



No. 39309 Date 6/9/18

To  
Principals of All Polytechnics

Sub: Final Revised syllabus of 1<sup>st</sup> & 2<sup>nd</sup> semester w.e.f 2018-19 session

Sir,

In continuation to this office letter No. 3684 dt. 16.8.2018, I am to say that, after discussion in the Polytechnic Principals' meeting held on 25/8/2018, and subsequent deliberations in the council, the final revised Syllabus for 1<sup>st</sup> & 2<sup>nd</sup> semester Diploma Engineering courses effective from 2018-19 session is hereby circulated with the following changes in the norms and contents. This syllabus shall be applicable for all diploma courses approved by AICTE, New Delhi under Engineering and Technology Programme and affiliated to this council w.e.f. 2018-19.

1. The conditions on selection of subjects specified in the above letter is hereby relaxed. Individual institution can select the subjects, where alternatives are available depending on the students strength and varieties of branches available with them, subject to condition that all students of a particular branch shall be offered only one of the alternative subjects and no part of students in a branch can be offered different alternative subject. The Institutions are to upload the subjects offered for different branches in SCTE&VT web portal to be notified in due course of time, so that the same can be followed from coming 1<sup>st</sup> semester onwards.
2. Engg. Mechanics and Basic Electrical Engg. & Electronics Engg. shall be offered as alternate to each other in both 1<sup>st</sup> & 2<sup>nd</sup> semester to be selected by the institute.
3. Subject contents of Communicative English, Basic Electrical & Electronics Engineering have been partially modified.
4. The Total Marks in a semester have been made as 750

Lateral Entry students admitted during 2018-19 shall appear the subjects of 1<sup>st</sup> and 2<sup>nd</sup> semester like previous year.

The students should be encouraged to undergo Internship Training during Summer Vacation to enhance their Skill and Employability.

Encl: As above

Yours faithfully

Controller of Examination

**STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA**

**TEACHING AND EVALUATION SCHEME FOR 1st Semester (COMMON TO ALL ENGINEERING COURSES)(wef 2018-19)**

Subject Code	Subject	Periods/week			Evaluation Scheme			
		L	T	P	Mid Sem Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
<b>Theory</b>								
Th.1a Th.1b	Communicative English <b>OR</b> Computer Application	4	-	-	20	80	3	100
Th.2a Th.2b	Engineering Physics <b>OR</b> Engineering Chemistry	4	-	-	20	80	3	100
Th.3	Engineering Mathematics-I	5	1	-	20	80	3	100
Th.4 Th.4a&b	Engg. Mechanics <b>OR</b> Basic Electrical & Electronics Engg.	4			20	80	3	100
	<i>Total</i>	17	-		80	320	-	400
<b>Practical</b>								
Pr.1a Pr.1b	Comm. English Lab <b>OR</b> Computer application Lab	-	-	4	50	-	-	50
Pr.2a Pr.2b	Engg. Physics Lab <b>OR</b> Engg. Chemistry Lab	-	-	4	50	50	3	100
Pr.3a Pr.3b	Engineering Drawing <b>OR</b> Workshop Practice	-	-	6	50	100	3 4	150
Pr.4	Seminar			4	50			50
	Student Centred Activities(SCA)		-	3	-	-	-	-
	<i>Total</i>	-	-	21	200	150	-	350
	<b>Grand Total</b>	<b>17</b>	<b>1</b>	<b>21</b>	<b>280</b>	<b>470</b>	<b>-</b>	<b>750</b>

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

**SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies etc. Seminar and SCA shall be conducted in a section.**

**There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester**

**In Th.4a&b Basic Electrical & Electronics Engg. paper there shall be examination in separate Answer books for Th.4a Basic Electrical Engg. and Th.4b Basic Electronics Engg. in the same sitting**

**STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA**

**TEACHING AND EVALUATION SCHEME FOR 2nd Semester (COMMON TO ALL ENGINEERING COURSES)(wef 2018-19)**

Subject Code	Subject	Periods/week			Evaluation Scheme			
		L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
<b>Theory</b>								
Th.1a Th.1b	Communicative English <b>OR</b> Computer Application	4	-	-	20	80	3	100
Th.2a Th.2b	Engineering Physics <b>OR</b> Engineering Chemistry	4	-	-	20	80	3	100
Th.3	Engineering Mathematics-II	5	1	-	20	80	3	100
Th.4 Th.4a&b	Engg. Mechanics <b>OR</b> Basic Electrical & Electronics Engg.	4			20	80	3	100
	<i>Total</i>	<i>17</i>	<i>1</i>		<i>80</i>	<i>320</i>	<i>-</i>	<i>400</i>
<b>Practical</b>								
Pr.1a Pr.1b	Comm. English Lab <b>OR</b> Computer application Lab	-	-	4	50	-	-	50
Pr.2a Pr.2b	Engg. Physics Lab <b>OR</b> Engg. Chemistry Lab	-	-	4	50	50	3	100
Pr.3a Pr.3b	Engineering Drawing <b>OR</b> Workshop Practice	-	-	6	50	100	3 4	150
Pr.4	Seminar			4	50			50
	Student Centred Activities(SCA)		-	3	-	-	-	-
	<i>Total</i>	<i>-</i>	<i>-</i>	<i>21</i>	<i>200</i>	<i>150</i>	<i>-</i>	<i>350</i>
	<b>Grand Total</b>	<b>17</b>	<b>1</b>	<b>21</b>	<b>280</b>	<b>470</b>	<b>-</b>	<b>750</b>

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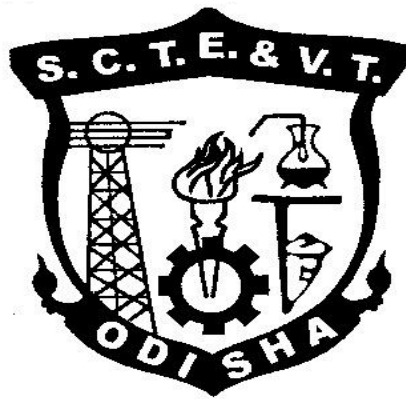
**In Th.4a&b Basic Electrical & Electronics Engg. paper there shall be examination in separate Answer books for Th.4a Basic Electrical Engg. and Th.4b Basic Electronics Engg. in the same sitting**

# **CURRICULLUM OF 1<sup>ST</sup> & 2<sup>ND</sup> SEMESTER**

**For**

**DIPLOMA IN ENGINEERING**

**(Effective FROM 2018-19 Session)**



**STATE COUNCIL FOR TECHNICAL EDUCATION  
& VOCATIONAL TRAINING, ODISHA,  
BHUBANESWAR**

# Th.1a. COMMUNICATIVE ENGLISH

(1<sup>st</sup> & 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

I.A : 20 Marks  
Term End Exam : 80 Marks  
TOTAL MARKS : 100 Marks

## Topic- wise distribution of periods with marks

S.L. No.	Topics	Periods
I	Literature Appreciation	20
II	Vocabulary	05
III	Application of Grammar	08
IV	Formal writing skills	15
V	Elements of communication	12
	• Introduction to communication	
	• Professional communication	
	• Nonverbal communication	
	Total	60

## OBJECTIVE

To comprehend the given passage

To answer correctly the questions on seen and unseen passages

To increase the vocabulary

To apply rules of grammar for flawless writing

To understand and use the basic concepts of communication in an organized set up and social context

To give a positive feedback in various situation, to use appropriate body language and to avoid barrier for effective communication

To improve writing skill

## Unit-I

### LITERATURE APPRECIATION

#### 1. Reading comprehension

Sub-skills of reading comprehension are to be worked out and tested through an unseen passage in about 200-500 words.

A student should get acquainted with sub-skills of reading for the purpose of:

- Skimming the gist
- Scanning for necessary information
- Close reading for inference and evaluation
- Main idea and supporting points
- Guessing the meaning of un-familiar words
- Note- making
- Summarizing
- Supplying a suitable title

#### 2. Text

The following chapter from “**Invitation to English**”, **Book-1** for +2 students of CHSE, Odisha.2016 reprint to be covered in class room:

- **Standing Up For Yourself** By Yevgeny Yevtushenko

- **The Magic Of Teamwork** By Sam Pitroda
- **Inchcape Rock** By Robert Southey
- **To My True Friend** By Elizabeth Pinard

The student is to answer comprehension questions from these chapters in the end examination.

