

1.1 ENGLISH AND COMMUNICATION SKILLS – I

L T P
3 - 2

RATIONALE

Communication skills play an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills.

LEARNING OUTCOME

After undergoing the subject, the student will be able to:

- Pronounce properly.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Converse logically.

DETAILED CONTENTS

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|----|---|----------|
| 1. | Basics of Communication | (12 hrs) |
| | 1.1 Definition and process of communication | |
| | 1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal | |
| | 1.3 Objectives of communication | |
| | 1.4 Essentials of communication | |
| | 1.5 Channels of communication | |
| | 1.6 Barriers to communication | |
| 2. | Functional Grammar and Vocabulary | (12 hrs) |
| | 2.1 Parts of speech | |
| | 2.2 Article | |
| | 2.3 Tenses | |
| | 2.4 Active and passive voice | |
| | 2.5 Synonyms and antonyms | |
| | 2.6 Pair of words | |
| | 2.7 Correction of incorrect sentences | |
| 3. | Listening | (04 hrs) |
| | 3.1 Meaning and process of listening | |
| | 3.2 Importance of listening | |
| | 3.3 Methods to improve listening skills | |

4. Speaking (04 hrs)
- 4.1 Importance
- 4.2 Methods to improve speaking
5. Reading (12 hrs)
- 5.1 Meaning
- 5.2 Techniques of reading: skimming, scanning, intensive and extensive reading
- 5.3 Comprehension, vocabulary enrichment and grammar exercises based on following readings:
- Section - I
- God Lives in the Panch – Munshi Prem Chand
 - The Gift of the Magi – O. Henry
 - Uncle Podger Hangs a Picture – Jerome K. Jerome
- Section - II
- Skylark – P.B. Shelley
 - Stopping by Woods on a Snowy Evening – Robert Frost
 - Where the Mind is Without Fear – Rabindranath Tagore
6. Writing (04 hrs)
- 6.1 Significance and effectiveness of writing
- 6.2 Paragraph of 100 – 120 words
- 6.3 Picture composition/Guided composition

LIST OF PRACTICALS

1. Self and peer introduction
2. Looking up words in a dictionary (meaning and pronunciation)
3. Newspaper reading
4. Just a Minute session – extempore
5. Situational conversation and role play
6. Using pre – recorded CDs/DVDs to students to listen and comprehend.
7. Greetings for different occasions
8. Improving pronunciation through tongue twisters.

INSTRUCTIONAL STRATEGY

Use of pre-recorded CDs/DVDs should be made to help the students in developing listening skills. Student centred activities such as group discussions, role play should be used to ensure active participation of students in the classroom.

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
3. Developing Communication Skills (2nd Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
4. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
5. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
6. Communication Skills by Sanjay Kumar & Pushp Lata; Oxford University Press, New Delhi

Websites for Reference:

1. [http://www.mindtools.com/](http://www.mindtools.com/page 8.html) page 8.html – 99k
2. <http://www.letstalk.com.in>
3. <http://www.englishlearning.com>
4. <http://learnenglish.britishcouncil.org/en/>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	25
2	12	25
3	04	08
4	04	08
5	12	26
6	04	08
Total	48	100

