

## 2.1 COMMUNICATING EFFECTIVELY IN ENGLISH II SEMESTER SYLLABUS

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### RATIONALE

Interpersonal communication is a natural and necessary part of organizational life. Yet communicating effectively can be challenging because of our inherent nature to assume, overreact to and misperceive what actually is happening. Poor or lack of communication is often cited as the cause of conflict and poor teamwork. In today's team-oriented workplace, managing communication and developing strategies for creating shared meaning are crucial to achieving results and creating successful organizations. The goal of the *Communicating Effectively in English* course is to produce civic-minded, competent communicators. To that end, students must demonstrate oral as well as written communication proficiency. These include organizational and interpersonal communication, public address and performance.

### II SEMESTER 48 hrs

#### 1. LISTENING COMPREHENSION 4hrs

- 1.1 Locating Main Ideas in a Listening Excerpt
- 1.2 Note-taking

#### 2. ORAL COMMUNICATION SKILLS 14 hrs

- 2.1 Offering-Responding to Offers
- 2.2 Requesting-Responding to Requests
- 2.3 Congratulating
- 2.4 Expressing Sympathy and Condolences
- 2.5 Expressing Disappointments
- 2.6 Asking Questions-Polite Responses
- 2.7 Apologizing, forgiving
- 2.8 Complaining
- 2.9 Persuading
- 2.10 Warning
- 2.11 Asking for and Giving Information
- 2.12 Giving Instructions
- 2.13 Getting and Giving Permission
- 2.14 Asking For and Giving Opinions

### **3. GRAMMAR AND USAGE**

**10hrs**

- 3.1 Prepositions
- 3.2 Pronouns
- 3.3 Determiners
- 3.4 Conjunctions
- 3.5 Question and Question Tag
- 3.6 Tenses (Simple Present, Simple Past)

\*One chapter revising the topics discussed during the first semester. (Punctuation, Articles, Framing questions, Verbs, Word formation)

### **4. WRITING SKILLS**

**10hrs**

- 4.1 Writing Notice
- 4.2 Writing Circular
- 4.3 Writing a Memo
- 4.4 Agenda for a Meeting
- 4.5 Minutes of the Meeting
- 4.6 Telephonic Messages

\* Writing a paragraph will be a continuous exercise through out the session. (Writing will be based on verbal stimuli, tables and graphs.)

### **5. READING SKILLS**

**10hrs**

- 5.1 Vocabulary Enhancement
- 5.2 Techniques of reading: Skimming, Scanning, Intensive and Extensive Reading

**NOTE: The Reading Skills of the learners (along with vocabulary enhancement) will be through reading thematic articles/essays and/or stories.**

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## 2.2 APPLIED MATHEMATICS-II

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### RATIONALE

Applied Mathematics forms the backbone of engineering discipline. Basic elements of differential calculus, integral calculus, differential equations and coordinate geometry have been included in the curriculum as foundation course and to provide base for continuing education to the students

### DETAILED CONTENTS

1. Co-ordinate Geometry (18 hrs)
  - 1.1 Area of a triangle, centroid and incentre of a triangle (given the vertices of a triangle), Simple problems on locus
  - 1.2 Equation of straight line in various standard forms (without proof) with their transformation from one form to another, Angle between two lines and perpendicular distance formula (without proof)
  - 1.3 Circle: General equation and its characteristics given:
    - $\frac{3}{4}$  The center and radius
    - $\frac{3}{4}$  Three points on it
    - $\frac{3}{4}$  The co-ordinates of the end's of the diameter
  - 1.4 Conics (parabola, ellipse and hyperbola), standard equation of conics (without proof), given the equation of conic to calculate foci, directrix, eccentricity, latus rectum, vertices and axis related to different conics Differential Calculus
2. Differential Calculus (22 hrs)
  - 2.1 Concept of function, four standard limits
$$\text{Lt}_{x \rightarrow a} (x^n - a^n) / (x - a), \text{Lt}_{x \rightarrow 0} \frac{\sin x}{x}, \text{Lt}_{x \rightarrow 0} \frac{(a^x - 1)}{x}, \text{Lt}_{x \rightarrow 0} (1+x)^{1/x}$$
  - 2.2 Concepts of differentiation and its physical interpretation
    - $\frac{3}{4}$  Differentiation by first principle of  $x^n$ ,  $(ax + b)^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $\sec x$ ,  $\text{cosec } x$  and  $\cot x$ ,  $e^x$ ,  $a^x$ ,  $\log x$ . Differentiation of a function of a function and explicit and implicit functions
    - $\frac{3}{4}$  Differentiation of sum, product and quotient of different functions
    - $\frac{3}{4}$  Logarithmic differentiation. Successive differentiation excluding  $n^{\text{th}}$  order

