



# **DIPLOMA IN ENGINEERING AND TECHNOLOGY**

FIRST YEAR

SEMESTER PATTERN

**N – SCHEME**

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 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	Communicative 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*	Communication Skill Practical *				2	2
	40002^	Computer Application Practical ^					
			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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**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	Communicative 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*	Communication Skill Practical *				2	2
	40002^	Computer Application Practical ^					
			18	5		9	32
Extra / Co-curricular activities	Physical Education						2
	Library						1
Total							35

\* For Non-Circuit Branches only

^ For Circuit Branches only

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**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	Communicative 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  
 40002^ Computer Application Practical

} will be in the second year

\* 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	Communicative 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

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**N SCHEME**

(Implemented from the Academic Year 2020 - 2021 onwards)

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**Thiru K. VIVEKANANDAN I.A.S.**

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**Co-ordinator**

**Dr. M.S. PADMANABAN, M.Tech., Ph.D.,**

Principal i/c

Central Polytechnic College, Chennai – 113.

**Subject: Communicative English I and II &  
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**Subject: Engineering Mathematics I & II**

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**Co-ordinator**

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**Subject: Engineering Physics I & II and Engineering Physics Practical**

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**Co-ordinator**

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**Subject: Engineering Chemistry I & II and  
Engineering Chemistry Practical**

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**Subject: Engineering Graphics I & II**

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

**Convener**

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Vice Principal  
Sri NallalaghuNadar Polytechnic  
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Dr. S.Aruna  
Lecturer / Civil Engg.  
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Thiru D.Dhilipkumar  
HOD / Computer  
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College, Mylapore, Chennai

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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 : COMMUNICATIVE ENGLISH – I

#### TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	
COMMUNICATIVE 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	Topics	Time (Hrs)
I	Functional Grammar and Usage	17
II	Vocabulary Enrichment	15
III	Situational English	15
IV	Creative English	15
V	English for Scholarly Presentation/ Fluency	11
Test & Model Exam		7
<b>Total</b>		<b>80</b>

## **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 inevitable.
- 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 COMMUNICATIVE ENGLISH –I

### DETAILED SYLLABUS

Contents: Theory

<b>Unit</b>	<b>Name of the Topics</b>	<b>Hours</b>
I	<b>Functional Grammar and Usage</b> 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	<b>Vocabulary Enrichment</b> Word Conversion (selective 25 words) Collocation - Noun with Verb, Adjective with Noun (Selective 25 Collocations) 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	<b>Situational English</b> 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	<b>Creative English</b> Review Writing (Book / Movie / TV Program) Visual Description Advertisement Writing Word Cloud Transforming Verbal Passage into Graphics	15
V	<b>English for Scholarly Presentation/ Fluency</b> "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](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**  
**COMMUNICATIVE ENGLISH – I**

**Time: 3 Hrs**

**Max.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 forth coming 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)".

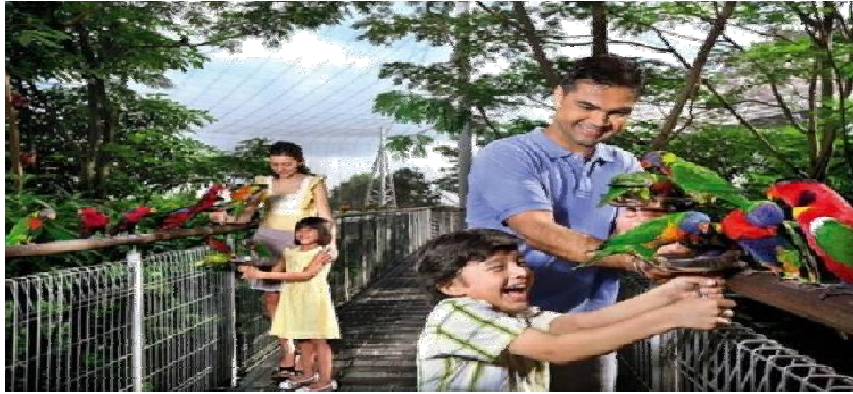
The term is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephones. Several products or services within an economy are associated with information technology, including computer hardware, software, 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 Programmes except DCP, 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

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			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:

Unit	Topics	Time (Hrs)
I	Algebra	15
II	Complex Number	15
III	Trigonometry	14
IV	Differential Calculus – I	15
V	Differential Calculus – II	14
Test & Model Exam		7
<b>Total</b>		<b>80</b>

**40012 ENGINEERING MATHEMATICS – I**

**DETAILED SYLLABUS**

**Contents: Theory**

Unit	Name of the Topics	Hours
I	<p><b>ALGEBRA</b></p> <p><b>1.1 MATRICES AND DETERMINANTS:</b></p> <p>MATRICES: Definition, Concept and Types of Matrices.</p> <p>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.</p> <p>DETERMINANTS: Definition and Evaluation of 2<sup>nd</sup> and 3<sup>rd</sup> order Determinants. Properties of determinants, product of Determinants. Determinant of a square Matrix – singular and non – singular Matrices - simple problems.</p>	3
	<p><b>1.2 APPLICATIONS OF MATRICES AND DETERMINANTS:</b></p> <p>Co-factor, Adjoint of Matrix, Inverse of Matrix and Rank of a matrix – Simple problems.</p> <p>Solution of simultaneous equations using Cramer’s rule - Matrix Inversion method - Gaussian Elimination method – simple problems.</p> <p>Characteristic Equation – Eigen Values and Eigen Vectors of a real matrix – consistency and inconsistency of system of linear equations.</p>	7
	<p><b>1.3 BINOMIAL THEOREM:</b></p> <p>Introduction – Factorial, Permutation and Combinations – Values of <math>nP_r</math> and <math>nC_r</math>.</p> <p>Statement of Binomial theorem for positive integral index. Expansion of Binomial - Finding general term – Middle term – Coefficient of <math>x^n</math> and Term independent of <math>x</math> – Binomial Theorem for rational index up to -3.</p> <p>Applications of binomial theorem – Finding the remainder, digits of a number and greatest term – simple problems.</p>	5
II	<p><b>COMPLEX NUMBERS</b></p> <p><b>2.1 ALGEBRA OF COMPLEX NUMBERS</b></p> <p>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.</p> <p>Argand Diagram – Collinear points, four points forming square, rectangle, rhombus and parallelogram only - Simple problems.</p> <p><b>2.2 DE MOIVRE’S THEOREM</b></p> <p>De Moivre’s Theorem (Statement &amp; Applications) – related simple problems.</p>	6

	<p><b>2.3 ROOTS OF COMPLEX NUMBERS</b></p> <p>Finding the <math>n^{th}</math> roots of unity – solving the equations of the form <math>x^n \pm 1 = 0</math> where <math>n \leq 7</math> - Simple problems.</p> <p><b>APPLICATIONS OF COMPLEX NUMBERS</b></p> <p>An application of Complex numbers: AC Circuits - Definitions – Impedance and Admittance - Simple Problems</p>	<b>4</b>
<b>III</b>	<p><b>TRIGONOMETRY</b></p> <p><b>3.1 TRIGONOMETRIC FUNCTIONS &amp; ALLIED ANGLES</b></p> <p>Trigonometric functions – Properties of Trigonometric functions - Relation between Degree &amp; Radian Measure – Simple problems.</p> <p>Applications of Radian Measure – Length of an arc of a sector – Linear and angular velocity - Trigonometric Ratios of Allied angles – Simple problems.</p> <p><b>3.2 TRIGONOMETRIC IDENTITIES</b></p> <p>Trigonometric Ratios of sum &amp; difference of two angles – Multiple and Sub multiple angles – Functions of 3A angles – Sum and Product Identities - Simple problems.</p> <p><b>3.3 PROPERTIES OF TRIANGLE &amp; INVERSE TRIGONOMETRIC FUNCTIONS</b></p> <p>Properties of Triangle – Law of Sines and Law of Cosines - Inverse Trigonometric Functions – Principal value – Properties of Inverse Trigonometric functions – simple problems.</p>	<b>5</b> <b>5</b> <b>4</b>
<b>IV</b>	<p><b>DIFFERENTIAL CALCULUS - I</b></p> <p><b>4.1 LIMITS</b></p> <p>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.</p> <p><b>4.2 DIFFERENTIATION</b></p> <p>The derivative of a Function – Differentiation of constant.</p> <p><math>x^n, \sin x, \cos x, \tan x, \cot x, \sec x, \operatorname{cosec} x, \log x, [e^x, a^x, \sin^{(-1)} x, [\cos^{(-1)} x, \tan^{(-1)} x, \cot^{(-1)} x, \sec^{(-1)} x, \operatorname{cosec}^{(-1)} x]]]</math></p> <p>(Formulae only) - Differentiation Rules: <math>u \pm v, uv, uvw, \frac{u}{v}</math> &amp; Chain rule – Simple problems.</p> <p><b>4.3 DIFFERENTIATION METHODS</b></p> <p>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.</p>	<b>5</b> <b>5</b> <b>5</b>
<b>V</b>	<p><b>DIFFERENTIAL CALCULUS – II</b></p> <p><b>5.1 SUCCESSIVE DIFFERENTIATION</b></p> <p>Successive differentiation upto second order (parametric form not included). Definition of differential equation, order and degree, formation of differential equation. Simple problems</p>	<b>5</b>

	<b>5.2 GEOMETRICAL APPLICATIONS</b> Curvature and Radius of curvature (cartesian form only) - Envelope of family of curves – Simple problems.	<b>5</b>
	<b>5.3 PARTIAL DIFFERENTIATION</b> Definition - Partial Differentiation of two variables upto second order only -simple problems. Jacobian and its properties. Euler’s theorem for homogeneous function – Simple problems.	<b>4</b>

**Reference Books:**

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, 1<sup>st</sup> 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, 2<sup>nd</sup> 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 Communicative 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.**

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

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.Marks: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:  $\lim_{x \rightarrow 0} \frac{\sin 7x}{9x}$
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  $\frac{\sin 2A}{1 + \cos 2A} = \tan A$
14. Suppose that a boat travels 10km from the port towards east and then turns  $60^\circ$  to its left. If the boat travels further 8 km, how far from the port is the boat?
15. Evaluate:  $\lim_{x \rightarrow 3} \frac{x^4 - 81}{x^4 - 9}$

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  $\theta$  if  $\cos \theta = -\frac{1}{2}$  &  $\theta$  lies in III quadrant. (7)

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

**(OR)**

B) i. Prove that  $(\cos \alpha - \cos \beta)^2 + (\sin \alpha - \sin \beta)^2 = 4\sin^2\left(\frac{\alpha - \beta}{2}\right)$  (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 intensity 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)  $\frac{1 + \cos x}{1 - \cos x}$  (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  $x = a \cos^3 t$ ,  $y = a \sin^3 t$

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  $x^2 \frac{d^2 y}{dx^2} - 4x \frac{dy}{dx} + (x^2 + 6)y = 0$ . (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.



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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 DCP, 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

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			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:

Unit	Topics	Time (Hrs)
I	S I UNITS AND STATICS	15
II	PROPERTIES OF MATTER	15
III	DYNAMICS- I	15
IV	DYNAMICS-II	14
V	SOUND AND MAGNETISM	14
TEST & MODEL		7
<b>Total</b>		<b>80</b>

## **40013 ENGINEERING PHYSICS – I**

### **DETAILED SYLLABUS**

#### **Contents: Theory**

<b>Unit</b>	<b>Name of the Topics</b>	<b>Hours</b>
<b>I</b>	<b>SI UNITS AND STATICS</b>	
	<b>1.1 UNITS AND MEASUREMENTS: -</b> 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.	5
	<b>1.2 STATICS: -</b> 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.	10
<b>II</b>	<b>PROPERTIES OF MATTER</b>	
	<b>2.1 ELASTICITY: -</b> 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-	5

	<p>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.</p> <p><b>2.2 VISCOSITY: -</b></p> <p>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.</p> <p><b>2.3 SURFACE TENSION: -</b></p> <p>Surface tension &amp; 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.</p>	5
<b>III</b>	<b>DYNAMICS–I</b>	
	<p><b>3.1. STRAIGHT LINE MOTION: -</b></p> <p>Introduction-Newton's Laws of motion-Fundamental Equations of motion for objects- horizontal motion-falling freely-thrown vertically upwards.</p>	2
	<p><b>3.2 PROJECTILE MOTION: -</b></p> <p>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.</p>	5
	<p><b>3.3 CIRCULAR MOTION: -</b></p> <p>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</p>	8

	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.	
<b>IV</b>	<b>DYNAMICS–II</b>	
	<b>4.1 ROTATIONAL MOTION OF RIGID BODIES: -</b>	7
	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.	
	<b>4.2 GRAVITATION: -</b>	3
	Newton’s laws of gravitation – Acceleration due to gravity on the surface of earth – Expression for variation of acceleration due to gravity with altitude	
	<b>4.3 SATELLITES: -</b>	4
	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.	
<b>V</b>	<b>SOUND AND MAGNETISM</b>	
	<b>5.1 SOUND: -</b>	9
	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 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	

	<p>frequency of vibration. Doppler effect – Definition and Applications – Ultrasonic and its uses – SONAR – Solved Problems.</p> <p><b>5.2 MAGNETISM: -</b></p> <p>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.</p>	5
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**Reference Books:**

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 Communicative 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.**

<b>PART A</b> Definitions and Statements. Question Number 1 to 5	5 X 1= 5 Marks
<b>PART B</b> Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
<b>PART C</b> 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**  
**ENGINEERING PHYSICS - I**

**Time: 3 Hrs**

**Max.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 - C**

**(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  $3.5 \times 10^{-4}$  m and density of water is  $1000 \text{ kgm}^{-3}$  (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  $10 \text{ ms}^{-1}$  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  $9.8 \text{ ms}^{-2}$ . 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  $0.65 \times 10^{-3} \text{ kgm}^{-1}$ . 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 DCP, 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