1.2 APPLIED MATHEMATICS - I

L T P
5 - -

RATIONALE

Contents of this course provide fundamental base for understanding engineering problems and their solution algorithms. Contents of this course will enable students to use basic tools like logarithm, binomial theorem, partial fractions, matrices etc. for solving complex engineering problems with exact solutions in a way which involve less computational task. By understanding the logarithm, they will be able to make long calculations in short time and it is also a pre-requisite for understanding Calculus.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Apply Complex Number and its representation for two dimensional designing and related calculations. They will be able to apply this knowledge in many engineering problems like alternating current/voltage. The concept of rotation of a vector using iota will enable them solve many engineering problems.
- Apply the basics concepts of Permutation and Combination to find out how many possible ways or arrangements are possible for a particular problem and its solutions. They will be able to count without actual counting. They will be able to apply this concept in understanding of Binomial Theorem and demonstrate better reasoning in different analytical situations.
- Calculate the approximate value of certain expressions and extract roots of certain expression in many engineering problems by Application of Binomial Theorem.
- Resolve a fraction to further fractions by applying basics concepts of Partial Fractions. They will be able to use and apply this knowledge in Integral Calculus.
- Solve engineering problems that are in matrix format by applying the basic understanding of Matrices and their properties, which are usually less computational. Further, this understanding will work as a backbone for the use and development of software in many engineering applications. Study of matrices and its properties will also provide educational base for continuing study and provide solution to many engineering problems by different methodologies.
- Design and solve related problems like constructions of roads, dams, bridges and calculation of height, distance, elevation etc. By the understanding of basic concepts of Trigonometry and 2 D geometry, they will be able to apply the same in different situations in surveying, navigation, astronomy and many other engineering problems. They will also be able to draw graphs of trigonometrical functions for many applications in the solution of engineering problems.

- Write the equations of a geometric shape used in many engineering problems such as straight line and circle. With the use of coordinate geometry, they will be able to explore and evaluate the idea of location, graph, linear relationships between two forms, and distance between two lines, which will be useful in solving engineering problems. They will be able to calculate the distance between a point and a line.

DETAILED CONTENTS

1. Algebra (30 hrs)
 - 1.1 Complex Numbers: Complex number, representation, modulus and amplitude.
 - 1.2 Basics and properties of logarithms.
 - 1.3 Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors).
 - 1.4 Meaning of ${}^n P_r$ & ${}^n C_r$ (mathematical expression). Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof), first and second binomial approximation with applications to engineering problems.
 - 1.5 Determinants and Matrices – Expansion of determinants (upto 3rd order, using properties and otherwise), solution of equations (upto 3 unknowns) by Cramer's rule, definition of Matrices with types, addition, subtraction and multiplication of matrices (upto 3rd order), Minors and Co-factors, inverse of a Matrix by Adjoint method (upto 3rd order), solution of simultaneous equations (upto 3rd order) by Matrix method. Area of a triangle using determinants.

2. Trigonometry (25 hrs)
 - 2.1 Concept of angle, measurement of angle in degrees, grades and radians and their conversions.
 - 2.2 T-Ratios of Allied angles (without proof), Sum, Difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).
 - 2.3 Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

3. Co-ordinate Geometry (25 hrs)
- 3.1 Cartesian and Polar coordinates (two dimensional), conversion from Cartesian to Polar coordinates and vice-versa
- 3.2 Slope of a line, equation of straight line in various standards forms (without proof); (slope intercept form, intercept form, one-point form, two-point form, symmetric form, normal form, general form), inter section of two straight lines, concurrency of lines, angle between straight lines, parallel and perpendicular lines, perpendicular distance formula, conversion of general form of equation to the various forms.
- 3.3 General equation of a circle and its characteristics. To find the equation of a circle, given:
- * Centre and radius
 - * Three points lying on it
 - * Coordinates of end points of a diameter

INSTRUCTIONAL STATREGY

Basic elements of algebra, trigonometry and coordinate geometry can be taught in the light of their applications in the field of engineering and technology. By laying more emphasis on applied part, teacher can also help in providing a good continuing education base to the students.

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Applied Mathematics, Vol. I & II by SS Sabharwal & Dr Sunita Jain, Eagle Parkashan, Jalandhar
3. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
4. Applied Mathematics I, Archana Sharma, Lords Publications, Jalandhar.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allotted (%)
1.	30	35
2.	25	35
3.	25	30
Total	80	100

1.3 APPLIED PHYSICS – I

L T P
4 - 2

RATIONALE

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

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOME

After undergoing this subject, the student will be able to:

- Identify physical quantities, parameters and select their units for use in engineering solutions and make measurements with accuracy by optimising different types of errors.
- Represent physical quantities as scalar and vectors and calculate area of an engineering design and determine net flow (flux) through a given closed surface, etc.
- Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.)
- Analyse and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
- Define work, energy and power and their units. Drive work, power and energy relationship and solve problems about work and power.
- Classify sources of energy as renewable or non renewable. State the principle of conservation of energy. Give advantages and disadvantages of each energy source and Identify forms of energy, conversions. Compare and contrast the physical properties associated with linear motion and rotational motion and give examples of conservation of angular momentum. Describe the surface tension phenomenon and its units, cause of surface tension and effects of temperature on surface tension and Solve statics problems that involve surface tension related forces.
- Describe the viscosity of liquids, coefficient of viscosity and the various factors affecting its value. calculate the viscosity of an unknown fluid using Stokes' Law and the terminal velocity
- Define stress and strain. State Hooke's law and conditions under which it is valid. Given an engineering stress–strain diagram, determine (a) the modulus of elasticity, (b) the yield strength (0.002 strain offset), and (c) the tensile strength, and (d) estimate the percent elongation.

- Express physical work in term of heat and temperature; Measure temperature in various processes on different scales (Celsius, Kelvin Fahrenheit etc.)
- Distinguish between conduction, convection and radiation, identify the different methods for reducing heat losses
- Define the terms: specific heat capacity, specific latent heat, analyse the result of heat transfer between bodies at different temperatures and states measure the specific heat capacity of a solid or a liquid

DETAILED CONTENTS

1. Units and Dimensions (10 hrs)
 - 1.1 Physical quantities Units - fundamental and derived units, systems of units (FPS, CGS and SI units)
 - 1.2 Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity, stress, strain, moment of inertia, gravitational constant.)
 - 1.3 Principle of homogeneity of dimensions
 - 1.4 Dimensional equations and their applications, conversion from one system of units to other, checking of dimensional equations and derivation of simple equations)
 - 1.5 Limitations of dimensional analysis
 - 1.6 Error in measurement, absolute error, relative error, rules for representing significant figures in calculation.
 - 1.7 Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

2. Force and Motion (12 hrs)
 - 2.1 Scalar and vector quantities – examples, representation of vector, types of vectors
 - 2.2 Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product.
 - 2.3 Resolution of Vectors and its application to lawn roller.
 - 2.4 Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.
 - 2.5 Impulse and its Applications
 - 2.6 Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period.
 - 2.7 Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)
 - 2.8 Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist

- 2.9 Application of various forces in lifts, cranes, large steam engines and turbines
3. Work, Power and Energy (10 hrs)
- 3.1 Work: and its units, examples of zero work, positive work and negative work
- 3.2 Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications.
- 3.3 Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications
- 3.4 Energy and its units: Kinetic energy and gravitational potential energy with examples and their derivation
- 3.5 Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.
- 3.6 Power and its units, calculation of power in numerical problems
- 3.7 Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.
4. Rotational Motion (10 hrs)
- 4.1 Concept of translatory and rotatory motions with examples
- 4.2 Definition of torque and angular momentum and their examples
- 4.3 Conservation of angular momentum (quantitative) and its examples
- 4.4 Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only).
- 4.5 Application of rotational motions in transport vehicles, and machines.
5. Properties of Matter (12 hrs)
- 5.1 Elasticity: definition of stress and strain, different types of moduli of elasticity, Hooke's law, significance of stress strain curve
- 5.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications
- 5.3 Surface tension: concept, its units, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension
- 5.4 Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.
- 5.5 Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications (no derivation and numerical).

6. Thermometry (10 hrs)
- 6.1 Difference between heat and temperature
 - 6.2 Modes of transfer of heat (Conduction, convection and radiation with examples)
 - 6.3 Different scales of temperature and their relationship
 - 6.4 Types of Thermometer (Mercury Thermometer, Bimetallic Thermometer, Platinum resistance Thermometer, Pyrometer)
 - 6.5 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
 - 6.6 Concept of Co-efficient of thermal conductivity
 - 6.7 Application of various systems of thermometry in refrigeration and air-conditioning etc.