## **UNIT- II**

### **VOCABULARY**

Use of synonyms, antonyms

- Same word used in different situations in different meaning
- Single word substitute

## **Unit-III**

### **APPLICATION OF ENGLISH GRAMMAR**

- Countable and Uncountable Noun
- Articles and Determiners
- Modal Verbs
- Tenses
- Voice-change
- Subject-verb Agreement

## **UNIT-IV**

### **FORMAL WRITING SKILLS**

1. Paragraph writing
  - Meaning
  - Features of Paragraph Writing ( Topic Statement, Supporting Points and Plot Compatibility)
  - Developing Ideas into Paragraphs ( Describing Place/ Person/ Object /Situation and any general topic of interest)
2. Notice
3. Agenda
4. Report writing (Format of a Report, Reporting an event / news)
5. Writing personal letter
6. Letter to the Principal, Librarian, Head of the Deptt, and Hostel Superintendent
7. Writing Business letters
  - Layout of a Business Letter
  - Letter of Enquiry, Placing an Order, Execution of an Order, Complaint, Cancellation of an order(Features, Format and example)
8. Job application and C.V.(Features, Format and example)

## **UNIT-V**

### **ELEMENTS OF COMMUNICATION**

#### **A. Introduction to Communication**

1. Meaning, Definition and concept of communication
2. Good Communication and Bad Communication
3. Communication model
  - One-way Communication Model and Two-way Communication Model with examples
4. Process of communication and factors responsible for it
  - Sender, Message, Channel, Receiver / Audience, Feedback, Noise, Context

#### **B. Professional Communication**

1. Meaning of professional communication
2. Types of professional communication
  - 2.1. Formal or Systematic Communication
    - Upward communication (How it takes place, symbol, merits and demerits)
    - Down-ward communication (How it takes place, symbol, merits and demerits)

- Parallel communication (How it takes place, symbol, merits and demerits)
- 2.2. Informal communication
- Grape vine communication (How it takes place, symbol, merits and demerits)

#### **D. Non- Verbal Communication**

1. Meaning of nonverbal Communication
2. Different areas of Non-verbal Communication
  - Kinesics or Body Language (Postures and Gestures, Facial Expression and Eye Contact)
  - Proxemics or Spatial Language (Private Space, Personal Space, Social Space, Public Space)
  - Language of Signs and Symbols(Audio Sign and Visual Sign in everyday life with merits and demerits)

#### **Syllabus Coverage up to I.A**

1. Reading Comprehension
2. Standing Up by Yourself
3. Use of Synonyms and Antonyms
4. Notice
5. Agenda

#### **Books Recommended:**

Invitation to English, Book-1, (for +2 students), CSHE (2016 reprint), Odisha  
 Invitation to English, Book-2, (for +2 students), CSHE (2016 reprint), Odisha  
 Invitation to English, Book-3, (for +2 students), CSHE (2016 reprint), Odisha  
 Invitation to English, Book-4, (for +2 students), CSHE (2016 reprint), Odisha  
 Wren and Martin High School English Grammar, Dr. NDV Prasad Rao, S. Chand Publication  
 Communication Skills, Sanjay Kumar and Puspalata, Oxford University Press

## Th.1b. COMPUTER APPLICATION

(1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

I.A : 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

### Objective:

The students will get to know about the fundamentals of computer. They will get acquainted with various components of computer hardware, software etc. Idea on Role of operating system and its usability will also be known. Knowledge on word processing, electronic spreadsheet, presentation software and Internet will also be acquired. The students will be given brief knowledge about Programming methodology and C programming.

### Topic wise distribution of periods

Sl. No.	Topics	Periods
1	Computer Organisation	05
2	Computer Software	07
3	Computer Network and Internet	08
4	File Management and Data Processing	05
5	Problem Solving Methodology	05
6	Overview of C Programming language	15
7	Advanced features of C	15
	<b>TOTAL</b>	<b>60</b>

### 1. COMPUTER ORGANISATION

Introduction to Computer Evolution of Computers Generation of Computers Classification of Computers  
Basic Organisation of Computer (Functional Block diagram) Input Devices, CPU & Output Devices.  
Computer Memory and Classification of Memory

### 2. COMPUTER SOFTWARE

Software concept, System software, Application software  
Overview of Operating System Objectives and Functions of O.S ,  
Types of Operating System: Batch Processing, Multiprogramming, Time Sharing OS  
Features of DOS, Windows and UNIX  
Programming Languages Compiler, interpreter Computer Virus  
Different Types of computer virus  
Detection and prevention of Virus  
Application of computers in different Domain

### 3. COMPUTER NETWORK AND INTERNET

Networking concept, Protocol, Connecting Media, Data Transmission mode  
Network Topologies, Types of Network  
Networking Devices like Hub, Repeater, Switch, Bridge, Router, Gateway & NIC  
Internet Services like E-Mail, WWW, FTP, Chatting, Internet Conferencing,  
Electronic Newspaper & Online Shopping  
Different types of Internet connectivity and ISP



#### **4. FILE MANAGEMENT AND DATA PROCESSING**

Concept of File and Folder  
File Access and Storage methods. Sequential, Direct, ISAM  
Data Capture, Data storage  
Data Processing and Retrieval

#### **5. PROBLEM SOLVING METHODOLOGY**

Algorithm, Pseudo code and Flowchart Generation of Programming Languages  
Structured Programming Language  
Examples of Problem solving through Flowchart

#### **6. OVERVIEW OF C PROGRAMMING LANGUAGE**

Constants, Variables and Data types in C Managing Input and Output operations.  
Operators, Expressions, Type conversion & Typecasting  
Decision Control and Looping Statements (If, If-else, If-else-if, Switch, While, Do-while, For, Break, Continue & Goto)  
Programming Assignments using the above features.

#### **7. ADVANCED FEATURES OF C**

Functions and Passing Parameters to the Function (Call by Value and Call by Reference) Scope of Variables and Storage Classes  
Recursion Function and Types of Recursion  
One Dimensional Array and Multidimensional Array  
String Operations and Pointers  
Pointer Expression and Pointer Arithmetic Programming Assignments using the above features. Structure and Union (Only concepts, No Programming)

### **Syllabus coverage upto I.A**

Chapter- 1,2 3,4

#### **Books Recommended**

1. Computer Fundamentals and Programming in C by Reema Thareja, Oxford University Press
2. Programming in ANSI C by A.N Kamthane, Pearson Education
3. Computer Application by Kalyani Publisher
4. Let us C by Y. Kanetkar, BPB
5. Computer Fundamentals, by E. Balaguruswamy, TMH

## **Th.2a. Engineering Physics** (1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

I.A: 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

<b>Unit</b>	<b>Topic</b>	<b>No. of periods</b>
1	UNITS & DIMENSIONS	03
2	SCALARS & VECTORS	03
3	KINEMATICS	06
4	WORK & FRICTION	05
5	GRAVITATION	05
6	OSCILLATIONS & WAVES	06
7	HEAT & THERMODYNAMICS	07
8	OPTICS	04
9	ELECTROSTATICS & MAGNETOSTATICS	07
10	CURRENT ELECTRICITY	06
11	ELECTROMAGNETISM & ELECTROMAGNETIC INDUCTION	05
12	MODERN PHYSICS	03
TOTAL :		60 Periods

### **UNIT 1 - UNITS AND DIMENSIONS**

- 1.1 Physical quantities - (Definition).
- 1.2 Definition of fundamental and derived units, systems of units (FPS, CGS, MKS and SI units).
- 1.3 Definition of dimension and Dimensional formulae of physical quantities.
- 1.4 Dimensional equations and Principle of homogeneity.
- 1.5 Checking the dimensional correctness of Physical relations.

### **UNIT 2 - SCALARS AND VECTORS**

- 2.1 Scalar and Vector quantities (definition and concept), Representation of a Vector – examples, types of vectors.
- 2.2 Triangle and Parallelogram law of vector Addition (Statement only). Simple Numerical.
- 2.3 Resolution of Vectors – Simple Numericals on Horizontal and Vertical components.
- 2.4 Vector multiplication (scalar product and vector product of vectors).

### **UNIT 3 - KINEMATICS**

- 3.1 Concept of Rest and Motion.
- 3.2 Displacement, Speed, Velocity, Acceleration & FORCE (Definition, formula, dimension & SI units).
- 3.3 Equations of Motion under Gravity (upward and downward motion) - no derivation.
- 3.4 Circular motion: Angular displacement, Angular velocity and Angular acceleration (definition, formula & SI units).
- 3.5 Relation between –(i) Linear & Angular velocity, (ii) Linear & Angular acceleration).
- 3.6 Define Projectile, Examples of Projectile.
- 3.7 Expression for Equation of Trajectory, Time of Flight, Maximum Height and Horizontal Range for a projectile fired at an angle, Condition for maximum Horizontal Range.