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			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	Topics	Time (Hrs)
I	<b>Basic concepts in chemistry</b> – Atomic Structure and Chemical bonding, Periodic Table, Acids and Bases	15
II	<b>Surface Chemistry</b> - Colloids, Nanotechnology, Catalysis	15
III	<b>Minerals and Metallurgy</b> – Metallurgy of Iron, Metallurgy of Tungsten and Titanium, Powder Metallurgy	15
IV	<b>Industrial Chemistry</b> – Nuclear Chemistry, Cement, Ceramics, Refractories and Glass	15
V	<b>Chemistry of Engineering Materials</b> – Polymer, Abrasives, Composite Materials	13
Test & Model Exam		7
<b>Total</b>		<b>80</b>

**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 Topics	Hours
I	<b>BASIC CONCEPTS IN CHEMISTRY</b>	
	<b>1.1 Atomic Structure and Chemical Bonding</b> 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.	<b>6</b>
	<b>1.2 Periodic Table</b> Modern periodic law – periodic classification of elements – features of modern periodic table – properties of s–p–d–f block elements.	<b>4</b>

	<p><b>1.3 Acids and Bases</b></p> <p>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</p>	<b>5</b>
<b>II</b>	<p><b>SURFACE CHEMISTRY</b></p> <p><b>2.1 Colloids</b></p> <p>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.</p> <p><b>2.2 Nanotechnology</b></p> <p>Nano particles – definition – properties – application of Nanotechnology – Engineering – medicine – biomaterial.</p> <p><b>2.3 Catalysis</b></p> <p>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.</p>	<p><b>6</b></p> <p><b>4</b></p> <p><b>5</b></p>
<b>III</b>	<p><b>MINERALS AND METALLURGY</b></p> <p><b>3.1 Minerals and Metallurgy</b></p> <p>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.</p> <p><b>3.2 Metallurgy of Tungsten and Titanium</b></p> <p>Extraction and uses of Tungsten and Titanium</p> <p><b>3.3 Powder Metallurgy</b></p> <p>Definition – Powder metallurgical process – Preparation of Metal Powder – Atomization – Reduction of Metal Oxide – blending – compacting – sintering – finishing – Applications of Powder Metallurgy.</p>	<p><b>7</b></p> <p><b>4</b></p> <p><b>4</b></p>

<p><b>IV</b></p>	<p><b>INDUSTRIAL CHEMISTRY</b></p> <p><b>4.1 Nuclear Chemistry</b></p> <p>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.</p> <p><b>4.2 Cement and Ceramics</b></p> <p>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.</p> <p><b>4.3 Refractories and Glass</b></p> <p>Definition – requirements of a good refractory – types with examples and uses – uses of silica, fire clay and alumina.</p> <p>Composition of Glass – Manufacture of Glass – annealing of glass – varieties of glass – Optical glass, wind shield glass and Photo chromatic glass.</p>	<p><b>6</b></p> <p><b>5</b></p> <p><b>4</b></p>
<p><b>V</b></p>	<p><b>CHEMISTRY OF ENGINEERING MATERIALS</b></p> <p><b>5.1 Polymer</b></p> <p>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.</p> <p><b>5.2 Abrasives</b></p> <p>Definition – classification – hardness in Moh’s scale – Natural abrasives –</p> <p>Diamond, Corundum, Emery and Garnet. Synthetic abrasives – Carborundum – Boroncarbide manufacture – properties and uses.</p> <p><b>5.3 Composite Materials</b></p> <p>Definition – examples – Classification of composites – Advantages over metals and polymers – General application</p>	<p><b>6</b></p> <p><b>4</b></p> <p><b>3</b></p>

**Reference Books:**

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 Communicative English I & II and  
Engineering Graphics I & II.**

Note: Clarke's 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.**

<b>PART A</b> Definitions and Statements. Question Number 1 to 5	5 X 1= 5 Marks
<b>PART B</b> Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
<b>PART C</b> 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**  
**ENGINEERING CHEMISTRY I**

**Part – A**

**(5x 1 = 5)**

**NB: 1. Answer all questions.**

**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**

**(10 x 2 = 20)**

**NB: 1. Answer any 10 questions**

**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?



**NB: 1. Answer all questions**

**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: (7)  
 (a) Polyurethane (b) PVC (c) Polypropylene (d) Polyethylene  
 (ii) Write a note on the following abrasives (8)  
 (a) Diamond (b) Corundum (c) Emery (d) Garnet

## 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 DCP, 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

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENGINEERING GRAPHICS - I	6	96	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	Topics	Time (Hrs)
I	Drawing Office Practice and Dimensioning	19
II	Geometric Constructions and Construction of Conics	19
III	Projection of Points & Straight Lines and Construction of Special Curves	19
IV	Orthographic Projections	32
Test & Model Exam.		07
<b>Total</b>		<b>96</b>

## **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

Unit	Name of the Topics	Hours												
i	<b>DRAWING OFFICE PRACTICE AND DIMENSIONING</b> <b>1.1 Drawing Office Practice</b> 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 border="1"><thead><tr><th colspan="2">Minimum criteria for class assessment</th></tr><tr><th>No. of Drawing sheets</th><th>No. of Exercises</th></tr></thead><tbody><tr><td>1</td><td>Upper case, lower case, slanting letters and numerals – each 5 sentences with different heights</td></tr></tbody></table> <b>1.2 Dimensioning</b> 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 border="1"><thead><tr><th colspan="2">Minimum criteria for class assessment</th></tr><tr><th>No. of Drawing sheets</th><th>No. of Exercises</th></tr></thead><tbody><tr><td>1</td><td>8 - 2D drawings</td></tr></tbody></table>	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises	1	Upper case, lower case, slanting letters and numerals – each 5 sentences with different heights	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises	1	8 - 2D drawings	<b>06</b>          <b>13</b>
Minimum criteria for class assessment														
No. of Drawing sheets	No. of Exercises													
1	Upper case, lower case, slanting letters and numerals – each 5 sentences with different heights													
Minimum criteria for class assessment														
No. of Drawing sheets	No. of Exercises													
1	8 - 2D drawings													

II

## GEOMETRIC CONSTRUCTIONS AND CONSTRUCTION OF CONICS

06

### 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.

Minimum criteria for class assessment	
No. of Drawing sheets	No. of Exercises covering all methods
1	10

### 2.2 Construction of Conics

13

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.

Minimum criteria for class assessment	
No. of Drawing sheets	No. of Exercises covering all methods
2	7

**III 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 plane – inclined to one plane and parallel to the other plane – parallel to both the planes – simple exercises.

Minimum criteria for class assessment	
No. of Drawing sheets	No. of Exercises
2	12

**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.

Minimum criteria for class assessment	
No. of Drawing sheets	No. of Exercises covering all methods
2	6

11

08

<b>IV</b>	<b>ORTHOGRAPHIC PROJECTIONS</b>	<b>11</b>											
	<p><b>4.1 First Angle Projections: Simple components</b></p> <p>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).</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <th colspan="2">Minimum criteria for class assessment</th> </tr> <tr> <td>No. of Drawing sheets</td> <td>No. of Exercises</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">6</td> </tr> </table> <p><b>4.2 First Angle Projections only: Engineering components</b></p> <p>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.)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <th colspan="2">Minimum criteria for class assessment</th> </tr> <tr> <td>No. of Drawing sheets</td> <td>No. of Exercises</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">12</td> </tr> </table>	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises	1	6	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises	3	12
Minimum criteria for class assessment													
No. of Drawing sheets	No. of Exercises												
1	6												
Minimum criteria for class assessment													
No. of Drawing sheets	No. of Exercises												
3	12												

**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.

# ENGINEERING GRAPHICS I

## PORTIONS FOR ASSESSMENT TEST

### Assessment Test 1

Portion: Unit I and II

#### Question pattern

Duration: 2 Hrs.

Max. Marks: 50  
(2 x 5 = 10)

#### Part A

Three questions will be asked.

Answer any two questions.

Each question carries five marks.

Minimum one question should be asked from each unit first chapter. (Chapter 1.1 and 2.1).

#### Part B

(2 x 20 = 40)

Three questions will be asked.

Answer any two questions.

Each question carries twenty marks.

Minimum one question should be asked from each unit second chapter. (Chapter 1.2 and 2.2).

### Assessment Test 2

Portion: Unit III and IV

#### Question pattern

Duration: 2 Hrs.

Max. Marks: 50  
(2 X 5 = 10)

#### Part A

Three questions will be asked.

Answer any two questions.

Each question carries five marks.

Minimum one question should be asked from each unit first chapter. (Chapter 3.1 and 4.1).

#### Part B

(2 X 20 = 40)

Three questions will be asked.

Answer any two questions.

Each question carries twenty marks.

Minimum one question should be asked from each unit second chapter. (Chapter 3.2 and 4.2).

#### Internal Assessment Marks:

Description	Marks
Class Assessment Sheets (Minimum 10 Sheets)	10
Average of Two Assessment Tests	05
Model Examination	05
Attendance	05
<b>Total</b>	<b>25</b>



**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 to 11). 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° 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.

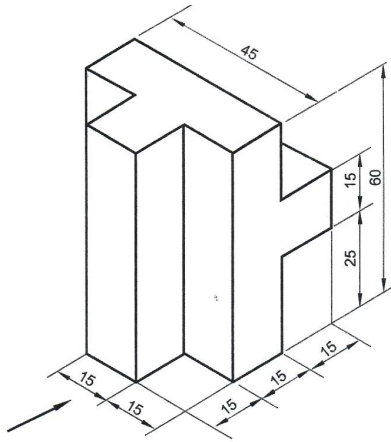


Fig: 1

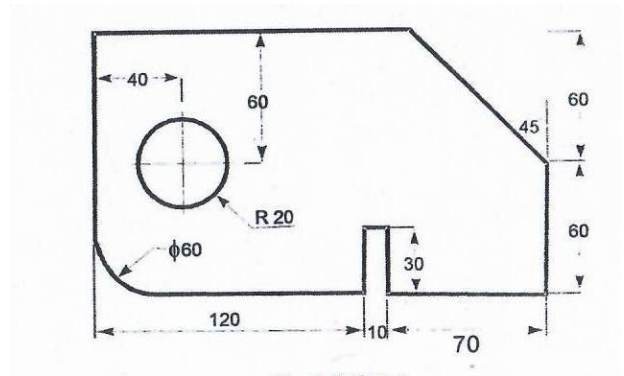


Fig: 2

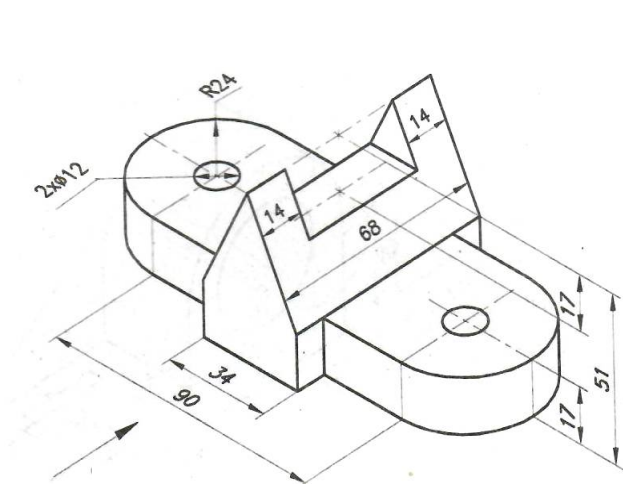


Fig: 3

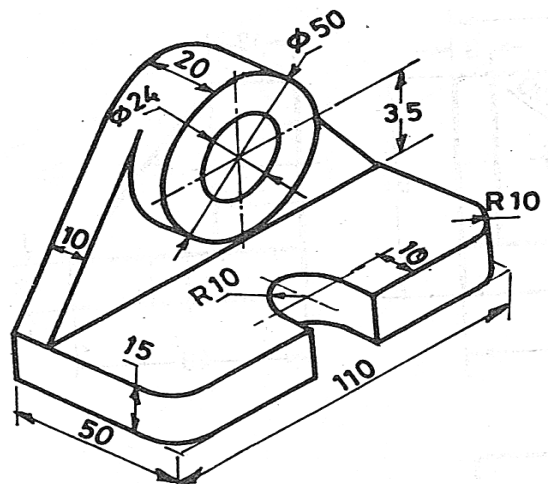


Fig: 4

**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**

No. of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
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**

Unit	Topics	Time (Hrs)
I	Listening Skill	10
II	Reading Skill	6
III	Speaking Skill	10
IV	Writing Skill	6
<b>Total</b>		<b>32</b>

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

Description		Marks
A	Listening	30
B	Reading	20
C	Speaking	30
D	Writing	20
<b>Total</b>		100



## Guidelines for Conduct of Practical Classes and Writing Record Note:

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

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

**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](http://www.youtube.com),

[www.letstalk.co.in](http://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.

# MODEL QUESTION PAPER

## 40001 – COMMUNICATION SKILL PRACTICAL

Time: 3 Hrs

Max.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.(5 exchanges) (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 about 50 words: (5x2=10)**

- 1. What is the definition of Non-Verbal Communication?
- 2. What does good eye-contact mean?
- 3. Why is body language important?
- 4. What are the types of non-verbal communication?
- 5. What is the difference between verbal and Non-verbal communication?
- 6. Sate some negative body language characteristics.
- 7. What is the importance of Non-verbal Communication?
- 8. How to improve verbal and non-verbal communication skills?