- 2.3 Application of derivatives for (a) rate measure (b) errors (c) real root by Newton's method (d) equation of tangent and normal (c) finding the maxima and minima of a function (simple engineering problems)
3. Integral Calculus (16 hrs)
- 3.1 Integration as inverse operation of differentiation
- 3.2 Simple integration by substitution, by parts and by partial fractions
- 3.3 Evaluation of definite integrals (simple problems) by explaining the general properties of definite integrals
- 3.4 Applications of integration for
- $\frac{3}{4}$  Simple problem on evaluation of area under a curve where limits are prescribed
  - $\frac{3}{4}$  Calculation of volume of a solid formed by revolution of an area about axis (simple problems) where limits are prescribed
  - $\frac{3}{4}$  To calculate average and root mean square value of a function
  - $\frac{3}{4}$  Area by Trapezoidal Rule and Simpson's Rule
4. Differential Equations (8 hrs)
- Solution of first order and first degree differential equation by
- $\frac{3}{4}$  Variable separation
  - $\frac{3}{4}$  Homogeneous differential equation and reducible Homogeneous differential equations
  - $\frac{3}{4}$  Linear differential equations and reducible linear differential equations

### RECOMMENDED BOOKS

1. Higher Engineering Mathematics by BS Grewal
2. Engineering Mathematics by BS Grewal
3. Engineering Mathematics vol. II by S Kohli and Others, IPH, Jalandhar
4. Engineering Mathematics by Ishan Publication
5. Applied Mathematics Vol. II by SS Sabharwal and Others; Eagle Parkashan, Jalandhar
6. Engineering Mathematics by IB Prasad
7. Applied Mathematics Vol. II by Dr RD Sharma
8. Advanced Engineering Mathematics by AB Mathur and VP Jagi; Khanna Publishers, Delhi
9. Higher Engineering Mathematics by BS Grewal; Khanna Publishers, Delhi
10. Engineering Mathematics by C Dass Chawla; Asian Publishers, New Delhi

## 2.3 APPLIED PHYSICS

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### RATIONALE

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

### DETAILED CONTENTS

#### 1. Waves and vibrations (8 hrs)

- 1.1 Waves, Generation of waves by vibrating particles.
- 1.2 Types of wave motion, transverse and longitudinal wave motion with examples
- 1.3 Relation between velocity of wave, frequency and wave length of a wave ( $v = \nu \lambda$ )
- 1.4 Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.
- 1.5 Vibration of spring mass system, cantilever and determination of their time period.
- 1.6 Free, forced and resonant vibrations with examples

#### 2. Applications of sound waves (8

- 2.1 Acoustics of buildings-reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation
- 2.2 Ultrasonics-Methods of production (magnetostriction and piezoelectric) and their engineering applications to cold welding, drilling, cleaning, flaw detection and SONAR

#### 3. Principles of optics (8 hrs)

- 3.1 Review of concept of mirrors, lenses, reflection & refraction of light, refractive index, lens formula (no derivation), real and virtual image, magnification.
- 3.2 Power of lens
- 3.3 Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case)
- 3.4 Total internal reflection, critical angle and conditions for total internal reflection.

#### 4. Electrostatics (10 hrs)

- 4.1 Coulomb's law, unit charge
- 4.2 Gauss's Law
- 4.3 Electric field intensity and electric potential
- 4.4 Electric field of point charge, charged sphere, straight charged conductor,

- plane charged sheet
- 4.5 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors
- 4.6 Dielectric and its effect on capacitors, dielectric constant and dielectric

**5. Current Electricity (8 hrs)**

- 5.1 Ohm's law
- 5.2 Resistance of a conductor, specific resistance, series and parallel Combination of resistors, effect of temperature on resistance
- 5.3 Kirchhoff's laws, Wheatstone bridge principle and its applications
- 5.4 Heating effect of current and concept of electric power