#### **UNIT 4 – WORK AND FRICTION**

- 4.1 Work – Definition, Formula & SI units.
- 4.2 Friction – Definition & Concept.
- 4.3 Types of friction (static, dynamic), Limiting Friction (Definition with Concept).
- 4.4 Laws of Limiting Friction (Only statement, No Experimental Verification).
- 4.5 Coefficient of Friction – Definition & Formula, Simple Numericals.
- 4.6 Methods to reduce friction.

#### **UNIT 5 - GRAVITATION**

- 5.1 Newton's Laws of Gravitation – Statement and Explanation.
- 5.2 Universal Gravitational Constant (G)- Definition, Unit and Dimension.
- 5.3 Acceleration due to gravity (g)- Definition and Concept.
  
- 5.4 Definition of mass and weight.
- 5.5 Relation between g and G.
- 5.6 Variation of g with altitude and depth (No derivation – Only Explanation).
- 5.7 Kepler's Laws of Planetary Motion (Statement only).

#### **UNIT 6 - OSCILLATIONS AND WAVES**

- 6.1 Simple Harmonic Motion (SHM) - Definition & Examples.
- 6.2 Expression (Formula/Equation) for displacement, velocity, acceleration of a body/ particle in SHM.
- 6.3. Wave motion – Definition & Concept.
- 6.4 Transverse and Longitudinal wave motion – Definition, Examples & Comparison.
- 6.5 Definition of different wave parameters (Amplitude, Wavelength, Frequency, Time Period.
- 6.6 Derivation of Relation between Velocity, Frequency and Wavelength of a wave
- 6.7 Ultrasonics – Definition, Properties & Applications.

#### **UNIT 7 - HEAT AND THERMODYNAMICS**

- 7.1 Heat and Temperature – Definition & Difference
- 7.2 Units of Heat (FPS, CGS, MKS & SI).
- 7.3 Specific Heat (concept, definition, unit, dimension and simple numerical)
- 7.4 Change of state (concept), Latent Heat (concept, definition, unit, dimension and simple numerical)
- 7.5 Thermal Expansion – Definition & Concept
- 7.6 Expansion of Solids (Concept)
- 7.7 Coefficient of linear, superficial and cubical expansions of Solids – Definition & Units.
- 7.8 Relation between  $\alpha$ ,  $\beta$  &  $\gamma$
- 7.9 Work and Heat - Concept & Relation.
- 7.10 Joule's Mechanical Equivalent of Heat (Definition, Unit)
- 7.11 First Law of Thermodynamics (Statement and concept only)

#### **UNIT 8 – OPTICS**

- 8.1 Reflection & Refraction – Definition.
- 8.2 Laws of reflection and refraction (Statement only)
- 8.3 Refractive index – Definition, Formula & Simple numerical.
- 8.4 Critical Angle and Total internal reflection – Concept, Definition & Explanation
- 8.5 Refraction through Prism (Ray Diagram & Formula only – NO derivation)..
- 8.6 Fiber Optics – Definition, Properties & Applications.

#### **UNIT 9 – ELECTROSTATICS & MAGNETOSTATICS**

- 9.1 Electrostatics – Definition & Concept.
- 9.2 Statement & Explanation of Coulombs laws, Definition of Unit charge.
- 9.3 Absolute & Relative Permittivity ( $\epsilon$ ) – Definition, Relation & Unit.

- 9.4 Electric potential and Electric Potential difference (Definition, Formula & SI Units).
- 9.5 Electric field, Electric field intensity (E) – Definition, Formula & Unit.
- 9.6 Capacitance - Definition, Formula & Unit.
- 9.7 Series and Parallel combination of Capacitors (No derivation, Formula for effective/Combined/total capacitance & Simple numericals).
- 9.8 Magnet, Properties of a magnet.
- 9.9 Coulomb's Laws in Magnetism – Statement & Explanation, Unit Pole (Definition).
- 9.10 Magnetic field, Magnetic Field intensity (H) - (Definition, Formula & SI Unit).
- 9.11 Magnetic lines of force ( Definition and Properties)
- 9.12 Magnetic Flux ( $\Phi$ ) & Magnetic Flux Density (B) – Definition, Formula & Unit.

### **UNIT 10 – CURRENT ELECTRICITY**

- 10.1 Electric Current – Definition, Formula & SI Units.
- 10.2 Ohm's law and its applications.
- 10.3 Series and Parallel combination of resistors (No derivation, Formula for effective/ Combined/ total resistance & Simple numericals).
- 10.4 Kirchhoff's laws (Statement & Explanation with diagram).
- 10.5 Application of Kirchhoff's laws to Wheatstone bridge - Balanced condition of Wheatstone's Bridge – Condition of Balance (Equation).

### **UNIT 11 – ELECTROMAGNETISM & ELECTROMAGNETIC INDUCTION**

- 11.1 Electromagnetism – Definition & Concept.
- 11.2 Force acting on a current carrying conductor placed in a uniform magnetic field, Fleming's Left Hand Rule
- 11.3 Faraday's Laws of Electromagnetic Induction (Statement only)
- 11.4 Lenz's Law (Statement)
- 11.5 Fleming's Right Hand Rule
- 11.6 Comparison between Fleming's Right Hand Rule and Fleming's Left Hand Rule.

### **UNIT 12 - MODERN PHYSICS**

- 12.1 LASER & laser beam (Concept and Definition)
- 12.2 Principle of LASER (Population Inversion & Optical Pumping)
- 12.3 Properties & Applications of LASER
- 12.4 Wireless Transmission – Ground Waves, Sky Waves, Space Waves ( Concept & Definition)

### **RECOMMENDED BOOKS**

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
3. Text Book of Engineering Physics by Barik, Das, Sharma, Kalyani Publisher
4. Concepts in Physics by H. C. Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi

### **Syllabus coverage upto I.A**

Units 1,2,3,4,5,6

## Th.2b. Engineering Chemistry (1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

I.A : 20 Marks  
Term End Exam : 80 Marks  
TOTAL MARKS : 100 Marks

### Objective:

Engineering Chemistry is concerned with the changes of matters with its environment and an ever growing subject. So, the aim of teaching Engineering Chemistry in Diploma Courses is to acquaint the students with the basic Chemistry of different materials used in industry and to equip the students with the basic principles of chemical changes taking place in different aspects connected to engineering fields. They also develop the right attitude to cope up with the continuous flow of new technology.

### Topic wise distribution of periods

Sl. No	Topics/ Units	Periods
A	Physical Chemistry	22
B	Inorganic Chemistry	08
C	Organic Chemistry	10
D	Industrial Chemistry	20
	<b>TOTAL</b>	<b>60</b>

### A. PHYSICAL CHEMISTRY

**Chapter 1: Atomic structure** : Fundamental particles ( electron, proton & neutron Definition, mass and charge ).Rutherford's Atomic model ( postulates and failure), Atomic mass and mass number, Definition, examples and properties of Isotopes, isobars and isotones. Bohr's Atomic model ( Postulates only), Bohr-Bury scheme, Aufbau's principle, Hund's rule, Electronic configuration (up to atomic no 30).

**Chapter 2 : Chemical Bonding** : Definition , types ( Electrovalent, Covalent and Coordinate bond with examples ( formation of NaCl, MgCl<sub>2</sub>, H<sub>2</sub>,Cl<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>O, CH<sub>4</sub>, NH<sub>3</sub>, NH<sub>4</sub><sup>+</sup>, SO<sub>2</sub> ).

**Chapter 3 : Acid base theory** : Concept of Arrhenius, Lowry Bronsted and Lewis theory for acid and base with examples ( Postulates and limitations only). Neutralization of acid & base. Definition of Salt, Types of salts ( Normal, acidic, basic, double, complex and mixed salts, definitions with 2 examples from each).

**Chapter 4: Solutions** : Definitions of atomic weight, molecular weight, Equivalent weight. Determination of equivalent weight of Acid, Base and Salt.