**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

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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 DCP, 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

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
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	Topics	Time (Hrs.)
I	BASICS OF COMPUTER	5
II	WORD PROCESSING	9
III	SPREAD SHEET	9
IV	PRESENTATION	9
<b>Total</b>		<b>32</b>

## 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	Topics	Hours
I	<b>Basics of Computer:</b> 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	<b>Word Processing:</b> 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	<b>Spread sheet:</b> 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.	
<b>IV</b>	<b>Presentations:</b> 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.	<b>9</b>

## 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

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## **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 where 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.

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## **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**

<b>Description</b>		<b>Marks</b>
A	Aim & Procedure	20
B	Execution *	50
C	Output Printout / Handout ^	20
D	Viva voce	10
<b>Total</b>		<b>100</b>

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

^ Students 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 DCP, HMCT and Film & TV.

Subject Code : 40006

Semester : I and II

Subject Title : ENGINEERING PHYSICS PRACTICAL

#### TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

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

## **SEMESTER - I**

### **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.

## SEMESTER- II

### 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		Marks
A	Formula & Diagram	20
B	Tabulation with proper units	10
C	Observation (including taking readings)	40
D	Calculation	15
E	Result	10
F	Viva voce	5
<b>Total</b>		<b>100</b>

## 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 Voltmeter, 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)

## MODEL QUESTION PAPER

### 40006 ENGINEERING PHYSICS PRACTICAL

**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.

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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 DCP, 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

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

## SEMESTER- I

### 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<sub>2</sub>SO<sub>4</sub>
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<sub>4</sub>.
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<sub>4</sub>.
6. Compare of strength of two given KMnO<sub>4</sub> 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).**

**SEMESTER- II**  
**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		Marks
A	PART A Engineering Chemistry I Practical	53
B	PART B Engineering Chemistry II Practical	42
C	VIVA VOCE	05
<b>Total</b>		<b>100</b>

### Guidelines 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
<b>Total</b>	<b>53</b>
<b>Volumetric Analysis</b>	
<b>Titration value accuracy for Titration I and II</b>	
<b>Accuracy</b>	<b>Marks</b>
±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 <sup>+</sup> (3X2)	6
Determination of TDS - three samples (3X7)	21
<b>Total</b>	<b>53</b>
<b>Accuracy per pH value</b>	
<b>Accuracy</b>	<b>Marks</b>
±0.2	7
above ±0.2 to ±0.4	5
above ±0.4	2
<b>TDS Value accuracy</b>	
<b>Accuracy</b>	<b>Marks</b>
±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

<b>FOR</b>	<b>Marks</b>
Identification Procedure of Acid Radical with Systematic procedure	21
Identification Procedure of Basic Radical with Systematic procedure	21
<b>TOTAL</b>	<b>42</b>
<b>Without systematic procedure</b>	
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)

<b>FOR</b>	<b>Marks</b>
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
<b>TOTAL</b>	<b>42</b>
<b>Without systematic procedure</b>	
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. (53 marks)

#### 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. (53 marks)

#### 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). (53 marks)

#### Part - B:

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

### MODEL4

#### Part - A:

Estimate the amount of sulphuric acid 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. (42 marks)

#### 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(50 ml)	35
2	Burette Stand	35
3	Pipette(20 ml) (With safety bulb)	35
4	Pipette(10 ml)	35
5	Conical Flask(250 ml)	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) (250 ml)	60
11	Reagent Bottle (White) (125 ml)	100
12	Reagent Bottle (Amber)(250 ml)	80
13	Test Tube(15 mm x 1.5 mm)	1000
14	Test Tube(15 mm x 2.5 mm)	500
15	Test Tube Stand	35
16	Test Tube Holder	35

17	Test Tube cleaning brush	35
18	Glass Trough	5
19	Beaker(100 ml)	35
20	Glass Rod(15 cm)	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

**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 : 40021

Semester : II

Subject Title : COMMUNICATIVE ENGLISH – II

**TEACHING AND SCHEME OF EXAMINATION**

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	
COMMUNICATIVE ENGLISH – II	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	Topics	Time (Hrs)
I	Functional Grammar and Usage	13
II	English for Enrichment	11
III	Situational English	11
IV	Creative English	11
V	English for Scholarly Presentation/ Fluency	11
Test & Model Exam		7
<b>Total</b>		<b>64</b>



## 40021 COMMUNICATIVE ENGLISH – II

### DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	<b>Functional Grammar and Usage</b> Application of Modal Verbs Negative Formation (No, Never, Nothing, Hardly, Seldom, No longer, None, Nowhere, Neither ... nor) Use of Subordinating Conjunctions Use of Conditionals Reported Speech (Dialogue to Indirect Speech) Punctuation	13
II	<b>English for Enrichment</b> The Language Game: Unscramble Phrases (Noun Phrase, Verb Phrase, Prepositional Phrase, etc.) Cause and Effect Writing Suitable Responses to the Given Questions Giving Instructions	11
III	<b>Situational English</b> Email for Official Communication Social Media Language Reacting to Situations Correction of Sentences Proverbs for Everyday Situations	11
IV	<b>Creative English</b> The Language Game: Word Puzzle Grid Notice Writing for the Given Situations Slogan Writing Technical Words Infographics Comprehension	11

V	<b>English for Scholarly Presentation/ Fluency</b> "The Lost Child" by Mulk Raj Anand "My Vision for India" by Abdul Kalam "From Lover's Gift" by Rabindranath Tagore "The Flower" by Tennyson	11
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## **Reference Books :**

### **Glossaries**

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

<https://techterms.com/definition/>

<http://dictionary.tamilcube.com/>

[https://www.lexilogos.com/english/tamil\\_dictionary.htm](https://www.lexilogos.com/english/tamil_dictionary.htm)

### **Grammar**

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

### **Motivation**

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

**MODEL QUESTION PAPER**  
**COMMUNICATIVE ENGLISH – II**

**Time: 3 Hrs.**

**Max. Marks: 100**

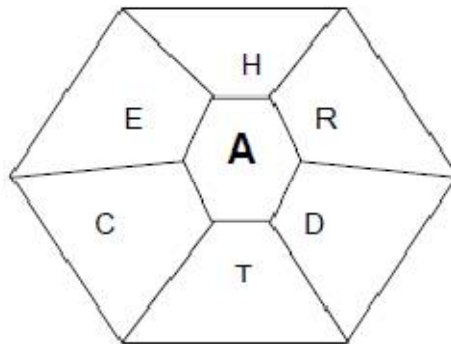
**I. Answer any TEN of the following:**

**(10 x 4 = 40)**

1. Rewrite the following sentences using suitable modal verbs without changing the meaning:
  - a. She is able to speak English.
  - b. You are allowed to go home.
  - c. It is not necessary for you to wait any longer.
  - d. He will probably pass the test.
2. Fill in the following sentences using suitable negatives:
  - a. \_\_\_\_\_ of Sankar's friends is invited for the party.
  - b. Lions \_\_\_\_\_ fight with each other.
  - c. \_\_\_\_\_ in my class is going for the tour.
  - d. \_\_\_\_\_ is as refreshing as the fragrance of jasmine.
3. Rewrite the following sentences using the subordinating conjunctions given in the brackets:
  - a. The meeting had to be postponed due to the Chairman's illness. (Rewrite with 'because')
  - b. We were late. We missed the train. (Rewrite with 'Since')
  - c. If we don't hurry up, we will miss our flight. (Rewrite with 'otherwise')
  - d. It was cold but we went for swimming. (Rewrite with 'although')
4. Complete the following conditional sentences with suitable verb given in the brackets:
  - a. If they \_\_\_\_\_ their house, they would be rich. (sell / sold / will sell)
  - b. If Aruna \_\_\_\_\_, call me. (comes / came / will come)
  - c. The zoo keeper \_\_\_\_\_ her with a fine if she had fed the animals. (punished / would have punished / will punish)
  - d. I would call the office if I \_\_\_\_\_ you. (was / were / am)
5. Rewrite the following conversation into reported speech:

Jai:           Where are you going?  
Gopi:         To the airport.  
Jai:           May I drop you there in my car?  
Gopi:         Thanks a lot. It will be a great help to me

6. Correct the paragraph by adding appropriate punctuation and capitalization:  
 my heart leaps up when I behold a rainbow in the sky wrote wordsworth the famous poet most of us share his feelings when we are lucky enough to see a rainbow have you ever tried to reach a rainbows end
7. Make any 4 words by combining the letters in the hexagon. The central letter should be common in each word.



8. Make use of the following phrases and write your own sentences:
- The black cat
  - Without fail
  - To a great extent
  - Has been working
9. Combine the cause with the effect and rewrite the sentences using appropriate connectives:

Sl.No	Cause	Connectives	Effect
a	Their son is ill	As a result	We stayed at home.
b	It was raining.	Because	We had to cancel the match.
c	She liked the puppy.	Consequently	They had to cancel the trip.
d	The weather was bad.	So	She adopted it.
		Therefore	
		This causes	

10. Write suitable responses either in affirmative or in negative to the following questions as directed:
- Did she write a nice essay? (Affirmative)
  - Do you mind if I sit in the corner seat? (Negative)
  - Are they playing football? (Negative)
  - Are you going to the movie tomorrow? (Affirmative)
11. Use imperatives and write any 4 instructions to be followed in the chemistry lab.

**II. Answer any FOUR of the following:**

**(4 x 5 = 20)**

- You are Mr.Arul and you recently bought a mobile phone from Smart Mobiles. Write an email to the Manager of Smart mobiles, explaining the poor quality of service offered in your city.
- Convert the following acronyms / abbreviations used in social media into formal language:
  - NVM
  - RSVP
  - TYT
  - BTW
  - POV
- Write a dialogue with minimum 5 exchanges between the Class tutor and a student on submitting assignments.
- Identify the grammatical / lexical errors in the following sentences and correct them:

Sl.No	Sentence	Error	Correction
A	Amar is a artist.		
B	He love to paint and draw.		
C	His favorite colour is bright green.		
D	He has buided his house.		

5. Match the meanings with their proverbs

Meanings	Proverbs
a. If you can't see someone or something, you soon forget about them.	1. A leopard can't change its spots.
b. Achieve two goals with one action.	2. Kill two birds with one stone
c. If you want to know about someone, look at his friends.	3. Too many cooks spoil the broth.
d. Some people never change.	4. Out of sight, out of mind.
e. No choice at all.	5. A double-edged sword.
	6. A person is known by the company he keeps.
	7. Hobson's choice.

III. Answer any FOUR of the following:

(4 x 5 = 20)

1. Find the antonyms of the given words in the vocabulary grid

a. Happy    b. Hard    c. Late    d. Hot    e. Expensive

W	S	A	P	A	E	H	C
E	O	U	G	L	Y	I	O
T	E	A	S	Y	E	G	L
S	A	D	O	A	U	H	D
O	R	I	G	H	T	T	E
F	L	V	E	F	D	I	N
T	Y	E	Q	U	I	C	K

- You are Sports – in – charge. Write a notice congratulating and praising the achievement of your college cricket team that has won the district level trophy.
- Write 2 Slogans on your own on “SAVE ENVIRONMENT”.
- Write the appropriate technical words for the following:
  - The area of Artificial Intelligence concerned with the practical use of robots
  - The plan / design of something that is laid out
  - The creation of something in the mind
  - An elaborate and systematic plan of action
  - A weakened state caused by long stress on a material
- Look at the following infographics and prepare a report of about 50 words using the information presented in it:



**IV. Write short notes on any FIVE of the following in about 50 words:**

**(5x4=20)**

1. Appreciate the former President Dr. Kalam's vision for India.
2. List out the things the child sees on his way to the fair.
3. "It is to life what Newton's law is to astronomy" – Explain.
4. What makes one side of the road shady?
5. Bring out the theme of the poem "The Flower".
6. Identify an individual's role in India's development

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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 DCP, HMCT and Film & TV.  
Subject Code : 40022  
Semester : II  
Subject Title : ENGINEERING MATHEMATICS II

**TEACHING AND SCHEME OF EXAMINATION**

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	
ENGINEERING MATHEMATICS II	4	64	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	Topics	Time (Hrs)
I	Analytical Geometry	12
II	Vector Algebra - I	11
III	Vector Algebra - II	11
IV	Integral Calculus - I	12
V	Integral Calculus - II	11
Test & Model Exam		7
<b>Total</b>		<b>64</b>

**40022 ENGINEERING MATHEMATICS – II**  
**DETAILED SYLLABUS**

**Contents: Theory**

Unit	Name of the Topics	Hours
<b>I</b>	<p><b>ANALYTICAL GEOMETRY</b></p> <p><b>1.1 ANALYTICAL GEOMETRY I:</b> Introduction – Locus – Straight lines – angle between two straight lines – pair of straight lines – simple problems.</p> <p><b>1.2 ANALYTICAL GEOMETRY II:</b> Circles – General equation of a circle – Equation of tangents to circle. Family of circles-Concentric circles – Orthogonal circles (condition only) – contact of circles - simple problems.</p> <p><b>1.3 CONICS</b> Definition, general equation and classification of conics. Sections of a cone - parabola, ellipse and hyperbola - standard equations – Applications of Conics – Simple problems.</p>	<p>3</p> <p>4</p> <p>5</p>
<b>II</b>	<p><b>VECTOR ALGEBRA – I</b></p> <p><b>2.1 VECTOR – INTRODUCTION</b> Definition of vector – types, addition, subtraction and scalar multiplication of vector, properties of addition and subtraction. Position vector. Resolution of vector in three dimensions, distance between two points, Direction cosines and direction ratios. Simple problems.</p> <p><b>2.2 PRODUCT OF TWO VECTORS</b> Scalar product – Vector product – condition for parallel and perpendicular vectors, properties, angle between two vectors, unit vector perpendicular to two vectors –simple problems.</p> <p><b>2.3 APPLICATION OF SCALAR AND VECTOR PRODUCT</b> Geometrical meaning of scalar product and vector product, workdone, moment –simple problems.</p>	<p>4</p> <p>4</p> <p>3</p>