**6. Semi conductor physics (8 hrs)**

- 6.1 Energy bands, intrinsic and extrinsic semi conductor, p-n junction diode and its characteristics
- 6.2 Diode as rectifier-half wave and full wave rectifier, semi conductor transistor pnp and npn (concept only)

**7. Modern Physics (9 hrs)**

- 7.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, ruby laser and applications
- 7.3 Fiber optics: Introduction and applications
- 7.4 Super conductivity: Phenomenon of super conductivity, Type I and Type II super conductor and its applications

**LIST OF PRACTICALS**

1. To determine and verify the time period of cantilever by drawing graph between load and depression
2. To determine the magnifying power of a compound microscope
3. To determine the magnifying power of an astronomical telescope
4. To verify Ohm's law
5. To verify law of resistances in series
6. To verify law of resistances in parallel
7. To convert a galvanometer into an ammeter of given range
8. To convert a galvanometer into a voltmeter of a given range

**RECOMMENDED BOOKS**

1. Concept of Physics Prof. H.C. Verma, Part-1 (Bharti Bhawan)
2. Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)
3. A Text Book of Applied Physics: Egale Parkashan, Jullandhar



## 2.4 APPLIED CHEMISTRY – II

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### RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a day's various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behavior when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

### DETAILED CONTENTS

#### 1. Metallurgy (10 hrs)

1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting calcination and refining as applied in relation to various metallurgical operations.

1.2 Metallurgy of (i) Aluminium (ii) Iron (iii) copper with their physical and chemical Properties.

1.3 Definition of an alloy, purposes of alloying, composition, properties and uses of alloys- brass, bronze, monel metal, magnalium, duralumin.

#### 2. Fuels (10 hrs)

2.1 Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples

2.2 Definition of Calorific value of a fuel and determination of calorific value of a liquid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorificvalues

2.3 Brief description of 'Proximate' and 'Ultimate' analysis of a fuel.

Importance of conducting the proximate and ultimate analysis of a fuel

2.4 Qualities of a good fuel and merits of gaseous fuels over those of other varieties of fuels

2.5 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas (iv) LPG (V) CNG

**3 Corrosion (3 hrs)**

3.1 Meaning of the term 'corrosion' and its definition

3.2 Theories of corrosion i.e.

(i) direct chemical action theory and

(ii) electro chemical theory

3.3 Prevention of corrosion by

1. (a) Alloying

(b) Providing metallic coatings

2. Cathodic protections: (a) Sacrificial

(b) Impressed voltage method

**4 Lubricants (4 hrs)**

4.1 Definition of (i) lubricant (ii) lubrication

4.2 Classification of lubricants

4.3 Principles of lubrication

(i) fluid film lubrication

(ii) boundary lubrication

(iii) extreme pressure lubrication

4.4 Characteristics of a lubricant such as viscosity, viscosity index, volatility oiliness, acidity, emulsification, flash point and fire point and pour point.

**5. Classification and Nomenclature of Organic Compounds (7 hrs)**

5.1 Homologous series

5.2 IUPAC Nomenclature of Hydrocarbons ,

Alcohols, Aldehydes and Ketones & Carboxylic acids

5.3 Hydrocarbons (Alkanes, Alkenes and Alkynes)-general preparation, Chemical properties and uses.

5.4 Alcohols (Diols and Triols not included)-general preparation, Chemical properties and uses.

5.5 Aldehydes and Ketones preparation properties and uses.

5.6 Monocarboxylic acids-general preparation, chemical properties and uses

**6 Rubber and Polymers (2 hrs)**

6.1 Definition of Rubber and Polymers

6.2 Types of Rubber

6.3 Classification of Polymers

6.4 Composition and uses of Polythene, PVC, Teflon, Bakelite.

**LIST OF PRACTICALS**

1. Gravimetric analysis and study of apparatus used there in
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances
3. Determine the viscosity of a given oil with the help of “Redwood viscometer”
4. Estimate the amount of ash in the given sample of coal
5. Determination of copper in the given brass solution, or sample of blue vitriol volumetrically
6. Electroplate the given strip of Cu with Ni
7. Detection of organic compounds (Aldehydes, Ketones, Carboxylic acid, and Amines)

**RECOMMENDED BOOKS**

1. “A Text Book of Applied Chemistry-I” by SS Kumar; Tata McGraw Hill, Delhi
2. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
3. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40

**Other additional books for reading**

1. Engineering Chemistry by Jain PC and Jain M
2. Chemistry of Engineering by Aggarwal CV
3. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
4. Progressive Applied Chemistry -I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

## 2.5 GENERAL ENGINEERING

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### RATIONALE

A diploma holder has to assist in activities of installation, operation and maintenance etc of different machines and equipment. These activities are not branch specific and instead require him to know basics of civil, electrical and mechanical engineering. The subject of General Engineering has been included to impart basic knowledge of civil, electrical and mechanical engineering to the students.

