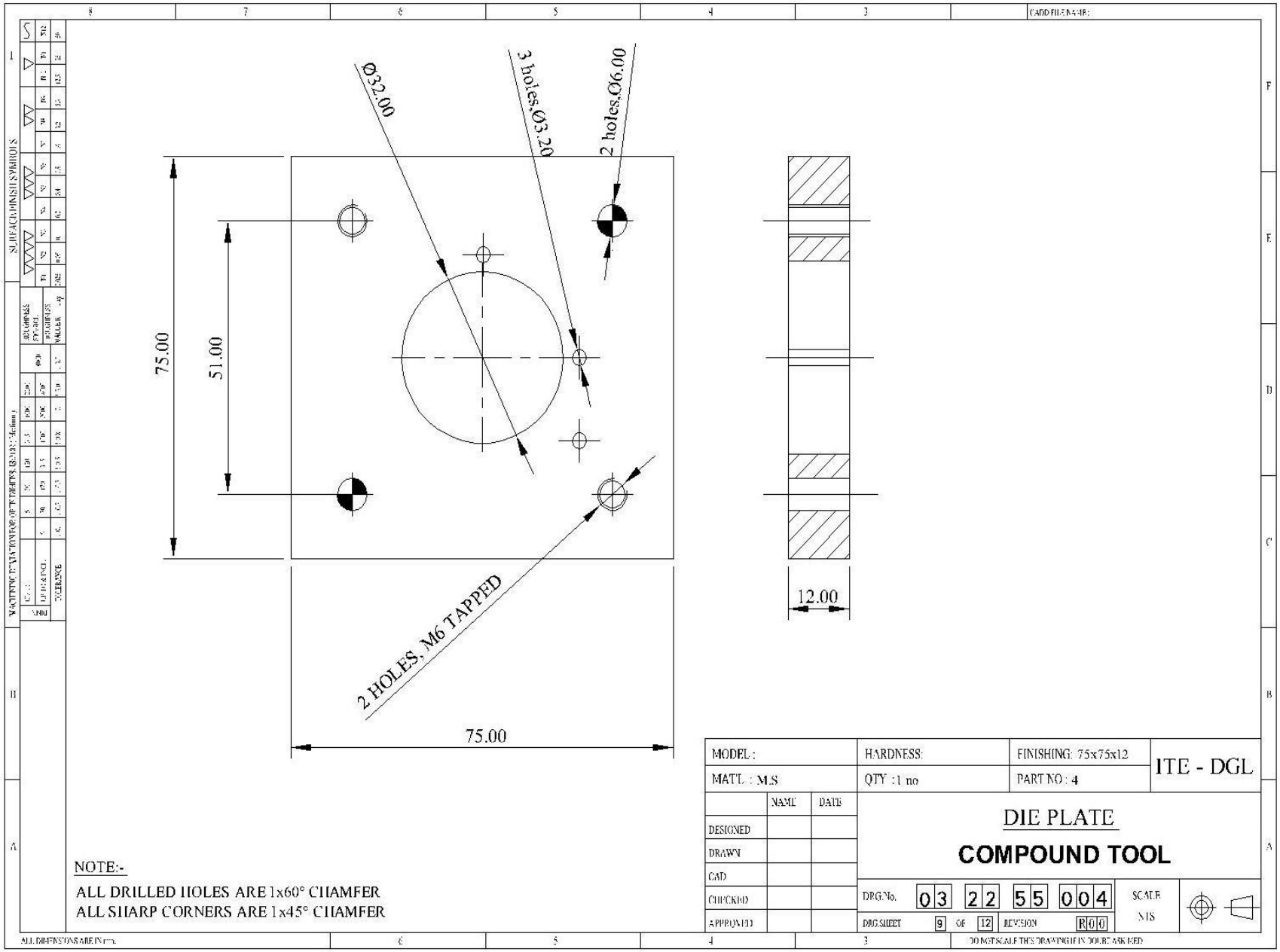
COMPOUND TOOL

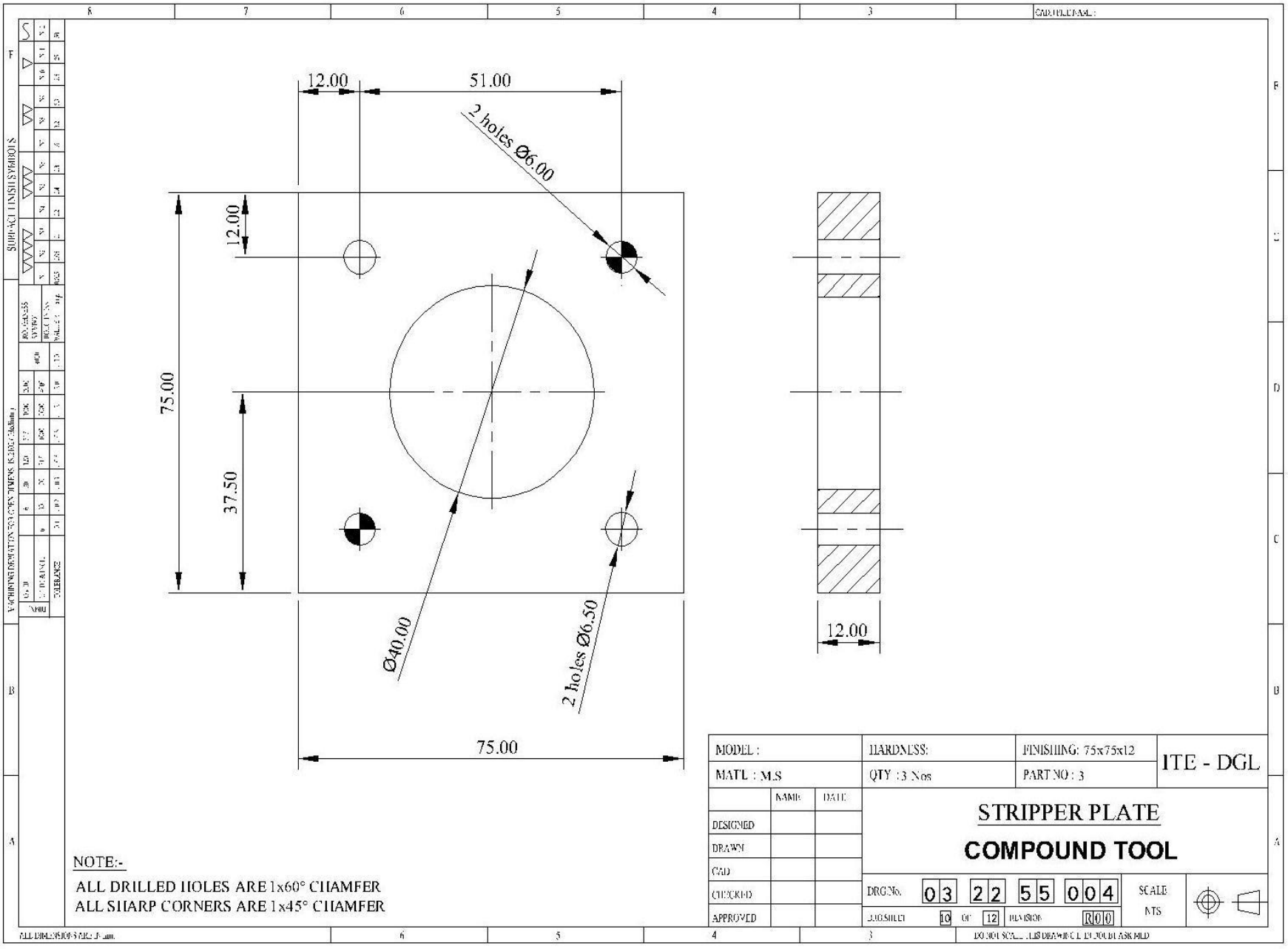
DRG.No. 03 22 55 004 SCALE NTS

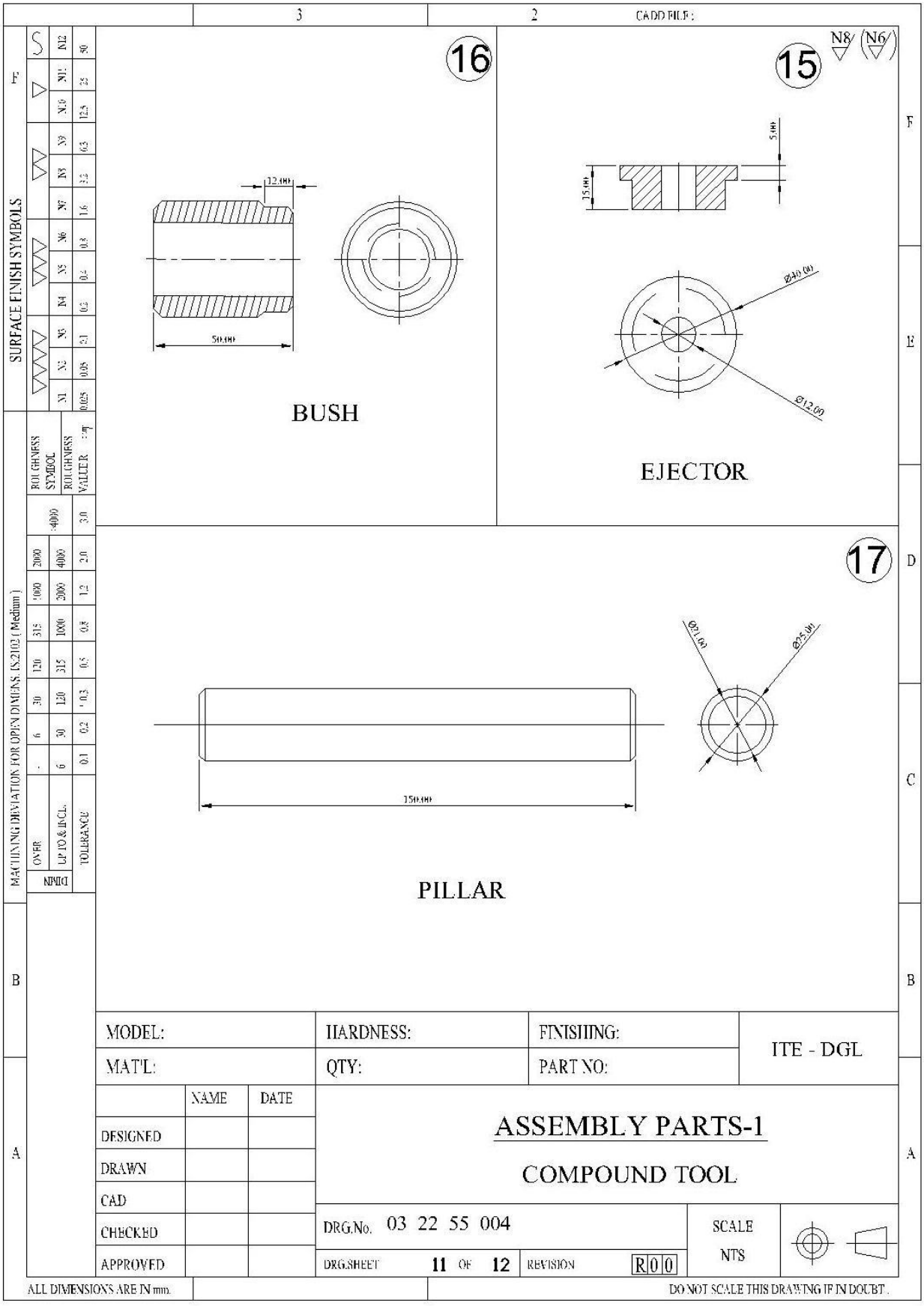
DRG SHEET 8 OF 12 REVISION R00

ALL DIMENSIONS ARE IN mm.

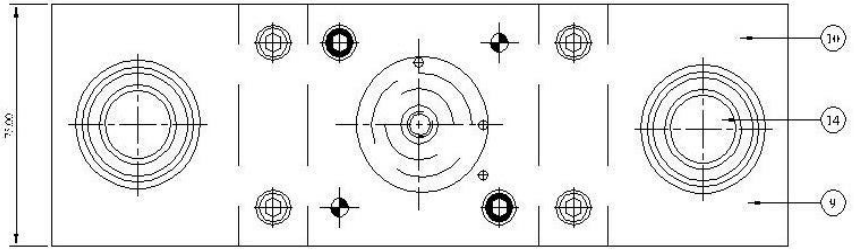
DO NOT SCALE THIS DRAWING IT IS DOUBLE DIMENSIONED

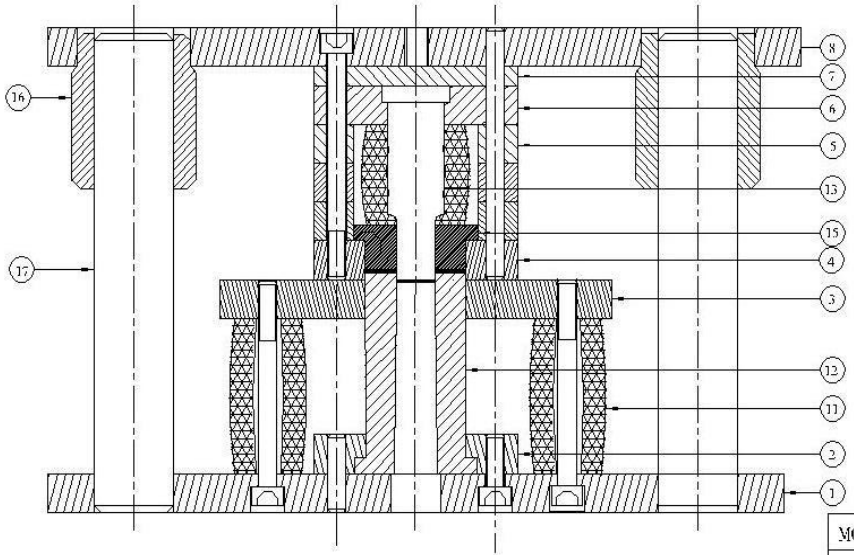

Ø32.00
3 holes,Ø3.20
2 holes,Ø6.00
75.00
51.00
2 HOLES, M6 TAPPED
75.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 75x75x12
ITE - DGL
MATL : M.S
QTY : 1 no
PART NO : 4
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DIE PLATE
COMPOUND TOOL
DRG.No. 03 22 55 004
DRG.SHEET 9 OF 12
REVISION R00
SCALE NTS


12.00
51.00
2 holes Ø6.00
12.00
75.00
37.50
Ø40.00
2 holes Ø6.50
75.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 75x75x12
ITE - DGL
MATL : M.S
QTY : 3 Nos
PART NO : 3
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
STRIPPER PLATE
COMPOUND TOOL
DRG No. 03 22 55 004
SCALE NTS
SHEET 10 OF 12
REVISION R0 0


16
BUSH
15
N8 (N6)
EJECTOR
17
PILLAR
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.
MODEL:
HARDNESS:
FINISHING:
ITE - DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
COMPOUND TOOL
DRG.No. 03 22 55 004
SCALE NTS
DRG.SHEET 11 OF 12
REVISION R0 0

PLAN





SECTIONAL ELEVATION

NOTE

1. ALL DIMENSIONS ARE IN mm
2. PROVIDE PUNCH DIE CLEARANCE PERSIDE AS 0.005
3. THE DIE PLATE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC
4. THE PUNCH SHALL BE HARDENED TO 60-62 HRC
5. AVOID SHARP CORNERS . 2 X 45° CHAMFER
6. FOR DIMENSIONS WITHOUT TOLERANCE SHALL BE PROVIDED AS ISO 2768-1

BILL OF MATERIALS

STD NO	NAME	MATERIAL	QUANTITY
17	PILLER	M.S	2
16	BUSH	M.S	2
15	EJECTOR	M.S	1
14	STOP PIN	M.S	2
13	PIERCING PUNCH	M.S	1
12	BLANKING PUNCH	M.S	1
11	PU RUBBER	PU	3
10	DOWELL Ø6	STD	4
9	ALLEN SCREW M6	STD	8
8	TOP PLATE	M.S	1
7	BACKUP PLATE	M.S	1
6	PIERCING PUNCH HOLDER	M.S	1
5	SPACER PLATE	M.S	3
4	DIE PLATE	M.S	1
3	STRIPPER PLATE	M.S	1
2	BLANKING PUNCH HOLDER	M.S	1
1	BOTTOM PLATE	M.S	1

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY
COMPOUND TOOL

DRG No. 03 22 55 004

SCALE: NTS

DRG SHEET 12 OF 12

REVISION R00

ALL DIMENSIONS ARE IN mm.

DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME!!