<p><b>III</b></p>	<p><b>VECTOR ALGEBRA - II</b></p> <p><b>3.1 PRODUCT OF THREE AND FOUR VECTORS</b>  Scalar and vector triple product and product of four vectors-simple problems.</p> <p><b>3.2 VECTOR DIFFERENTIATION</b>  Vector point function and vector field, scalar point function and scalar field, vector differential operator – Gradient – basic properties of the gradient- simple problems.</p> <p><b>3.3 APPLICATION OF VECTOR DIFFERENTIATION</b>  Divergence, basic properties, solenoidal, curl of a vector function, irrotational vector- simple problems.</p>	<p>3</p> <p>4</p> <p>4</p>
<p><b>IV</b></p>	<p><b>INTEGRAL CALCULUS – I</b></p> <p><b>4.1 INTEGRATION - DECOMPOSITON METHOD</b>  Historical approach for integration - Anti derivative - Definition of the integral as an anti-derivative - Fundamental rules for integration - Integration using decomposition method - simple problems based on Engineering Applications.</p> <p><b>4.2 METHODS OF INTEGRATION - INTEGRATION BY SUBSTITUION</b>  Integrals of the form <math>\int [f(x)]^n f'(x)dx</math>, where <math>n \neq -1</math>,  <math>\int \frac{f'(x)}{f(x)} dx</math> and <math>\int F[f(x)] f'(x)dx</math> - simple problems.</p> <p><b>4.3 STANDARD INTEGRALS</b>  Integrals of the form <math>\int \frac{dx}{a^2 \pm x^2}</math>, <math>\int \frac{dx}{x^2 - a^2}</math>, <math>\int \frac{dx}{\sqrt{a^2 - x^2}}</math>,  <math>\int \sqrt{a^2 - x^2} dx</math>, <math>\int \sqrt{x^2 \pm a^2} dx</math>- Simple problems.</p>	<p>4</p> <p>4</p> <p>4</p>
<p><b>V</b></p>	<p><b>INTEGRAL CALCULUS - II</b></p> <p><b>5.1 METHODS OF INTEGRATION - INTEGRATION BY PARTS</b>  Integrals of the form <math>\int x \sin nx dx</math>, <math>\int x \cos nx dx</math>, <math>\int xe^{nx} dx</math>, <math>\int x^n \log x dx</math>,  and <math>\int \log x dx</math> Simple problems.</p>	<p>4</p>

	<p><b>5.2 BERNOULLI'S FORMULA</b></p> <p>Evaluation for the integrals</p> <p><math>\int x^m \sin nx dx</math>, <math>\int x^m \cos nx dx</math> and <math>\int x^m e^{nx} dx</math> Where <math>m \leq 3</math> using Bernoulli's formula - Simple problems.</p>	4
	<p><b>5.3 DEFINITE INTEGRALS</b></p> <p>Definition of definite integral – Properties of definite integrals - Simple problems.</p>	3

**Reference Books:**

1. Higher Secondary +1 Mathematics volume I&II. Tamilnadu Text book corporation.
2. Higher Secondary +2 Mathematics Volume I&II. Tamilnadu Text book corporation.
3. Engineering Mathematics V. Sundaram, R. Balasubramanian
4. Engineering Mathematics – I C.B.Gupta, A.K.Malik, New age international Publishers, 1<sup>st</sup> 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.Pondey, RR.Sharma, New age international publishers.
8. Engineering Mathematics – I Guruprasad Samanta, New age international publishers, 2<sup>nd</sup> edition 2015.
9. Engineering Mathematics Reena Garg, Khanna publishing House, New Delhi, Revised edn. – 2018.
10. Engineering Mathematics Volume I P. Kandasamyand K. Thilagavathy, S. Chand & Company Ltd.

**Board Examination-Question Paper Pattern**

**For all theory subjects except Communicative 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.**

<b>PART A</b> Definitions and Statements. Question Number 1 to 5	5 X 1= 5 Marks
<b>PART B</b> Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
<b>PART C</b> 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**  
**40022 ENGINEERING MATHEMATICS - II**

Time: 3.00 hrs.

**Max.Mark:100**

Note:

1. Answer all question 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. Find the value of P if the lines represented by  $Px^2 - 5xy - 7y^2 = 0$ , are perpendicular to each other.
2. Show that the vectors  $2\vec{i} - 4\vec{j} + 8\vec{k}$  and  $3\vec{i} - 6\vec{j} + 12\vec{k}$  are parallel.
3. Define vector Differential operator.
4. Evaluate  $\int (x^2 - x - 1) dx$
5. Evaluate  $\int_1^2 \frac{1}{x} dx$

**Part- B**

**(10×2=20)**

6. Find the angle between the lines  $y = \sqrt{3}x$  and  $x - y = 0$
7. Find the equation of the circle with centre  $(-3, -4)$  passes through the point  $(2,2)$
8. Find the equation of the hyperbola with vertices  $(0, \pm 4)$  and foci  $(0, \pm 6)$
9. Find the projection of  $3\vec{i} + 4\vec{j} - 5\vec{k}$  on  $\vec{i} + 2\vec{j} + 2\vec{k}$
10. Find the value of 'm', if the vectors  $3\vec{i} - \vec{j} + 5\vec{k}$  and  $-6\vec{i} + m\vec{j} + 4\vec{k}$  are perpendicular.
11. Find the unit vector which is perpendicular to both the vectors  $2\vec{i} - 3\vec{j} + 4\vec{k}$  and  $\vec{i} + \vec{k}$
12. Determine whether the three vectors  $2\vec{i} + 3\vec{j} + \vec{k}$ ,  $\vec{i} - 2\vec{j} + 2\vec{k}$ , and  $3\vec{i} + \vec{j} + 3\vec{k}$  are coplanar.
13. Find the unit normal vector to the surface  $z = x^2 + y^2$  at the point  $(1, -2, 5)$
14. If  $\vec{F} = xyz\vec{i} + 3x^2y\vec{j} + (xy^2 - zy^3)\vec{k}$  then find  $div\vec{F}$  and  $curl\vec{F}$
15. Evaluate  $\int \tan^2 x dx$
16. Evaluate  $\int (2 \sin x + 7) dx$
17. Evaluate  $\int \frac{dx}{\sqrt{9-x^2}}$
18. Evaluate.  $\int \frac{\cos x}{1+\sin x} dx$
19. Evaluate.  $\int x e^x dx$

20. Evaluate.  $\int_0^{\pi/2} \sin^2 x \, dx$

**Part – C**

**(5×15=75)**

21. A) i. Show that the circles  $x^2 + y^2 - 4x - 6y + 9 = 0$  and  $x^2 + y^2 + 2x + 2y - 7 = 0$  touch each other. Find the coordinates of the point of contact of the two circles. (7)
- ii. Find the value of k so that the equation  $3x^2 - 7xy - 6y^2 - 5x + 26y + k = 0$  represents a pair of straight lines. (8)

**(or)**

- B) i. Find the axis, vertex, focus, equation of directrix, Latus rectum, length of the latusrectum for the parabola  $y^2 + 8x - 6y + 1 = 0$  (7)
- ii. A satellite is travelling around the earth in an elliptical orbit having the earth at a focus and of eccentricity  $\frac{1}{2}$ . The shortest distance that the satellite gets to the earth is 400Kms. Find the longest distance that the satellite gets from the earth (8)
22. A) i. Show that the vectors  $2\vec{i} - \vec{j} + \vec{k}$ ,  $\vec{i} - 3\vec{j} - 5\vec{k}$  and  $3\vec{i} - 4\vec{j} - 4\vec{k}$  form a right-angled triangle (7)
- ii. Find the projection of  $3\vec{i} + \vec{j} - 2\vec{k}$  on  $7\vec{i} + \vec{j} + 2\vec{k}$ . Also find the angle between them (8)

**(or)**

- B) i. A particle acted on by forces  $3\vec{i} - 2\vec{j} + 2\vec{k}$  and  $2\vec{i} + \vec{j} - 3\vec{k}$  is displaced from the point  $\vec{i} + 3\vec{j} - \vec{k}$  to the point  $4\vec{i} - \vec{j} + 2\vec{k}$ . Find the work done by the forces. (7)
- ii. Find the magnitude of moment of a force  $3\vec{i} + 4\vec{j} + 5\vec{k}$  acting through a point  $\vec{i} - 2\vec{j} + 3\vec{k}$  about the point  $4\vec{i} - 3\vec{j} + \vec{k}$  (8)
23. A) i. If the four points A (6, -7, 0), B (16, -19,-4), C (0, 3, -6) and D (2, -5, 10) then prove that  $\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AD}$  are coplanar. (7)
- ii. Find the acute angle between the surfaces  $xy^2z = 3x + z^2$  and  $3x^2 - y^2 + 2z = 1$  at the point (1, -2, 1) (8)

**(or)**

- B) i. If  $\vec{F} = (2x + 2y + 2z)\vec{i} - (xy + yz + zx)\vec{j} + 3xyz\vec{k}$  then find  $\nabla \times \vec{F}$  and  $\nabla \times (\nabla \times \vec{F})$  (7)
- ii. If  $\vec{a} = 2\vec{i} + 3\vec{j} - \vec{k}$ ,  $\vec{b} = \vec{j} + \vec{k}$ ,  $\vec{c} = \vec{i} + \vec{k}$ ,  $\vec{d} = \vec{i} + \vec{j} + \vec{k}$  evaluate  $(\vec{a} \times \vec{b}) \cdot (\vec{c} \times \vec{d})$  (8)

24. A) Evaluate

a) i)  $\int (\sin x + \cos x)^2 dx$     ii)  $\int \sqrt{(9x^2 + 16)} dx$  (7)

b) i)  $\int \frac{\cos^2 x}{1 - \sin x} dx$     ii)  $\int \frac{1}{(3x+2)^2 + 16} dx$  (8)

(or)

B) Evaluate

a) i)  $\int \frac{2ax+b}{\sqrt{ax^2+bx+c}} dx$     ii)  $\int \cos^3 x dx$  (7)

b) i)  $\int \sin 5x \cdot \cos 2x dx$     ii)  $\int \frac{dx}{4+9x^2}$  (8)

25. A) Evaluate

a) i)  $\int x^2 \sin 2x dx$     ii)  $\int x^n \log x dx$  (7)

b) i)  $\int x^2 \cos 5x dx$     ii)  $\int x^3 e^{2x} dx$  (8)

(or)

B) Evaluate

a) i)  $\int x^2 \log x dx$     ii)  $\int_0^{\frac{\pi}{2}} \sin^3 x dx$  (7)

b) i)  $\int x^3 e^{-x} dx$     ii)  $\int_0^{\pi} \frac{\sin x}{\sin x + \cos x} dx$  (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 DCP, HMCT and Film & TV.

Subject Code : 40023

Semester : II

Subject Title : ENGINEERING PHYSICS II

#### TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	
ENGINEERING PHYSICS II	4	64	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	Topics	Time (Hrs)
I	HEAT	12
II	THERMODYNAMICS, LIQUEFACTION OF GASES & NON- CONVENTIONAL ENERGY	12
III	LIGHT AND REMOTE SENSING	11
IV	ELECTRICITY	11
V	ELECTRONICS	11
Test & Model Exam		7
<b>Total</b>		<b>64</b>

**40023 ENGINEERING PHYSICS – II**  
**DETAILED SYLLABUS**

Contents: Theory

Unit	Name of the Topics	Hours
I	<p><b>HEAT</b></p> <p><b>1.1 TRANSFER OF HEAT</b></p> <p>Concept of Heat and Temperature - Centigrade, Fahrenheit and Kelvin scales of temperature measurement- Conduction, convection and radiation - Definitions and explanations-Good and Poor conductors- Examples. Coefficient of thermal conductivity-Definition and SI Unit- Properties of thermal radiation – Heat conversions.</p>	4
	<p><b>1.2 KINETIC THEORY OF GASES</b></p> <p>Postulates –Mean square velocity and Root Mean Square (RMS) velocity of molecules - Definitions and expressions – Expression for the pressure of a gas on the basis of postulates of kinetic theory of gases - Relation between pressure and kinetic energy of the gas-Relation between kinetic energy and absolute temperature–Simple problems based on the expression for the pressure of a gas.</p>	
	<p><b>1.3 SPECIFIC HEAT CAPACITY</b></p> <p>Specific heat capacity of a substance (solids and liquids) –Definition – Specific heat capacity of a gas at constant volume – Specific heat capacity of a gas at constant pressure– Ratio of specific heat capacities – Explanation for <math>C_p</math> is greater than <math>C_v</math>– Derivation of Mayer’s relation – calculation of Universal gas constant R from the gas equation <math>PV= RT</math>. Simple problems based on Mayer’s relation – Solved problems.</p>	4
II	<p><b>THERMODYNAMICS, LIQUEFACTION OF GASES and NON-CONVENTIONAL ENERGY</b></p> <p><b>2.1 THERMODYNAMICS</b></p> <p>First law of thermodynamics – Statement - Isothermal and Adiabatic changes - Explanation – Equations for isothermal and adiabatic changes (No derivation) Simple problems based on equations <math>P_1V_1 = P_2V_2</math> and <math>P_1V_1^\gamma = P_2V_2^\gamma</math>. Second law of thermodynamics – Clausius statement and</p>	5