Modes of expression of the concentrations ( Molarity , Normality & Molality) with Simple Problems. pH of solution ( definition with simple numericals )  
Importance of pH in industry ( sugar, textile, paper industries only)

**Chapter 5 : Electrochemistry** : Definition and types ( Strong & weak) of Electrolytes with example. Electrolysis ( Principle & process) with example of NaCl (fused and aqueous solution).

Faraday's 1st and 2<sup>nd</sup> law of Electrolysis ( Statement, mathematical expression and Simple numerical) Industrial application of Electrolysis- Electroplating ( Zinc only).

**Chapter 6 : Corrosion:** Definition of Corrosion, Types of Corrosion- Atmospheric Corrosion, Waterline corrosion. Mechanism of rusting of Iron only. Protection from Corrosion by (i) Alloying and (ii) Galvanization.

## **B. INORGANIC CHEMISTRY**

**Chapter 7 : Metallurgy:** Definition of Mineral, ores , gangue with example. Distinction between Ores And Minerals. General methods of extraction of metals,

- i) Ore Dressing
- ii) Concentration ( Gravity separation, magnetic separation, Froth floatation & leaching)
- iii) Oxidation (Calcinations, Roasting )
- iv) Reduction (Smelting, Definition & examples of flux, slag)
- v) Refining of the metal ( Electro refining, & Distillation only)

**Chapter 8 : Alloys:** Definition of alloy. Types of alloys ( Ferro, Non Ferro & Amalgam) with example. Composition and uses of Brass, Bronze, Alnico, Duralumin

## **C. ORGANIC CHEMISTRY**

**Chapter 9 : Hydrocarbons :** Saturated and Unsaturated Hydrocarbons ( Definition with example)

Aliphatic and Aromatic Hydrocarbons ( Huckle's rule only). Difference between Aliphatic and aromatic hydrocarbons

IUPAC system of nomenclature of Alkane, Alkene, Alkyne, alkyl halide and alcohol ( up to 6 carbons ) with bond line notation.

Uses of some common aromatic compounds ( Benzene, Toluene, BHC, Phenol, Naphthalene, Anthracene and Benzoic acid) in daily life.

## **D. INDUSTRIAL CHEMISTRY**

**Chapter 10 : Water Treatment :** Sources of water, Soft water, Hard water, hardness, types of Hardness (temporary or carbonate and permanent or non-carbonate), Removal of hardness by lime soda method ( hot lime & cold lime—Principle, process & advantages ) , Advantages of Hot lime over cold lime process.

Organic Ion exchange method ( principle, process, and regeneration of exhausted resins)

**Chapter 11 : Lubricants:** Definition of lubricant, Types ( solid, liquid and semisolid with examples only ) and specific uses of lubricants ( Graphite, Oils, Grease), Purpose of lubrication

**Chapter 12 : Fuel:** Definition and classification of fuel, Definition of calorific value of fuel, Choice of good fuel.

Liquid: Diesel, Petrol, and Kerosene --- Composition and uses.

Gaseous: Producer gas and Water gas (Composition and uses). Elementary idea about LPG, CNG and coal gas (Composition and uses only).

**Chapter 13 : Polymer:** Definition of Monomer, Polymer, Homo-polymer, Co-polymer and Degree of polymerization. Difference between Thermosetting and Thermoplastic, Composition and uses of Polythene, & Poly-Vinyl Chloride and Bakelite.

Definition of Elastomer ( Rubber). Natural Rubber (it's draw backs ). Vulcanisation of Rubber. Advantages of Vulcanised rubber over raw rubber.

**Chapter 14: Chemicals in Agriculture:** Pesticides: Insecticides, herbicides, fungicides- Examples and uses.

Bio Fertilizers: Definition, examples and uses.

## **Syllabus Coverage upto I.A**

Chapter 1,2,3,4,5,6

**Books Recommended**

1. Text Book of Intermediate Chemistry Part-1 and Part-2 by Nanda, Das, Sharma, Kalyani Publishers
2. Engg. Chemistry by B.K. Sharma, Krishna Prakashan Media Pvt. Ltd
3. Engineering Chemistry by Y.R. Sharma and P. Mitra, Kalyani Publishers
4. Engineering Chemistry for Diploma – Dr. R K Mohapatra, PHI Publication, New Delhi.
5. Engineering Chemistry- Jain & Jain, Dhanpat Roy and Sons.

## Th.3. ENGINEERING MATHEMATICS-I ( 1<sup>ST</sup> Sem Common)

Theory: 5 Periods per Week  
Total Periods: 75 Periods  
Examination: 3 Hours

I.A : 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

### OBJECTIVE:

1. This subject helps the students to develop logical thinking which is useful in comprehending the principles of all to the subjects.
2. Analytical and systematic approach towards any problem is developed through learning of this subject.
3. Mathematics being a versatile subject can be used at every stage of human life.

### Topic wise distribution of periods and marks

Sl. No.	Subject	Unit	Topic	Periods
A	Algebra	1	Matrices and Determinant	18
B	Trigonometry	2	Trigonometry	15
C	Two Dimensional Geometry	3	Co-ordinate Geometry in Two Dimensions (Straight Line)	13
		4	Circle	07
D	Three Dimensional Geometry	5	Co-ordinate Geometry in Three Dimensions	15
		6	Sphere	07
			<b>TOTAL</b>	<b>75</b>

### 1) MATRICES AND DETERMINANTS

- a) Types of matrices
- b) Algebra of matrices
- c) Determinant
- d) Properties of determinant
- e) Inverse of a matrix (second and third order)  
(Question should be on second order matrix)
- f) Cramer's Rule (Question should be on two variables)
- g) Solution of simultaneous equations by matrix inverse method  
(Question should be on two variables)

### 2) TRIGONOMETRY

- a) Trigonometrical ratios
- b) Compound angles, multiple and sub-multiple angles (only formulae)
- c) Define inverse circular functions and its properties (no derivation)

### 3) CO-ORDINATE GEOMETRY IN TWO DIMENSIONS (Straight line)

- a) Introduction of geometry in two dimension
- b) Distance formulae, division formulae, area of a triangle (only formulae no derivation)
- c) Define slope of a line, angle between two lines (only F), condition of perpendicularity and parallelism.
- d) Different forms of straight lines (only formulae)
  - i) One point form (ii) two point form (iii) slope form (iv) intercept form (v) Perpendicular form
- e) Equation of a line passing through a point and (i) parallel to a line (ii) Perpendicular to a line
- f) Equation of a line passing through the intersection of two lines
- g) Distance of a point from a line

### 4) CIRCLE



- a) Equation of a circle
  - (i) center radius form
  - (ii) general equation of a circle
  - (iii) end point of diameter form

#### **5) CO-ORDINATE GEOMETRY IN THREE DIMENSIONS**

- a) Distance formulae, section formulae, direction ratio, direction cosine, angle between two lines (condition of parallelism and perpendicularity)
- b) Equation of a plane
  - i) General form, angle between two planes, perpendicular distance of a point from a plane, equation of a plane passing through a point and
  - i) parallel to a plane (ii) perpendicular to a plane

#### **6) SPHERE**

- a) Equation of a sphere
  - i) center radius form
  - ii) general form
  - iii) two end points of a diameter form (only formulae and problems)

#### **Books Recommended:**

1. Elements of Mathematics \_ Vol. \_ 1 & 2 (Odisha State Bureau of Text Book preparation & Production)

#### **Reference Books:**

1. Mathematics Part- I & Part- II- Textbook for Class XII, NCERT Publication

### **Syllabus to be covered up to IA**

**Ch.1, Ch,2, and Ch,3,(a,b,c)**

## Th. 4. ENGINEERING MECHANICS ( 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

I.A : 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

### Objective:

**On completion of the subject, the student will be able to do:**

1. Compute the force, moment & their application through solving of simple problems on coplanar forces.
2. Understand the concept of equilibrium of rigid bodies.
3. Know the existence of friction & its applications through solution of problems on above.
4. Locate the C.G. & find M.I. of different geometrical figures.
5. Know the application of simple lifting machines.
6. Understand the principles of dynamics.

### Topic wise distribution of periods

Sl. No.	Topics	Periods
1	Fundamentals of Engineering Mechanics	14
2	Equilibrium	08
3	Friction	10
4	Centroid & moment of Inertia	14
5	Simple Machines	08
6	Dynamics	06
	<b>TOTAL</b>	<b>60</b>

### 1. FUNDAMENTALS OF ENGINEERING MECHANICS

#### 1.1 Fundamentals.

Definitions of Mechanics, Statics, Dynamics, Rigid Bodies,

#### 1.2 Force

Force System.