Details of The Equipment's (for a batch of 30 students)

NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)
YEAR	THIRD
SEMESTER	V
NAME OF THE LABORATORY	4022560 PRESS TOOLS PRACTICAL

S.N	**LIST OF THE EQUIPMENTS WITH SPECIFICATIONS REMARKS, IF ANY**	**QUANTITY REQUIRED**
1	Centre Lathe, 4 ½' bed length	5
2	Drilling machine	2
3	Shaping machine, stroke length 300mm	2
4	Vertical milling machine	2
5	Surface grinding machine	2
6	Bench vice	10
7	Fitting file set	10
8	Tap set	4
9	Surface plate	2
10	Vernier height gauge 0-250mm	2
11	Dial test indicator with magnetic stand	2
12	Angle plate	2
13	Mechanical power press (15tons- 100 tons)	1
14	Tool maker's straight edge – 150 mm	1
15	Digital Micrometer – 0.-25mm range, 0.001mm least count	3

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4020570–ENTREPRENEURSHIP AND START UP

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020-2021 onwards)

Course Name : 1220: Diploma in Mechanical Engineering (TOOL & DIE)

Subject Code : 4020570

Semester : V

Subject Title : **ENTREPRENEURSHIP & STARTUP**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ENTREPRENEURSHIP & STARTUP	4	64	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced for 75 marks for result

Topics and Allocation of Hours

UNIT	Topic	Hours
1	Entrepreneurship – Introduction and Process	10
2	Business Idea and Banking	10
3	Start ups, E-cell and Success Stories	10
4	Pricing and Cost Analysis	10
5	Business Plan Preparation	10
Revision, Field visit and Preparation of case study report		14
Total		64

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and start ups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:

At the end of the study of 5th semester the students will be able to

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spirit and resourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture
- Familiarization with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turnover
- Familiarization of various financial and non financial schemes
- Aware the concept of incubation and starts ups

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
1	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** • Concept, Functions and Importance • Myths about Entrepreneurship • Pros and Cons of Entrepreneurship • Process of Entrepreneurship • Benefits of Entrepreneur • Competencies and Characteristics • Ethical Entrepreneurship • Entrepreneurial Values and Attitudes • Motivation • Creativity • Innovation • Entrepreneurs - as problem solvers • Mindset of an employee and an entrepreneur • Business Failure – causes and remedies • Role of Networking in entrepreneurship	10
2	**BUSINESS IDEA AND BANKING** • Types of Business: Manufacturing, Trading and Services • Stakeholders: Sellers, Vendors and Consumers • E- Commerce Business Models • Types of Resources - Human, Capital and Entrepreneurial tools • Goals of Business and Goal Setting • Patent, copyright and Intellectual Property Rights • Negotiations - Importance and methods • Customer Relations and Vendor Management • Size and Capital based classification of business enterprises • Role of Financial Institutions	10

	• Role of Government policy • Entrepreneurial support systems • Incentive schemes for State Government • Incentive schemes for Central Government	
3	**STARTUPS, E-CELL AND SUCCESS STORIES** • Concept of Incubation centre's • Activities of DIC, financial institutions and other relevance institutions • Success stories of Indian and global business legends • Field Visit to MSME's • Various sources of Information • Learn to earn • Startup and its stages • Role of Technology – E-commerce and Social Media • Role of E-Cell • E-Cell to Entrepreneurship	**10**
4	**PRICING AND COST ANALYSIS** • Calculation of Unit of Sale, Unit Price and Unit Cost • Types of Costs - Variable and Fixed, Operational Costs • Break Even Analysis • Understand the meaning and concept of the term Cash Inflow and Cash Outflow • Prepare a Cash Flow Projection • Pricing and Factors affecting pricing • Understand the importance and preparation of Income Statement • Launch Strategies after pricing and proof of concept • Branding - Business name, logo, tag line • Promotion strategy	**10**

5	**BUSINESS PLAN PREPARATION** • Generation of Ideas, • Business Ideas vs. Business Opportunities • Selecting the Right Opportunity • Product selection • New product development and analysis • Feasibility Study Report – Technical analysis, financial analysis and commercial analysis • Market Research - Concept, Importance and Process • Marketing and Sales strategy • Digital marketing • Social Entrepreneurship • Risk Taking-Concept • Types of business risks	**10**

REFERNCE BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra - 282002
2. Dr. G.K. Varshney, Business Regulatory Framework , Sahitya Bhawan Publications, Agra - 282002
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301
4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
5. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
6. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
7. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
8. Prasanna Chandra, Financial Management, Tata McGraw Hill education private

limited, New Delhi
9. I. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers, Rajasthan
10. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
11. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioners guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

Board Examination – Evaluation Pattern

Internal Mark Allocation

Assignment (Theory portion)*	-	10
Seminar Presentation	-	10
Attendance	-	5
Total	**-**	**25**

Note: * Two assignments should be submitted. The same must be evaluated and converted to 10 marks.

Guidelines for assignment:

First assignment – Unit I

Second assignment – Unit II

Guidelines for Seminar Presentation - Unit III

Each assignment should have five three marks questions and two five marks questions.

BOARD EXAMINATION

Note

1. The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.
2. The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Board Practical Examinations.
3. The question paper consists of theory and practical portions. All students

should write the answers for theory questions (45 Marks) and practical portions (55 Marks) should be completed for board examinations.

4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do the examination for 3Hrs.
5. For Written Examination: theory question and answer: 45 Marks

   Ten questions will be asked for 3 marks each. Five questions from each unit 1 & 2. (10 X 3 = 30).

   Three questions will be asked for 5 marks each. One question from each unit 1, 2 & 3. (3 X 5 = 15)
6. For Practical Examination: The business plan/Feasibility report or Report on Unit 4 & 5 should be submitted during the board practical examinations. The same have to be evaluated for the report submission (40 marks).

DETAILED ALLOCATION OF MARKS

Sl. No	Description	Marks
Part A	Written Examination - Theory Question and answer 10 questions x 3 marks = 30 marks 3 questions x 5 marks = 15 marks	45
Part B	Practical Examination – Submission on Business Plan/Feasibility Report or Report on Unit 4 & 5	40
Part C	Viva voce	15
	Total	100

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

VI SEMESTER

2020 – 2021 onwards

4022610 – TOOL DESIGN AND DRAWING

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022610

Semester : VI

Subject Title : **TOOL DESIGN AND DRAWING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester**:** 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
TOOL DESIGN AND DRAWING	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Time allocation

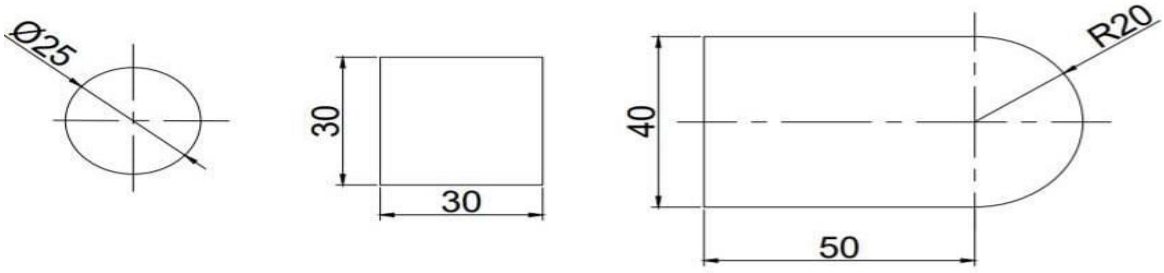
TOPIC	TIME (Hrs)
I. Design of Press Tools	40
II. Design of Jigs and Fixtures	20
III. Design of Gauges	13
TEST & MODEL EXAMINATIONS	10
TOTAL	80

DETAILED SYLLABUS

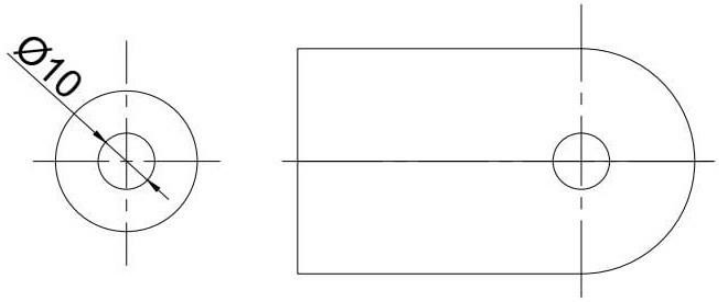
Contents: Theory

Name of the Topic	Hours
I. DESIGN OF PRESS TOOLS: Fourteen steps to design a Die – strip layout types of strip layout – wider win, narrow and other layout – calculating of percentage utilization and percentage stop – method of increasing strip utilization – calculation of cutting force, calculation press capacity – Design of die plate strip; die and punch clearance land, angular clearance – design blanking punches – design piercing punches – method of reducing cutting force in progressive dies – Design punch plate, design plots, Design a stop – finger stop, Automatic stops – Design of strippers, Selection of fasteners and moulds - Selection of die sets drawing – Assembly the pillar draw of dies, Adding plunger of die moulds	**40**
II. DESIGN OF JIGS AND FIXTURES: Design of Plate jig (turn over type) - Indexing jig - Milling fixture - Grinding fixture.	**20**
III. GAUGE DESIGN 1. Design of Plain plug gauge as per IS 3455, IS 6137, IS 6244, IS 6246 and IS 7018 : Part 2 2. Design of snap gauge as per IS 3477 3. Design of plain ring gauges as per IS 3485	**13**
TEST & MODEL EXAMINATIONS	**07**
Total	**80**

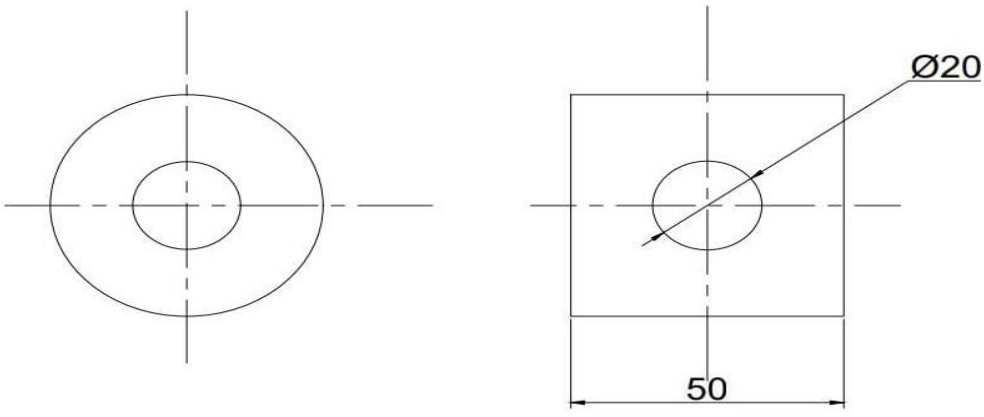
Design of Blanking Tool:



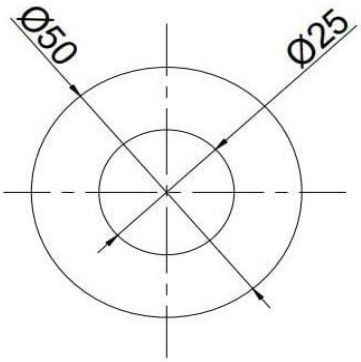
Design of piercing Tool



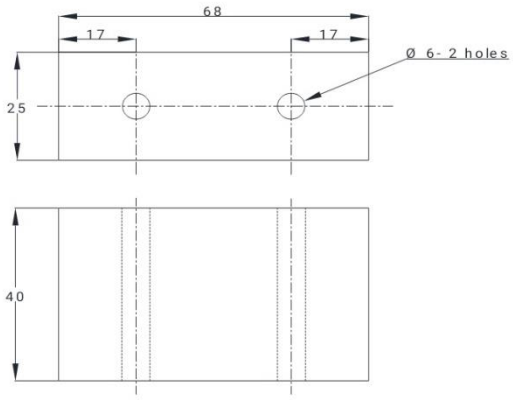
Design of Progressive Tool



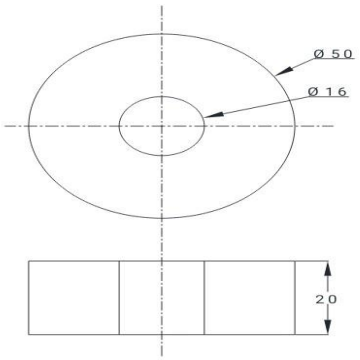
Design of Compound Tool



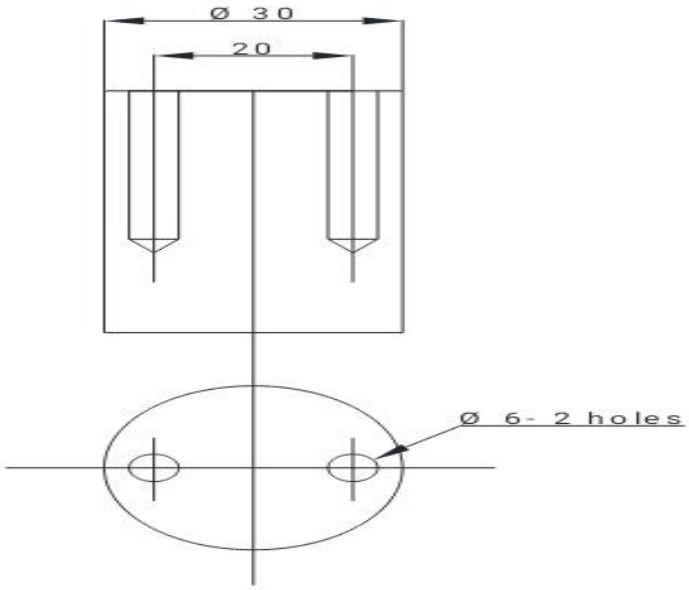
Channel Drill Jig



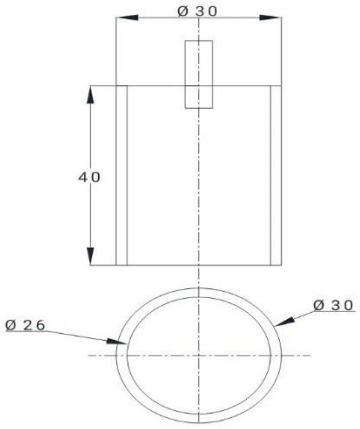
Inspection Fixture



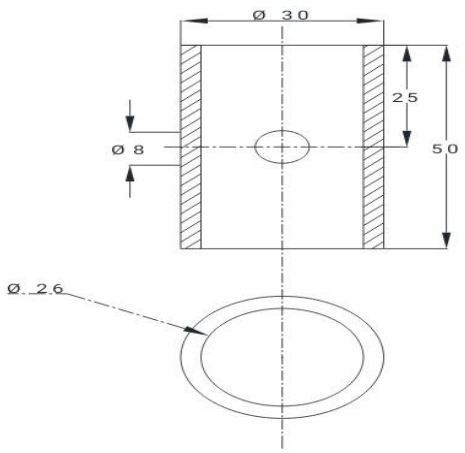
Template Drill Jig



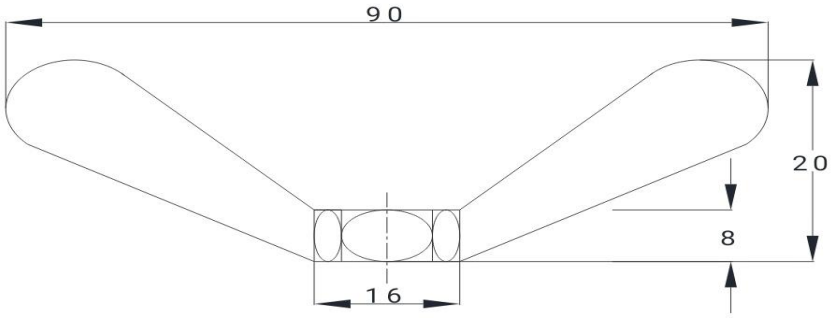
Milling Fixture



Indexing Drill Jig



Welding Fixture



References:-

1. J.R.Paquin, Die design fundamentals, Industrial Press Inc, 1990.
2. Donaldson, Tool Design , Tata McGraw-hill Book company, 23rd edition, 2006
3. Donald F. Eary., Edward A. Reed, Techniques of Press working sheet metal, Prentice-Hall,Inc.,Second Edition, 1974.
4. Indian Standard Specifications **IS 3455, IS 6137, IS 6244, IS 6246 ,IS 7018 : Part 2, IS 3477 and IS 3485.**

INSTRUCTIONS FOR QUESTION PAPER SETTING:

1. **Part A** is Tool Design and drawing Question for 50 marks. Either or Type question is to be asked. **One question from UNIT I and one question from Unit II**. The question asked should be such that it could be answered in **135 minutes** time. Please avoid components of very complicated profiles which consumes more time.
2. **Part B** is gauge design and drawing question from **UNIT III** for 25 marks . Please ensure that the tolerance grade for gauge design dimensions are given in question paper which is an essential data for gauge design using standards.
3. For mark and time allocation please refer the model question paper enclosed herewith

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

V SEMESTER

2020 – 2021 onwards

4022620 PLASTIC MOLDING TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022620

Semester : VI

Subject Title : **PLASTIC MOULDING TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
PLASTIC MOULDING TECHNOLOGY	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Time allocation

UNIT	TOPIC	TIME (Hrs)
I	Plastic Materials and Processing techniques	14
II	Injection Moulding Machine, Injection Mould and its functional system	15
III	Injection Mould Design	15
IV	Compression, Blow and Transfer moulding machine and Mould Design	14
V	Plastic Product Design , Decoration of Plastic Products & Maintenance and repairs of injection moulds	15
	TEST & MODEL EXAMINATIONS	07
	Total	80

RATIONALE: -

Plastic plays an important role in the present day industrial products and for the manufacture of plastic components lot of moulds are used. Hence Considering the immense potential in the fields of Plastic processing, mould design, making and maintenance, it is essential to understand the basics of plastic materials, processing and moulding technology adopted to convert the raw plastic material into desired products.