#### Note:

1. The students of Civil Engineering, Chemical Engineering, Chemical Engineering (pulp and paper) will be studying only Part A (Mechanical Engineering) and Part B (Electrical Engineering)
2. The students of Electrical engineering, Electronics and Communication Engineering, Instrumentation and Control Engineering, Computer Engineering and Information Technology will be studying only Part A (Mechanical Engineering ) and Part C (Civil Engineering)
3. The students of Mechanical Engineering will be studying only Part B (Electrical Engineering) and Part C (Civil Engineering)
4. The students of other branches of engineering and technology will be studying all the three Parts A (Mechanical Engineering), Part B (Electrical Engineering) and Part C (Civil Engineering), unless specified otherwise
5. A time of 2 hours per week has been allotted to Mechanical Engineering, 2 hours per week to Electrical Engineering and 1 hour per week to Civil Engineering in the lecture hours, for teaching theory and a lump-sum time of 2 hours week has been allotted for the Practicals.

### DETAILED CONTENTS PART-A

#### MECHANICAL ENGINEERING

##### Theory

1. **Transmission of Power** (8 hrs)
  - 1.1 Transmission of power through belt, rope drives and pulleys, gears and chains
  - 1.2 Different type of pulleys and their application

- 1.3 Chain drives and its comparison with belt drive
- 1.4 Gear drives, types of gears, simple gear trains and velocity ratio

**2. Internal combustion Engines** (14 hrs)

- 2.1 Classification and application of IC Engines commonly used: spark ignition and compression ignition engines.
- 2.2 Working principles of two stroke and four stroke petrol and diesel engines
- 2.3 Ignition system in petrol engines i.e. spark ignition, magneto ignition
- 2.4 Spark plug
- 2.5 Carburetor
- 2.6 Cooling system of IC Engines: Lubrication of IC Engines
- 2.7 General maintenance of engines

**3. Air Conditioning System** (8 hrs)

- 3.1 Basic principle of refrigeration and air conditioning
- 3.2 Working of centralized air conditioner
- 3.3 Concept of split air conditioner and its applications

**4. Pumps: Types and their uses** (2 hrs)

**PRACTICAL EXERCISES IN MECHANICAL ENGINEERING**

1. Study of main parts of 4 stroke petrol and diesel engines by actually dismantling them (The idea is to acquaint the students with the most common troubles occurring in the engines)
2. Study of main parts of 2 stroke petrol engine by actually dismantling it. (The idea is to acquaint the students with the most common trouble occurring in the engines)
3. Study of ignition system of petrol engines
4. Study of fuel and air circuit of a petrol engine
5. Study of fuel injection system and air circuit of a diesel engine
6. Study of cooling system and lubricating (including greasing) of an IC Engine
7. Study of friction clutch
8. Study of hydraulic brake
9. Study of various drives for transmission of powers. Models of belts, pulleys, gears, chains and clutches
10. Study of air conditioning system in a building

NOTE: Study will include dismantling and reassembling of actual parts

**PART B****ELECTRICAL ENGINEERING****Theory**

5. Application and Advantages of Electricity: (3 hrs)
  - 5.1 Difference between AC and DC
  - 5.2 Various applications of electricity
  - 5.3 Advantages of electrical energy over other types of energy
  
6. Basic Quantities of Electricity: (4 hrs)
  - 6.1 Definition of voltage, current, power and energy with their units
  - 6.2 Name of the instruments used for measurement of quantities given in 5.1
  - 6.3 Connection of the instruments in 5.2 in electric circuit
  
7. Various Types of Power Plants: (3 hrs)
  - 7.1 Elementary block diagram of thermal, hydro and nuclear power stations
  - 7.2 Brief explanation of the principle of power generation in above power stations
  