	<p>Kelvin's statement - Working of Carnot's reversible engine with indicator diagram and its efficiency – Applications of heat and thermodynamics.</p> <p><b>2.2 LIQUEFACTION OF GASES</b></p> <p>Critical temperature, critical pressure and critical volume – Definitions – Principle used in cascade process – Cascade process of liquefaction of oxygen – Disadvantages of cascade process - Joule Thomson effect – Temperature of inversion – Liquefaction of air by Linde's process.</p> <p><b>2.3 NON – CONVENTIONAL ENERGY</b></p> <p>Introduction – Non-renewable and Renewable (Alternate) energy sources – Examples – Solar energy, wind energy, – Advantages and disadvantages of renewable energy – Tidal Energy.</p>	4
<b>III</b>	<p><b>LIGHT AND REMOTE SENSING</b></p> <p><b>3.1 OPTICS</b></p> <p>Refraction – Laws of refraction – Refractive index of a medium – Derivation of refractive index of glass prism using minimum deviation - Definition – Spectrometer – Experimental determination of refractive index using spectrometer- Phenomenon of total internal reflection – Fiber optics - Introduction – Optical Fiber Cable as a wave guide – advantages of OFC – problems using the refractive index – Applications of total internal reflection.</p> <p><b>3.2 LASER</b></p> <p>LASER – Characteristics of LASER – principle of LASER – Spontaneous emission – Stimulated emission – population inversion – Ruby Laser- Construction and working- Uses of LASER.</p> <p><b>3.3 REMOTE SENSING</b></p> <p>Remote sensing – Introduction – Active and passive remote sensing – Explanation and examples – Components of remote sensing – Data acquisition and data analysis - Reference data – RADAR – principle and working with block diagram.</p>	4
<b>IV</b>	<p><b>ELECRICITY</b></p> <p><b>4.1 ELECTRICAL CIRCUITS</b></p> <p>Ohm's law – Laws of resistances – Resistivity, Conductivity, Super</p>	4

	<p>conductivity and Meissner effect- Definitions – Kirchhoff's current and voltage laws. Condition for balancing the Wheat Stone's bridge - Simple problems based on expression for resistivity. Capacitance of a capacitor – Definition – 'farad'– Definition– expressions for effective capacitance when capacitors are connected in series and in parallel. Simple problems based on effective capacitance for series and parallel connections of capacitors – Applications of capacitors.</p> <p><b>4.2 EFFECTS OF CURRENT</b></p> <p>Joule's law of heating – Experimental determination of specific heat capacity of a liquid using Joule's calorimeter – Faraday's laws on electrolysis – Electro chemical equivalent (e.c.e) of an element – Definition – Experimental determination of e.c.e. of copper - Simple problems based on expressions for e.c.e – Applications of heating effect of electric current.</p> <p><b>4.3 MEASURING INSTRUMENTS</b></p> <p>Expression for the force acting on a current carrying straight conductor placed in a uniform magnetic field – Fleming's Left Hand rule – Expression for the torque experienced by a rectangular current carrying coil placed inside a uniform magnetic field – Working of a moving coil galvanometer and its merits – Conversion of galvanometer into an Ammeter and Voltmeter. Simple problems based on conversion of Galvanometer into Ammeter and Voltmeter – Solved problems.</p>	3
<b>V</b>	<p><b>ELECTRONICS</b></p> <p><b>5.1 SEMI CONDUCTORS</b></p> <p>Semiconductors – Intrinsic semiconductors -Concept of holes - Doping – Extrinsic semiconductors – Energy bands in solids – Energy band diagram of good conductors, insulators and semiconductors – Concepts of Fermi level – P type and N type semiconductors.</p> <p><b>5.2 DIODES AND TRANSISTORS</b></p> <p>P-N junction diode – Forward bias and reverse bias –Rectification action of diode – Working of full wave bridge rectifier using P N junction diodes - PNP and NPN transistors – Three different configurations – Working of</p>	3
		5

	<p>NPN and PNP transistor in common base configuration.</p> <p><b>5.3 DIGITAL ELECTRONICS</b></p> <p>Digital electronics – Introduction – Logic levels – Basic logic gates: OR, AND , NOT gates – Universal logic gates: NAND and NOR gates – Symbolic representation, Boolean expression and Truth table for all above logic gates – Integrated circuits– Levels of integration – SSI, MSI, LSI and VLSI-Advantages of ICs – Applications of transistors, gates and ICs – Solved problems.</p>	3
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**Reference Books:**

1. Fundamentals of physics – Brijlal and Subramaniam.
2. Fundamentals of Electricity – D.N. Vasudeva – S. Chand & co
3. Non- Conventional energy sources – G.D. Rai.- Khanna publishers
4. Text book of Remote sensing and Geographical information systems – M. Anji Reddy BS publications.

### **Board Examination-Question Paper Pattern**

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

Note: Clarke's 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.**

<b>PART A</b> Definitions and Statements. Question Number 1 to 5	5 X 1= 5 Marks
<b>PART B</b> Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
<b>PART C</b> 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

## ENGINEERING PHYSICS - II

Time: 3 Hrs

Max. Marks: 100

### Part - A

(5 X 1 = 5)

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

1. Define mean free path.
2. State first law of thermodynamics:-
3. Expand the acronym of RADAR?
4. State Ohm's law.
5. What is rectifier?

### Part - B

(10 X 2 = 20)

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

6. Define conduction.
7. Define root mean square velocity of gas molecules.
8. Define specific heat capacity of a solid.
9. State Kelvin statement of second law of thermodynamics.
10. What is the disadvantage of cascade process?
11. What is meant by temperature of inversion?
12. Give the condition for total internal reflection.
13. Give any two properties of laser.
14. What is active remote sensing?
15. State any one law of the laws of resistance.
16. State Joule's law of heating.
17. State the Fleming's left hand rule.
18. What are intrinsic semiconductors?
19. What is dopping?
20. Give any two advantages of an integrated circuit.

### Part - C

(5 X 15 = 75)

Note: Answer ALL questions by choosing either a & b (OR) c & d

- |    |   |  |     |
|----|---|--|-----|
| 21 | A | i) What are the properties of thermal radiation?   | (8) |
|    |   | ii) Derive the expression for the pressure of a gas on the basis of kinetic theory of gases. | (7) |

**OR**

- B i) Derive Mayer's relation for a perfect gas. (8)  
ii) Calculate the value of universal gas constant R from the gas equation  $PV = RT$ . (7)
- 22 A i) Explain isothermal and adiabatic change. (8)  
ii) A certain mass of gas at 1 atm pressure is suddenly compressed to one-fourth of its original volume. Find the resulting pressure ( $\gamma = 1.4$ ) (7)

**OR**

- B. i) Describe the Linde's process for the liquefaction of air. (8)  
ii) Write an essay on wind energy. (7)
- 23 A i) Describe an experiment to determine the refractive index of glass prism using spectrometer. (8)  
ii) Describe the construction and working of the Ruby LASER. (7)

**OR**

- B. i) Describe the components of remote sensing. (8)  
ii) Explain the working of RADAR with block diagram. (7)
- 24 A i) State and explain Kirchoff's current and voltage law. (8)  
ii) The capacitors of values  $20\mu\text{f}$ ,  $30\mu\text{f}$  and  $60\mu\text{f}$  are connected (i) in series and (ii) in parallel. Calculate the effective capacitance in each case (7)

**OR**

- B. i) Describe an experiment to determine the specific heat capacity of a liquid using Joule's calorimeter (8)  
ii) Derive an expression for the torque on a rectangular coil placed on a uniform magnetic field (7)
- 25 A i) Explain N type and P type semiconductors. (8)  
ii) Explain the working of full wave bridge rectifier using PN junction diode. (7)

**OR**

- B. i) Explain AND, OR and NOT gates with the help of truth tables. (8)  
ii) Explain the various levels of integration circuit. (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 DCP, HMCT and Film & TV.

Subject Code : 40024

Semester : II

Subject Title : ENGINEERING CHEMISTRY II

**TEACHING AND SCHEME OF EXAMINATION**

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	
ENGINEERING CHEMISTRY II	4	64	25	100*	100	3 Hrs.

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

**Topics and Allocation of Hours:**

Unit	Topics	Time (Hrs)
I	<b>Electrochemistry</b> – Electro Chemistry-I, Electro Chemistry-II – Energy Sources.	12
II	<b>Chemistry of corrosion and prevention</b> - corrosion – theory of Corrosion – Methods of Prevention of Corrosion, Organic Coatings	11
III	<b>Energy Chemistry</b> - Fuels, Combustion, Rocket Propellants.	11
IV	<b>Applied Chemistry</b> – Technology of Water – I,– Technology of Water – II	11
IV	<b>Environmental Chemistry</b> – Air Pollution, Water Pollution, Solid Waste Management and Green Chemistry	12
Test & Model Exam		7
<b>Total</b>		<b>64</b>

**RATIONALE:**

- The subject Engineering Chemistry – II develop basic understanding about electrochemistry, energy resources, corrosion, methods of prevention of corrosion and its organic coatings.
- Energy chemistry explains various aspects with regard to fuels, combustion and rocket propellants.
- Prime importance is given to technology of water, its analysis of few parameters like pH, TDS, Hardness, dissolved chlorine, e-coli etc.
- Environmental chemistry explains environmental pollution, solid waste management and green chemistry.

**OBJECTIVES:**

The objective of this Course is to make the student:

1. To acquire knowledge about electro chemistry, electro chemical cell.
2. To know about corrosion and prevention.
3. To acquire knowledge about fuels, combustion of fuels and rocket propellants.
4. To know about water and its analysis.
5. To acquire knowledge about Environmental Chemistry.

**40014 ENGINEERING CHEMISTRY– II  
DETAILED SYLLABUS**

**Contents: Theory**

Unit	Name of the Topics	Hours
<b>I</b>	<p><b>ELECRO CHEMISTRY</b></p> <p><b>1.1 Electrochemistry-I</b> Electronic concept of oxidation and reduction – Faradays’ laws of electrolysis – simple problems – electrolytes - nonelectrolytes – electrolysis – definition – Mechanism – Industrial applications of Electrolysis – electroplating – chromeplating.</p> <p><b>1.2 Electrochemical cell</b> Electrochemical cell – Definition Galvanic cell – Formation of Daniel cell – Electrochemical series – Definition – significance.</p> <p><b>1.3 Energy Sources</b> Primary Battery – Secondary Battery – Definition and example – cell – Construction, working principle and Uses of Lead acid – Storage battery – Lithium ion – battery - Solar Cell – Definition – working principle.</p>	<p>5</p> <p>4</p> <p>3</p>
<b>II</b>	<p><b>CHEMISTRY OF CORROSION AND PREVENTION</b></p> <p><b>2.1 Corrosion</b> Definition – types of corrosion – theories of corrosion – galvanic cell formation theory – differential aeration theory – factors influencing rate of corrosion.</p> <p><b>2.2 Methods of Prevention of corrosion</b> Galvanization – tinning – anodisation – cathodic protection – sacrificial anode method and impressed voltage method.</p> <p><b>2.3 Organic Coatings</b> Paint – definition – Components of paints – Varnish – definition – Preparation of oil varnish – differences between paint and varnish – Special Paints – Luminescent paint, fire retardant paint, Aluminum paint and distemper.</p>	<p>4</p> <p>4</p> <p>3</p>

<p><b>III</b></p>	<p><b>ENERGY CHEMISTRY</b></p> <p><b>3.1 Fuels</b></p> <p>Fuel – Definition – Calorific value – calorie – Liquid fuels – liquid hydrogen – power alcohol – uses – Refining of Petroleum – Fractional distillation – Cracking (Concept only) – Gaseous fuels – Preparation, composition and specific uses of Producer gas and Water gas – Composition and uses of CNG and LPG – advantages of gaseous fuels.</p> <p><b>3.2 Combustion</b></p> <p>Definition – Combustion calculation by mass (for solid and liquid fuels) – Stoichiometric calculations – Volume of air required – Definition of Flue gas – Flue gas Analysis – Orsat Apparatus – Simple numerical problems.</p> <p><b>3.3 Rocket Propellants</b></p> <p>Definition – characteristics – Classification of propellants –brief idea of solid and liquid propellants.</p>	<p>4</p> <p>4</p> <p>3</p>
<p><b>IV</b></p>	<p><b>APPLIED CHEMISTRY</b></p> <p><b>4.1 Technology of Water–I</b></p> <p>Sources of water – depletion of underground water – Reasons – Rain water harvesting (Basic ideas) – advantages – Hard water and soft water – Hardness of water – Carbonate and Non–carbonate hardness – Methods of expressing hardness – mg/lit and ppm – Simple problems – Disadvantages of hard water – Estimation of total hardness by EDTA method – Problems involving Total, Carbonate and Non–carbonate hardness in ppm – Disadvantages of using hard water in boilers –Scale formation, Corrosion of boiler metal, Caustic Embrittlement – Priming and Foaming.</p> <p><b>4.2 Technology of Water–II</b></p> <p>Softening of hard water – Ion-Exchange method and Reverse Osmosis method – Municipal supply – purification of drinking water – Quality of potable water (WHO standard) – parameters of potable water – pH – TDS – residual Chlorine permissible limits – determination of ecoli (preliminary idea)</p>	<p>6</p> <p>5</p>

V	<b>ENVIRONMENTAL CHEMISTRY</b>	
	<b>5.1 Air Pollution</b> Pollution and Air pollution – Definition – Air pollutants (SO <sub>2</sub> , H <sub>2</sub> S, HF, CO and Dust) – Sources and Harmful effects – smog and types of smog – Formation of Acid Rain – Harmful effects – Green House Effect – Causes – Global warming – Harmful effects – Ozone Layer – Importance – Causes for Depletion of Ozone Layer (No equations) – Harmful effects of Ozone Layer Depletion – Control of Air Pollution.	4
	<b>5.2 Water Pollution</b> Causes of Water Pollution – Sewage, Effluents, Algae and Microorganisms – Harmful effects – Definition – Sewage – Sewerage – Disposal – Industrial Effluents – Harmful effects of Effluents Treatment of Effluents – Eutrophication – definition – harmful effects.	4
<b>5.3 Solid Waste Management</b> Solid Waste – Definition – Problems – Types of Solid Waste – Methods of Disposal – Land fill and Incineration – Recycling – Definition – Examples – Advantages of Recycling (Basic ideas) Green Chemistry Definition – Goals of Green Chemistry (Basic ideas)	4	

**Reference Book:**

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. Handbook of rain water harvesting, Chennai Metrowater, 2018
7. Engineering Chemistry, Jain&Jain Dhanpat Raj Publishing Comapany,2016
8. Pradeeps new course chemistry, Vol I, Class 11,Dr.S.C. Khetarpal, Dr.S.N.Dhawan, Pradeep Publication,2018
9. Electrochemistry and Corrosion Science,,Nestor Perez,

<https://link.springer.com/book/10.1007%2F978-3-319-24847-9#toc>

**Board Examination - Question Paper Pattern**

**For all theory subjects except Communicative 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.**

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

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

**MODEL QUESTION PAPER**  
**ENGINEERING CHEMISTRY II**

**Part – A**

**(5 X 1=5)**

**NB: 1. Answer all questions**

**2. All questions carry equal marks**

1. What is one Faraday?
2. What is called Galvanisation?
3. What is meant by producer gas?
4. Define e-coli?
5. What is meant by smog?