OBJECTIVES

- Familiarise different plastics materials and their properties
- Familiarise of the conventional injection-moulding machine types, their specification, Operation terminology and their parts.
- Compare different moulding processes used in industries, their application
- Explain the design procedure for injection moulding.
- Explain the design procedure for compression moulding
- Explain the concepts in the design of blow moulds.
- Appreciate the decoration techniques, plating techniques used for plastic components.
- Explain the working of injection moulding machine
- Understand the intermediate injection moulding design concepts

DETAILED SYLLABUS

4022620 - PLASTIC MOULDING TECHNOLOGY

Contents: Theory

Unit No.	Name of the Topics	Hours
I	**Plastic Materials and Processing techniques** **1.0 Plastics:** Introduction – type of Plastics - Thermo Plastic Materials – Thermo setting Materials – Commodity Plastics – Engineering materials – Density - Melting Temperature – Shrinkage – Bulk Factor – Moulding Properties – Applications – Additives - Master Batches – Pigments. **Injection Moulding:** Hot Runner Injection Moulding Process, Multi colour and multi component Injection Moulding Process, Reaction Injection Moulding Process. **1.2 Blow Moulding**: concept and working principle only **1.3 Compression & Transfer Moulding** – Compression Moulding Procedure- Difference between Injection and Compression moulding.- Transfer Moulding -Advantages and Disadvantages. **1.4 Other processes:** Rotational Moulding, Thermoforming, Extrusion- Pipe extrusion, Blown film, Cast film extrusion, Rod Extrusion– Co extrusion,	**7** **2** **3** **2**
II	**Injection Moulding machine, injection mould and its functional systems** **2.1 Injection Moulding Machines:** Basic parts and functioning of an injection moulding machine. Types of injection moulding machine (Screw type & Plunger Type) – Single stage and two stage – Clamping unit (Toggle & Hydraulic) - Types of nozzles – Typical injection. Moulding cycle, Cycle time - Machine specifications (Definition only). **2.2 Injection Mould: - Terms** used in connection with injection moulds, classification of moulds, Functions of the injection moulds. **2.3 Functional systems of injection mould** – **Sprue and runner system** - Runner, Cross section shape, Runner size, Runner layout – Gates, Necessity, Centre gate, Edge gate, Balanced gating, Types of Gates. **Core and Cavity-** Shrinkage calculation - Core and cavity dimension.	**3** **3** **3**

	Parting surface: Flat Parting surface – Non flat parting surface - Venting – Mould clamping - direct, indirect. **2.4 Cooling System** – Cooling Integer type cavity plates – Cooling integer type core plate - Cooling bolster – Cooling cavity inserts – Cooling core inserts – Water connection and seals. (Concept & Description of design only) **2.5 Ejection system**: Ejector grid - Ejector plates assembly – Ejector rod, Ejector plate and ejector retaining plate - Methods of Ejection – Ejection from fixed half- Sprue puller.	**3** **3**
III	**<u>Injection Mould Design & Intermediate Moulds</u>** **3.1 –Basic procedure for mould design –** Determination of mould size – Maximum number of cavities, Clamping force , Maximum clamping area, Required opening stroke. Computation of number of cavities, cavity layouts, number of parting lines, Design of runner and gate. **3.2 Intermediate Moulds:** Moulding external undercuts-Split mould - Finger cam, dog leg cam & track. Hydraulic & spring actuation of split - Side core and side cavity, Methods of actuation - Mould with internal undercut : Form pin, actuation, split core, jumping off - Mould for threaded component: Manual & automatic unscrewing methods hand mould for rotating & lose core methods - Multi day light mould – Under feed mould – Triple day light mould – Hot runner unit mould, Advantages and Limitations, Hot runner nozzles & sprue, runner less mould - Materials for Injection Mould – Standard Mould systems, Advantages and limitations **(**Concept & Description of design only). **3.3 Alignment of Moulds**: Functions of alignment, alignment with the axis of the plasticizing unit, internal alignment and interlocking, alignment of large moulds. Changing of moulds – system for a quick change of moulds for thermoplastics, mould exchanger for elastomer moulds.	**4** **6** **5**

IV	**Compression, Blow and Transfer Moulding machines and Mould Design** **4.1 Compression & Transfer Moulding Machines**: - Type of compression Moulding Machine – Toggle type mechanical machine – Hydraulically operated Machine – Auxiliary Ram type machines (Vertical Transfer Machine) – Bottom Transfer Machine – Machine Parts – Machine Specifications- Pot and plunger Transfer machines **4.2 Compression mould Design:** Economic determination of no. of cavities, flash thickness allowances, design of mould cavity, design of loading chamber, bulk factor, loading chamber depth & heat requirement for heating the mould related to - curing time, breathing time. Materials for Compression mould. **4.3 Blow moulding Machines** - Extrusion Blow Moulding Machine (EBM) – Stretch Blow Moulding Machine (SBM) – Injection Blow Moulding Machine (IBM) – Machine Parts – Machine Specifications. **4.4 Blow Mould Design:** Mould layout, pinch off, venting, Head die design, parison diameter calculation, shrinkage calculation, design of mould clamping accessories.	**4** **4** **3** **3**
V	**Plastic Product Design, Decoration of Plastic Products and Maintenance & Repair of Injection Moulds:** **5.1 Plastic Product Design:** Wall thickness - Ribs and profiled structures – Gussets or support ribs - Bosses - Holes - Radii & Corners - Tolerances - Coring - Undercuts – Draft angle. **5.2 Decoration of Plastic Parts:** Painting and coating (Dipping, Spraying and Depositing) – Metalizing (Vacuum metallization, Vacuum evaporation, sputtering) – Plating (Electroless plating, Electrolytic plating) - Flame and arc spraying - hot foil stamping – hot transfer – In mold decorating - Water transfer – Printing– Laser Marking, Vapor polishing, Decals - Understanding Recycling Codes. **5.3 Maintenance of Injection Moulds:** Advantages of Preventive maintenance, maintenance of - cooling lines, mould surfaces, heating & control systems. Action taken after examination and cleaning. Repair and	**4** **7** **4**

	alterations of injection moulds.	
	TEST & MODEL EXAMINATIONS	**07**

Text Books:

1. Pye.R.G.W., "Injection Mould Design", Affiliated East – west press pvt Ltd, 2000

2. Athalye.A.S., 'Injection Moulding", 2nd Edn., Multi Tech Publishing Co., 1998

3. George menges and Paul mohren, “How to make Injection moulds”, Hawer publishers, 1991

Reference Books:

1. Briston and Gosselin, “Introduction to Plastics", Newnes-Butterworths, London, 1970

2. Mills.N.J., “Plastics", ELBS, 1986

3. Dominick V.Rosato and Donald V.Rosato., "Injection Moulding Hand Book", CBS Publishers & Distributors, Delhi, 1987

4. Athalye.A.S., "Plastics Materials Handbook", Multi Tech Publishing Co., 1995

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

VI SEMESTER

2020 – 2021 onwards

4020610 – INDUSTRIAL ENGINEERING & MANAGEMENT

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4020610

Semester : VI

Subject Title : **INDUSTRIAL ENGINEERING AND MANAGEMENT**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
INDUSTRIAL ENGINEERING MANAGEMENT	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Plant Engineering and Plant Safety	14
II	Work Study, Method Study and Work Measurement	15
III	Principles, Personnel Management and Organizatioal Behavior:	16
IV	Financial and Material Management	14
V	Engineering Ethics and Human Values	14
	TEST & MODEL EXAMINATIONS	07
	Total	**80**

RATIONALE:

In the Indian Economy, Industries and Enterprises always find prominent place. After globalization, the students should be trained not only in manufacturing process but also in managing activities of industries. The knowledge about plant, safety, work study techniques, personnel management, financial management and engineering ethics and human values will definitely help the students as managers to suit the industries.

OBJECTIVES:

- To study the different types of layout.
- To study the safety aspects and its impacts on an organization.
- To study different work measurement techniques.
- To study engineering ethics and human values.
- To study the staff selection procedure and training of them.
- To study capital and resources of capital.
- To study inventory control system.
- To study about organization and it's behavior.

DETAILED SYLLABUS

4020610 INDUSTRIAL ENGINEERING AND MANAGEMENT

Contents: Theory

Unit	Name of the Topics	Time
I	**Plant Engineering and Plant Safety** **Chapter: 1.1: Plant Engineering :** Plant – Selection of site of industry – Plant layout – Principles of a good layout – types – process, product and fixed position – techniques to improve layout – Principles of material handling equipment – Plantmaintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance. **Chapter: 1.2: Plant Safety:** Importance – accident - causes and cost of an accident-accident proneness - prevention of accidents - Industrial disputes - settlement of Industrial disputes-Collective bargaining, conciliation, Mediation, arbitration - Indian Factories Act 1948 and its provisions related to health, welfare and safety.	**7** **7**

II	**Work Study, Method Study and Work Measurement** **Chapter: 2.1: Work Study:** Productivity – Standard of living – method of improving productivity – Objectives – Importance of good working conditions. **Chapter: 2.2: Method Study:** Definition – Objectives – Selection of a job for method study –Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart, Man Machine chart, String diagram and flow diagram. **Chapter: 2.3: Work Measurement:** Definition – Basic procedure in making a time study – Employees rating factor – Application of time allowances – Rest, Personal, Process, Special and Policy allowances – Calculation of standard time – Problems – Basic concept of production study – Techniques of work measurement-Ratio delay study, Synthesis from standard data, analytical estimating and Pre determined Motion Time System (PMTS).	**3** **5** **7**
III	**Principles, Personnel Management and Organizational Behavior:** **Chapter: 3.1: Principles of Management:** Definition of management – Administration - Organization – F.W. Taylor's and Henry Fayol's Principles of Management – Functions of Manager – Directing – Leadership –Types of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation --Modern management techniques- Management Information Systems – Strategic management – SWOT Analysis - Business Process Re-engineering (BPR) – Enterprises Resource Planning (ERP) –Activity Based Management (ABM) – Global Perspective – Principles and brief description. **Chapter: 3.2: Personnel Management:** Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school training – Job evaluation and merit rating – objectives and importance – wages and salary administration – Components of wages – Wage fixation – Type of wage payment – Halsey's 50% plan, Rowan's plan and Emerson's efficiency plan – Problems.	**6** **6**

	Chapter: 3.3: Organizational behavior: Definition – organization-- Types of Organization – Line, Staff, Taylor's Pure functional types – Line and staff and committee type –Organizational Approaches, individual behavior - causes - Environmental effect - Behavior and Performance, Perception - organizational implications.	**4**
IV	**Financial and Material Management** **Chapter: 4.1: Financial Management:**Fixed and working capital – Resources of capital – shares preference and equity shares – debentures – Type of debentures – Public deposits, Factory costing – direct cost – indirect cost – Factory overhead – Selling price of a product – Profit – Problems. Depreciation – Causes – Methods - Straight line, sinking fund and percentage on diminishing value method – Problems. **Chapter: 4.2: Material Management:** Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Minimum Stock, Lead Time, Reorder Level - Economic order quantity - problems – supply chain management - Introduction – Purchasing procedure – Store keeping – Bin card.	**7** **7**
V	**Engineering Ethics and Human Values** **Chapter: 5.1: Engineering Ethics**: Definition-engineering ethics-personal and business ethics- duties and rights-engineering as a profession - core qualities of professional practitioners-environment and their impact-code of ethics- procedure for solving ethical conflicts - ethical judgement-Kohiberg's stages of moral development - value based ethics- engineers as managers, consultants and leaders- environmental ethics- computer ethics- Intellectual Property Rights (IPRs). **Chapter: 5.2: Human values :** morals – values – integrity- service learning-civic virtue - respect for others- living peacefully- caring – sharing – honesty- courage - valuing time cooperation - commitments – empathy-selfconfidence – character- stress management.	**8** **6**

Reference Books :

1. Industrial Engineering and Management, O.P. Khanna, Revised Edition Publications(P)Ltd – 2004, 67/4 Madras House, Daryaganj, NewDelhi– 110002.
2. Engineering Economics and Management, T.R. Banga& S.C. Sharma, McGraw Hill Editiion. 2 – 2001, NewDelhi.
3. HeraldKoontz and Heinz Weihrich,' Essentials of Management', McGraw Hill Publishing Company, Singapore International Edition.Latest
4. Govindarajan .M, Natarajan. S, Senthilkumar V.V, Engineering ethics , prentice hall of India New Delhi, 2004.
5. Management, Aglobal perspective, Heinz Weihrich, Harold Koontz, 10th Edition, McGraw Hill International Edition.Latest.
6. Essentials of Management,4th Edition, Joseph L.Massie,Prentice- Hall of India, NewDelhi 2004.
7. S.Chandran, Organizational Behaviours,Vikas Publishing House Pvt. Ltd. Latest
8. M.Govindarajan and S.Natarajan ,Principles of Management ,Prentce Hall of India Pvt.Ltd. NewDelhi.Latest.
9. Charles B. Fledderman, Engineering ethics, pearson prentice hall, New Jersey, 2004.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

VI SEMESTER

2020 – 2021 onwards

4020631 – INDUSTRIAL ROBOTICS AND 3D PRINTING

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220 DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Subject Code : 4020631
Semester : VI
Subject Title : **INDUSTRIAL ROBOTICS AND 3D PRINTING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
INDUSTRIAL ROBOTICS AND 3D PRINTING	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Fundamentals of Robot Technology	12
II	Drive Systems, End Effecters, Sensors and Machine Vision System	12
III	Robot Programming, Robot Applications in Maufacturing	12
IV	Introduction and Design for Additive Manufacturing	18
V	Additive Manufacturing Processes	19
TEST AND MODEL EXAMINATION		07
Total		**80**

RATIONALE:

Rapid industrialization and globalization needs industries to be more competitive and deliver cost effective quality products. This needs industries to implement flexible manufacturing systems where Robotic technology plays major role. Hence study of robotic technology is very essential.

3Dprinting is often utilized when manufacturers need to create a product accurately, quickly and at a low quantity. This has lead to 3D printers being brought in to prototype industrial robots, helping to aid the development of better, more efficient robots in the industrial sector.

OBJECTIVES:

- Understand fundamentals of robotics
- Acquire knowledge structure and elements of robot
- Gain knowledge on controller and various drives used in robotics
- Develop knowledge on role of sensors and vision system
- Acquire skill to program and control robot
- Understand to adopt robot to various industrial applications.
- To acquire the knowledge on 3D Printing and design principles for additive manufacturing
- To understand the principles of latest manufacturing processes in Additive manufacturing

DETAILED SYLLABUS

Contents: Theory

Unit	Name Of The Topic	Hours
I	**Fundamentals of Robot Technology** Introduction – History of robot– Definitions– Basic configuration of Robotics – Robot Components – Manipulator, End effecter, Driving system, Controller and Sensors – Degrees of freedom – Links and joints – Types of joints – Joint notation scheme – Pitch, Yaw, Roll – Classification of robots – Work envelope and Work Volume – Effect of structure on Control ,Work envelop and Work	12

	volume- Introduction to PUMA robot- Robot controller – Configuration - Four types of controls – Open loop and closed loop controls – Speed of response and stability – Precision of movements: Spatial resolutions, accuracy and repeatability.	
II	**Drive Systems, End Effecters, Sensors and Machine Vision System** Pneumatic drives – Hydraulic drives – Mechanical drives – Electrical drives – Stepper motors, DC Servo motors and AC Servo motors– Applications and Comparisons of Drives. End effecters – Grippers – Mechanical Grippers, Magnetic Grippers, Vacuum Grippers- Selection and design considerations in robot gripper- Requirements of Sensors – Position sensors: LVDT, Resolvers, Optical encoders- Proximity sensors: Inductive, Capacitive, Ultrasonic and Optical proximity sensors- Touch Sensors – Range Sensors- Machine Vision System: Sensing & Digitizing Image Data – Image Processing and Analysis - Application	12
III	**Robot Programming, Robot Applications In Manufacturing** Forward kinematics, Inverse kinematics and differences – Forward kinematics and Reverse kinematics of manipulators with Two and Three degrees of freedom – Derivations. Robot programming –Lead through programming, Textual programming – Teach Pendant for Robot system– Robot programming languages – Motion commands, Sensor commands, End effecter commands. Robot applications – Material handling-Spot welding – Arc welding – Spray painting – Assembling – Finishing-AGV-RGV.	12
IV	**Introduction and Design for Additive Manufacturing** **Introduction to Additive Manufacturing** Additive Manufacturing – 3D Printing – Rapid prototyping – Overview – Need – Additive manufacturing Vs CNC Machining - Development of Additive Manufacturing Technology – Principle of AM Process – Generalised Additive Manufacturing Process Chain	9

	- Classification - Benefits – Direct and Indirect process, Prototyping, Manufacturing and Tooling **Design for Additive Manufacturing** Design tools: Data processing - CAD model preparation – STL file - Part orientation and support structure generation - Model slicing - Tool path generation. Design for Additive Manufacturing: Concepts and objectives - AM unique capabilities - DFAM for part quality improvement – strategies – Design Rules – Quality aspects – Software for AM – MIMICS, etc.	9
V	**Additive Manufacturing Processes** **Photo polymerization and Powder Bed Fusion Processes** Photo polymerization: SLA - Photo curable materials - Process - reaction rates – scan patterns - Advantages and Applications. Powder Bed Fusion: SLS - Process description - powder fusion mechanism – material feed system - Process Parameters - Materials and Applications. Electron Beam Melting **Extrusion Based And Sheet Lamination Processes** Extrusion Based System: FDM – Introduction - Basic Principle – plotting and path control - Materials - Applications and Limitations - Bio-extrusion. Sheet Lamination Process: LOM – Materials - Gluing or Adhesive bonding - Thermal bonding – Ultrasonic AM. **Printing Processes And Beam Deposition Processes** Droplet formation technologies - Continuous mode - Drop on Demand mode - Three Dimensional Printing – Advantages – Bio-plotter - Beam Deposition Process: LENS- Process description - Material delivery - Process parameters – Materials – Benefits. Applications of AM technologies in Automotive, Manufacturing, Architectural, Healthcare, and Consumer products.	7 5 7

Reference Books:

1. Industrial Robotics – Technology, Programming and Applications, P.Groover, MCGraw Hill, 2001

2. Chua C.K., Leong K.F., and Lim C.S., **"**Rapid prototyping: Principles and applications**"**, Third edition, World Scientific Publishers, 2010.
3. Ian Gibson, David W. Rosen, Brent Stucker **"**Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing**"** Springer, 2010.
4. Robotics Control, Sensing, Vision and Intelligence, Fu.K.S.Gonzalz.R.C., and Lee C.S.G, McGraw-Hill Book Co., 1987
5. Robotics for Engineers, Yoram Koren, McGraw-Hill Book Co., 1992
6. Robotics and Image Processing, Janakiraman.P.A, Tata McGraw-Hill, 1995
7. Andreas Gebhardt **"**Understanding Additive Manufacturing: Rapid Prototyping, Rapid Manufacturing**"** Hanser Gardner Publication 2011.
8. Kamrani A.K. and Nasr E.A., **"**Rapid Prototyping: Theory and practice**"**, Springer, 2006.
9. Liou L.W. and Liou F.W., **"**Rapid Prototyping and Engineering applications: A tool box for prototype development**"**, CRC Press, 2007.
10. Tom Page, **"**Design for Additive Manufacturing**"** LAP Lambert Academic Publishing, 2012.
11. Amit Bandyopadhyay, and Susmita Bose, "Additive Manufacturing", CRC Press.
12. John O Milewski., "Additive Manufacturing of Metals: From Fundamental Technology to Rocket Nozzles, Medical Implants, and Custom Jewellery", Springer Series in Materials Science
13. Sabrie Soloman. "Additive Manufacturing: Advanced Manufacturing Technology in 3d Print Deposit"
14. David Ian Wimpenny and Pulak M Pandey, "Advances in 3D Printing and Additive Manufacturing Technologies"
15. Andreas Gebhardt, Hanser, "Understanding Additive Manufacturing"

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

VI SEMESTER

2020 – 2021 onwards

4020620 – E VEHICLE TECHNOLOGY & POLICY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4020620

Semester : V

Subject Title : **E VEHICLE TECHNOLOGY & POLICY**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
E VEHICLE TECHNOLOGY & POLICY	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Environmental impact and history, Types of Electric vehicles	15
II	Electric vehicle, Electrical Propulsion System	15
III	Energy Storages, Charging System, Effects and Impacts	14
IV	Electric Mobility Policy Frame Work	14
V	Tamilnadu E-Vehicle Policy 2019	15
	TEST & MODEL EXAMINATIONS	7
	Total	**80**

RATIONALE:

The world is transitioning to cleaner mobility options with the aim at improving air quality and reducing dependency on fossil fuels. Electric Vehicles (EVs) have emerged a popular clean mobility choice to reduce emissions. EVs are powered fully or partially by batteries, they can help to reduce dependence on fossil fuels also air quality. Tamil Nadu is one of the most advanced states in India. Tamil Nadu has a highly developed industrial eco-system and is very strong in sectors like automobiles and auto-components. Many globally renowned companies have setup their manufacturing facilities in Tamil Nadu. Due the rapid depletion of fossil fuel and increase in fuel cost, environmental pollution, the shift to clean transport is necessary. This subject introduced by keeping all the above factors.