Definition, Classification of force system according to plane & line of action.

Characteristics of Force & effect of Force. Principles of Transmissibility & Principles of Superposition. Action & Reaction Forces & concept of Free Body Diagram.

#### 1.3 Resolution of a Force.

Definition, Method of Resolution, Types of Component forces, Perpendicular components & non-perpendicular components.

#### 1.4 Composition of Forces.

Definition, Resultant Force, Method of composition of forces, such as

1.4.1 Analytical Method such as Law of Parallelogram of forces & method of resolution.

#### 1.4.2. Graphical Method.

Introduction, Space diagram, Vector diagram, Polygon law of forces.

1.4.3 Resultant of concurrent, non-concurrent & parallel force system by Analytical & Graphical Method.

#### 1.5 Moment of Force.

Definition, Geometrical meaning of moment of a force, measurement of moment of a force & its S.I units. Classification of moments according to

direction of rotation, sign convention, Law of moments, Varignon's Theorem, Couple – Definition, S.I. units, measurement of couple, properties of couple.

## **2. EQUILIBRIUM**

2.1 Definition, condition of equilibrium, Analytical & Graphical conditions of equilibrium for concurrent, non-concurrent & Free Body Diagram.

2.2 Lamia's Theorem – Statement, Application for solving various engineering problems.

## **3. FRICTION**

3.1 Definition of friction, Frictional forces, Limiting frictional force, Coefficient of Friction.

Angle of Friction & Repose, Laws of Friction, Advantages & Disadvantages of Friction.

3.2 Equilibrium of bodies on level plane – Force applied on horizontal & inclined plane (up & down).

3.3 Ladder, Wedge Friction.

## **4. CENTROID & MOMENT OF INERTIA**

4.1 Centroid – Definition, Moment of an area about an axis, centroid of geometrical figures such as squares, rectangles, triangles, circles, semicircles & quarter circles, centroid of composite figures.

4.2 Moment of Inertia – Definition, Parallel axis & Perpendicular axis Theorems. M.I. of plane lamina & different engineering sections.

## **5. SIMPLE MACHINES**

5.1 Definition of simple machine, velocity ratio of simple and compound gear train, explain simple & compound lifting machine, define M.A, V.R. & Efficiency & State the relation between them, State Law of Machine, Reversibility of Machine, Self Locking Machine.

5.2 Study of simple machines – simple axle & wheel, single purchase crab winch & double purchase crab winch, Worm & Worm Wheel, Screw Jack.

5.3 Types of hoisting machine like derricks etc, Their use and working principle. No problems.

## **6. DYNAMICS**

6.1 Kinematics & Kinetics, Principles of Dynamics, Newton's Laws of Motion, Motion of Particle acted upon by a constant force, Equations of motion, De-Alembert's Principle.

6.2 Work, Power, Energy & its Engineering Applications, Kinetic & Potential energy & its application.

6.3 Momentum & impulse, conservation of energy & linear momentum, collision of elastic bodies, and Coefficient of Restitution.

### **Syllabus coverage upto I.A**

Chapter 1, 2 and 3.1

### **Books Recommended**

1. Engineering Mechanics – by A.R. Basu (TMH Publication Delhi)
2. Engineering Machines – Basudev Bhattacharya (Oxford University Press).
3. Text Book of Engineering Mechanics – R.S Khurmi (S. Chand).
4. Applied Mechanics & Strength of Material – By I.B. Prasad.
5. Engineering Mechanics – By Timosheenko, Young & Rao.
6. Engineering Mechanics – Beer & Johnson (TMH Publication).

## Th.4(a). BASIC ELECTRICAL ENGINEERING (1<sup>st</sup> sem Common)

Theory: 2 Periods per Week  
Total Periods: 30 Periods  
Examination: 1.5 Hours

I.A : 10 Marks  
End Sem Exam : 40 Marks  
TOTAL MARKS : 50 Marks

### Topic wise Distribution of Periods and Marks

Sl.No.	Topics	Periods
1	Fundamentals	05
2	A C Theory	08
3	Generation of Elect. Power	03
4	Conversion of Electrical Energy	07
5	Wiring and Power Billing	04
6	Measuring Instrument	03
	<b>Total</b>	<b>30</b>

#### Objective

1. To be familiar with A.C Fundamental and circuits
2. To be familiar with basic principle and application of energy conversion devices
3. To be familiar with generation of Electrical power
4. To be familiar with wiring and protective device
5. To be familiar with calculation and commercial Billing of electrical power & energy
6. To have basic knowledge of various electrical measuring instruments & conservation of electrical energy

#### 1. FUNDAMENTALS

- 1.1 Concept of current flow.
- 1.2 Concept of source and load.
- 1.3 State Ohm's law and concept of resistance.
- 1.4 Relation of V, I & R in series circuit.
- 1.5 Relation of V, I & R in parallel circuit.
- 1.6 Division of current in parallel circuit.
- 1.7 Effect of power in series & parallel circuit.
- 1.8 Kirchhoff's Law.
- 1.9 Simple problems on Kirchhoff's law.

#### 2. A.C. THEORY

- 2.1 Generation of alternating emf.
- 2.2 Difference between D.C. & A.C.
- 2.3 Define Amplitude, instantaneous value, cycle, Time period, frequency, phase angle, phase difference.
- 2.4 State & Explain RMS value, Average value, Amplitude factor & Form factor with Simple problems.
- 2.5 Represent AC values in phasor diagrams.
- 2.6 AC through pure resistance, inductance & capacitance
- 2.7 AC through RL, RC, RLC series circuits.
- 2.8 Simple problems on RL, RC & RLC series circuits.
- 2.9 Concept of Power and Power factor
- 2.10 Impedance triangle and power triangle.

### **3. GENERATION OF ELECTRICAL POWER**

- 3.1 Give elementary idea on generation of electricity from thermal , hydro & nuclear power station with block diagram

### **4. CONVERSION OF ELECTRICAL ENERGY**

(No operation, Derivation, numerical problems)

- 4.1 Introduction of DC machines.  
4.2 Main parts of DC machines.  
4.3 Classification of DC generator  
4.4 Classification of DC motor.  
4.5 Uses of different types of DC generators & motors.  
4.6 Types and uses of single phase induction motors.  
4.7 Concept of Lumen  
4.8 Different types of Lamps (Filament, Fluorescent, LED bulb) its Construction and Principle.  
4.9 Star rating of home appliances (Terminology, Energy efficiency, Star rating Concept)

### **5. WIRING AND POWER BILLING**

- 5.1 Types of wiring for domestic installations.  
5.2 Layout of household electrical wiring (single line diagram showing all the important component in the system).  
5.3 List out the basic protective devices used in house hold wiring.  
5.4 Calculate energy consumed in a small electrical installation

### **6. MEASURING INSTRUMENTS**

- 6.1 Introduction to measuring instruments.  
6.2 Torques in instruments.  
6.3 Different uses of PMMC type of instruments (Ammeter & Voltmeter).  
6.4 Different uses of MI type of instruments (Ammeter & Voltmeter).  
6.5 Draw the connection diagram of A.C/ D.C Ammeter, voltmeter, energy meter and wattmeter. (Single phase only).

### **Syllabus Coverage upto I.A**

Chapter 1,2,3

### **BOOKS RECOMENDED:**

1. ABC of Electrical Enginnering by Jain & Jain (Dhanpat Rai Publication)
2. Fundamentals of Electrical Engg and Electronics by B.L Thereja
3. Concept of Basic Electrical Enginnering ,P.K Das and A.K. Mallick by B.M Publications
4. Fundamentals of Electrical Engg by Asfaq Hussain
5. Fundamentals of Electrical Engg by JB Gupta
6. Basic Electrical Engg. By Chakraborti (Mcgraw Hill)

## Th.4(b). BASIC ELECTRONIC ENGINEERING (1<sup>st</sup> sem Common)

Theory: 2 Periods per Week  
Total Periods: 30 Periods  
Examination: 1.5 Hours

I.A : 10 Marks  
End Sem Exam : 40 Marks  
TOTAL MARKS : 50 Marks

### Topic wise Distribution of Periods and Marks

Sl.No.	Topics	Periods
1	Electronic Devices	8
2	Electronic circuits	9
3	Communication System	3
4	Transducers & Measuring instruments	10
	<b>Total</b>	<b>30</b>

#### Objective

1. To be familiar with Electronic devices
2. To be familiar with Electronic circuits
3. To be familiar with communication system
4. To be familiar with Electronic measuring instruments

#### 1. ELECTRONIC DEVICES

- 1.1 Basic Concept of Electronics and its application.
- 1.2 Basic Concept of Electron Emission & its types.
- 1.3 Classification of material according to electrical conductivity (Conductor, Semiconductor & Insulator) with respect to energy band diagram only.
- 1.4 Difference between Intrinsic & Extrinsic Semiconductor.
- 1.5 Difference between vacuum tube & semiconductor.
- 1.6 Principle of working and use of PN junction diode, Zener diode and Light Emitting Diode (LED)
- 1.7 Integrated circuits (I.C) & its advantages.