**Part – B**

**(10 X 2=20)**

**NB: 1. Answer any 10 questions**

**2. All questions carry equal marks**

6. Define Faraday's I law of electrolysis.
7. Mention the anode and cathode of Lithium ion battery.
8. Write down the cell notation of Daniel cell.
9. Define corrosion.
10. What is meant by galvanisation?
11. What are luminescent paints?
12. Mention the composition of LPG.
13. Write down the equation for the calculation of finding theoretical quantity of oxygen required for the combustion of 1kg of a fuel containing carbon, hydrogen, sulphur and moisture?
14. What are rocket propellants?
15. What is called a bio material?
16. What is hardness of water?
17. How will you remove temporary hardness of water?
18. What are green house gases?
19. Define eutrophication.
20. Define green chemistry.

**Part – C**

**(5 X 15 = 75)**

**NB: 1. Answer all questions**

**2. Answer any one of the subdivisions either (a) or (b) from each question**

21. A (i) What are the industrial applications of electrolysis. (7)  
(ii) What is a secondary battery? Explain the working principle of lead acid battery. (8)
- (or)**
- B (i) Explain the cell reactions in Daniel cell. (7)  
(ii) What is Faraday's second law of electrolysis? During electrolysis of silver nitrate, 4.029g of silver was found to get deposited over the cathode. How much time is required to get the deposition when 1 ampere current is passed? (equivalent weight of silver is 108) (8)
22. A (i) Explain differential aeration theory of corrosion with suitable example. (7)  
(ii) Distinguish between paint and varnish. Explain the preparation of oil and spirit varnish. (8)
- (or)**
- B (i) Write notes on cathodic protection. (7)  
(ii) What are the types of corrosion. Mention the factor that influences the rate of corrosion. (8)
23. A (i) Write notes of refining of petroleum (7)  
(ii) Explain flue gas analysis using Orsat apparatus with a neat diagram (8)
- (or)**
- B (i) What are the characteristics of rocket propellants. (7)  
(ii) A coal sample contains 80%C, 8%H, 1%S and 3%ash by mass. Find the amount of air required to burn 1kg of coal (8)
24. A (i) Write notes on rain water harvesting. (7)  
(ii) When 250ml of sample of hard water is titrated against standard EDTA of strength 0.01M, it consumed 12.5ml. The same sample after boiling required only 8.5ml of the same EDTA. Calculate the carbonate and non carbonate hardness of the sample in mg/L (8)
- (or)**
- B (i) Explain ion exchange process of removing hardness. (7)  
(ii) Write a note on dissolved chlorine. (8)
25. A (i) What are the harmful effects of global warming? (7)  
(ii) What is meant by depletion of ozone layer? Mention their harmful effects. (8)
- (or)**
- B (i) Explain land fill operation and recycling of solid waste management. (7)  
(ii) Mention the harmful effects of sewage and ways to treat them. (8)



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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 DCP, HMCT and Film & TV.

Subject Code : 40025

Semester : II

Subject Title : ENGINEERING GRAPHICS - II

**TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	
ENGINEERING GRAPHICS - II	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	Topics	Time (Hrs)
I	Construction of Polygons and Projection of Planes	15
II	Projection of Solids and Section of Solids	20
III	Development of Surfaces	15
IV	Missing Views and Isometric Projections	23
Test & Model Exam.		07
<b>Total</b>		<b>80</b>

## **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 the use of proper drawing instruments.

This subject is aimed at providing basic understanding of the fundamentals of engineering drawings mainly visualization of three dimensional drawings for practical applications and the use of drawings in real life engineering applications.

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

The chapters are arranged in sequence and starts from the construction of polygons, concepts of projection of planes, solids and section of solids. It proceeds to the construction of development of surfaces and isometric projections.

By the end of the subject, it is expected that the students would be matured to visualize engineering components by reading an engineering drawing.

## **OBJECTIVES:**

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

- Understand the importance of drawing
- Identify and use of the drawing instruments
- Acquire knowledge about the construction of polygons in various positions
- Understand the concepts of projection of planes
- Draw the projection of solids and section of solids
- Draw the development of solids and sheet metal components
- Draw the missing views from the given drawing
- Convert orthographic views into isometric drawings

**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.

## 40025 ENGINEERING GRAPHICS - II

### DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours						
I	<b>CONSTRUCTION OF POLYGONS AND PROJECTION OF PLANES</b> <b>1.1 Construction of Polygons</b> Construction of regular polygon: triangle, square, pentagon and hexagon – various positions – side of the polygon is parallel, perpendicular and inclined to principal planes. <table border="1" style="margin: 10px auto;"><thead><tr><th colspan="2">Minimum criteria for class assessment</th></tr><tr><th>No. of Drawing sheets</th><th>No. of Exercises covering all methods</th></tr></thead><tbody><tr><td style="text-align: center;">1</td><td style="text-align: center;">12</td></tr></tbody></table>	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises covering all methods	1	12	<b>06</b>
	Minimum criteria for class assessment							
No. of Drawing sheets	No. of Exercises covering all methods							
1	12							
	<b>1.2 Projection of Planes</b> Projection of planes – rectangle, square, hexagon and circle–plane parallel to HP and perpendicular to VP – plane parallel to VP and perpendicular to HP – plane perpendicular to both HP and VP – plane parallel to both the planes – simple exercises. <table border="1" style="margin: 10px auto;"><thead><tr><th colspan="2">Minimum criteria for class assessment</th></tr><tr><th>No. of Drawing sheets</th><th>No. of Exercises covering all portions</th></tr></thead><tbody><tr><td style="text-align: center;">2</td><td style="text-align: center;">16</td></tr></tbody></table>	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises covering all portions	2	16	<b>09</b>
Minimum criteria for class assessment								
No. of Drawing sheets	No. of Exercises covering all portions							
2	16							
II	<b>PROJECTION OF SOLIDS AND SECTION OF SOLIDS</b> <b>2.1 Projection of Solids – I</b> Introduction – important terms – classification of solids – triangular and hexagonal prisms and pyramids – solids of revolution – cylinder and cone–projection of solids in simple positions – axis parallel to one plane and perpendicular to other plane. <table border="1" style="margin: 10px auto;"><thead><tr><th colspan="2">Minimum criteria for class assessment</th></tr><tr><th>No. of Drawing sheets</th><th>No. of Exercises covering all portions</th></tr></thead><tbody><tr><td style="text-align: center;">1</td><td style="text-align: center;">8</td></tr></tbody></table>	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises covering all portions	1	8	<b>06</b>
Minimum criteria for class assessment								
No. of Drawing sheets	No. of Exercises covering all portions							
1	8							
	<b>2.2 PROJECTION AND SECTION OF SOLIDS</b> <b>2.2.1 Projection of Solids - II</b> Position of solid–axis inclined to one plane and parallel to other plane –axis parallel to both planes – simple exercises. <table border="1" style="margin: 10px auto;"><thead><tr><th colspan="2">Minimum criteria for class assessment</th></tr><tr><th>No. of Drawing sheets</th><th>No. of Exercises covering all portions</th></tr></thead><tbody><tr><td style="text-align: center;">1</td><td style="text-align: center;">6</td></tr></tbody></table>	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises covering all portions	1	6	<b>14</b>
Minimum criteria for class assessment								
No. of Drawing sheets	No. of Exercises covering all portions							
1	6							
	<b>2.2.2 Section of Solids</b> Need for section view – cutting plane – cutting plane line–representation as per BIS code–Hatching line – true section–section of simple solids –							

	<p>triangular and hexagonal prisms and pyramids, cylinder, cone – position of solids – axis perpendicular to one plane and parallel to other plane – position of cutting planes – cutting plane perpendicular to one plane and parallel to another plane – cutting plane perpendicular to one plane and inclined to another plane – true shape– exercises.</p> <table border="1" data-bbox="300 416 1273 528"> <tr> <th colspan="2">Minimum criteria for class assessment</th> </tr> <tr> <th>No. of Drawing sheets</th> <th>No. of Exercises covering all portions</th> </tr> <tr> <td>2</td> <td>8</td> </tr> </table>	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises covering all portions	2	8							
Minimum criteria for class assessment														
No. of Drawing sheets	No. of Exercises covering all portions													
2	8													
<p><b>III</b></p>	<p><b>DEVELOPMENT OF SURFACES</b></p> <p><b>3.1 Development of Regular Solids</b></p> <p>Need for preparing development drawing with reference to sheet metal work – procedure for preparing development drawing of prism, pyramid, cylinder and cone –exercises in rectangular, square and hexagonal prisms and pyramids – exercises in regular cylinder and cone.</p> <table border="1" data-bbox="300 752 1273 864"> <tr> <th colspan="2">Minimum criteria for class assessment</th> </tr> <tr> <th>No. of Drawing sheets</th> <th>No. of Exercises covering all portions</th> </tr> <tr> <td>1</td> <td>8</td> </tr> </table> <p><b>3.2 Development of Components</b></p> <p>Cutting plane – cutting plane line – development of truncated prism and cylinder – frustum of pyramid and cone – development of simple engineering components such as elbow, ducts, lamp shade and funnel.</p> <table border="1" data-bbox="316 1048 1257 1160"> <tr> <th colspan="2">Minimum criteria for class assessment</th> </tr> <tr> <th>No. of Drawing sheets</th> <th>No. of Exercises covering all portions</th> </tr> <tr> <td>3</td> <td>10</td> </tr> </table>	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises covering all portions	1	8	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises covering all portions	3	10	<p><b>06</b></p> <p><b>09</b></p>
Minimum criteria for class assessment														
No. of Drawing sheets	No. of Exercises covering all portions													
1	8													
Minimum criteria for class assessment														
No. of Drawing sheets	No. of Exercises covering all portions													
3	10													
<p><b>IV</b></p>	<p><b>MISSING VIEWS AND ISOMETRIC PROJECTIONS</b></p> <p><b>4.1 Missing Views</b></p> <p>Reading a drawing – missing views – visualization – possible view problems – Drawing a missing view or third view (Draw missing view only) – simple exercises.</p> <table border="1" data-bbox="450 1429 1120 1541"> <tr> <th colspan="2">Minimum criteria for class assessment</th> </tr> <tr> <th>No. of Drawing sheets</th> <th>No. of Exercises</th> </tr> <tr> <td>1</td> <td>6</td> </tr> </table> <p><b>4.2 Isometric Projections</b></p> <p>Introduction–isometric view – isometric projection – methods of drawing an isometric view – box method – construction of arcs and circles – four centre method for drawing ellipse – construction of isometric drawing of components from the given orthographic views – simple exercises.</p> <table border="1" data-bbox="456 1800 1117 1912"> <tr> <th colspan="2">Minimum criteria for class assessment</th> </tr> <tr> <th>No. of Drawing sheets</th> <th>No. of Exercises</th> </tr> <tr> <td>1</td> <td>8</td> </tr> </table>	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises	1	6	Minimum criteria for class assessment		No. of Drawing sheets	No. of Exercises	1	8	<p><b>09</b></p> <p><b>14</b></p>
Minimum criteria for class assessment														
No. of Drawing sheets	No. of Exercises													
1	6													
Minimum criteria for class assessment														
No. of Drawing sheets	No. of Exercises													
1	8													

**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 KV "A Text Book of Engineering Drawing and Graphics" Publisher: N Dhanalakshmi.
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.

## ENGINEERING GRAPHICS II

### PORTIONS FOR ASSESSMENT TEST

#### Assessment Test 1

Portion: Unit I and II

#### Question pattern

**Duration: 2 Hrs.**

**Max. Marks: 50**

**(2 X 5 = 10)**

#### Part - A

Three questions will be asked.

Answer any two questions.

Each question carries five marks.

Minimum one question should be asked from each unit first chapter. (Chapter 1.1 and 2.1).

#### Part - B

**(2 X 20 = 40)**

Three questions will be asked.

Answer any two questions.

Each question carries twenty marks.

Minimum one question should be asked from each unit second chapter. (Chapter 1.2 and 2.2).

#### Assessment Test 2

Portion: Unit III and IV

#### Question pattern

**Duration: 2 Hrs.**

**Max. Marks: 50**

**(2 X 5 = 10)**

#### Part - A

Three questions will be asked.

Answer any two questions.

Each question carries five marks.

Minimum one question should be asked from each unit first chapter. (Chapter 3.1 and 4.1).

#### Part - B

**(2 X 20 = 40)**

Three questions will be asked.

Answer any two questions.

Each question carries twenty marks.

Minimum one question should be asked from each unit second chapter. (Chapter 3.2 and 4.2).