OBJECTIVES:

- To learn the environmental impact and history of Electric Vehicles.
- To understand the concept of Electric Vehicle and its types.
- To study the configurations of Electric Vehicles
- To acquire knowledge about Energy Storages, Charging System, Effects and Impacts
- To appreciate the Electric Mobility Policy Frame work India and EV Policy Tamil Nadu 2019.

DETAILED SYLLABUS

4020620 E Vehicle Technology & Policy

Contents: Theory

Unit	Name of the Topics	Hours
I	**Environmental impact and history:** Environmental impact of conventional vehicle **-** Air pollution – Petroleum resources – History of Electric vehicles & Hybrid Electric Vehicles - Conventional drive train system – Rear Wheel, Front Wheel and All wheel - Parts of Drive train system **Types of Electric Vehicles:** Introduction to Battery Electric Vehicle (BEV) – Definition BEV – Necessity BEV – Different between BEV and Conventional Vehicle - Advantages of BEV - Block diagram of BEV – Hybrid electric Vehicle (HEV) - Plug-in Hybrid Electric Vehicle (PHEV) – Fuel Cell Electric Vehicle (FCEV) – Description.	**8** **7**
II	**Electric Vehicles:** Configurations of Electric Vehicle – Performance of Electric Vehicles – Tractive Effort in Normal Driving – energy consumption. Hybrid Electric Vehicles: Concept of Hybrid electric drive trains – Architecture of Hybrid Electric Drive trains – Series, Parallel and Series & Parallel **Electric Propulsion Systems:** Types of EV motors - DC motor drives– Permanent Magnetic Brush Less DC Motor Drives (BLDC) – Principles, Construction and Working – Hub motor Drive system – Merits and Demerits of DC motor drive, BLDC motor drive	**7** **8**
III	**Energy Storages:** Electrochemical Batteries – Battery Technologies – Construction and working of Lead Acid Batteries, Nickel Based Batteries and Lithium Based Batteries - Role of Battery Management System (BMS)– Battery pack development Technology– Cell Series and Parallel connection to	**6**

	develop battery pack. **Charging:** Battery Charging techniques - Constant current and Constant voltage, Trickle charging – Battery Swapping Techniques – DC charging – Wireless charging **–** Maintenance of Battery pack – Latest development in battery chemistry. **Effects and Impacts:** Effects of EV – Impacts on Power grid – Impacts on Environment – Impacts on Economy.	**6** **2**
IV	**Electric Mobility Policy Frame Work** Government of India Electric Mobility Policy Frame work – Global Scenario of EV adoption – Electric mobility in India – National Electric Mobility Mission Plan 2020 – Action led by Original Equipment Manufacturers – Need of EV Policy – Advantage of EV Eco system – Scope and Applicability of EV Policy – ARAI Standards for Electric Vehicle – AIS 038, AIS 039 &AIS 123 - Key Performance Indicator - Global impact – Trends and Future Developments	**14**
V	**Tamil Nadu E-Vehicle Policy 2019** Tamil Nadu E-vehicle Policy 2019: Vehicle Population in Tamil Nadu – Objectives of EV Policy – Policy Measures – Demand side incentives – Supply side incentives to promote EV manufacturing – Revision of Transport Regulation of EV – City building codes – Capacity Building and Skilling – Charging structure – implementing agencies – Reasearch &Development and Business Incubation – Recycling Ecosystem – Battery and EVs	**15**

Reference Books

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York.
2. Comparison of Electric and Conventional Vehicles in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Vehicle (IJSR), Akshat Bansal, Akriti Agarwal
3. A Comprehensive Study of Key Electric Vehicle (EV) Components, Technologies, Challenges, Impacts, and Future Direction of Development (MDPI), Fuad Un-Noor, Sanjeevikumar Padmanaban, Lucian Mihet-Popa, Mohammad Nurunnabi Mollah and Eklas Hossain.
4. Electric Vehicles: A future Projection CII October 2020 report.
5. Design and analysis of aluminum/air battery system for electric vehicles, Shaohua Yang, Harold Knickle, Elsevier.
6. Propelling Electric Vehicles in India, Technical study of Electric Vehicles and Charging Infrastructure
7. ZERO EMISSION VEHICLES (ZEVs): TOWARDS A POLICY FRAMEWORK – NTI Aayog.
8. FASTER ADOPTION OF ELECTRIC VEHICLES IN INDIA: PERSPECTIVE OF CONSUMERS AND INDUSTRY, The Energy and Resources Institute, New Delhi.
9. India EV Story: Emerging Opportunities by Innovation Norway.
10. Automotive Industry Standards – AIS 038, AIS 039 & AIS 123 – Manual

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

VI SEMESTER

2020 – 2021 onwards

4020640 – SOLID MODELLING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220 DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4020640

Semester : VI

Subject Title : **SOLID MODELLING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
SOLID MODELLING PRACTICAL	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

RATIONALE:

A Mechanical Engineering Diploma Engineer is expected to possess a thorough understanding of drawing, which includes clear visualization and proficiency in reading and interpreting a wide variety of production drawing. The market driven economy demands frequent changes in product design to suit the customer requirements. The introduction of this subject is to provide hands on experience in sketching and modeling of the industrial components using any one of the Computer Aided Design and Modelling packages. The aim of this subject is to help the student to attain the industry identified competency through practice in CAD software.

OBJECTIVES:

- Prepare 2D Drawing using sketcher or part modelling of any parametric CAD software.
- Generate 3D Solid models from 2D sketch or part modelling of any parametric CAD software.
- Prepare assembly of part models using assembly of any parametric CAD software.
- Generate orthographic views of 3D solid models/assemblies using drafting of any parametric software.
- Plot a drawing for given part model/assembly.

DETAILED SYLLABUS

Contents: Practical

Introduction

Parametric CAD software – sketch – elements – entities: line – circle – arc – ellipse – polygon – text – dimensions – sketch tools – fillet – chamfer – offset – trim – extend – mirror – rotate – block. Partmodelling– reference planes – reference point – reference axes – co-ordinate system – extrude – revolve – swept – helix and spiral – lofts – dome – shell – draft – rib – wrap – intersect – holes – patterns. Assembly – approaches – mate – coincident – sub assembly –rebuild – isolate. Drawing views – Save – Plot – model view – exploded view – projected view – section view – import – export – Appearance – rendering.

Exercises

PART A: Draw the given 3D drawing using 3D modelling commands.

1. Model 1
2. Model 2
3. Model 3
4. Model 4
5. Model 5
6. Model 6

PART B: Draw the part models and assemble the components using 3D modelling.

1. Revolving Centre
2. Tail stock
3. Machine Vice

4. Crane hook
5. Petrol Engine Connecting Rod
6. Pipe Vice

Board Examination

Note: All the exercises should be completed All the exercises should be given for examination, the students are permitted to select by lot or the question paper from DOTE should be followed. Record note book should be submitted during examination.

Two exercises will be given for examination by selecting one exercise in each PART. The printout of exercises of the student work should be submitted with answer paper and the same have to be evaluated as per the allocation.

DETAILLED ALLOCATION OF MARKS

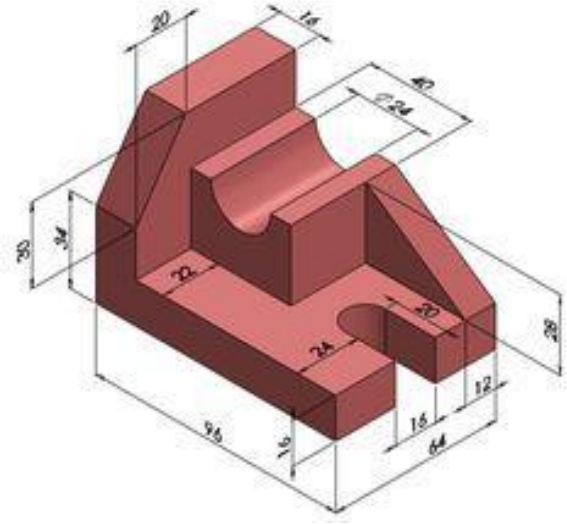
Sl. No.	Performance Indicator	Marks
Part A – 3D Component Modelling		
1	Sketching	15
2	3D Modelling	15
Part B – Assemble Drawing Modelling		
3	Sketching / Part modelling	20
4	Assembly	30
5	Solid Model / Views	10
6	Vivavoce	10
Total		100

LIST OF EQUIPMENTS (for the batch of 30 students)

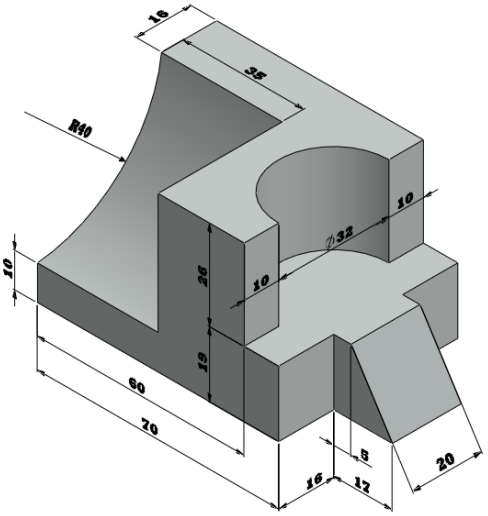
- Personal computer : 30 Nos.
- Laser Printer : 1 No.
- Software : GUI System Software
  : Modelling package – Sufficient to the strength.

Exercises

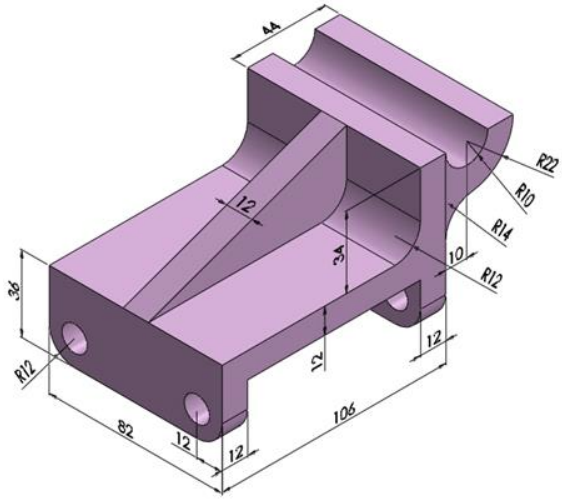
PART A: Draw the given 3D drawing using 3D modelling commands.



Model 1



Model 2



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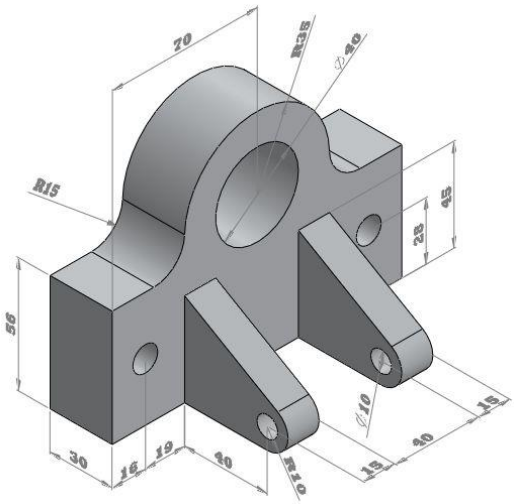

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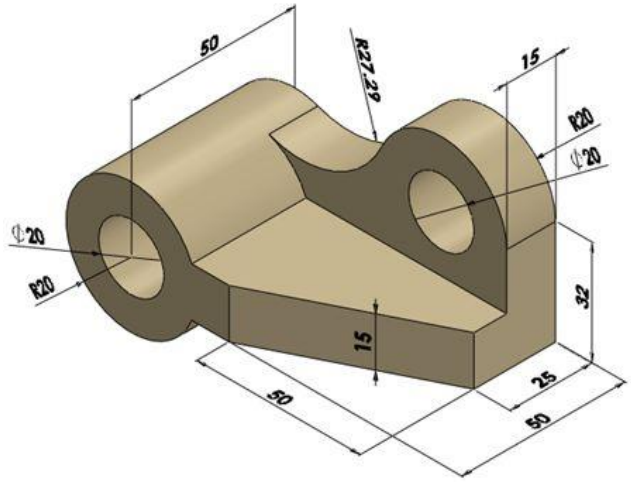

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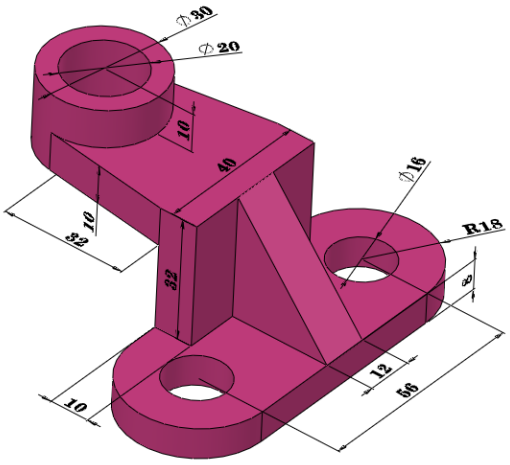


Model 6

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

VI SEMESTER

2020 – 2021 onwards

4020651 – INDUSTRIAL ROBOTICS AND 3D PRINTING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4020651

Semester : VI

Subject Title : **INDUSTRIAL ROBOTICS AND 3D PRINTING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
INDUSTRIAL ROBOTICS AND 3D PRINTING PRACTICAL	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Objectives

- Study of Robot / Study of robot simulation software
- To study the components required.
- To study the techniques of programming for various industrial manufacturing applications.
- Prepare a record of work done.
- Acquire knowledge in the field of Additive Manufacturing
- Explain the various concepts of Solid Modelling
- Create STL files to manufacture components using 3D Printer

DETAILED SYLLABUS

Contents:

3D Printing : Getting to know the User Interface of the Modelling software – Home Screen – Navigating the main Screen – Options Bar – Application Menu & Quick Access Toolbar – Describe the function of a sketch - Describe the various types of sketches. Create sketches of 3D models. Basic Modelling Considerations – Describe part creation within the design process. Add placed features to existing parts. Create complex shapes by sweeping or lofting profiles. Assemblies - Managing the assemblies - Assemble a mechanical piece of equipment using constraints. STL files – introduction – conversion of parts from other file formats to STL file – Additive Manufacturing – types of 3D Printers – orientation and positioning of parts - producing 3D working models using 3D Printers.

Exercises:

PART A- Robot Programming

1. Position recording using Cartesian co-ordinate system - (No. of positions - 9)
2. Position recording using Polar co-ordinate system - (No. of positions - 9)
3. Pick and place the objects - No. of objects - 6)
4. Pick and stack the objects - (No. of objects - 6)
5. Spray painting practice - (Area - 300mm x 300mm)
6. Spot welding practice - (No. of spots - 9)
7. Arc welding practice – (Length of weld 50 mm)
8. Assembling practice - (Minimum 3 Components)
9. Profile cutting practice - (Complicated profile – combination of lines and arcs)
10. Machine loading and unloading practice with time delay - (No. of times - 9)

PART B - 3D Printing

1. Create the model and produce the Gear Train in 3D printing.
2. Create the model and produce the Sun-planetary gear mechanism.
3. Create the model and produce the Geneva Gear & Ratchet mechanism.

4. Create the model and produce the Slide-crank mechanism.

Note: Every student is asked to design and produce only one component of an assembly. After the completion of the product, individual parts are checked for its precision and matting in the assembly. Hence group exercises can be given. The models can be scaled according to the print area of the 3D Printer.

Board Examination

Note:

- All the exercises should be completed. Two exercises will be given for examination by selecting one exercise in each PART.
- All the exercises should be given for examination, the students are permitted to select by lot or the question paper from DOTE should be followed.
- Record note book should be submitted during examination.

