

2.1 COMMUNICATING EFFECTIVELY IN ENGLISH II SEMESTER SYLLABUS

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

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:
 - ¾ The center and radius
 - ¾ Three points on it
 - ¾ 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
2. Differential Calculus (22 hrs)
 - 2.1 Concept of function, four standard limits
$$\lim_{x \rightarrow a} (x^n - a^n) / (x - a), \lim_{x \rightarrow 0} \sin x/x, \lim_{x \rightarrow 0} (a^x - 1)/x, \lim_{x \rightarrow 0} (1+x)^{1/x}$$
 - 2.2 Concepts of differentiation and its physical interpretation
 - ¾ Differentiation by first principle of x^n , $(ax + b)^n$, $\sin x$, $\cos x$, $\tan x$, $\sec x$, $\operatorname{cosec} x$ and $\cot x$, e^x , a^x , $\log x$. Differentiation of a function of a function and explicit and implicit functions
 - ¾ Differentiation of sum, product and quotient of different functions
 - ¾ Logarithmic differentiation. Successive differentiation excluding n^{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 CHEMISTRY – II

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 Calorific values

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

2.4 ENGINEERING DRAWING – II

RATIONAL

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

- Note:
1. First angle projection is to be followed
 2. Minimum of 15 sheets to be prepared by each student
 3. SP 46 – 1988 should be followed
 4. Instructions relevant to various drawings may be given along with
Students

DETAILED CONTENTS

1. Detail and Assembly Drawing (2 sheets)
 - 1.1 Principle and utility of detail and assembly drawings
 - 1.2 Wooden joints i.e. corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortice and Tenon joint, Corner and Through halving joint, Closed Mortise and Tenon joint
2. Threads (3 sheets)
 - 2.1 Nomenclature of threads, types of threads (metric), single and multiple start threads
 - 2.2 Forms of various external thread sections such as V, square and acme threads, BA, BSW and Knuckle, Metric, Seller Thread, Buttress Threads
 - 2.3 Simplified conventions of left hand and right hand threads, both external and internal threads
3. Locking Devices (1 sheet)

Lock nuts, castle nuts, split pin nuts, sawn nuts, slotted nut
4. Nuts and Bolts (3 sheets)

Different views of hexagonal and square nuts; Different views of hexagonal and square nuts; Assembly of hexagonal headed, square headed, square headed with square neck bolts with hexagonal and square nuts and washers. Foundations bolts
– Rag bolt and Lewis bolt

5. Screws, Studs and Washers (1 sheet)
 - 5.1 Drawing various types of machine screws
 - 5.2 Drawing various types of studs and set screws
6. Keys and Cotters (3 sheets)
 - 6.1 Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position
 - 6.2 Cotter joints (i) sleeve and cotter joint (ii) gib and cotter joint (iii) knuckle joint (iv) Spigot and socket joint
7. Rivets and Riveted Joints (2 sheets)
 - 7.1 Types of structural and general purpose rivet heads
 - 7.2 Caulking and fullering of riveted joints
 - 7.3 Types of riveted joints – lap, butt (single riveted, double riveted lap joint, single cover plate and double cover plate), chain and zig – zag riveting
8. Welded Joints (1 sheet)
 - 8.1 Various conventions and symbols of welded joints (IS 696)
 - 8.2 Practical applications of welded joints say joints on steel frames, windows, doors and furniture
9. Couplings (2 sheets)
 - 9.1 Muff or Box coupling, half lap muff coupling
 - 9.2 Flange coupling (Protected and non-protected)
 - 9.3 Flexible coupling

10. Symbols and Conventions (2 sheets)
 - 10.1 Civil engineering sanitary fitting symbols
 - 10.2 Electrical fitting symbols for domestic interior installations
 - 10.3 Building plan drawing with electrical and civil engineering symbols
11. Development of Surfaces (3 sheets)
 - 11.1 Construction of geometrical figures such as square, pentagon, hexagon
 - 11.2 Development of surfaces of cylinder, square, pentagonal and hexagonal, Prism, Cone and Pyramid, Section pentagonal and hexagonal pyramid
12. Interpenetration of (2 sheets)
 - 12.1 Cylinder to cylinder
 - 12.2 Cylinder to cone
13. AUTO CAD
 - 13.1 Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode
 - 13.2 Drawing commands – point, line, arc, circle, ellipse
 - 13.3 Editing commands – scale, erase, copy, stretch, lengthen and explode
 - 13.4 Dimensioning and placing text in drawing area
 - 13.5 Sectioning and hatching
 - 13.6 Inquiry for different parameters of drawing entity