LIST OF PRACTICALS (to perform minimum eight experiments)

1. To find volume of solid sphere using a vernier calipers
2. To find internal diameter and depth of a beaker using a vernier calipers and hence find its volume.
3. To find the diameter of wire using a screw gauge
4. To determine the thickness of glass strip using a spherometer
5. To verify parallelogram law of forces
6. To study conservation of energy of a ball or cylinder rolling down an inclined plane.
7. To find the Moment of Inertia of a flywheel about its axis of rotation
8. To determine the atmospheric pressure at a place using Fortin's Barometer
9. To determine the viscosity of glycerin by Stoke's method
10. To determine the coefficient of linear expansion of a metal rod
11. To determine force constant of spring using Hooks law

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics of mechanics, work power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
5. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
6. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
7. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
8. Engineering Physics by DK Bhhatacharya & Poonam Tandan; Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allotted (%)
1.	10	15
2.	12	20
3.	10	15
4.	10	15
5.	12	20
6.	10	15
Total	64	100

1.4 APPLIED CHEMISTRY – I

L T P
4 - 2

RATIONALE

The use of various chemicals and chemical products in diverse technical and engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma-engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

- Classify various substances based on state of aggregation
- Ascertain qualitatively few physical properties of substances such as density melting and boiling points etc qualitatively.
- Calculate qualitative and quantitative of simple chemical substances.
- Explain and substantiate the laws of chemical combinations.
- Substantiate the laws and principles on which structure of atom is established.
- Explain and predict properties of substances.
- Explain various engineering properties of substances.
- Prepare solution of required concentrations.
- Prepare pH and buffer solutions and understand their significance in industrial process such as electrolysis, electrochemical machining of materials etc.
- Explain sources of water and various characteristics of water (quantitatively).
- Explain cause and factors which can adversely affecting natural water quality and remedial measures available for water purification to achieve water quality standards required for domestic, agricultural and industrial applications.
- Explain the reasons for scarcity of natural water (locally and globally) on mother Earth.
- Think critically, develop and adapt water conservation techniques.
- Explain corrosion of metal and their preventive measures.
- Classify the substance based on the electric behavior and apply these laws/principles efficiently in industrial electrochemical processes.
- Distinguish and construct electrochemical cells and electrolytic cells.
- Explain the principle and mechanisms of latest electrochemical machining technology.
- Explain various biochemical process, pollutions and their control measures polymers composites etc.

DETAILED CONTENTS

1. Basic Concept of Chemistry (08 hrs)
 - 1.1 Physical Classification of matter –solids, liquids, gases.
 - 1.2 Chemical Classification of matter – element, compounds and mixtures
 - 1.3 Symbols of elements and valency, writing of chemical formulae of simple compounds.
 - 1.4 Calculation of percentage of elements in the following compounds using atomic and molecular masses of CaCO_3 , NaCl , CuSO_4 , NaOH , Ca(OH)_2 , H_2SO_4 , $\text{C}_2\text{H}_2\text{O}_4$. (Atomic mass of elements should be provided)
 - 1.5 Chemical equations, thermo-chemical equations, balancing of chemical equations (hit and trial method)

2. Atomic Structure, Periodic Table and Chemical Bonding (14 hrs)
 - 2.1 Fundamental particles- mass and charges of electrons, protons and neutrons with names of the scientists who discovered these fundamental particles.
 - 2.2 Bohr's model of atom and successes and drawbacks of Bohr's Model of atom (qualitative treatment only).
 - 2.3 Atomic number, atomic mass number isotopes and isobars.
 - 2.4 Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance,
 - 2.5 Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are excluded).
 - 2.6 Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded)
 - 2.7 Chemical bonding and cause of bonding and types of chemical bonding ; Ionic bond (example NaCl) and Covalent bond (sigma (σ) and pi (π) bonds) with examples of H_2 , O_2 , N_2 and CH_4 . Elementary idea of hybridization and its types (sp^3 , sp^2 & sp) with examples of CH_4 , BF_3 & BeCl_2 .
 - 2.8 Metallic bonding- explanation with the help of electron gas (sea) model.

3. Solutions (08 hrs)
 - 3.1 Definition of solution, solute and solvent with examples
 - 3.2 Methods to express the concentration of solution- molarity (M), molality (m) and normality (N) and numericals based on calculation of M , m and N
 - 3.3 Introduction to pH of solution, simple numericals on pH and industrial applications of pH.
 - 3.4 Definition of buffer solution and types of buffer solutions with examples and industrial applications of buffers solutions.