DETAILLED ALLOCATION OF MARKS

Sl. No.	Performance Indicator	Marks
Part A – Robot Programming		
1	Robot Program	20
2	Simulate / Execution	30
3	Result	10
Part B – 3D Prinitng		
4	CAD - Modelling	15
5	3D Printing	15
6	Vivavoce	10
Total		100

LIST OF EQUIPMENTS (for the batch of 30 students)

Personal computer	:	15 Nos.
6 Axis Robot	:	1 No.
3D Printer	:	1 No.
Software	:	GUI System Software
	:	Modelling package / 3D Printer–Sufficient to the strength.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

VI SEMESTER

2020 – 2021 onwards

4020550 – THERMAL ENGINEERING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : 1020 DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4020550

Semester : VI

Subject Title : **THERMAL ENGINEERING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
STRENGTH OF MATERIALS	5	80	25	100*	100	3 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Determine the flash and fire point and viscosity of oil.
- Draw the valve timing diagram of petrol and diesel engines.
- Draw the port timing diagram of petrol and diesel engines.
- Conduct performance test on petrol and diesel engines.
- Prepare heat balance sheet for an IC engine.
- Conduct of C.O.P of Refrigerators.
- Determine the volumetric efficiency of the Air Compressor.

Experiments:

PART-A

1. Determine flash and fire point of the given oil using open cup and closed cup apparatus.
2. Determine the absolute viscosity of the given lubricating oil using Redwood viscometer.
3. Determine the absolute viscosity of the given lubricating oil using Say bolt viscometer.
4. Port timing diagram of two stroke petrol Engine
5. Valve time diagram for four stroke petrol Engine.
6. Valve time diagram for four stroke diesel engines.

PART-B

1. Load test (Performance test) on Four Stroke Petrol Engine.
2. Load test (Performance test) on Four Stroke diesel Engine.
3. Morse test on Multi-cylinder petrol engine.
4. Heat balance test on Four Stroke Diesel / Petrol Engine.
5. Volumetric efficiency of Air Compressor.
6. Determination of COP of Refrigeration System.

BOARD EXAMINATION

Note:

- All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Detailled Allocation of Marks

Part A:		**35**
Observation and Tabular Column	5	
Calculations	20	
Result / Graph	10	
Part B:		**55**
Observation and Tabular Column	10	
Formulae, Calculations	30	
Result / Graph	15	
Viva Voce		**10**
Total		**100**

LIST OF EQUIPMENTS (for the batch of 30 students)

1. Open cup apparatus - 2 Nos.
2. Close cup apparatus - 2 Nos.
3. Redwood viscometer - 2 Nos.
4. Say bolt viscometer - 2 Nos.
5. Four stroke petrol engine Model - 2 Nos.
6. Four stroke diesel engine Model - 2 Nos.
7. Two stroke petrol engine Model - 2 Nos.
8. Four stroke Petrol Engine Test rig - 1 No.
9. Four stroke Diesel engine Test rig - 1 No.
10. Multi -cylinder petrol engine test rig - 1 No.
11. Air compressor test rig – 1 No.
12. Refrigeration Test rig – 1 No.
13. Guarded Plate Apparatus – 1 No.
14. Measuring instruments - Required quantity
15. Consumables - Required quantity

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

VI SEMESTER

2020 – 2021 onwards

4022650 - PLASTIC MOULDS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022650

Semester : VI

Subject Title : **PLASTIC MOULDS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
PLASTIC MOULDS PRACTICAL	6	96	25	100*	100	16 hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

OBJECTIVES

- Design and fabricate single cavity injection mould
- Design and fabricate multi cavity injection mould
- Design and fabricate blow mould.
- Design and fabricate of compression mould
- Practice on different machining operations
- Use different machine tools in making plastic moulds

DETAILED SYLLABUS

i) Design of Plastic Moulds: **(16 Hrs)**

1. Injection Mould Design: Methodical approach to mould design.

- Design of Hand injection mould
- Design of three plate mould

2. Design of simple Compression Mould.

3. Design of simple Blow mould.

ii) Mould Design and Manufacture Exercises: **(48 Hrs)**

1. Design and Fabrication of single cavity hand injection mould with flat parting surface (To suit to Hand Injection Moulding Machine)
2. Design and fabrication of multi cavity injection mould (To suit to Hand injection Moulding Machine)
3. Design and fabrication of simple compression mould.
4. Design and fabrication of simple blow mould.

Note:-

1. Batch size should not be more than 5 students for class work.
2. For examination, exercise should be given to students individually and not in batches.
3. The examination duration is 16 hours.
4. Students should be trained in setting the mould and to make necessary adjustments, trial production using the mould manufactured by them and rectification of mould defects if any.
5. For Board examination any one of the above tool (S.No 1 to 4) is to be manufactured and trial production should be taken. The evaluation of the performance should be based on the component dimensions and finish obtained from the mould manufactured by the student during the 16 hours examination.

Record: Mould drawings for all the exercises should be drawn in A2 sheet Manually, with all calculations filed neatly for Record work. The Design should include the Sectional Elevation, plan view, Bill of materials with all necessary calculation using methodological mould design.

Examination:

In the examination students have to Design and fabricate moulds for similar components as practiced in the class work

SCHEME OF EXAMINATION:

Design of Mould	-50 marks
Mould making	-20 marks
Mould setting & trial production	-10 Marks
Component quality	-10 marks
Viva Voce	-10 Marks
Total	**-100 Marks**

Details of The Equipment's (for a batch of 30 students)

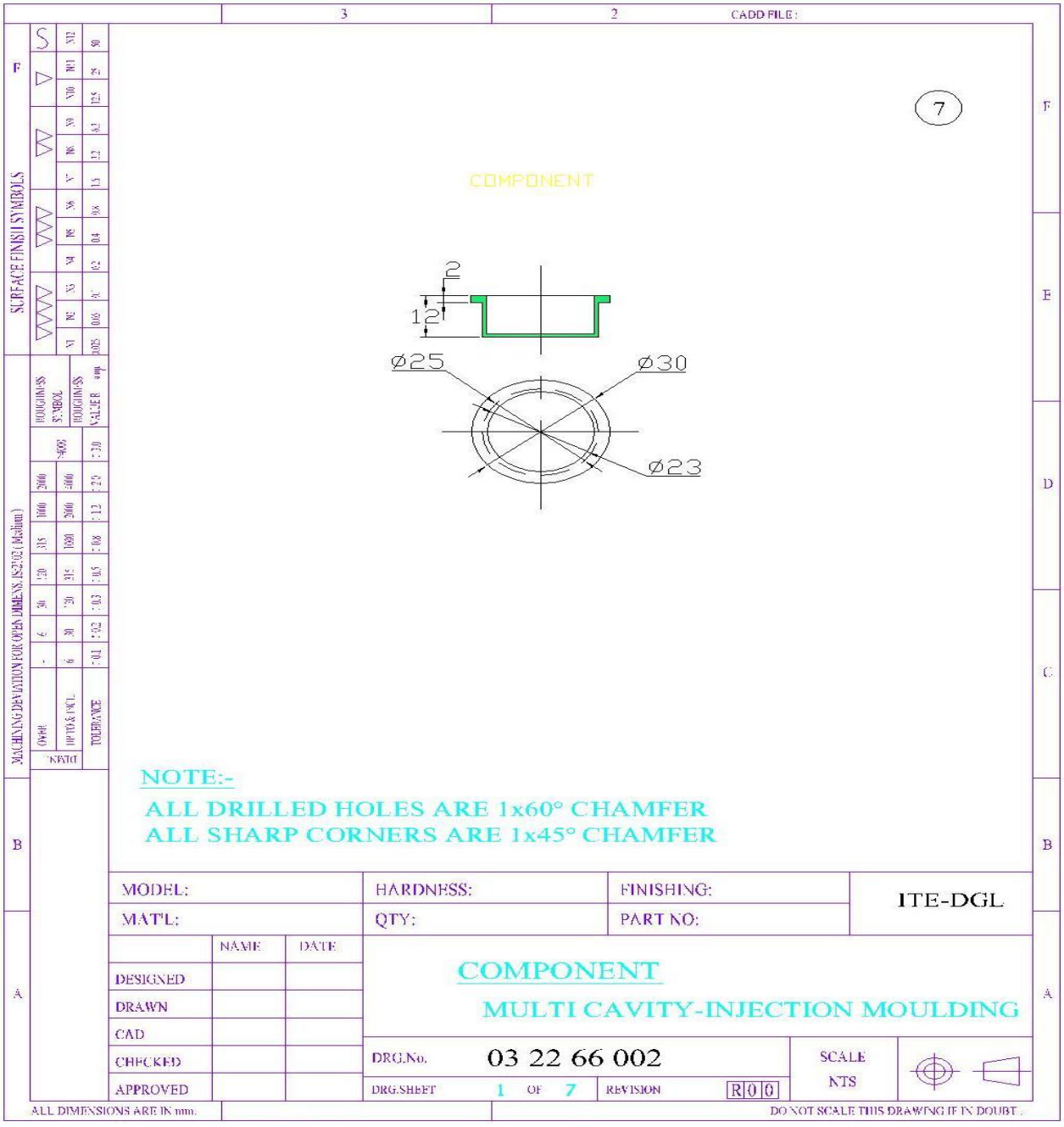
NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)
YEAR	THIRD
SEMESTER	VI
NAME OF THE LABORATORY	4022650 PLASTIC MOULDS PRACTICAL

S.N	**LIST OF THE EQUIPMENTS WITH SPECIFICATIONS REMARKS, IF ANY**	**QUANTITY REQUIRED**
1	Centre Lathe, 4 ½' bed length	5
2	Drilling machine	2
3	Shaping machine, stroke length 300mm	2
4	Vertical milling machine	2
5	Surface grinding machine	2
6	Hand Injection Moulding Machine – 1 OZ	1
7	Bench vice	10
8	Fitting file set	10
9	Tap set	4
10	Surface plate	2
11	Vernier height gauge 0-250mm	2
12	Dial test indicator with magnetic stand	2
13	Angle plate	2
14	Tool maker's straight edge – 150 mm	1
15	Digital Micrometer – 0.-25mm range, 0.001mm least count	3
16	Hand injection moulding machine	1
17	Hand injection Blow moulding machine	1

Exercise – I Single Cavity Injection Mould

- For exercise I, refer the subject 4022340 and the Drawings are available in the subject 4022340 – Computer Aided Machine & Tool Drawing in Exercise no.10

Exercise – II Multi Cavity Injection Mould



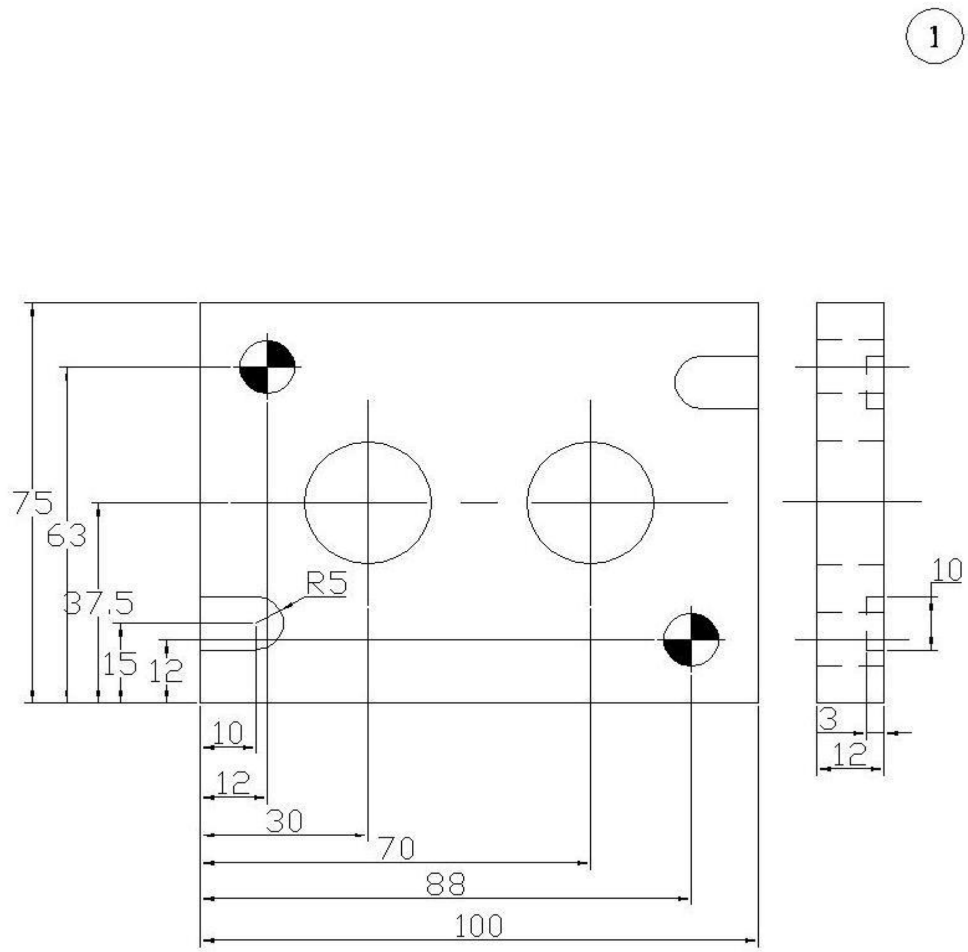
	3	2	CADD FILE :

SURFACE FINISH SYMBOLS

ROUGHNESS SYMBOL	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
ROUGHNESS VALUE R_a μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)

DIMNS. OVER	-	6	30	120	315	1000	2000	4000
UP TO & INCL.	6	30	120	315	1000	2000	4000	
TOLERANCE	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2.0	±3.0



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER

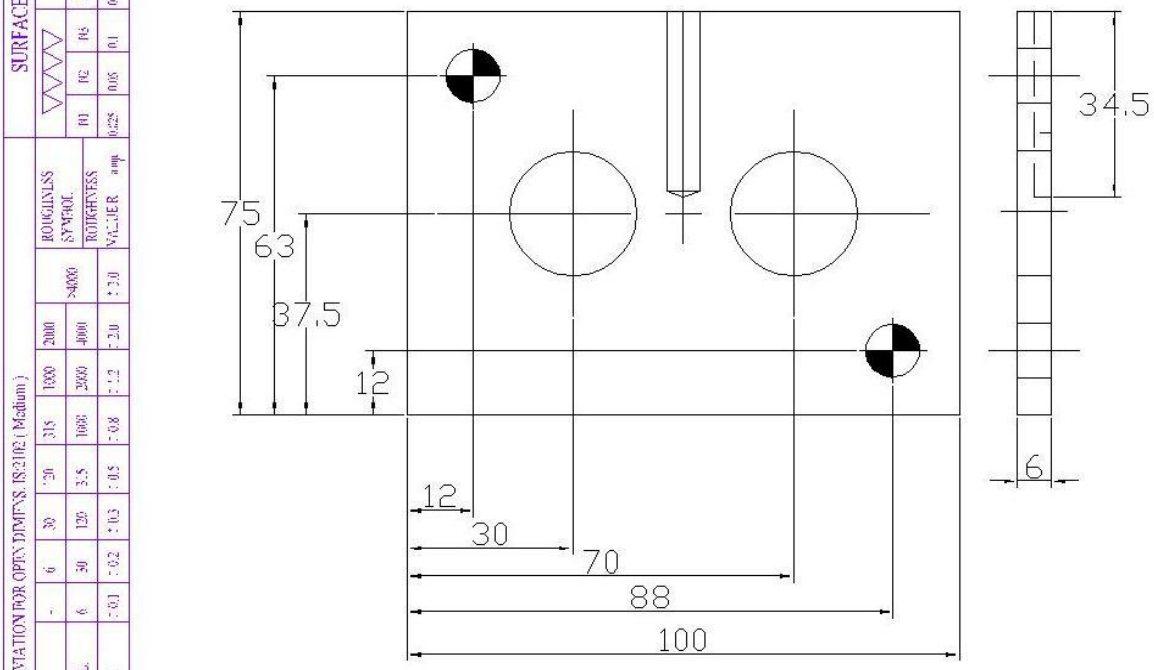
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL:	HARDNESS:	FINISHING:	ITE-DGL
MAT'L:	QTY:	PART NO:	

	NAME	DATE	
DESIGNED			**CORE PLATE**
DRAWN			**MULTI CAVITY-INJECTION MOULDING**
CAD			
CHECKED			DRG.No. 03 22 66 002
APPROVED			DRG.SHEET 2 OF 7 REVISION R00

SCALE NTS

ALL DIMENSIONS ARE IN mm. | DO NOT SCALE THIS DRAWING IF IN DOUBT.



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER

ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL:	HARDNESS:	FINISHING:	ITE-DGL
MAT'L:	QTY:	PART NO:	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

STRIPPER PLATE

DRG.No. 03 22 66 002

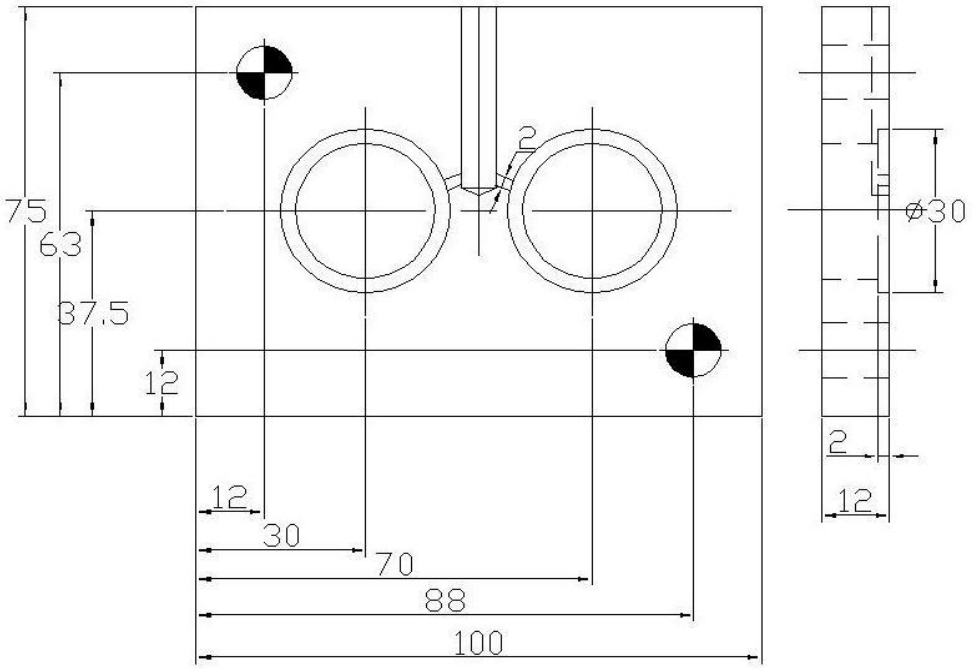
SCALE NTS

DRG.SHEET 3 OF 7 REVISION R0.0

MULTI CAVITY INJECTION MOULDING

ALL DIMENSIONS ARE IN mm.