#### Internal Assessment Marks:

Description	Marks
Class assessment Sheets (Minimum 10 Sheets)	10
Average of Two Assessment Tests	05
Model Examination	05
Attendance	05
<b>Total</b>	<b>25</b>

**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 to 11). 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 - II

**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. Draw a regular pentagon of side 40 mm with one of its base edge inclined at  $60^\circ$  to HP.
2. Draw the projections of a cylinder of base diameter 40mm and height 60mm with its base on the HP.
3. A triangular pyramid of base side 30mm and height 60mm rests on HP on its base with one base edge is perpendicular to VP. Draw the front view and top view.
4. Draw the development of a rectangular pyramid of side 20mm X 44mm and altitude 60 mm.
5. Draw the missing top view of the object shown in Fig: 1.

### Part - B

**(4x20= 80)**

**Answer any four questions. Each question carries twenty marks.**

6. A hexagonal plane with 30 mm side has its surface parallel to and at 15 mm in front of VP and perpendicular to HP. Draw its projections, when a side is inclined at  $45^\circ$  to the HP.
7. A hexagonal prism of base edge 25mm and height 60mm lies on the ground on one of its rectangular faces with its axis inclined at  $45^\circ$  to the VP. Draw the projections of the prism.
8. A cone of base diameter 50mm and axis 60mm long has its base on the ground. It is cut by a cutting plane perpendicular to the VP and inclined at  $30^\circ$  to the HP, which meets the axis at 35 mm from the apex. Draw the front view, sectional elevation and true shape of the section.

9. A cylinder of 30 mm diameter and 35 mm axis length is cut by a section plane inclined at  $30^\circ$  to HP and passes through 15 mm from base along the axis. Draw the development of the lower portion of the truncated cylinder.
10. Draw the development of a funnel as shown in Fig:2.
11. Draw the isometric view of the given component as shown in Fig:3.

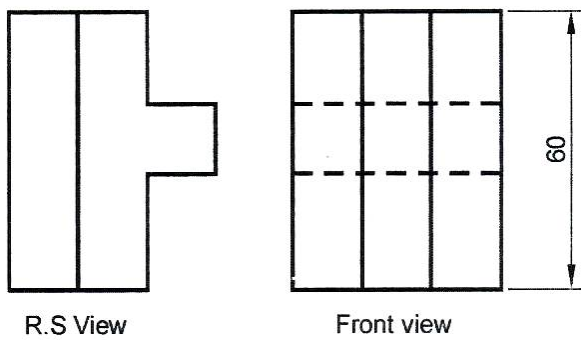


Fig:1

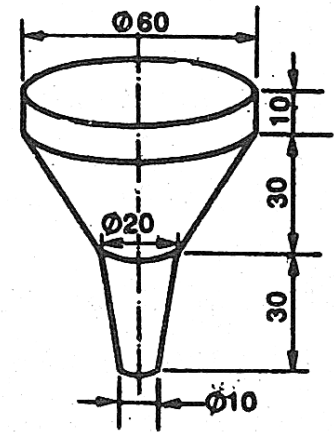


Fig:2

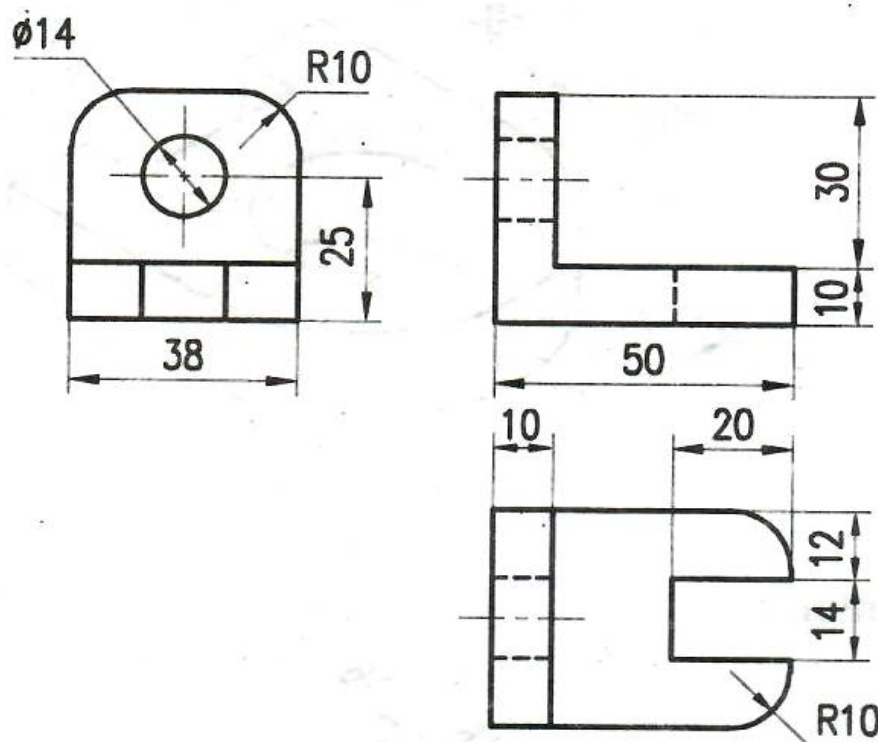


Fig:3

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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 DCP, HMCT and Film & TV.  
Subject Code : 40028  
Semester : II Semester  
Subject Title : **BASICS OF INDUSTRIES & WORKSHOP PRACTICAL**

#### TEACHING AND SCHEME OF EXAMINATION

Number of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
BASICS OF INDUSTRIES & WORKSHOP PRACTICAL	5 Hrs.	80 Hrs.	Internal Assessment	Board Examination	Total	3 Hrs.
	(Theory: 2 hrs Practical: 3 Hrs.)		25	100 *	100	

\* Examination will be conducted for 100 Marks and will be reduced to 75 Marks.

#### Topics and Allocation of Hours:

Unit	Topics	Time (Hrs)
<b>A: THEORY PORTION</b>		
I	BASICS OF INDUSTRIES	6
II	INDUSTRIAL SAFETY AND MAINTENANCE	6
III	QUALITY AND STANDARDS	6
IV	BASICS OF ENGINEERING	8
V	INDUSTRY 4.0	6
<b>B: PRACTICAL PORTION</b>		
BASIC ENGINEERING MANUFACTURING PRACTICES		24.
BASIC SERVICE AND MAINTENANCE PRACTICES		24
<b>Total</b>		<b>80</b>

## COURSE OBJECTIVE:

- To learn the basics of industries.
- To understand the MSME.
- To understand the importance of safety and plant maintenance.
- To learn the importance of the quality and its standards.
- To study the basics of engineering.
- To understand the industry 4.0.
- To understand the importance of global readiness in industries.
- To understand basic tools and measuring instruments in general workshop.
- To understand and familiar with the shop floor practices and safety procedures.
- To understand the basic engineering manufacturing practices on the metal and wood works.
- To understand the basic service and maintenance practices in the wiring and basic plumbing practices.
- To learn the importance and various methods of rainwater harvesting to improve the ground water level.
- To understand the principles of basic industrial and domestic applications.

### **BASICS OF INDUSTRIES**

#### **DETAILED SYLLABUS**

#### **Contents: Theory Portion**

<b>Unit</b>	<b>Name of the Topics</b>	<b>Hours</b>
<b>I</b>	<b>BASICS OF INDUSTRIES:</b> What is Industry? - Classification– Factors influences the location of the industries. Types of industries: Small Scale Industries: Definitions – procedure to start. Medium scale industries: Definition. Large scale industries: Definition. Manufacturing Industry - purpose of manufacture – global manufacture. Engineering Industry: Introduction – Products of various engineering sectors.	<b>6</b>
<b>II</b>	<b>INDUSTRIAL SAFETY AND MAINTENANCE:</b> Introduction – Safety equipment – Health and safety procedure – Personnel Protective Equipment – Safe working practices - Safety Signs. Plant Maintenance: Introduction – objectives – importance.	<b>6</b>

	Types of Maintenance: Break down maintenance – Preventive maintenance – Predictive Maintenance. TPM: introduction – objectives - Steps of TPM process.	
<b>III</b>	<b>QUALITY AND STANDARDS:</b> Definition of Quality – Total Quality Management - introduction – basic concepts – Quality Council – objectives. 5S Principle – Sort, Set in Order, Shine, Standardise and Sustain. – Necessity of 5S – Six Sigma – Essential elements – Methodologies – Six Sigma belt. ISO standards – Intellectual Property Rights - Engineering Ethics. Brief description only.	6
<b>IV</b>	<b>BASICS OF ENGINEERING:</b> Tolerance - limits – Deviation – Allowance – Definitions only. Types of tolerances: Unilateral, Bilateral – Fits – Types of fits. List of important materials used for building construction – Requirements of water for construction. Mortar: Types and its properties. Concrete: constituents – requirements. Types of roofing – Types of foundation – requirements of good foundation – Standard sizes of doors and windows. Weathering course: purpose – materials required. Earth quake: types of earth quake and its remedial measures. Rain water harvesting – types - importance. Electrical flux – electrical flux density – electrical field intensity – current – EMF – potential difference – resistivity – ohms law – work – power – energy – Kirchhoff's law – definitions only.	8
<b>V</b>	<b>INDUSTRY 4.0</b> Industrial revolution – Definition - Industry 4.0 - Definition – Key trends. Components: Big data – Cloud computing – Internet of Things – Simulation – Autonomous Robots – Augmented reality – Cyber security – System integration – Additive manufacturing. Evolution of Industry 4.0 – Global readiness – Global trend – Initiative by industries and Government – Importance of Industry 4.0.	6

### **Reference Books:**

1. Basic Manufacturing “Roger Timings” Third Edition – Newnes, An imprint of Elsevier.
2. Industrial Organisation and Engineering Economics – “T.R. Banga, S.C.Sharma”- Khanna Publishers
3. Industrial Engineering and Management “O.P.Khana” – Dhanbat Rai Publications.
4. Machine Drawing -K.L.Narayana, P.kannaiah, K.Venkatareddy – New Age International Publishers.
5. Elements of Civil Engineering - M.S.Palanisamy – Tata Mc Grawhill Publication.
6. A Text Book of Electrical Technology B.L.Theraja, A.K.Theraja – S.Chand& Company Ltd.
7. IJTSRD Conference Issue | March 2019 - The Fourth Industrial Revolution (I4.0) in India Challenges & Opportunities by Viraj Vijay Jadhav, Ravindra Mahadeokar.
8. Industry4.0 – All India Management Association report.
9. CII Reports.

## CONTENTS: PRACTICAL PORTION

### WORKSHOP PRACTICAL

Note:

1. The observation note book or observation manual may be used. 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.
2. The proper safety procedure and norms should be followed with proper uniform (Khaki pant & shirt) with shoe during the practices.

### **BASIC ENGINEERING MANUFACTURING PRACTICE**

**24Hrs.**

(Tutorial – 6 Hrs. Practice – 18 Hrs.)

#### **Objective:**

At the end of this course, the students will be able to

- Know the basic workshop production processes and general safety precautions inside the shop.
- Read and interpret job drawings.
- Identify suitable marking and measuring tools for metal and wood materials.
- Select and use various cutting and filing tools for metal works.
- Select and use various chiselling and planing tools for woodworks.
- Learn different metal working operations like marking, cutting, filing, drilling, tapping etc.
- Understand different wood working operations like marking, planing, chiselling, sawing etc.
- Study and handle drilling machine and work holding devices.
- Produce jobs as per specified dimensions and inspect the job for the quality.
- Study the basic measuring instruments and measurements.

#### **Skills:**

- Ability to read job drawing
- Ability to identify and select proper material, tools, equipment and machine.
- Ability to set tools, work piece, and machines for desired operations.
- Ability to use safety equipment and follow safety procedures during operations.
- Ability to complete job as per job drawing in allotted time.
- Ability to measure and inspect the job for confirming desired dimensions and shape.
- Ability to acquire hands-on experience.
- Ability to use of workshop practices in day today industrial and domestic life helps to dissolve the problems.



## Syllabus

**Introduction of Manufacturing:** Definition – Type of manufacturing: Casting Process – Forming Process – Joining Process – Material removal process – Material addition Process.

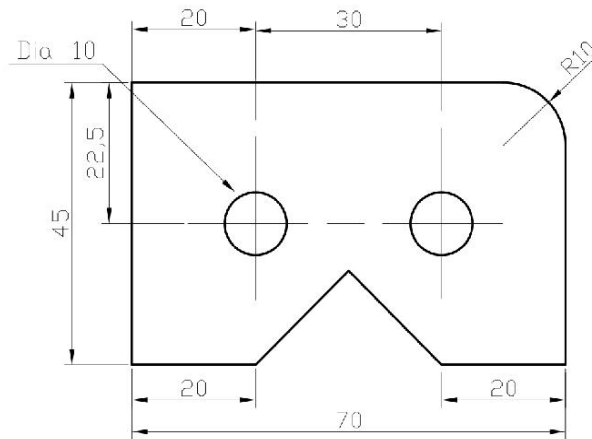
**Bench work:** Metal work (Fitting) and Wood work (Carpentry) – Selection of material – Types of materials - Holding Devices - Striking Tools - Cutting Tools - Measuring and Marking tools- Power tools. Steps/procedures to prepare a part. Safety precautions in workshop.

### **Exercises**

**Note:** Practices should be given to cover all the operations. All the students should be given sufficient practice to do the below exercises for the board practical examinations. Importance should be given for the measurement and dimensions.