4. Water (14 hrs)
- 4.1 Demonstration of water resources on Earth using pie chart.
 - 4.2 Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter (mgL^{-1}) and part per million (ppm) and simple numericals.
 - 4.3 Disadvantages caused by the use of hard water in domestic and boiler feed water.
 - 4.4 Removal of hardness -Permutit process and Ion-exchange process.
 - 4.5 Chemical analysis of water for estimation of
 - a) Total dissolved solids (TDS)
 - b) Alkalinity of water .
 - 4.6 Drinking water and characteristics of drinking water.
 - 4.7 Natural water sterilization by chlorine and UV radiation and reverse osmosis (elementary idea).
5. Electro Chemistry (14 hrs)
- 5.1 Electronic concept of oxidation, reduction and redox reactions
 - 5.2 Definition of terms: electrolytes, non-electrolytes with suitable examples
 - 5.3 Faradays laws of electrolysis and simple numerical problems.
 - 5.4 Industrial Application of Electrolysis – Electroplating, electrolytic refining and electrometallurgy.
 - 5.5 Application of redox reactions in electrochemical cells – commercial dry cell (Primary), commercially used lead storage battery (Secondary cell).
6. Organic Chemistry (06 hrs)
- 6.1 Tetra valency and catenation property of carbon to produce huge organic compounds.
 - 6.2 Classification of organic compounds on the bases of functional groups
 - 6.3 Nomenclature of simple organic compounds in accordance with I.U.P.A.C. (compounds having two carbon atoms in a molecule belongs to alkanes, alkenes, alkynes, alkyl chlorides, alcohols, ethers, aldehydes, ketones, carboxylic acids, amines) (compounds containing more than one functional groups are excluded) and their common names (if any)

LIST OF PRACTICALS

1. Volumetric analysis and apparatus used in volumetric analysis
2. Preparation of standard solution of oxalic acid or potassium permanganate
3. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
4. Volumetric estimation of ferrous ammonium sulfate solution by titrating it against standard potassium permanganate solution in acidic medium
5. To prepare iodoform from ethanol or acetone.

6. To prepare Mohr's salt from ferrous sulfate and ammonium sulfate
7. Determination of pH of given solution using pH meter
8. To distinguish between aldehyde and ketone by Tollen's reagent (benzaldehyde and acetone may be used).
9. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution

INSTRUCTIONAL STRATEGY

Teachers may take help of various models and charts while imparting instructions to make the concept clear. More emphasis should be laid on discussing and explaining practical applications of various chemical process and reactions. In addition, students should be encouraged or motivated to study those processes in more details, which may find practical application in their future professional career.

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.
6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, Meerut, India.

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (hrs)	Marks Allotted (%)
1.	08	12
2.	14	22
3.	08	12
4.	14	22
5.	14	22
6.	06	10
Total	64	100

1.5 BASICS OF INFORMATION TECHNOLOGY

L T P
- - 3

RATIONALE

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools using MS Office/Open Office/Libre Office using internet etc., form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

Explanation of Introductory part should be demonstrated with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- Identify Computer Hardware Components, Network Components and Peripherals.
- Explain the role of an Operating System.
- Install System and Application Software.
- Explain the function of the system components including Processor, Motherboard and Input-output devices.
- Use Word Processing Software to prepare document.
- Use Spreadsheet Software to create workbooks and automate calculation.
- Use Presentation Software to create interactive presentation.
- Perform fundamental tasks common to most application software including print, save, edit, cut, copy, paste, format, spell and grammar check.
- Find and evaluate information on the Web.
- Install Antivirus.
- Safeguard against Online Frauds, threats and crimes.

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Basic Concepts of IT and Its Application

Information Technology concept and scope, applications of IT. in office, Air and Railway Ticket reservation, Banks financial transactions, E-Commerce and E-Governance applications etc., Ethics of IT, concept of online frauds, threats of IT crimes.