8. Elements of Transmission Line: (4 hrs)
  - 8.1 Pictorial diagram of a three-phase transmission and distribution system showing transformers, supports, conductors, insulators and earth wire etc.
  - 8.2 Brief function of accessories of transmission lines
  - 8.3 Earthing of lines, substation and power station - need and practices adopted
  
9. Distribution System (4 hrs)
  - 9.1 Distinction between high and low voltage distribution system
  - 9.2 Identification of three phase wires, neutral wires and the earth wire on a low voltage distribution system
  - 9.3 Identification of the voltage between phases and between one phase and neutral
  - 9.4 Distinction between three phase and single phase supply
  
10. Supply from the Poles to the Distribution Board: (3 hrs)
  - 10.1 Arrangement of supply system from pole to the distribution board
  - 10.2 Function of service line, energy meter, main switch, distribution board

11. Domestic Installation: (4 hrs)
- 11.1 Distinction between light and fan circuits and single phase power circuit, sub circuits
  - 11.2 Various accessories and parts of installation, identification of wiring systems
  - 11.3 Common safety measures and earthing
  - 11.4 Introduction to BIS code of safety and wiring installation
12. Electric Motors and Pumps: (5 hrs)
- 12.1 Definition and various application of single phase and three phase motors
  - 12.2 Connection and starting of three phase motors by star delta starter
  - 12.3 Conversion of horse power in watts or kilowatts
  - 12.4 Type of pumps and their applications

### **PRACTICAL EXERCISES IN ELECTRICAL ENGINEERING:**

1. Use of Megger:  
**Objective:** To make the students familiar with different uses of megger
2. Connection of a three phase motor and starter including fuses and reversing of direction of rotation.  
**Objective:** Students may be made familiar with the equipment needed to control a three-phase motor  
The students must experience that by changing any two phases, the direction of rotation is reversed.
3. Connection of a lamp, ceiling fan, socket outlet, geyser, floor grinder, voltage stabiliser etc.  
**Objective:** Students may be made familiar with the different types of equipment and circuits used in the domestic installations
4. Trouble shooting in a three-phase motor  
**Note:** The teacher may create anyone of the following faults
  - (a) Loose connections
  - (b) Blown fuse
  - (c) Tripped overload protection
  - (d) Incorrect direction of rotation
  - (e) Single phasing
  - (f) Burnt winding to be simulated by a loose connection behind a terminal box.**Objective:** The students must be able to detect the most common faults, which may occur in a three-phase motor, using meggar wherever necessary

5. Trouble shooting in a domestic wiring system.  
**Note:** The teacher may introduce a fault in the existing wiring system of a classroom or workshop like  
 (a) blown fuse  
 (b) loose connection  
 (c) faulty components/accessories etc.  
**Objective:** Students must be able to detect common faults which may occur in a domestic wiring system
6. Treatment of electric shock  
**Note:** The teacher may give a demonstration how an electric shock must be treated.  
**Objective:** Students must be trained to treat the persons suffering from an electric shock
7. Study of a distribution Board  
**Note:** Students may be asked to study the distribution board in the institution and note down all accessories.  
**Objective:** Students must be made familiar with the distribution board
8. Connections and reading down an energy meter  
**Objective:** Students may be asked to connect an energy meter to a load and calibrate reading
9. Demonstration in electrical machine laboratory  
**Objective:** Students may be shown different types of electrical machines and their starters and should be told that the three phase induction motors are most commonly used.
10. Study of submersible motor pump set:  
**Objective:** To tell use of the set in water supply and irrigation works.

### PART C

#### CIVIL ENGINEERING

##### Theory

13. Construction Materials (10 hrs)  
 Basics of various construction materials such as stones, bricks, lime, cement and timber along with their properties, physical/ field testing and uses, elements of brick masonry.
14. Foundations (8 hrs)  
 i) Bearing capacity of soil and its importance



- ii) Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines
15. Concrete (8 hrs)  
Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/ field testing of concrete, mixing of concrete
16. RCC (4 hrs)  
Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building

### **PRACTICAL EXERCISES IN CIVIL ENGINEERING**

#### Testing of bricks

- a) Shape and size
- b) Soundness test
- c) Water absorption
- d) Crushing strength

#### Testing of concrete

- a) Slump test
- b) Compressive Strength of concrete cube

3. The students should be taken to different construction sites to show them various construction materials, concreting process and construction of RCC structural elements, foundations and other civil works

Note: While imparting instructions, teachers are expected to lay more emphasis on concepts and principles. It will be better if the classes for general engineering are conducted in the laboratories and organized demonstrations for explaining various concepts and principles.