#### 2. ELECTRONIC CIRCUITS

- 2.1 Rectifier & its uses.
- 2.2 Principles of working of different types of Rectifiers with their merits and demerits
- 2.3 Functions of filters and classification of simple Filter circuit (Capacitor, choke input and  $\pi$ )
- 2.4 Working of D.C power supply system (unregulated) with help of block diagrams only
- 2.5 Transistor, Different types of Transistor Configuration and state output and input current gain relationship in CE, CB and CC configuration( No mathematical derivation)
- 2.6 Need of biasing and explain different types of biasing with circuit diagram.( only CE configuration)
- 2.7 Amplifiers(concept) , working principles of single phase CE amplifier
- 2.8 Electronic Oscillator and its classification
- 2.9 Working of Basic Oscillator with different elements through simple Block Diagram

#### 3. COMMUNICATION SYSTEM

- 3.1 Basic communication system (concept & explanation with help of Block diagram)
- 3.2 Concept of Modulation and Demodulation, Difference between them
- 3.3 Different types of Modulation (AM, FM & PM) based on signal, carrier wave and modulated wave (only concept, No mathematical Derivation)

#### **4. TRANSDUCERS AND MEASURING INSTRUMENTS**

- 4.1 Concept of Transducer and sensor with their differences.
- 4.2 Different type of Transducers & concept of active and passive transducer.
- 4.3 Working principle of photo emissive, photoconductive, photovoltaic transducer and its application
- 4.4 Multimeter and its applications
- 4.5 Analog and Digital Multimeter and their differences
- 4.6 Working principle of Multimeter with Basic Block diagram
- 4.7 CRO, working principle of CRO with simple Block diagram

#### **Syllabus Coverage upto I.A**

Chapter 1,2(upto 2.6)

#### **BOOKS RECOMENDED:**

1. Principles of Electronics by V.K Mehta and Rohit Mehta,S Chand Publication
2. Principles of Electronics by S.K. SAHADEV (Dhanpatrai Publication)

## Th.3. ENGINEERING MATHEMATICS – II ( 2<sup>nd</sup> Sem Common)

Theory: 5 Periods per Week  
Total Periods: 75 Periods  
Examination: 3 Hours

I.A : 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

### Objective:

Principles and application in Engineering are firmly ground on abstract mathematical structures. Students passing from secondary level need familiarization with such structure with a view to develop their knowledge, skill and perceptions about the applied science. Calculus is the most important mathematical tool in forming engineering application into mathematical models. Wide application of calculus makes it imperative to develop methods of solving differential equations. The knowledge of limit, derivative and derivative needs to be exhaustively practiced. To help a systematic growth of skill in solving equation by calculus method will be the endeavor of this course content. Understanding the concept of co-ordinate system in 3D in case of lines, planes and sphere and it's use to solve Engineering problems. After completion of the course the student will be equipped with basic knowledge to form equations and solve them competently.

### Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Vector Algebra	15	12
2	Limits and Continuity	12	12
3	Derivatives	21	20
4	Integration	15	24
5	Differential Equation	12	12
<b>TOTAL</b>		<b>75</b>	<b>80</b>

### 1) VECTOR ALGEBRA

- a) Introduction
- b) Types of vectors (null vector, parallel vector , collinear vectors)  
(in component form )
- c) Representation of vector
- d) Magnitude and direction of vectors
- e) Addition and subtraction of vectors
- f) Position vector
- g) Scalar product of two vectors
- h) Geometrical meaning of dot product
- i) Angle between two vectors
- j) Scalar and vector projection of two vectors
- k) Vector product and geometrical meaning  
(Area of triangle and parallelogram)

### 2) LIMITS AND CONTINUITY

- a) Definition of function, based on set theory
- b) Types of functions
  - i) Constant function
  - ii) Identity function
  - iii) Absolute value function
  - iv) The Greatest integer function
  - v) Trigonometric function
    - vi) Exponential function
    - vii) Logarithmic function
- c) Introduction of limit
- d) Existence of limit
- e) Methods of evaluation of limit



$$\text{i) } \lim_{x \rightarrow 0} \frac{x^n - a^n}{x - a} = na^{n-1}$$

$$\text{ii) } \lim_{x \rightarrow 0} \frac{a^x - 1}{x} = \log_e a$$

$$\text{iii) } \lim_{x \rightarrow 0} \frac{e^x - 1}{x} = 1$$

$$\text{iv) } \lim_{x \rightarrow 0} (1 + x)^{1/x} = e$$

$$\text{v) } \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x = e$$

$$\text{vi) } \lim_{x \rightarrow 0} \frac{\log(1+x)}{x} = 1$$

$$\text{vii) } \lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

$$\text{viii) } \lim_{x \rightarrow 0} \frac{\tan x}{x} = 1$$

e) Definition of continuity of a function at a point and problems based on it

### 3) DERIVATIVES

a) Derivative of a function at a point

b) Algebra of derivative

c) Derivative of standard functions

$x^n, a^x, \log_a x, e^x, \sin x, \cos x, \tan x, \cot x, \sec x, \csc x, \sin^{-1} x, \cos^{-1} x,$   
 $\tan^{-1} x, \cot^{-1} x, \sec^{-1} x, \csc^{-1} x$

d) Derivative of composite function (Chain Rule)

e) Methods of differentiation of

i) Parametric function

ii) Implicit function

iii) Logarithmic function

iv) a function with respect to another function

f) Applications of Derivative

i) Successive Differentiation (up to second order)

ii) Partial Differentiation (function of two variables up to second order)

g) Problems based on above

### 4) INTEGRATION

a) Definition of integration as inverse of differentiation

b) Integrals of standard functions

c) Methods of integration

i) Integration by substitution

ii) Integration by parts

d) Integration of the following forms

$$\text{i) } \int \frac{dx}{x^2 + a^2} \quad \text{ii) } \int \frac{dx}{x^2 - a^2} \quad \text{iii) } \int \frac{dx}{a^2 - x^2} \quad \text{iv) } \int \frac{dx}{\sqrt{x^2 + a^2}} \quad \text{v) } \int \frac{dx}{\sqrt{x^2 - a^2}} \quad \text{vi) } \int \frac{dx}{\sqrt{a^2 - x^2}}$$

$$\text{vii) } \int \frac{dx}{x\sqrt{x^2 - a^2}} \quad \text{viii) } \int \sqrt{a^2 - x^2} dx \quad \text{ix) } \int \sqrt{a^2 + x^2} dx \quad \text{x) } \int \sqrt{x^2 - a^2} dx$$

e) Definite integral, properties of definite integrals

$$\text{i) } \int_0^a f(x) dx = \int_0^a f(a - x) dx$$

$$\text{ii) } \int_a^b f(x) dx = - \int_b^a f(x) dx$$

$$\text{iii) } \int_a^c f(x) dx = \int_a^b f(x) dx + \int_b^c f(x) dx, \quad a < b < c$$

$$\text{iv) } \int_{-a}^a f(x) dx = 0, \text{ if } f(x) = \text{odd}$$

$$= 2 \int_0^a f(x) dx, \text{ if } f(x) = \text{even}$$

f) Application of integration

i) Area enclosed by a curve and X – axis

ii) Area of a circle with centre at origin

## 5) DIFFERENTIAL EQUATION

- a) Order and degree of a differential equation
- b) Solution of differential equation
  - i) 1st order and 1st degree equation by the method of separation of variables
  - ii) Linear equation  $\frac{dy}{dx} + Py = Q$ , where P,Q are functions of  $x$

### Syllabus to be covered up to IA

Ch. 2 and Ch. 3

#### **Books Recommended:**

1. Elements of Mathematics \_ Vol. \_ 1 & 2 (Odisha State Bureau of Text Book preparation & Production)

#### **Reference Books:**

Mathematics Part- I & Part- II- Textbook for Class XII, NCERT Publication

# Pr.1a. Communicative English Lab

(1<sup>st</sup> & 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods

Sessional : 50 Marks  
TOTAL MARKS : 50 Marks

SI No.	Topic	Periods
1	Listening Skill	10
2	Speaking Skill	20
3	Personality Development	10
4	Interpersonal Skills	10
5	Presenting in G D , Seminar and Conferences	10
	Total	60

## PRACTICAL

### 1. LISTENING SKILLS

- The student should be able to listen to a text read aloud in normal speed with focus on intonation
- After listening the student can fill-in-blanks, choose a suitable title, make a summary, supply required information and be able to answer comprehension questions from the passage read aloud.