2. Computer Hardware:

Block diagram of a computer, components of computer system, CPU, Memory, Input devices; keyboard, Scanner, mouse etc; Output devices; VDU, LCD, Printers etc. Primary and Secondary Memory: RAM, ROM, magnetic disks – tracks and sectors, optical disk (CD , DVD & Blue Ray Disk.), USB/Flash Drive.

3. Software Concepts:

System software, Application software, Virtualization software and Utility software, Introduction of Operating System, Installation of Window / linux, Features of OPEN OFFICE/MS_OFFICE(MS word, Excel, PowerPoint) .

4. Internet Concepts:

Basics of Networking – LAN, WAN, Wi-Fi technologies and sharing of printers and other resources, Concept of IP addresses, DNS, introduction of internet, applications of internet like: e-mail and browsing, concept of search engine and safe searching. Various browsers like Internet explorer/Microsoft Edge, Mozilla Firefox, use of cookies and history, WWW (World Wide Web), hyperlinks, introduction to Anti-virus.

LIST OF PRACTICAL EXERCISES

1. Given a PC, name its various components and peripherals. List their functions .
2. Installing various components of computer system and installing system software and application software
3. Installation of I/O devices, printers and installation of operating system viz. Windows/BOSS/ LINUX
4. Features of Windows as an operating system
 - Start
 - Shut down and restore
 - Creating and operating on the icons
 - Opening, closing and sizing the windows and working with windows interfacing elements (option buttons, checkbox, scroll etc.)

- Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file and folders
- Changing settings like, date, time, colour (back ground and fore ground etc.)
- Using short cuts
- Using on line help

5. Word Processing (MS Office/Open Office)

- a) File Management:
 - Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file
- b) Page set up:
 - Setting margins, tab setting, ruler, indenting
- c) Editing a document:
 - Entering text, cut, copy, paste using tool- bars
- d) Formatting a document:
 - Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
 - Aligning of text in a document, justification of document, inserting bullets and numbering
 - Formatting paragraph, inserting page breaks and column breaks, line spacing
 - Use of headers, footers: Inserting footnote, end note, use of comments, autotext
 - Inserting date, time, special symbols, importing graphic images, drawing tools
- e) Tables and Borders:
 - Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
 - Print preview, zoom, page set up, printing options
 - Using find, replace options
- f) Using Tools like:
 - Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and lables
 - Using shapes and drawing toolbar,
 - Working with more than one window .

6. Spread Sheet Processing (MS Office/Open Office)

- a) Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spread sheets

- b) Menu commands:
Create, format charts, organise, manage data, solving problem by analyzing data. Programming with Excel Work Sheet, getting information while working
- c) Work books:
Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations
Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting
- d) Creating a chart:
Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
Using a list to organize data, sorting and filtering data in list
- e) Retrieve data with query:
Create a pivot table, customizing a pivot table. Statistical analysis of data
- f) Exchange data with other application:
Embedding objects, linking to other applications, import, export document.

7. PowerPoint Presentation (MS Office/Open Office)

- a) Introduction to PowerPoint
 - How to start PowerPoint
 - Working environment: concept of toolbars, slide layout & templates.
 - Opening a new/existing presentation
 - Different views for viewing slides in a presentation: normal, slide sorter.
- b) Addition, deletion and saving of slides
- c) Insertion of multimedia elements
 - Adding text boxes
 - Adding/importing pictures
 - Adding movies and sound
 - Adding tables and charts etc.
 - Adding organizational chart
 - Editing objects
 - Working with Clip Art
- d) Formatting slides
 - Using slide master
 - Text formatting
 - Changing slide layout
 - Changing slide colour scheme
 - Changing background
 - Applying design template

- e) How to view the slide show?
 - Viewing the presentation using slide navigator
 - Slide transition
 - Animation effects, timing, order etc.
 - f) Use of Pack and Go Options.
8. Internet and its Applications
- a) Establishing an internet connection.
 - b) Browsing and down loading of information from internet.
 - c) Sending and receiving e-mail
 - Creating a message
 - Creating an address book
 - Attaching a file with e-mail message
 - Receiving a message
 - Deleting a message
 - d) Assigning IP Addresses to computers and use of domain names.
9. Functioning of Antivirus
- a) Installation and updation of an antivirus.
 - b) How to scan and remove the virus.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office in addition to working on internet. The student should be made capable of working on computers independently.