### **RECOMMENDED BOOKS**

#### **Mechanical Engineering**

1. General Mechanical Engineering by M. Adithan; TTTI, Chandigarh
2. Basic Civil and Mechanical Engineering by Jayagopal; Vikas Publications, New Delhi
3. IC Engines and Automobile Engineering by Dr.MP Poonia, Standard Publishers, New Delhi
4. Refrigeration and Air Conditioning by RK Rajput; SK Kataria and sons; Ludhiana

5. Theory of Machines by RS Khurmi and JK Gupta; S. Chand and Company Ltd., New Delhi

### **Electrical Engineering**

1. Electrical Technology Part 1: Basic Electrical Engineering by Theraja, BL; S Chand and Company, New Delhi
2. Principles of Electrical Engineering by Gupta BR, S Chand and Company, New Delhi
3. Basic Electrical Engineering by Mehta VK; S Chand and Company, New Delhi
4. Basic Electricity and Measurements by Suryanarayan NV and N Delhi; Tata McGraw Hill, 1987, New Delhi
5. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and sons, New Delhi
6. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill, New Delhi
7. Basic Electricity by BR Sharma; Satya Parkashan, New Delhi

### **Civil Engineering**

1. Textbook of Concrete Technology 2<sup>nd</sup> Edition by Kulkarni, PD Ghosh RK and Phull, YR; New Age International (P) Ltd., Publishers, New Delhi
2. Materials of Construction by Ghose; Tata McGraw Hill Publishing Co., Ltd., New Delhi
3. Civil Engineering Materials by TTTI, Chandigarh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Concrete Technology by Gambhir; Tata McGraw Hill Publishing Co., Ltd., New Delhi
5. Building Construction by J Jha and Sinha; Khanna Publishers, Delhi
6. Building Construction by Vazirani and Chandola; Khanna Publishers, Delhi
7. Civil Engineering Materials by SV Deodhar and Singhai; Khanna Publishers, Delhi
8. Soil Mechanics and foundation Engineering by SK Garg; Khanna Publishers, Delhi

## 2.6 BASIC MICROBIOLOGY

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### RATIONALE

The main objectives of this subject is to develop knowledge and skills in the students in the following major areas:

- a) the nature of micro-organisms found in food
- b) techniques to assess the growth of micro-organisms
- c) nature of useful micro-organisms
- d) techniques to identify the micro-organisms

The basic knowledge and skills about these aspects are essential to understand others subject areas and for the application of microbiological considerations required in the food preservation and processing technology.

### DETAILED CONTENTS

1. **Introduction** (16 hrs)  
 Classification of living system: Whittaker's five Kingdom concept. Definition of Microbiology. Historical Developments in Microbiology. Classification of microorganisms (Unicellular, Multicellular, Prokaryotes, Eukaryotes). Cell and cell organelles ( including ribosomes, mitochondria, endoplasmic reticulum, vacuoles, etc) – their functions
2. **Pure Culture** (8 hrs)  
 Streak plating, pour plating, spread plating, serial dilution technique, Isolation and preservation – lyophilization, slant method, liquid nitrogen method
3. **Microbial Growth** (8 hrs)  
 Growth curve and its different phases, Synchronous growth, factors affecting microbial growth, generation time-their significance
4. **Bacteria** (8 hrs)  
 Structure size and shape. Types depending upon different requirements. Gram positive and negative bacteria. Mode of reproduction.
5. **Fungi** (8 hrs)  
 Yeast and moulds –structure: their growth requirements, mode of reproduction, its importance.

**LIST OF PRACTICALS**

1. Study of microscope
2. Study of yeast under Microscope
3. Study of moulds under Microscope.
4. Study of bacteria under microscope
5. Size determination of microorganisms under microscope
6. Media preparation for fungi
7. Media preparation for bacteria
8. Preparation of glass-wares for sterilization.
9. Methods of sterilization-dry heat and moist heat
10. Aseptic transfer of culture
11. Enumeration of bacteria in the media by pour plating, spread plating and streaking techniques
12. Measurement of cell number in a culture
13. Simple staining of bacteria
14. Differential staining: Gram staining of bacteria.
15. Capsule staining
16. Spore Staining

**Note:** Teachers should make use of charts and other appropriate media to support classroom instruction. Emphasis during the practical session should be on performance by individual students and teacher should develop instructional manual for various exercises to facilitate the students. Visits to some of the local industries and quality control centers may be arranged to demonstrate various aspects of basic microbiology to the students. Experts may be invited to deliver lectures on latest developments in the field.