DO NOT SCALE THIS DRAWING IF IN DOUBT.



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL:	HARDNESS:	FINISHING:	ITE-DGL
MATL:	QTY:	PART NO:	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

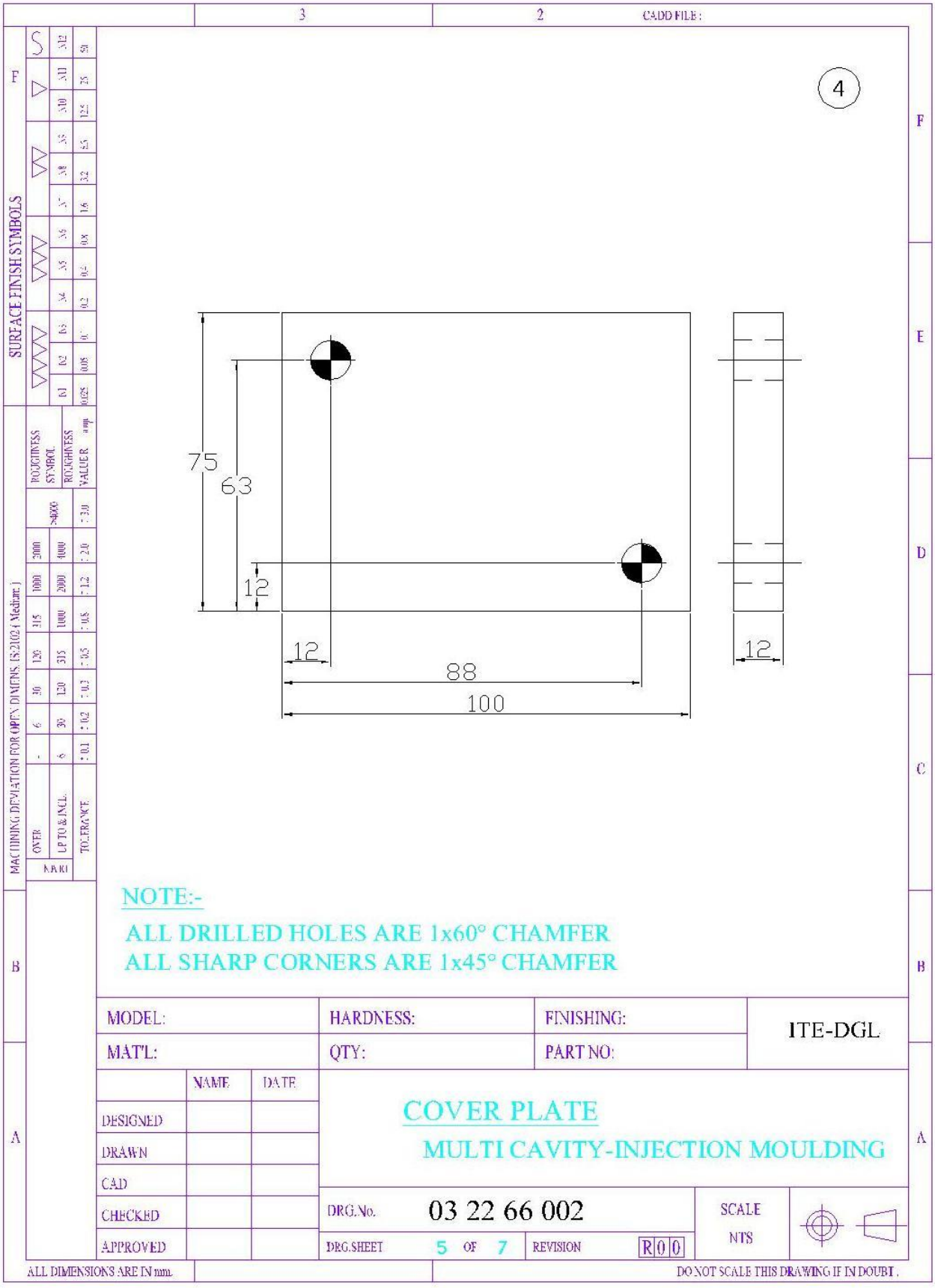
CAVITY PLATE
MULTI CAVITY-INJECTION MOULDING

DRG.No. 03 22 66 002

DRG.SHEET 4 OF 7 REVISION R00

SCALE NTS

ALL DIMENSIONS ARE IN mm. DO NOT SCALE THIS DRAWING IF IN DOUBT.

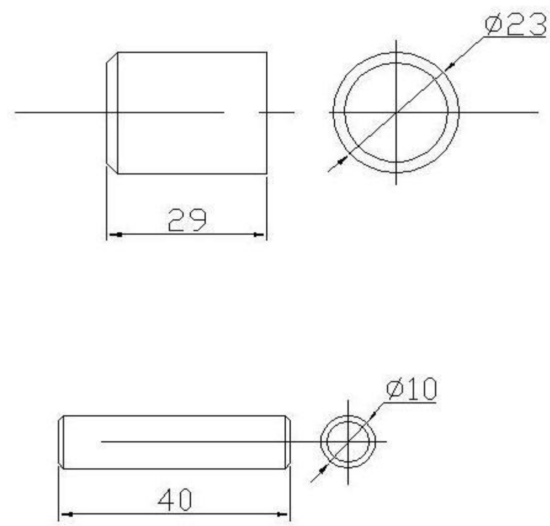

3
2
CADD FILE :
4
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. (IS:2102-1 Medium)
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
75
63
12
12
88
100
12
MODEL:
HARDNESS:
FINISHING:
ITE-DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
COVER PLATE
MULTI CAVITY-INJECTION MOULDING
DRG.No. 03 22 66 002
SCALE NTS
DRG.SHEET 5 OF 7
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

3 | 2 | CADD FILE :

SURFACE FINISH SYMBOLS

MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)

(5)



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL:	HARDNESS:	FINISHING:	ITE-DGL
MAT'L:	QTY:	PART NO:	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

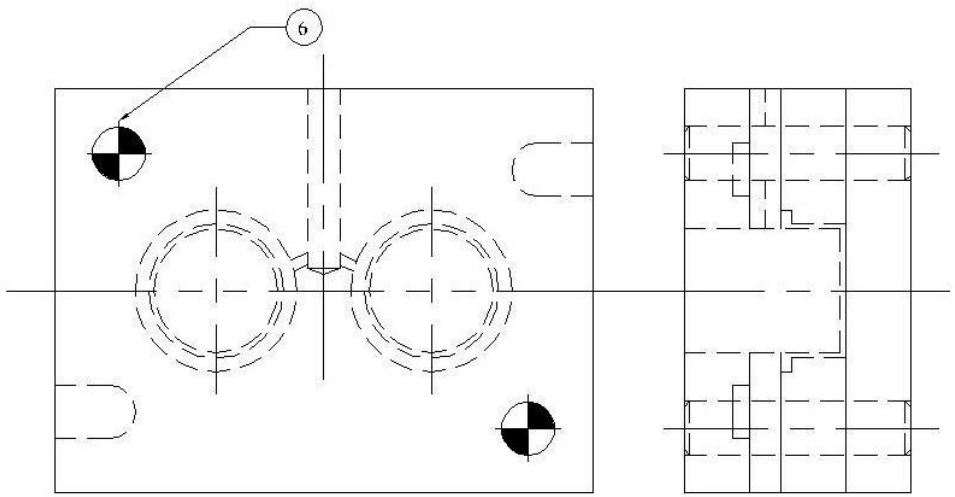
CORE PIN

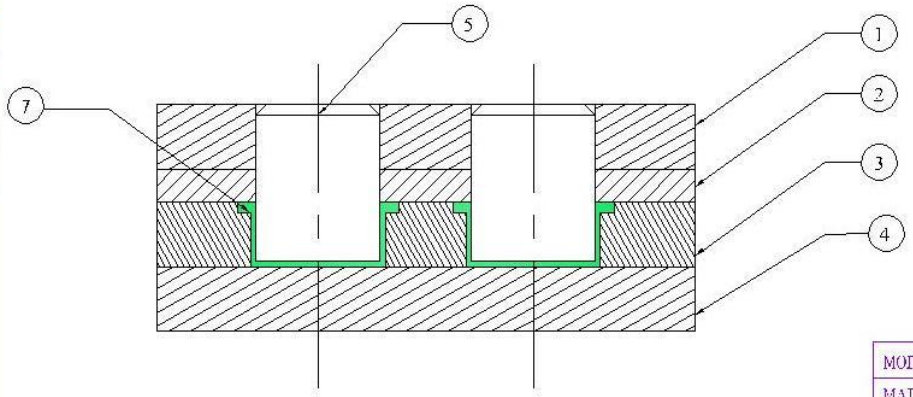
MULTI CAVITY-INJECTION MOULDING

DRG.No. 03 22 66 002 | SCALE NTS

DRG.SHEET 6 OF 7 | REVISION R00

ALL DIMENSIONS ARE IN mm. | DO NOT SCALE THIS DRAWING IF IN DOUBT .





BILL OF MATERIALS			
SI.NO	PART NAME	MATERIAL	QUANTITY
1	CORE PLATE	MS	1
2	STRIPPER PLATE	MS	1
3	CAVITY PLATE	MS	1
4	COVER PLATE	MS	2
5	CORE PIN	MS	2
6	GUIDE PIN	STD	2
7	COMPONENT	HDPE	2

NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

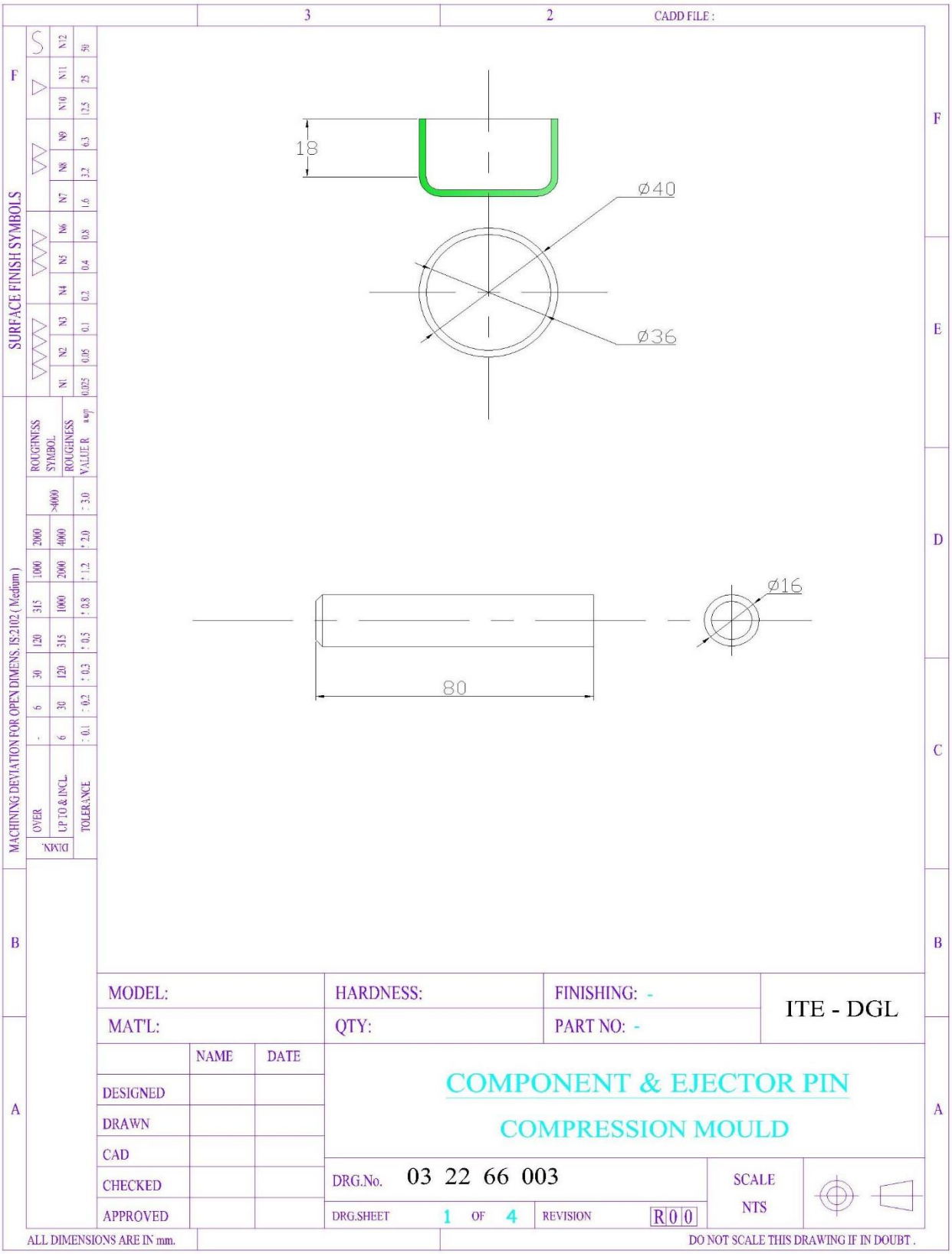
MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MATL :	QTY :	PART NO :	

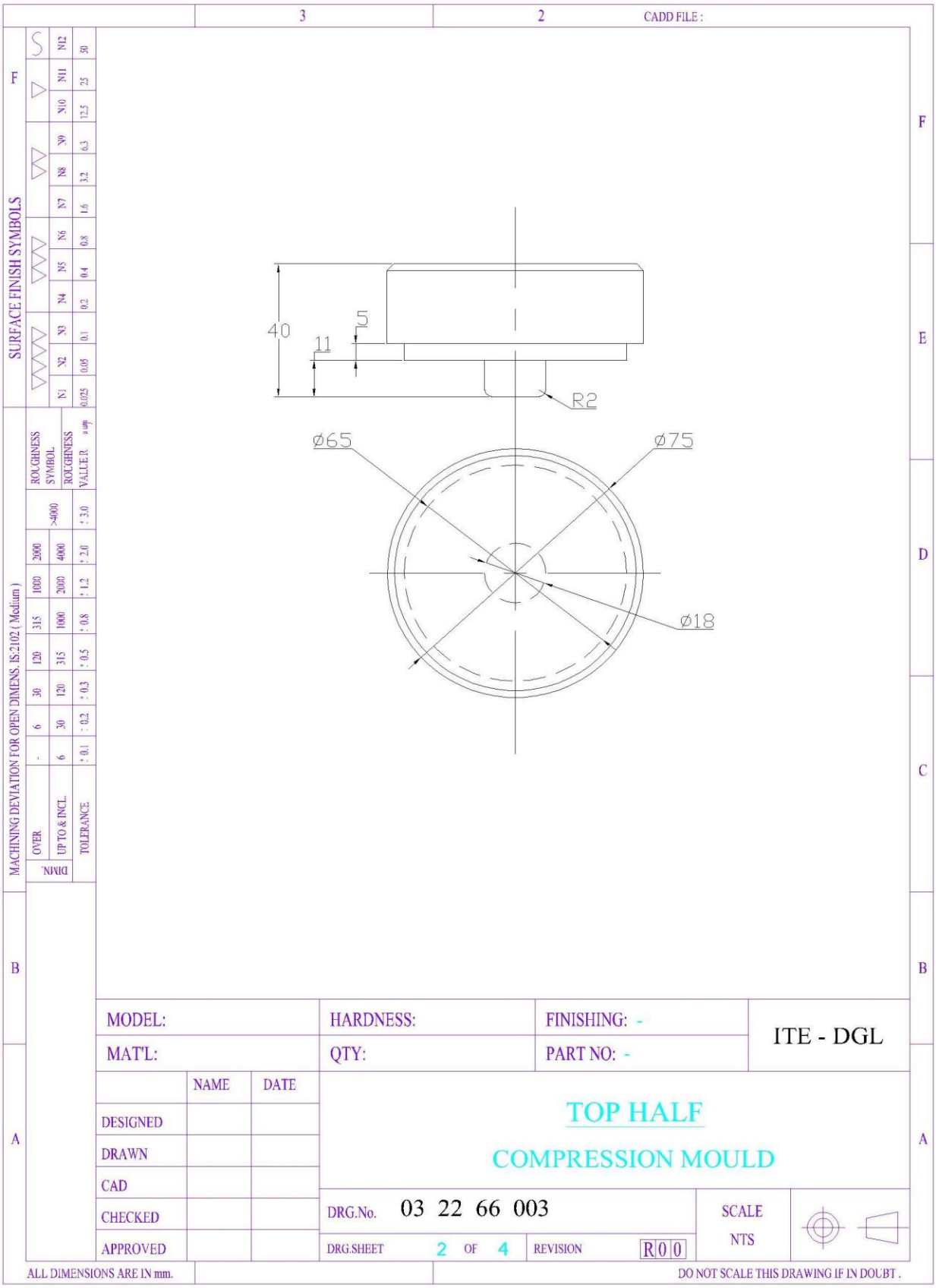
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLE VIEW
MULTI CAVITY-INJECTION MOULDING