#### **Exercise 1**

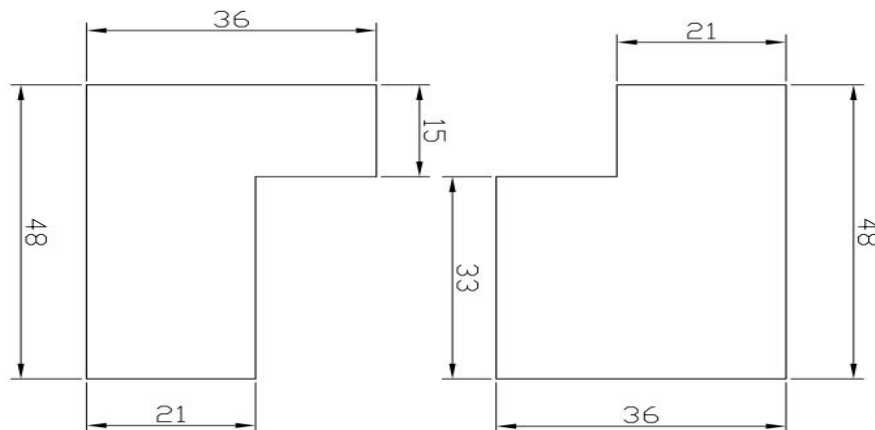
Raw material: 75mm X 50mm X 3 mm thick M.S. flat – 1 No.



All dimensions are in mm

#### **Exercise 2**

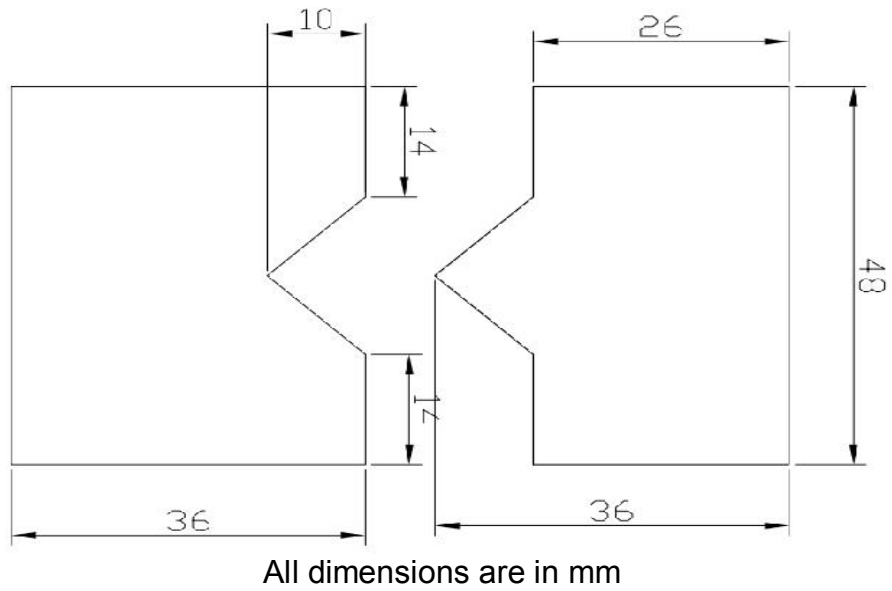
Raw material: 50mm X 40mm X 3 mm thick M.S. flat – 2Nos.



All dimensions are in mm

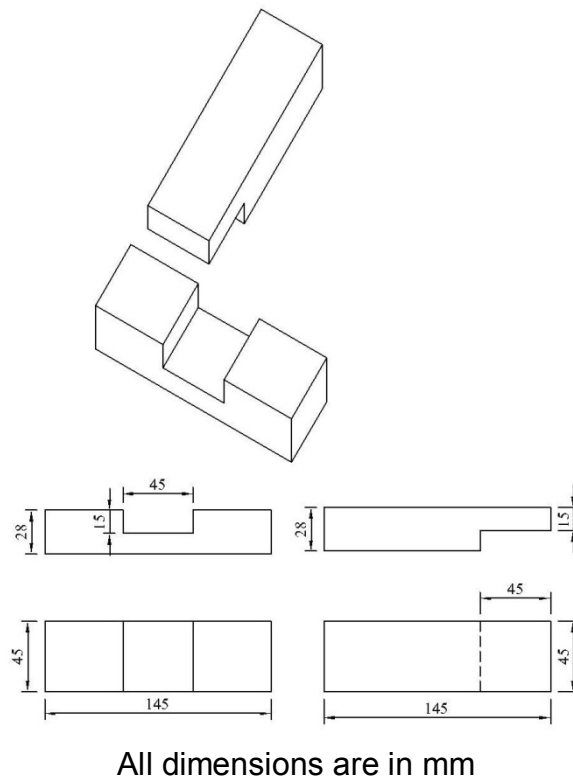
### Exercise 3

Raw material: 50mm X 40mm X 3 mm thick M.S. flat – 2Nos



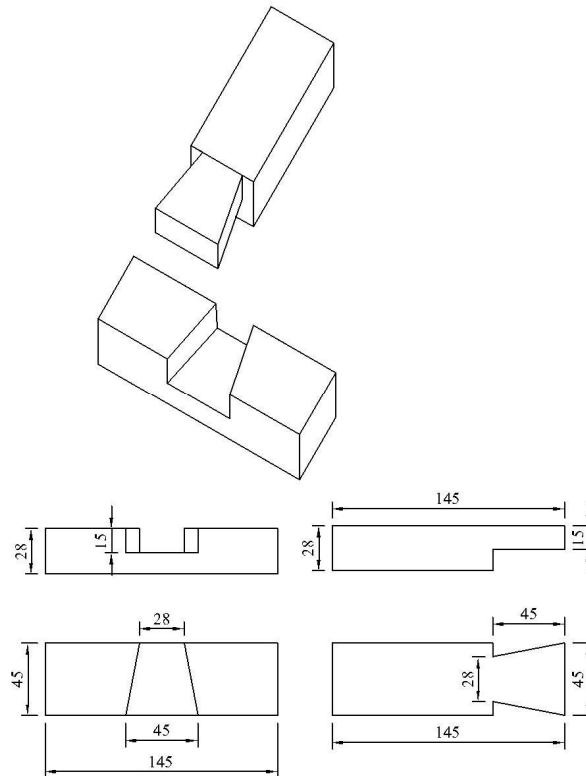
### Exercise 4

Raw material: 150 mm X 50mm X 30mm thick Wood – 2Nos.



## Exercise 5

Raw material: 150 mm X 50mm X 30mm thick Wood –2 Nos.



All dimensions are in mm

## BASIC SERVICE AND MAINTENANCE PRACTICE

**24Hrs.**

(Tutorial – 6 Hrs. Practice – 18 Hrs.)

### Objective:

At the end of this course, the students will be able to

- Identify, select and use various wires and colour codes practiced in the industry.
- Adopt safety practices while working with electric power supply.
- Able to know about the basic tools and measuring equipment.
- Understand the importance of earthing.
- Identify and make use of different electrical fittings and accessories.
- Read and understand circuit diagram and symbols.
- Practice simple wiring based on the circuit.
- Ability to use multimeter for measurements.
- Identify, select and use various plumbing tools and components
- To install pipes and accessories.
- To repair or replace components In case of water leakages.
- To make use of PVC pipes, pipe fittings and accessories.
- To know about different plumbing layouts and pipe joints.
- Pipe threading using standard die sets.

## Skills:

- Ability to read circuit diagram.
- Ability to identify and select proper wires and tools.
- Ability to follow safety procedures during work.
- Ability to complete connections as per circuit in allotted time.
- Ability to check the connections and measure the voltage.
- Ability to read layout diagram.
- Ability to identify and select proper pipes, accessories and tools.
- Ability to follow safety procedures during work.
- Ability to complete connections as per layout in allotted time.
- Ability to check the leakages in connections.
- Ability to acquire hands-on experience

## Syllabus

Electricity - Ohm's Law - current – voltage - resistor – capacitor – inductor - Wiring materials – Conducting materials - Insulating materials - Semiconductor materials - Types of switches – Types of holders – wiring accessories and tools – types of casings – MCB – types of wiring - Wiring colour codes. Distribution Board – Types of wiring circuit - Electrical hazard - First Aid for Electrical Emergencies, Rescue techniques. Lux: Definition – Use. Earthing: different methods – Importance – how to Improve of earth resistance - Earth Leakage circuit breaker (ELCB) - BIS provision.

Plumbing: Introduction- important equipment, tools and accessories for installation and service in piping systems- plumbing fixtures. Pipes: types of materials - Pipe fittings - Power tools. Marking and measuring tools

**Note: Students should draw the circuit diagram / block diagram and collect the components according to their requirement. The connections should be done by the student in a board and should be verified. Suitable safety precautions should be made accordingly.**

### Exercise 6:

Draw the circuit and connect the LED bulb, Tube light and one plug point socket with individual switch control in a board. Measure the current and voltage for various loads.

### Exercise 7:

Draw the circuit and connect two lamps in series and parallel with switch control in a board. Measure the current and voltage.

**Exercise 8:**

Draw the circuit and connect stair case wiring for a LED bulb using two-way switches In a board.

**Exercise 9:**

Draw a block diagram and install a sink / wash basin with tap using PVC pipe and accessories such as gate valve, bend / elbow, tee, coupling, water meter etc. with draining system.

**Exercise 10:**

Draw a block diagram and provide the tap connection with water meter and gate valve from overhead tank and rectify the leakages in tap and pipeline. Also measure the flow through the water meter.

**Internal Mark Allocation**

Assignment (Theory portion)*	- 10
Practical (Observation (5) and Record work(5))	- 10
Attendance	- 5
<b>Total</b>	<b>- 25</b>

**Note: \* Three assignments should be submitted. The same must be evaluated and converted to 10 marks.**

Guidelines for assignment:

First assignment – Unit I & II

Second assignment – Unit III & IV

Third assignment – All Units

Each assignment should have five two marks questions and two five marks questions.

## BOARD EXAMINATION

### Note

1. The students should be taught theory portion and proper training in all the exercises. All the portions should be completed before examinations.
2. The students should maintain theory assignment, observation note book / manual and record notebook. The assignment and record note book 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 any ONE exercise (50 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 theory question and answer: 45 Marks  
Ten questions will be asked for 2 marks each. Two questions from each unit.  
(10 X 2 = 20).  
Five questions will be asked for 5 marks each. One question from each unit.  
(5 X 5 = 25)
6. Required instruments / equipments / tools should be available for the batch strength as prescribed for practice and examination.
7. The external examiner should verify the availability of the equipments / instruments for the batch strength before the commencement of Practical Examination.

### DETAILED ALLOCATION OF MARKS

	Description				Marks
A	Theory Question and Answer (5 X 9 = 45 Marks)				45
B	BASIC ENGINEERING PRODUCTION PRACTICE	(OR)	BASIC SERVICE AND MAINTENANCE PRACTICE		50
	Marking, Cutting / Planning. Tools list	15	Circuit diagram / Block Diagram. Tools list	15	
	Filing / Chiseling, Dimensions	25	Connection, Checking	25	
	Finish	10	Finish	10	
C	Viva voce				5
<b>TOTAL</b>					<b>100</b>

## TOOLS REQUIRED

Bench Vice - Fitted in the work bench	15 Nos.
Carpentry Vice - Fitted in the work bench	10 Nos.
Drilling machine (Separate in the First Year)	2 Nos.
Wiring board with stand	10 Nos.
Plumbing board with stand	10 Nos.
File flat 150 mm rough	10 Nos.
Fie flat 150 mm smooth	10 nos.
File flat 300mm rough / smooth	5 Nos. each
File round 150mm rough / smooth	5 Nos. each
File triangular 150mm rough / smooth	10 Nos. each
File half round 150 mm rough / smooth	10 Nos.
Steel rule 300 mm	30 Nos.
Vernier caliper	10 Nos.
Vernier height gauge	3 Nos.
Try square 200 mm	20 Nos.
Scriber	10 Nos.
Marking Gauges	10 Nos.
Mortise gauge	5 Nos.
Divider	10 Nos.
Caliper Inside and Outside	10 Nos. each
Spring Caliper	10 Nos. each
Carpenters folding rule	10 Nos.
Saws	5 Nos.
Tenon saw	5 Nos.
Bow saw	5 Nos.
Keyhole saw	5 Nos.
Firmer chisel	10 Nos.
Beveled chisel	10 Nos.
Mortise chisel	10 Nos.
Jack plane	10 nos.
Screw Driver 100 mm	10 Nos.
Cutting Pliers insulated	10 Nos.
Knife Electrician D.B.	10 Nos.
Hammer Ball peen. 0.25 Kg	10 Nos.
Plumb bob 115 grams	5 Nos.
Neon tester pencil bit type 500 volt	10 Nos.
Spanner set DE Set of 6 from 6x7 to 16x7	5 Nos.

Spanner set Ring Set of 6 from 6x7 to 16x7	5 Nos.
Pliers flat nose insulated 150mm	5 Nos.
Pliers round nose insulated 200mm	3 Nos.
Pliers long nose insulated 200mm	3 Nos.
Screw driver heavy duty 200mm	3 Nos.
Screw driver heavy duty 300 mm	3 Nos.
Screw driver set 100-300 mm	5 Nos.
Soldering iron 60 w/230 v	5 Nos.
Center punch 100mm	10 Nos.
Wooden mallet 1 kg	10 Nos.
Firmer chisel 1"	10 Nos.
Firmer chisel ½"	10 Nos.
Hammer Ball Peen 0.50 kg.	10 Nos.
Hammer cross Peen 0.50 kg.	5 Nos.
Adjustable spanner 300mm	3 Nos.
Allen keys Set 5 to 11	2 set
Spirit level 300mm	3 No.
Rubber gloves 5000volts	10 pairs
Multi meter AC/DC	5 Nos.
Water meter	2 Nos.
Electrical hand power drilling machine 12mm	1 No.
Megger (Insulation tester) 500 volts	1 Nos.
Pipe cutting machine	2 Nos.
Pipe bending machine	2 Nos.
Rubber matting 2meter x 1meter x 9mm	2 nos.
Fire extinguishers Dry chemical 5 Kg	4 Nos.
Consumables	Required quantity
Additional tools and instruments	Required quantity
(To complete the exercises)	



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