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.

5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

1.6 ENGINEERING DRAWING - I

L T P
- - 6

RATIONALE

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

Note:

- i) First angle projection is to be followed
- ii) Minimum of 16 sheets to be prepared and atleast 2 sheets on AutoCAD
- iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- Identify and use of different grades of pencils and other drafting instruments which are used in engineering field
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles (orthographic views)
- Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches
- Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances
- Use basic commands of AutoCAD.

DETAILED CONTENTS

1. Introduction to Engineering Drawing (03 sheets)
 - 1.1 Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards.

- 1.2 Different types of lines in Engineering drawing as per BIS specifications
 - 1.3 Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.
 - 1.4 Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75 degree, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4
2. Dimensioning Technique (01 sheet)
- 2.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
 - 2.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches
3. Scales (02 sheets)
- 3.1 Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale
 - 3.2 Drawing of plain and diagonal scales
4. Orthographic Projections (06 sheets)
- 4.1 Theory of orthographic projections (Elaborate theoretical instructions)
 - 4.2 Projection of Points in different quadrant
 - 4.3 Projection of Straight Line (1st and 3rd angle)
 - 4.3.1. Line parallel to both the planes
 - 4.3.2. Line perpendicular to any one of the reference plane
 - 4.3.3. Line inclined to any one of the reference plane.
 - 4.4 Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1st angle only
 - 4.5 Three views of orthographic projection of different objects. (At least one sheet in 3rd angle)
 - 4.6 Identification of surfaces

5. Sections (02 sheets)
- 5.1 Importance and salient features
- 5.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
- 5.3 Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
- 5.4 Orthographic sectional views of different objects.
6. Isometric Views (02 sheets)
- 6.1 Fundamentals of isometric projections and isometric scale.
- 6.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism.
7. Common Symbols and Conventions used in Engineering (02 sheets)
- 7.1 Civil Engineering sanitary fitting symbols
- 7.2 Electrical fitting symbols for domestic interior installations
- *8. Introduction to AutoCAD (02 sheets)
- Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.
- * Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.**

INSTRUCTIONAL STRATEGY

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice on AutoCAD should be established.

RECOMMENDED BOOKS

1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar
5. Engineering Drawing I by DK Goel, GBD Publication.

1.7 GENERAL WORKSHOP PRACTICE – I

(Common for Mechanical Engineering, Mechanical Engineering (RAC), Production and Industrial Engineering, Automobile Engineering and Civil Engineering)

L T P
- - 6

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOME

After completing the course the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Follow safety procedures and measures.
- Use safety equipment.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: 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.

The following shops are included in the syllabus:

1. Welding Shop – I
2. Fitting Shop – I
3. Sheet Metal Shop – I
4. Electric Shop-I
5. Carpentry Shop – I
6. Smithy Shop – I

1. WELDING SHOP – I

- 1.1 Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions.
- 1.2 Jobs to be prepared
 - Job I Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).
 - Job II Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).
 - Job III Preparation of lap joint using arc welding process.
 - Job IV Preparation of butt joint using arc welding process. (100 mm long).
 - Job V Preparation of T Joint using gas or arc welding (100mm x 6 mm M.S. Flat).

2. FITTING SHOP – I

- 2.1 Use of personal protective equipment and safety precautions while working.
- 2.2 Basic deburring processes.
- 2.3 Introduction to fitting shop tools, marking and measuring devices/equipment.
- 2.4 Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)
- 2.5 Identification of various steel sections (flat, angle, channel, bar etc.).
- 2.6 Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).
 - Job I Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).
 - Job II Filing a rectangular/square piece to maintain dimensions within an accuracy of $\pm .25$ mm.
 - Job III Making a cut-out from a square piece of MS flat using hand hacksaw and chipping.

3. SHEET METAL SHOP – I

- 3.1. Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.
- 3.2 Introduction and demonstration of hand tools used in sheet metal shop.
- 3.3 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine,

Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Brake etc.