**RECOMMENDED BOOKS**

1. Essentials of Microbiology by K.S. Bilgrami, CBS
2. Food Microbiology by W.C. Frazier: Tata Mc Graw Hill
3. Modern Food Microbiology by James M. Jay; CBS
4. Bacteriology by Salle
5. Basic Food Microbiology; Bannett Chapmen and Hall
6. Standard Methods for Waste Water Analysis – American Public Health Association (APHA)

## 2.7 GENERAL WORKSHOP PRACTICE - I & II

### RATIONAL

Manual abilities to handle engineering materials with hand tools need to be developed in the students. They will be using different types of tools/equipment in different shops for fabrication purposes. Besides developing the necessary skills, the students will appreciate the importance of quality and safety measures.

### DETAILED CONTENTS

- Note:**
1. The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.
  2. The shops to be offered in I and II semester may be decided at polytechnic level
  3. The students should be taken to various shops (not included in the curriculum) in the polytechnic in batches and should be given knowledge of the various machines/equipment. Such as machine shop, foundry shop, sheet metal shop, etc.
  4. Students of Diploma in Chemical Engineering will undergo Shops 1 to 6 only

Following seven shops are being proposed:

1. **Carpentry shop**
2. **Fitting and plumbing shop**
3. **Welding shop**
4. **Paint shop**
5. **Forging and sheet metal shop**
6. **Electric shop**
7. **Electronics Shop**

#### 1. **Carpentry Shop**

- 1.1 Introduction to various types of wood, carpentry tools - their identification with sketches. Different types of wood joints.
- 1.2 Simple operations viz. hand sawing, marking, planning
- 1.3 Introduction and sharpening of wood working tools and practice of proper adjustment of tools

- 1.4 Demonstration and use of wood working machines i.e. band saw, circular saw, rip saw, bow saw and trammels. Universal wood working machine and wood turning lathe
- 1.5 Making of various joints (Also draw the sketches of various wooden joints in the Practical Note Book)
  - a) Cross lap joint
  - b) T-lap joint
  - c) Corner lap joint
  - d) Mortise and tenon joint
  - e) Dovetail joint
  - f) Prepare a file handle or any utility items by wood turning lathe

## **2. Fitting and Plumbing Shop**

- 2.1. Introduction to fitting shop, common materials used in fitting shop, description and demonstration of various types of work-holding devices and surface plate, V-block
- 2.2 Demonstration and use of simple operation of hack-sawing, demonstration of various types of blades and their uses
- 2.3 Demonstrate and use of all important fitting shop tools with the help of neat sketches (files, punch, hammer, scraper, taps and dyes etc.)
- 2.4 Introduction of chipping, demonstration on chipping and its applications.  
Demonstration and function of chipping tools.
- 2.5 Description, demonstration and practice of simple operation of hack saw, straight and angular cutting.
- 2.6 Demonstrations, description and use of various types of blades - their uses and method of fitting the blade.
- 2.7 Introduction and use of measuring tools used in fitting shop like: Try square, Steel rule, Measuring Tape, Outside micrometer, Vernier Caliper and Vernier Height Gauge
- 2.8 Description, demonstration and practice of thread cutting using taps and dies

- 2.9 Plumbing: Descriptions and drawing of various plumbing shop tools, Safety precautions. Introduction and demonstration of pipe dies, Pipe holding devices, Demonstration and practice of Pipe Fittings such as Sockets, Elbow, Tee, Reducer, Nipple, Union coupling, plug, Bend, Float valves and Taps

Job: Cutting and filing practice on a square of 45 X 45 mm<sup>2</sup> from MS flat

Job: Angular cutting practice of 45° (on the above job)

Job: Preparation of stud (to cut external threads) with the help of dies (mm or BSW)

Job: Drilling, counter drilling and internal thread cutting with Taps

Job: H-Fitting in Mild steel (ms) square

Job: Pipe cutting practice and thread cutting on GI Pipe with pipe dies

### 3. Welding Shop

- 3.1 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 and safety precautions

- 3.2 Introduction to electric arc welding (AC and DC), practice in setting current and voltage for striking proper arc, precautions while using electric arc welding. Applications of arc welding. Introduction to polarity and their use

- 3.3 Introduction to brazing process, filler material and fluxes; applications of brazing. Use of solder. Introduction of soldering materials

- 3.4 Demonstrate and use of the different tools used in the welding shop with sketches. Hand shield, helmet, clipping hammer, gloves, welding lead, connectors, apron, goggles etc.