DRG.No. 03 22 66 002 SCALE: NTS
SHEET 7 OF 7 REVISION R00

Exercise – III Compression Mould




3
2
CADD FILE :
F
B
A
SURFACE FINISH SYMBOLS
N12 50
N11 25
N10 12.5
N9 6.3
N8 3.2
N7 1.6
N6 0.8
N5 0.4
N4 0.2
N3 0.1
N2 0.05
N1 0.025
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a um
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
DIMN.
OVER
UP TO & INCL.
TOLERANCE
- 6 ± 0.1
6 30 ± 0.2
30 120 ± 0.3
120 315 ± 0.5
315 1000 ± 0.8
1000 2000 ± 1.2
2000 4000 ± 2.0
>4000 ± 3.0
40
5
11
R2
ø65
ø75
ø18
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
TOP HALF
COMPRESSION MOULD
DRG.No. 03 22 66 003
DRG.SHEET 2 OF 4
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

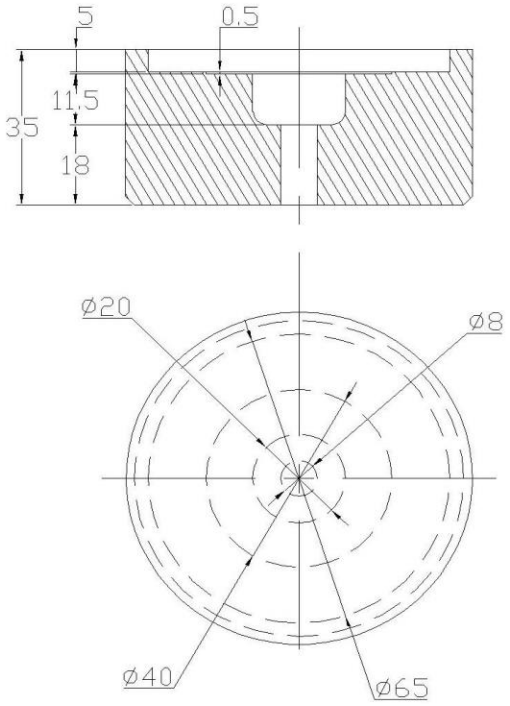
3	2	CADD FILE :

SURFACE FINISH SYMBOLS

N12	50	
N11	25	
N10	12.5	
N9	6.3	
N8	3.2	
N7	1.6	
N6	0.8	
N5	0.4	
N4	0.2	
N3	0.1	
N2	0.05	
N1	0.025	

MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)

DIMN.	OVER	-	6	30	120	315	1000	2000	>4000
	UP TO & INCL.	6	30	120	315	1000	2000	4000	
TOLERANCE		± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2.0	± 3.0
ROUGHNESS SYMBOL									
ROUGHNESS VALUE Ra mm									



MODEL:	HARDNESS:	FINISHING: -	ITE - DGL
MAT'L:	QTY:	PART NO: -	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

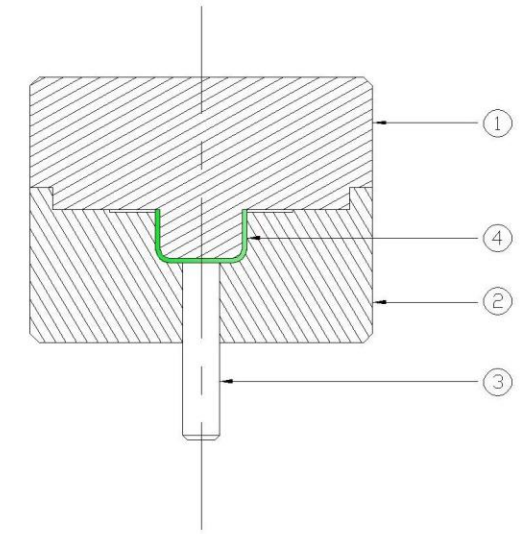
BOTTOM HALF

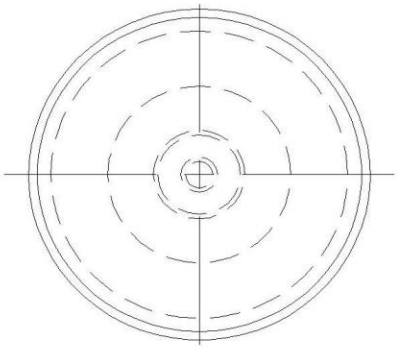
COMPRESSION MOULD

DRG.No.	03 22 66 003	SCALE	NTS
DRG.SHEET	3 OF 4	REVISION	R0 0

ALL DIMENSIONS ARE IN mm.

DO NOT SCALE THIS DRAWING IF IN DOUBT .





BILL OF MATERIALS

SI.NO	PART NAME	MATERIAL	QUANTITY
1	TOP HALF	MS	1
2	BOTTOM HALF	MS	1
3	EJECTOR	STD	1
4	MOULDING	UF	1

MODEL:	HARDNESS:	FINISHING: -	ITE - DGL
MAT'L:	QTY:	PART NO: -	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLED VIEW

COMPRESSION MOULD

DRG.No. 03 22 66 003

DRG.SHEET 4 OF 4 REVISION R0 0

SCALE NTS

SURFACE FINISH SYMBOLS

ROUGHNESS SYMBOL	N12	N11	N10	N9	N8	N7	N6	N5	N4	N3	N2	N1
ROUGHNESS VALUE R a μm	50	25	12.5	6.3	3.2	1.6	0.8	0.4	0.2	0.1	0.05	0.025

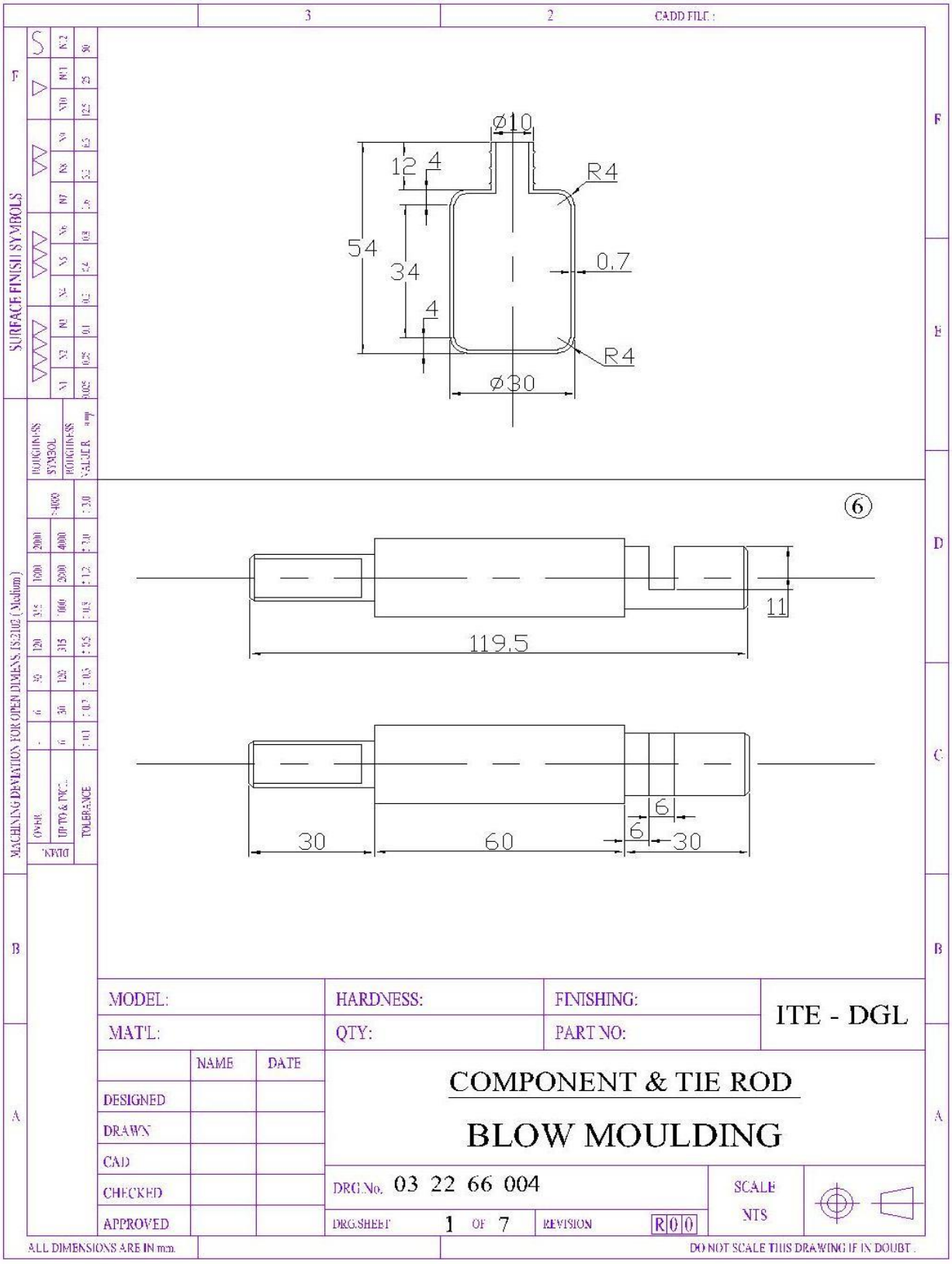
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)

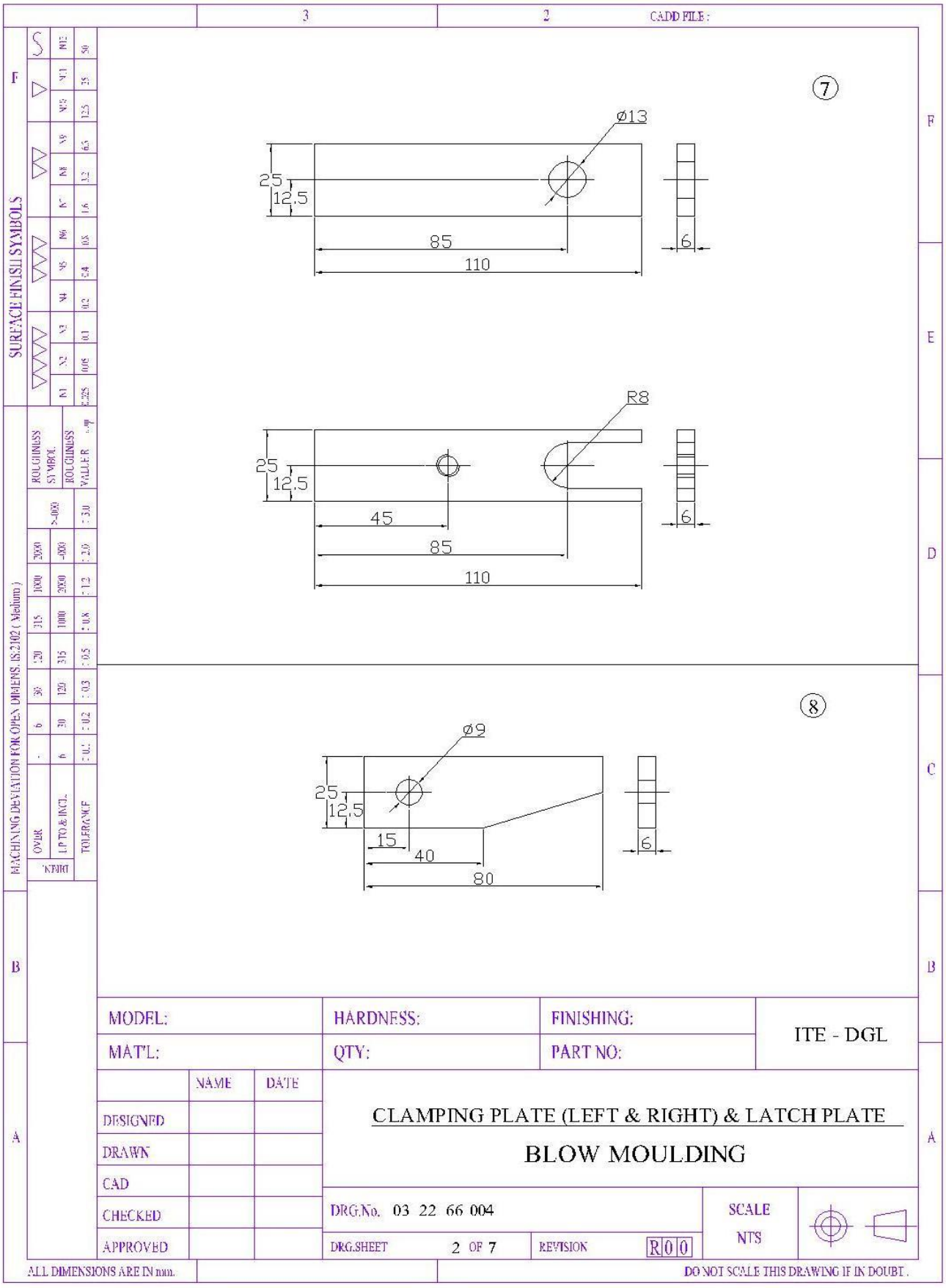
DIMN.	OVER	-	6	30	120	315	1000	2000	>4000
TOLERANCE	UP TO & INCL.	6	30	120	315	1000	2000	4000	
		± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2.0	± 3.0

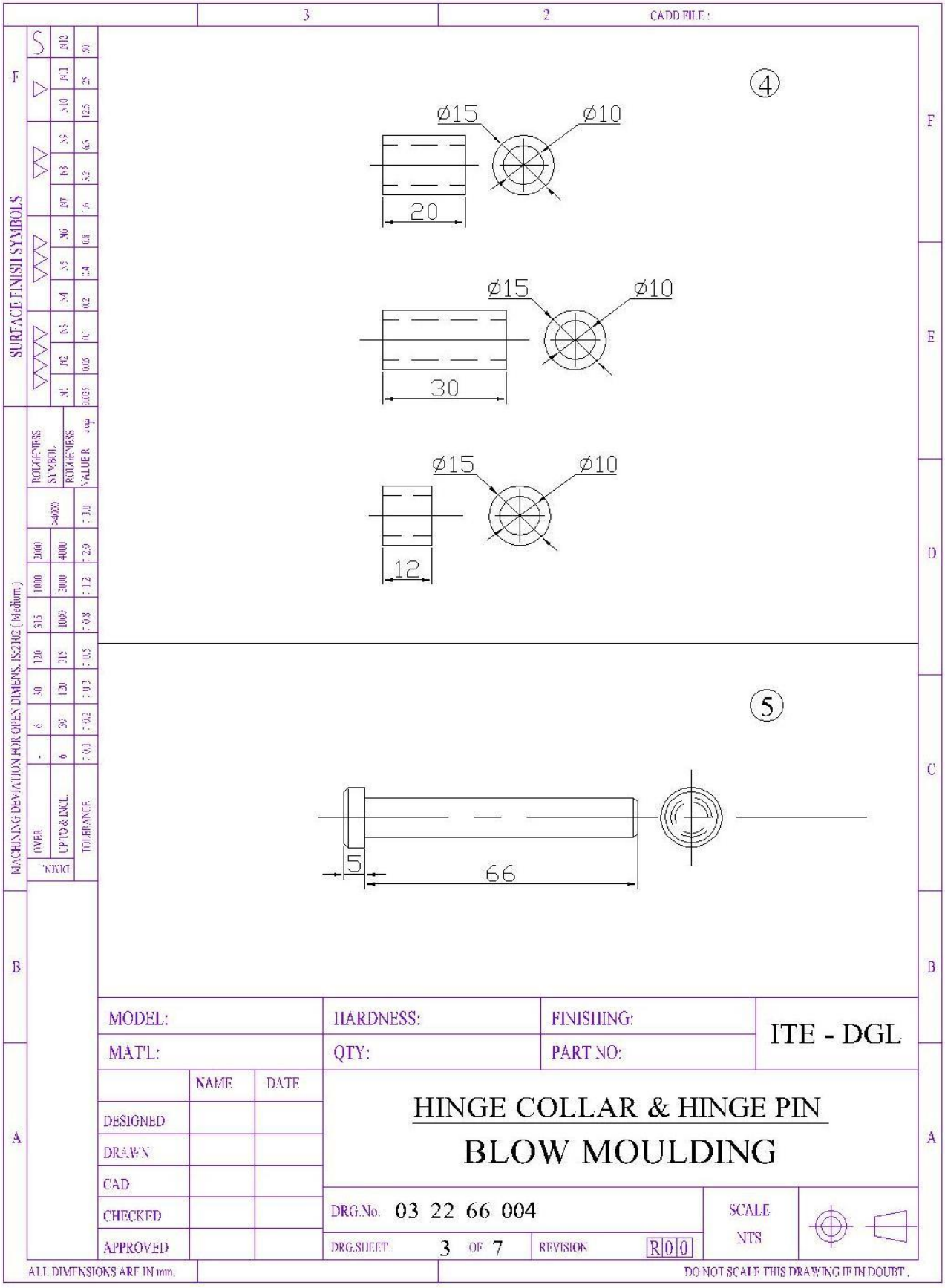
ALL DIMENSIONS ARE IN mm.