- 3.4 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.
- 3.5 Study of various types of nuts, bolts, rivets, screws etc.
- Job I Shearing practice on a sheet using hand shears.
- Job II Practice on making Single riveted lap joint/Double riveted lap Joint.
- Job III Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

4. ELECTRIC SHOP - I

- 4.1 Study, demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, fuses, cleats, clamps and allied items, tools and accessories.
- 4.2 Study of electrical safety measures and protective devices.
- Job I Identification of phase, Neutral and Earth wires for connection to domestic electrical appliances and their connections to three pin plugs.
- Job II Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping.
- 4.3 Study of common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc.
- 4.4 Introduction to the construction of lead acid battery and its working.
- Job III Installation of battery and connecting two or three batteries in series and parallel.
- 4.5 Introduction to battery charger and its functioning.
- Job IV Charging a battery and testing with hydrometer and cell tester

5. CARPENTRY SHOP - I

- 5.1 General Shop Talk
- 5.1.1 Name and use of raw materials used in carpentry shop : wood & alternative materials
- 5.1.2 Names, uses, care and maintenance of hand tools such as different types of Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc.
- 5.1.3 Specification of tools used in carpentry shop.
- 5.1.4 Different types of Timbers, their properties, uses & defects.
- 5.1.5 Seasoning of wood.
- 5.1.6 Estimation.

- 5.2 Practice
 - 5.2.1 Practices for Basic Carpentry Work
 - 5.2.2 Sawing practice using different types of saws
 - 5.2.3 Assembling jack plane — Planning practice including sharpening of jack plane cutter
 - 5.2.4 Chiselling practice using different types of chisels including sharpening of chisel
 - 5.2.5 Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.
- 5.3 Job Practice
 - Job I Marking, sawing, planning and chiselling and their practice
 - Job II Half Lap Joint (cross, L or T – any one)
 - Job III Mortise and Tenon joint (T-Joint)
 - Job IV Dove tail Joint (Lap or Bridle Joint)

6. SMITHY SHOP - I

- 6.1 General Shop Talk
 - 6.1.1 Purpose of Smithy shop
 - 6.1.2 Different types of Hearths used in Smithy shop
 - 6.1.3 Purpose, specifications, uses, care and maintenance of various tools and equipments used in hand forging by segregating as cutting tools, supporting tools, holding tools, measuring tools etc.
 - 6.1.4 Types of fuel used and maximum temperature obtained
 - 6.1.5 Types of raw materials used in Smithy shop
 - 6.1.6 Uses of Fire Bricks & Clays in Forging workshop.
- 6.2 Practice
 - 6.2.1 Practice of firing of hearth/Furnace, Cleaning of Clinkers and Temperature Control of Fire.
 - 6.2.2 Practice on different basic Smithy/Forging operations such as Cutting, Upsetting, Drawing down, Setting down, Necking, Bending, Fullering, Swaging, Punching and Drifting
 - a) Demonstration — Making cube, hexagonal cube, hexagonal bar from round bar
 - 6.2.3 Practice of Simple Heat treatment processes like Tempering, Normalizing Hardening etc
- Job Practice: Job Preparation
 - Job I Making a cold / hot, hexagonal / octagonal flat chisel including tempering of edges.
 - Job II Production of utility goods e.g. hexagonal bolt / square shank boring tool, fan hook (long S-type) [Two jobs are to be done by the students].
 - Job III To prepare a cube from a M.S. round by forging method.

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

TRAFFIC AWARENESS & ROAD SAFETY CAMP (I)

A diploma holder must have knowledge of various types of traffic rules and regulations. Road safety education is vital for people of all ages. As a responsible citizen, you should be aware of each and every road safety rules. Observation is the key skill you need in ensuring road safety. By obeying safety rules and regulations, you can save yourself and others on the road. This camp covers the basic concepts of traffic rules and safety. Lectures will be delivered on following broad topics with the coordination of Distt. Traffic police. There will be no exam for this camp.

1. Road safety Scenario

2. School bus and traffic management

3. Awareness of Traffic Signs

4. Speeding Limit

5. Always Wear your Shields

6. Overtaking

7. Awareness through Hoardings

8. Walking & Safe cycling