### 2. SPEAKING SKILL

- Reading aloud of dialogues, texts, poems, speeches focusing on intonation.
- Self-introduction
- Role-plays on any two- situations
- Telephonic conversation

### 3. PERSONALITY DEVELOPMENT

- Initiation
- Physical appearance
- Audience purpose

### 4. INTERPERSONAL SKILLS

Appropriate use of non-verbal skills in face-to-face communication  
[i.e. viva- voice, group-interviews, GDs and seminars]

### 5. PRESENTING IN GD, SEMINARS AND CONFERENCES

- Leadership quality
- Time management
- Achieving the target

# Pr.1b. COMPUTER APPLICATION Lab

(1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods

Sessional : 50 Marks  
TOTAL MARKS : 50 Marks

- 1. BASICCOMPUTER OPERATION** **2 periods**  
Identification of different components of Computer  
Switch on and Booting Process  
Shut down, Restart of computer
  
- 2. OPERATINGSYSTEM** **13 periods**  
Basic DOS commands (CLS, DIR, DATE, TIME, VERSION, MD, CD, RD, DEL, COPY, REN, USE OF WILD CARDS, PATH)  
Basic Windows OS operations (DESKTOP, ICONS,, START BUTTON, TASK BAR)  
MOUSE OPERATIONS- SINGLE CLICK, DOUBLE CLICK, DRAG  
MAXIMIZE, MINIMIZE, RESTORE Windows Explorer, My Computer Files and Folders, Copy, Cut, Paste  
Utilities: Word, notepad, paint, calculator etc
  
- 3. WORKING WITH MS-OFFICE** **20 periods**  
Basic operations of Word Processing Package. (MS-Word )  
Basic operations of Electronic Spread Sheet Package. (MS-Excel)  
Basic operations of Presentation Package (MS- Power point)  
*(Create, Edit, Format, Save, Print/View in the above three packages)*
  
- 4. WORKING WITH INTERNET** **10 periods**  
Getting acquainted with Internet connection, Browser, website  
URL, webpage, http, WWW, net browsing  
Creating E-Mail Id, sending and receiving E-mail Chatting
  
- 5. C PROGRAMMING** **15 periods**
  1. Write a Program in C to find the greatest number among three integers.
  2. Write a Program in C to find the average of n numbers by using for loop.
  3. Write a Program in C to compute  $(a + b)^3$
  4. Write a Program in C to convert time in seconds to time in hours, minutes and seconds.
  5. Write a program in C to find the sum of the following series.  $1+1/x+1/x^2+.....+1/x^n$
  6. Write a program in C to determine whether a number is prime or not?
  7. Write a program in C to compute simple interest and compound interest of a given principal, rate of interest and time period.
  8. Write a program in C to check whether a given number is palindrome or not?
  9. Write a program in C to compute the sine series.
  10. Write a program in C to accept row wise and column wise element in a two dimensional array and print them.
  11. Write a program in C to find the number of times an element occurs in an array.
  12. Write a program in C to find the vowels in a given string.
  13. Write a program in C to find the factorial of a number, by using recursion.
  14. Write a program in C to find the sum of Fibonacci series, by using function.
  15. Write a program in C to accept a number from keyboard and print it in reverse order of entry, by using function.

## Pr.2a. Engineering Physics Lab

(1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week

Total Periods: 60 Periods

Examination: 3 Hours

Sessional : 50 Marks

End Sem Exams : 50 Marks

TOTAL MARKS : 100 Marks

(Any 10 Experiments)

SL.NO	NAME OF THE EXPERIMENTS
1	To find the cross sectional area of a wire using a screw gauge.
2	To find the thickness and volume of a glass piece using a screw gauge.
3	To find volume of a solid cylinder using a Vernier Calipers.
4	To find volume of a hollow cylinder using a Vernier Calipers.
5	To determine the radius of curvature of convex surface using a Spherometer.
6	To determine the radius of curvature of concave surface using a Spherometer.
7	To find the time period of a simple pendulum and determine acceleration due to gravity.
8	To determine the angle of Prism.
9	To determine the angle of Minimum Deviation by I ~ D curve method.
10	To trace lines of force due to a bar magnet with North pole pointing North and locate the neutral points.
11	To trace lines of force due to a bar magnet with North pole pointing South and locate the neutral points.
12	To verify Ohm's Law by Ammeter – Voltmeter method.

## Pr.2b. Engineering Chemistry Lab (1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week

Total Periods: 60 Periods

Examination: 3 Hours

Sessional : 50 Marks

End Sem Exams : 50 Marks

TOTAL MARKS : 100 Marks

Sl No.	Experiment
1	Preparation and study of physical and chemical properties CO <sub>2</sub> gas.
2	Preparation and study of physical and chemical properties NH <sub>3</sub> gas.
3	Crystallization of Copper sulphate from copper carbonate.
4	Simple acid-base titrations (i) Acidimetry (ii) Alkalimetry
5	Tests for acid radicals (Known): (i) Carbonate, (ii) Sulphide, (iii) Chloride, (iv) Nitrate and (v) Sulphate.
6	Test for Basic radicals (Known): (i) Ammonium, (ii) Zinc, (iii) Magnesium, (iv) Aluminium, (v) Calcium, (vi) Sodium and (vii) potassium.
7	Test for unknown Acid radicals
8	Test for unknown basic radicals
9	Test for unknown salt (composed of one basic radical and one acid radical)

### Recommended Books:

- (i) Practical Intermediate Chemistry By Dr. Bichitrananda Nanda
- (ii) Elemental Experimental chemistry by Dr. Y R Sharma, A K Das, Kalyani Publisher

## Pr.3a. Engineering Drawing (1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 6 Periods per Week  
Total Periods: 90 Periods  
Examination: 3 Hours

Sessional : 50 Marks  
End Sem Exams : 100 Marks  
TOTAL MARKS : 150 Marks

### Objective

After completion of the study of Engg. Drawing the student should be able to

1. Understand the importance of Engineering Drawing.
2. Demonstrate the use of different drawing instrument.
3. Make free hand lettering and numbering.
4. Practice of dimensioning of drawing.
5. Undertake different geometric constructions, projections of straight line, planes and solids.
6. Take up different orthographic projections.
7. Draw sectional views, development of surface of different solids.
8. Develop the concept of building drawing.
9. Prepare 2D engineering drawing using Auto CAD software.

### Topic wise distribution of periods.

Sl. No.	Topics	Periods
1	Introduction and Demonstration	03
2	Types of Lines, Lettering & Dimensioning	03
3	Scales	03
4	Curves	06
5	Orthographic Projections	21
6	Section and Developments	21
7	Isometric Projections	06
8	Building Drawing	12
9	Practices on Auto CAD	15
	<b>TOTAL</b>	<b>90</b>

(All drawings are to be made in First Angle Projection)

### 1. INTRODUCTION & DEMONSTRATION

- 1.1 Identify various sizes of drawing boards, drawing sheets as per BIS.
- 1.2 List the types of pencils, instruments, and scales (RF).
- 1.3 Demonstrate lying of drawing sheet, margin, standard layout and title block as per BIS, folding principle of drawings (blue prints, print outs etc).

### 2. TYPES OF LINES, LETTERING & DIMENSIONING

- 2.1 Demonstrate and explain the use of various types of lines.
- 2.2 Demonstrate the principle of single stroke, gothic lettering & numerals as per BIS.

### 3. SCALES

- 3.1 Significance of scales in drawing; different scales.
- 3.2 Define and draw plain sale and diagonal sale.

#### **4. CURVES**

- 4.1 Explain Conic sections with illustration, Explain terms like focus, vertex, directrix and eccentricity.
- 4.2 Draw conics sections by eccentricity method – Ellipse, Parabola and Hyperbola.
- 4.3 Draw Ellipse by concentric circle method and arc of circle method.
- 4.4 Draw parabola by Rectangle Method and Tangent Method.