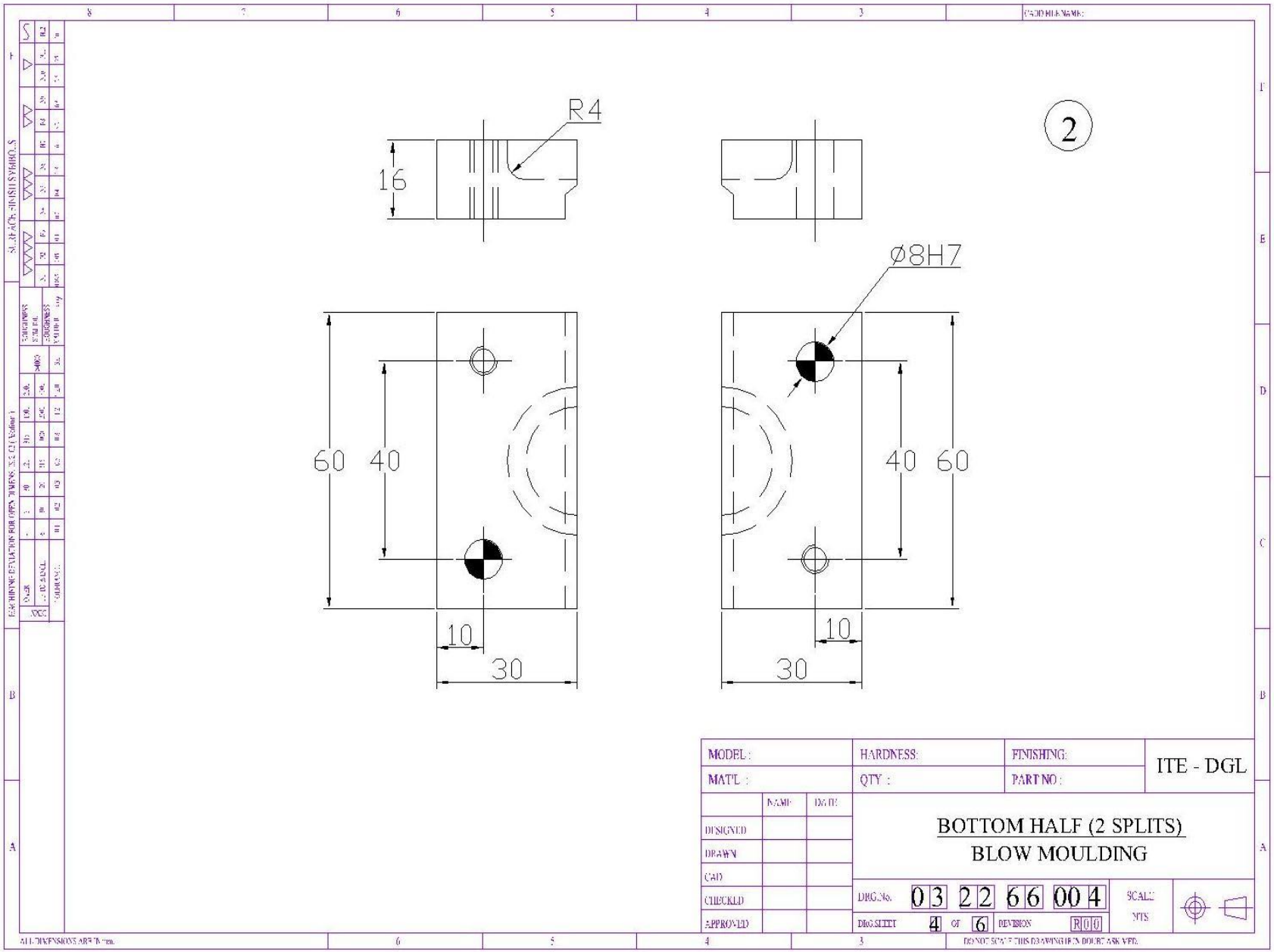
DO NOT SCALE THIS DRAWING IF IN DOUBT .

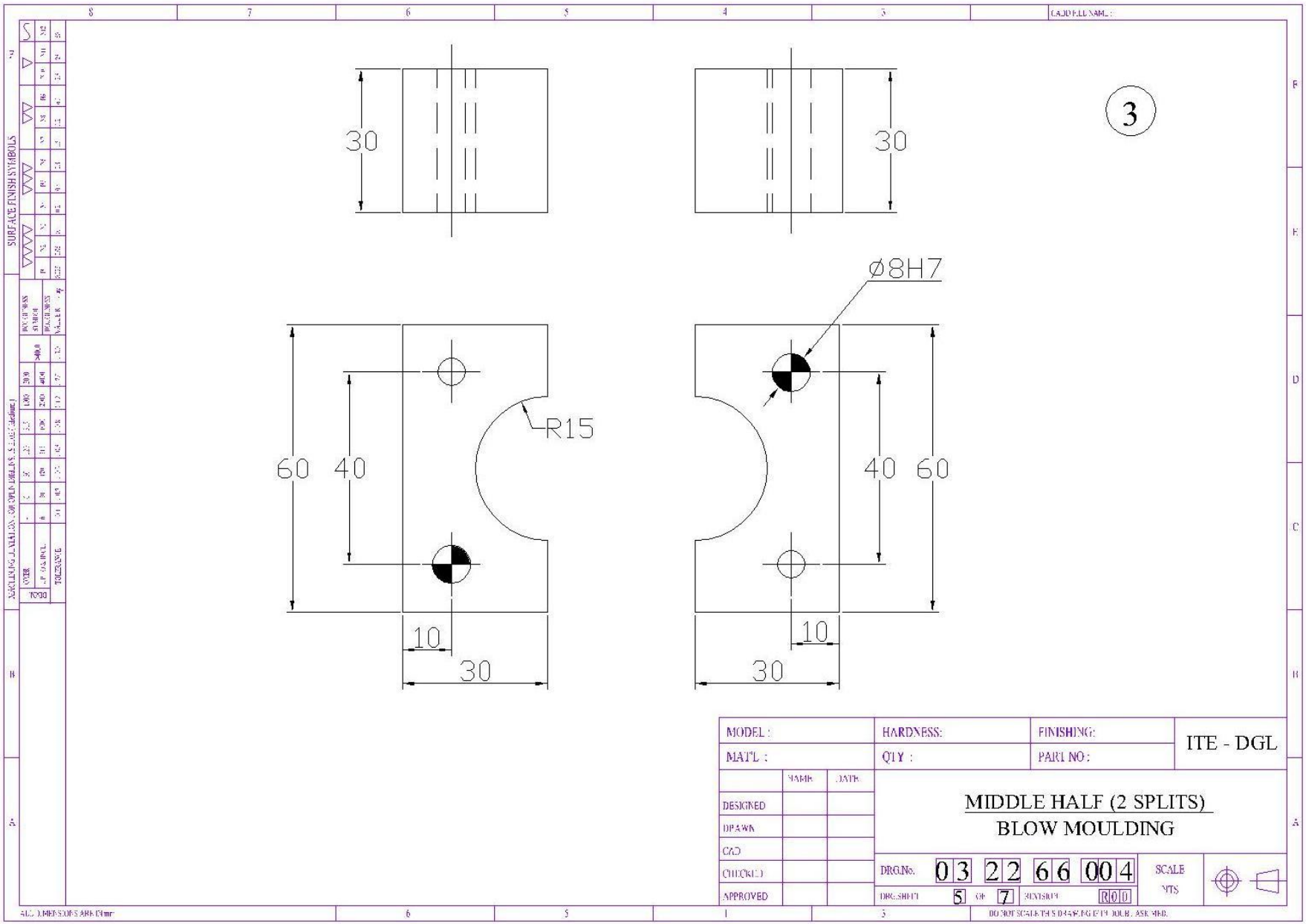
Exercise – IV Blow Mould




3
2
CADD FILE :
SURFACE FINISH SYMBOLS
ROUGHNESS SYMBOL
ROUGHNESS VALUE Ra μm
N12 50
N11 25
N10 12.5
N9 6.5
N8 3.2
N7 1.6
N6 0.8
N5 0.4
N4 0.2
N3 0.1
N2 0.05
N1 0.025
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
OVER
UP TO & INCL.
DIMEN.
TOLERANCE
- 6 ± 0.1
6 30 ± 0.2
30 120 ± 0.3
120 315 ± 0.5
315 1000 ± 0.8
1000 2000 ± 1.2
2000 -4000 ± 2.0
>-4000 ± 3.0
⑦
Ø13
25
12.5
85
110
6
R8
25
12.5
45
85
110
6
⑧
Ø9
25
12.5
15
40
80
6
MODEL:
HARDNESS:
FINISHING:
ITE - DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
CLAMPING PLATE (LEFT & RIGHT) & LATCH PLATE
BLOW MOULDING
DRG.No. 03 22 66 004
SCALE NTS
DRG.SHEET 2 OF 7
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
4
Ø15
Ø10
20
Ø15
Ø10
30
Ø15
Ø10
12
5
5
66
MODEL:
HARDNESS:
FINISHING:
ITE - DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
HINGE COLLAR & HINGE PIN
BLOW MOULDING
DRG.No. 03 22 66 004
SCALE
NTS
DRG.SHEET 3 OF 7
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


R4
16
Ø8H7
60
40
10
30
40
60
10
30
2
MODEL :
HARDNESS:
FINISHING:
ITE - DGL
MATL :
QTY :
PART NO :
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BOTTOM HALF (2 SPLITS)
BLOW MOULDING
DRG.No. 03 22 66 004
SCALE: NTS
DRG.SLNO 4 OF 6
REVISION R00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MIDDLE HALF (2 SPLITS)
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DRG.No. 03 22 66 004
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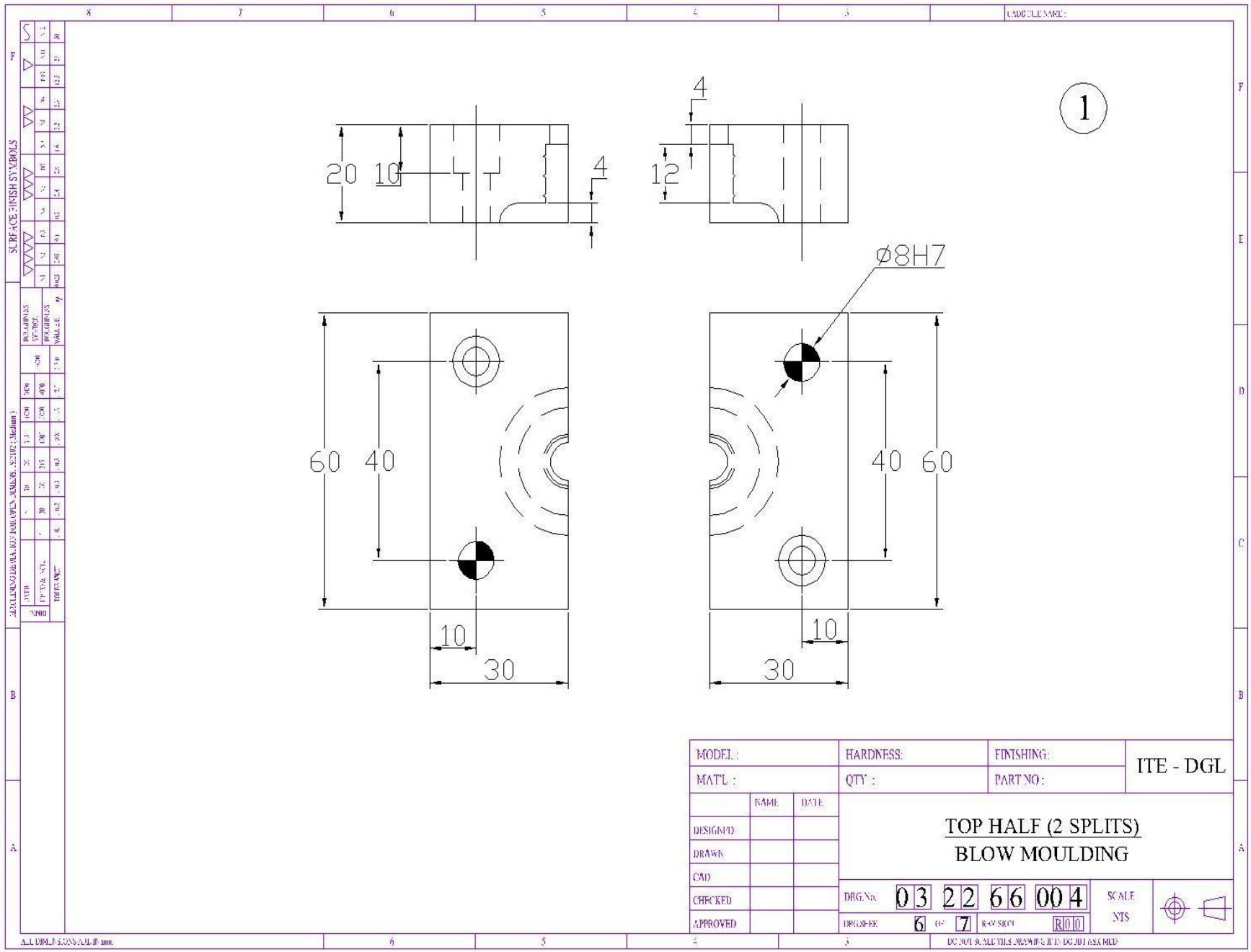
REVISION R00
SURFACE FINISH SYMBOLS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APPROVED
TOP HALF (2 SPLITS)
BLOW MOULDING
DRG.No. 03 22 66 004
SCALE NTS
DRG SHEET 6 OF 7
REV SIGN R00
SURFACE FINISH SYMBOLS

NOTE

1. ALL DIMENSIONS ARE IN mm

2. PROVIDE PUNCH/DIE CLEARENCE PERSIDE AS 0.001

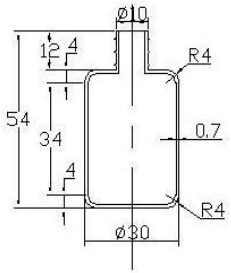
3. THE DIE PLATE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC

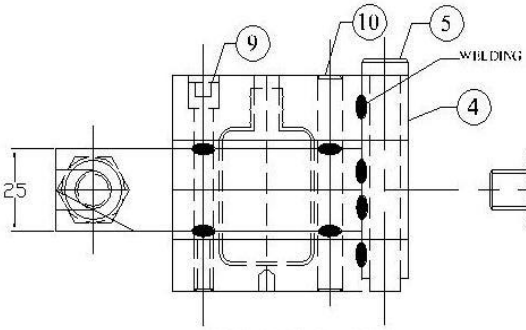
4. THE PUNCH SHALL BE HARDENED TO 60-62 HRC

5. AVOID SHARP CORNERS

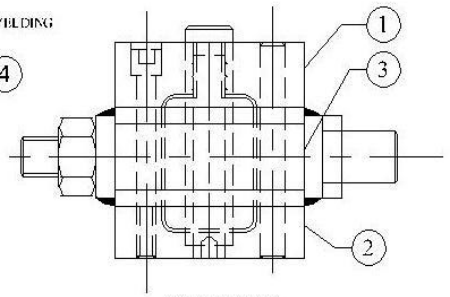
6. FOR DIMENSIONS WITHOUT TOLERANCE SHALL BE PROVIDED AS ISO 2768-1

COMPONENT

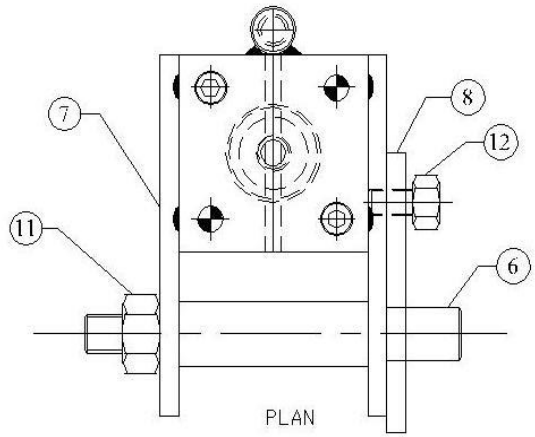




RIGHT SIDE VIEW



ELEVATION



PLAN

BILL OF MATERIALS

SI.NO	PART NAME	MATERIAL	QUANTITY
1	TOP HALF	MS	2
2	BOTTOM HALF	MS	2
3	MIDDLE HALF	MS	2
4	HINGE COLLAR	MS	3
5	HINGE PIN	MS	1
6	TIE ROD	MS	1
7	CLAMPING PLATE	MS	2
8	LATCH	MS	1
9	ALLEN SCREW M6	STD	2
10	DOWELL ø8	STD	2
11	NUT M12	STD	1
12	BOLT M8	STD	1

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL. :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY DRAWING
BLOW MOULDING

DRG No. 03 22 66 004 SCALE NTS

DRG SHEET 7 OF 7 REVISION R00

ALL DIMENSIONS ARE IN mm. DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

III YEAR

N – SCHEME

VI SEMESTER

2020 – 2021 onwards

4022660- PROJECT WORK AND INTERNSHIP

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

N-SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1220: DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Subject Code : 4022660

Semester : VI

Subject Title : **PROJECT WORK & INTERNSHIP**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
PROJECT WORK & INTERNSHIP	6	96	25	100*	100	3hrs

* Minimum marks for pass is 50 out of which minimum 50 marks should be obtained out of 100 marks in the board Examination alone.

RATIONALE:

This subject 'Project work & Internship' is the continuation of the previous semester subjects. The students are to implement the detailed project plan, which they have prepared. This project is generally an integration of the various types of skills acquired during their course of study. Hence it is essential that students are given opportunity to develop and integrate the highly essential industry-oriented competencies and skills. The subject build up greater confidence to face in the world of work.

OBJECTIVES:

- Implement the theoretical & practical knowledge gained through the curriculum in to an application suitable for a real practical &working environment preferably in an industrial environment.
- Implement the planned activity as a team.

- Take appropriate decisions on collected information.
- Carry out cooperative learning through synchronous guided discussions with in the class in key dates, a synchronous document sharing and discussions, as well as to prepare collaborative edition of final project report.

PROJECT WORK & INTERNSHIP:

The students of all Diploma Courses have to do a Project Work as a part of curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamilnadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for best three projects i.e. Institution wise, region wise & state wise. **The project work must be reviewed twice in the same semester. The project work is approved during the Vth semester by the properly constituted committee with guidelines.**

a) Internal Assessment Mark for Project Work & Internship:

Detail of Assessment	**Period of Assessment**	**Max Marks**
Project review I	6th week	**10 marks**
Project review II	12th week	**10 marks**
Attendance	Entire semester	**05 marks** (Award of marks same as theory subject pattern)
Total		**25 marks**

Proper record should be maintained for the two projects review and preserved for one semester after the publication of board exam results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of marks for Project Work and Internship in Board Examination:

Details Of Marks Allocation	**Max Marks**
Demonstration/Presentation	**25 marks**
Report	**25 marks**
Viva Voce	**30 marks**
Internship Report	**20 marks**
Total	**100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV/V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year" Project Work and Internship" for 20 marks. The internship shall be taken in any Industry/Government are Private Certified Agencies which are in social sector/Govt.skill centers/Institution/Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work and Internship Board Examination.