- 3.5 Demonstration of welding defects and Various types of joints and end preparation

Job: Preparation of cap joint by arc welding

Job: Preparation of Tee joint by arc welding

Job: Preparation of single V or double V butt joint by using Electric arc welding

Job: Brazing Practice. Use of Speltor (on MS sheet pieces) Job: Gas welding practice on worn-out and broken parts



#### **4. Paint Shop**

Introduction of painting shop and necessity. Different types of paints. Introduction of powder coating plant and their uses.

Job: Preparation of surface before painting such as cleaning, sanding, putty, procedure and application of primer coat, and painting steel item.

Job: Painting practice by brush on MS sheet

Job: Practice of dip painting

Job: Practice of lettering: Name plates / Sign board

Job: Polishing and painting on wooden and metallic surfaces

Job: Practical demonstration of powder coating

#### **5. Forging and sheet metal shop**

Introduction to forging, forging tools, tongs, blowers/pressure blowers, hammers, chisels, punch, anvil, swag-block etc. Forging operations.

5.1 Forge a L hook or Ring from MS rod 6 mm  $\varphi$

5.2 Forge a chisel and give an idea of hardening and tempering

5.3 Lap joint with forge welding

5.4 High Strength Steel (HSS) tools – forging of Lathe shaper tools like side-tools and V-shape tools

5.5 Making sheet metal joints

5.6 Making sheet metal tray or a funnel or a computer chassis

5.7 Preparation of sheet metal jobs involving rolling, shearing, creasing, bending and cornering

5.8 Prepare a lap riveting joint of sheet metal pieces

#### **6. Electric Shop**

6.1 Demonstration of tools commonly used in Electric Shop

6.2 Safety precautions , electric shock treatment

6.3 Demonstration of Common Electric material like: wires, fuses, ceiling roses, battens, cleats and allied items

#### 6.4 Demonstration of Voltmeter, Ammeter, Multimeter and Energy meter

Job: Wiring practice in batten wiring, plastic casing-capping and conduit

Job: Control of one lamp by one switch Job: Control of one lamp by two switches Job: Control of one bell by one switch Job:

Assemble a Tube light

Job: Dismantle, study, find out fault, repair the fault, assemble and test domestic appliances like electric iron, electric mixer, ceiling and table fan, tube-light, water heater (geyser) and desert cooler

Job: Laying out of complete wiring of a house (Single-phase and Three- phase)

### 7. Electronics Shop

7.1 Identification, familiarization, demonstration and use of the following electronic instruments:

- a) Multi-meter digital
- b) Single beam simple CRO , function of every knob on the front panel
- c) Power supply , fixed voltage and variable voltage, single output as well as dual output.

7.2 Identification , familiarization and uses of commonly used tools; active and passive components; colour code and types of resistor and potentiometers

7.3 Cut, strip, join and insulate two lengths of wires/cables (repeat with different types of cables/ wires)

7.4 Demonstrate and practice the skill to remove components/wires by unsoldering

7.5 Cut, bend, tin component, leads, inserts. Solder components e.g. resistor, capacitor, diodes, transistors on a PCB

7.6 Wiring of a small circuit on a PCB/tag strip involving laying, sleeving and use of identifier tags

7.7 Demonstrate the joining (or connecting) methods/mounting and dismantling method, as well as uses of the items mentioned below:

- a) Various types of plugs, sockets, connectors suitable for general-purpose audio video use. Some of such connectors e.g. 2 and 3 pin mains plug and sockets, Banana plugs, sockets and

similar male and female connectors and terminal strips.

- b) Various types of switches such as: normal/miniature toggle, slide, push button piano key, rotary, SPST, SPDT, DPST, DPDT, band selector, multi-way Master Mains Switch.

7.8 Exposure to modern soldering and de-soldering processes (Field visits)

7.9 De-solder pump, remove and clean all the components and wires from a given equipment, a PCB or a tag strip.