#### **5. ORTHOGRAPHIC PROJECTIONS**

- 5.1 Demonstrate the principles of 1<sup>st</sup> angle and 3<sup>rd</sup> angle projections with the help of models and draw symbols.
- 5.2 Draw projection of points.
- 5.3 Draw projection of straight line (parallel to both planes, parallel to one and perpendicular to other, parallel to one and inclined to other and inclined to both reference planes).
- 5.4 Draw plane figure such as squares, rectangles, triangles, circle, Pentagon and hexagon (perpendicular to one plane and inclined to other).
- 5.5 Draw projections of solids such as prism, cylinder, cone, tetrahedron and pyramid in simple position (with axis parallel to one reference plane and perpendicular to other reference plane).

#### **6. SECTION & DEVELOPMENTS**

- 6.1 Draw the sectional projection & development of prism, cylinder, cone and pyramid in simple position by a cutting plane perpendicular to one reference plane and inclined to other reference plane.
- 6.2 Draw true shape of the cutting sections.

#### **7. ISOMETRIC PROJECTIONS**

Draw isometric view & Isometric projection of prism, pyramid, cone & cylinder with axis horizontal and vertical with construction of isometric scales.

#### **8. BUILDING DRAWING**

- 8.1 Explain terms related to building drawing.
- 8.2 Draw plan, elevation of single room building with verandah (Flat roof according to given line plan and specification).

#### **9. PRACTICES ON AUTO CAD**

- 9.1 Introduction-Settings, Limits etc.
- 9.2 Auto CAD commands-  
Draw commands (Line, circle, arc, polygon, ellipse, rectangle).  
Edit command, Dimension commands and Modify Commands for two dimensional drafting only.
- 9.3 Exercise for practice using Auto CAD.
  - 9.3.1 Orthographic projections of lines, planes and solids as per chapter 5.0.
  - 9.3.2 Isometric projection as per Chapter 7.0.

**Note:** Focus should be on Hands on Practice of student using AutoCAD software

#### **Books Recommended**

1. Machine Drawing by Basudeb Bhattacharya, Oxford University Press.
2. A Text Book of Engineering Drawing by Dr. R.K. Dhawan.
3. A Text Book of Engineering Graphics & Auto CAD by K Venugopal.
4. A Text book of Engineering Drawing by N.D. Bhatt.
5. Engineering Drawing by P.S. Gill.
6. A Introduction to Auto CAD – 2012 by George Omura, Willey India Publishers.



## Pr.3b. Workshop Practice

(1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 6 Periods per Week  
Total Periods: 90 Periods  
Examination: 4 Hours

Sessional : 50 Marks  
End Sem Exams : 100 Marks  
TOTAL MARKS : 150 Marks

### Objective:

1. To demonstrate safely practice in various shops of the workshop.
2. To select suitable tools & equipment in the following shops. (a) Fitting.  
(b) Sheet Metal.  
(c) Welding (Gas & Electrical). (d) Turning.
3. To select suitable materials for different process in the above shops.
4. To demonstrate the different processes adopted in the above shops.
5. To finish the jobs within stipulated time and with accuracy as per specifications.

### Topic Wise distribution of periods

Sl. No.	Topics	Periods
1	Fitting Shop	24
2	Sheet Metal	18
3	Welding Shop	24
4	Turning Shop	21
5	Exposure to CNC Milling / Lathe Machine	03
	<b>TOTAL</b>	<b>90</b>

### 1. FITTING SHOP

- 1.1 Demonstrate safety practices in the fitting shop.
- 1.2 Select suitable holding & clamping devices for fitting jobs.
- 1.3 Select suitable tools like- files, vice, chisels, punch, scriber, hammers, surface plate, V-block, try square, caliper etc.
- 1.4 Demonstrate the following operations:  
Sawing, Chipping, Fitting, Craping, Grinding, Marking, Reaming, Tapping, Drilling & Angular cutting.
- 1.5 Introduction of chipping, demonstration on chipping and its applications.
- 1.6 Description, demonstration and practice of simple operation of hack saw straight and angular cutting.
- 1.7 Introduction and use of measuring tools used in fitting shop like steel rule, measuring tape, outside micrometer, vernier caliper and vernier height gauge.
- 1.8 Description and Demonstration and practice of thread cutting using taps and dies.  
Job: Cutting & fitting practice on a square of 50mm X 50mm X 8mm MS Flat. Job: Angular cutting practice of 45 degree (on the above job).  
Job: Preparation of stud (to cut external threads) with the help of dies (mm or BSW). Job: H-fitting in the mild steel (ms) square.  
Job: Prepare one job on male female fitting.

## **2. SHEET METAL**

- 2.1 Demonstrate safety practices in sheet metal shop.
- 2.2 Prepare surface development for the jobs according to the drawing.
- 2.3 Cut M.S and G.P. sheets according to the surface development / drawing using standard sheet metal cutting tools.
- 2.4 Select hand tools for sheet metal work.
- 2.5 Demonstrate the process of metal clamp joining and reveted joining of sheet metals.

Job: Making of sheet metal joints.

Job: Prepare a sheet metal tray or a funnel.

Job: Prepare a sheet metal job involving rolling, shearing, creasing, bending & cornering. Job: Prepare a lap riveting joint.

## **3. WELDING SHOP**

- 3.1 Introduction.
- 3.2 Safety precautions in welding, safety equipments & its application in welding shop.
- 3.3 Introduction to welding, type of welding, common materials that can be welded, introduction to gas welding equipment, types of flame, adjustment of flame, applications of gas welding, Welding tools & safety precautions.
- 3.4 Introduction to electric arc welding (AC & DC), practice in setting current & voltage for striking proper arc, precautions while using electric arc welding. Applications of arc welding. Introduction to polarity & their use.
- 3.5 Demonstrate & use of the different tools used in the welding shop with sketches, Hand shield, helmet, clipping hammer, gloves, welding lead, connectors, aprons, goggles, etc.
- 3.6 Demonstrate of welding defects & various types of joints & end preparation.  
Job: Preparation of lap joint by arc welding rod. Job: Preparation of Tee joint by arc welding.  
Job: Preparation of single V or double V butt joint by electric arc welding. Job: Brazing practice. Use of Spelt or (on MS sheet pieces).  
Job: Gas welding practice on worn-out & broken parts.

## **4. TURNING SHOP**

- 4.1 Introduction.
- 4.2 Safety precaution & safety equipments.
- 4.3 Various marking, measuring, cutting & holding tools.
- 4.4 Demonstration of different parts of a lathe, demonstration on centering & turning operation in a group of 06 students.  
Job: plain turning, taper turning & grooving practices on round bar.

## **5. EXPOSURE TO C.N.C MILLING / LATHE MACHINE**

### **Reference Books**

1. Workshop Technology by S.K.Hajara Choudhary, Media Promoters Publishers, New Delhi.
2. Workshop Technology by B.S. Raghubanshi, Dhanpat Rai and Sons, New Delhi.
3. Workshop Technology by H.S. Bawa – TMH.
4. Workshop Familiarization by E Wilkinson.
5. Sheet metal shop practice by Bruce & Meyer.
6. Workshop Technology by R.S. Khurmi & J.K. Gupta, S.Chand.

### **Notes**

1. *Work, Progress book should be maintained continuously.*
2. *The roll numbers of the students must be punched on each job.*
3. *The turning shop job should be done by students' maximum 06 students in a group*

## **Pr.4 Seminar**

**(1<sup>st</sup> / 2<sup>nd</sup> sem Common)**

Theory: 4 Periods per Week  
Total Periods: 60 Periods

Sessional : 50 Marks  
TOTAL MARKS : 50 Marks

The students shall present seminar on different topics on latest science and Technology in the entire class. There shall not be any grouping of students. The students shall present the seminar topic to the whole class/section. All other students should be allowed and encouraged to put questions to the presenter student, who shall answer the questions. A student has to present seminar on at least 2 topics in a semester. He/she has to submit seminar report for each topic separately, to the teacher concerned, which shall be preserved for verification by the authorities. The students should be encouraged to refer to the magazines, journals, e-materials etc. for preparing for seminar topic. Attendance of all students other than the presenters should be ensured, so that seminar shall be more participative and knowledge of students shall improve by listening to many topics presented.