Note: A minimum of 15 sheets should be prepared by each student

RECOMMENDED BOOKS

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House
2. A Text Book of Engineering Drawing by Surjit Singh Published by Dhanpat Rai and Co. Delhi
3. Engineering Drawing by PS Gill; published by SK kataria and Sons, New Delhi

2.5 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 ($v = \eta\lambda$)
- 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

2.6 ENGINEERING MATERIALS

RATIONALE

The knowledge of engineering materials is essential for Chemical Engineering discipline. The knowledge of mechanical, electrical, thermal and chemical properties of a material is necessary to make a proper selection of the material for process equipment. Effect of surrounding materials, failure under service conditions etc also affect the material selection

DETAILED CONTENTS

1. Importance of consideration of engineering materials (4 hrs)
2. Different types of engineering materials in use in chemical industries (6 hrs)
3. Properties expected for use of engineering materials in chemical industries 6hrs
4. Classification of engineering materials (18 hrs)
 - 4.1 Metallic Materials
 - 4.1.1 Ferrous Metals
Important varieties of iron ores, cast iron; types, properties and uses of cast iron, pig iron: types of pig iron. Wrought iron: properties and uses of wrought iron; Steel: factors affecting physical properties of steel and uses of steel (no manufacturing process)
 - 4.1.2 Non-ferrous Metals
Aluminium, cobalt, copper, lead, magnesium, nickel, tin and zinc, their properties and uses
 - 4.1.3 Various alloys of aluminium, copper, magnesium, nickel and steel
 - 4.2 Non-metallic materials
 - 4.2.1 Polymers
Nylon - 66, nylon - 6, polyesters, polycarbonates, polyurathenes, PVC, Polypropylene, rubber
 - 4.2.2 Ceramics
Definition of ceramic, clays, properties of clay, earthen wares and stone wares, uses of stonewares

Definition of refractory, classification of refractories, properties of refractories, common refractory bricks, fire clay bricks, dolomite bricks, high alumina bricks and carbon bricks

4.2.3 Glass

Definition, classification, composition, types and properties of glass

5. Mechanical, thermal and electrical properties (10 hrs)
- Tensile strength, compressive strength, shear strength, ductility and malleability, methods of improving strength; specific heat, glass transition temperature, crystalline melting temperature, thermal conductivity, dielectric strength, dielectric constant, power loss and electrical diffusivity
6. Specification of materials according to BIS (4 hrs)

RECOMMENDED BOOKS

1. Materials in Industry by WJ Patton; Prentice Hall Publication
2. Introduction to Engineering Materials by Aggarwal; Tata McGraw Hill Publication
3. Material Science by Narula; Tata McGraw Hill Publication
4. Elements of Metallurgy by HS Bawa; Tata McGraw Hill Publication

2.7 INTRODUCTION TO CHEMICAL ENGINEERING

RATIONALE

It is an introductory subject to be given to students opting for chemical engineering. It will expose to the students various areas to be covered in this course and various field jobs where they can join later on. The course will also impart to the students elementary knowledge regarding units and conversions. This knowledge is essentially required for supervisors.

DETAILED CONTENTS

1. What is chemical engineering? Brief history of chemical engineering (4 hrs)
2. Concept of unit operations and unit process in chemical engineering (4 hrs)
3. Functions of a chemical engineers, career opportunities for chemical engineers (3 hrs)
4. Scope of chemical engineering with respect to the new emerging areas in the field of chemical engineering like environmental engineering, bio-chemical and bio- medical engineering, membrane separation techniques, polymer science and engineering (5 hrs)
5. Systems of units and unit conversions involving process variables like pressure, temperature, viscosity, density, specific gravity, thermal conductivity (6 hrs)
6. Composition of mixtures and solutions; mass fractions, mole fractions, molarity, molality and normality (6 hrs)
7. Flow sheet, need and utility of studying a process with the help of flow sheet, symbols (8 hrs)
8. One case study say Urea Plant to show different unit operations and processes in conjunction thereby telling relevance of different subjects to be studied in chemical engineering (12 hrs)

RECOMMENDED BOOKS

1. Introduction to Chemical Engineering by Little John, CE and Meenaglum CM; McGraw Hill
2. Introduction to Chemical Engineering by Anderson LB; McGraw Hill Publication

3. Basic Principles of Chemical Engineering by Shaheen El; Joplin, Missouri, USA
4. Elementary Principles of Chemical Processes Second Edition by Felder RM and Fousseau RW; John Wiley and Sons
5. Basic Principles and Calculations of Chemical Engineering by Himmelbleu DM; Prentice Hall
6. Unit Operations of Chemical Engineering by McCabe and Smith, McGraw Hill Publication
7. Elementary Chemical Engineering by Peter, McGraw Hill Publication

2.8 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 mm² 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 φ

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.