1.1 ENGLISH AND COMMUNICATION SKILLS – I

L   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 OUTCOMES

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

1. Basics of Communication   (12 hrs)

   Definition and process of communication
   Introduction to types of communication - formal and informal, oral and written, verbal and non-verbal
   Objectives of communication
   Essentials of communication
   Introduction to channels of communication - formal (upward, downward, diagonal, horizontal), informal (grapevine, consensus)
   Barriers to communication

2. Functional Grammar and Vocabulary   (12 hrs)

   Parts of speech
   Article
   Tenses
   Subject verb agreement sentences
   Active and passive voice
   Synonyms and antonyms
   Pair of words
   Correction of incorrect sentences

3.   Listening   (04 hrs)

Meaning of listening
        Listening and hearing
Importance of listening
Active listening   – Meaning and strategies
Methods to improve listening skills

4.   Speaking   (03 hrs)

Importance
Methods to improve speaking

5.   Reading   (12 hrs)

Meaning
Techniques of reading: skimming, scanning, intensive and extensivereading
Comprehension, vocabulary enrichment and grammar exercises based on following readings:

Section - I
- My Struggle for an Education – Booker T. Washington
- Abraham Lincoln's letter to his son's headmaster – Abraham Lincoln
- Gateman's Gift – R.K Narayan
- The Selfish Giant - Oscar Wilde

Section - II
- Say Not, the Struggle Nought Availeth – A H Clough
- Stopping by Woods on a Snowy Evening – Robert Frost
- Where the Mind is Without Fear – Rabindranath Tagore

6.   Writing   (02 hrs)

Significance and effectiveness of writing
Paragraph writing   – Word choice, sentence formation and construction of paragraph.

LIST OF PRACTICALS

1.   Self and peer introduction
2.   Newspaper reading
3.   Just a Minute session – extempore
4.   Situational conversation and role play
5.   Language learning using open source software.

6. Greetings for different occasions
7. Improving pronunciation through tongue twisters.

INSTRUCTIONAL STRATEGY

Open source software should be used 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. Revathi, Srinivas, "Communicating Effectively in English, Book-I", Abhishek Publications, Chandigarh.
2. Mohan, Krishna & Meera Banerji, "Developing Communication Skills (2nd Edition)", Published by Macmillan Publishers India Ltd; New Delhi.
3. Eastwood, John, "Oxford Practice Grammar", Oxford University Press, London
4. Chadha, R. K., "Communication Techniques and Skills", Dhanpat Rai Publications, New Delhi.
5. Wren & Martin, "High School English Grammar and Composition", S. Chand & Company Ltd., Delhi.
6. Kumar, Sanjay & Pushp Lata, "Communication Skills", Oxford University Press, New Delhi

WEBSITES FOR REFERENCE

1. http://www.mindtools.com/ page 8.html
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 (Out of 50)
1	12	12
2	12	12
3	04	6
4	03	3
5	12	15
6	02	2
Total	**45**	**50**

APPLIED MATHEMATICS - I

L   P
4   -

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 binomial theorem, partial fractions, etc. for solving complex engineering problems with exact solutions in a way which involve less computational task. The analytical capabilities will enable the students to solve problems in engineering field.

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.
- Apply the basic concepts of permutation and combination to find out various ways or arrangements possible for a particular problem.
- Apply binomial theorem to find approximate value of certain expressions and extracting roots of certain expressions.
- Apply basics concepts of partial fractions to simplify the concept of rational expression.
- Solve engineering problems that are in matrix format by applying the basic understanding of matrices and their properties,
- Solve problems related to height, distance, elevation by making use of trigonometry.
- Write the equation of straight line and circle by using coordinate geometry.
- Optimize the utilization of resources by applying concepts of linear programming.

DETAILED CONTENTS

1. **Algebra** (20 hrs)

   Complex Numbers: Complex number, representation, modulus and amplitude.

   Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors).

   Meaning of ^np_r & ^nc_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.

   Introduction to Matrices and Determinants– Addition, subtraction and multiplication (upto 3 * 3 matrices), Determinants, simple properties, Crammer Rule.

2. **Trigonometry** (15 hrs)

   Introduction to T ratios, 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).

   Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

3. **Co-ordinate Geometry** (18 hrs)

   Cartesian and Polar coordinates (two dimensional), conversion from Cartesian to Polar coordinates and vice-versa

   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.

   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

4.   Operations Research   (7 hrs)

    Linear Programming Problems formulations.

    Graphical Method

INSTRUCTIONAL STATREGY

Basic of algebra, trigonometry, coordinate geometry, operations research 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.   Grewal, BS, "Elementary Engineering Mathematics", Khanna Publishers, New Delhi

2.   Sabharwal, SS & Dr Sunita Jain, "Applied Mathematics, Vol. I & II", Eagle Parkashan, Jalandhar

3.   Sastry, SS, "Engineering Mathematics, Vol I & II", Prentice Hall of India Pvt. Ltd.,

4.   Pal, Srimanta and Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1.	20	16
2.	15	12
3.	18	16
4	7	06
Total	**60**	**50**

APPLIED PHYSICS **– I**

L   P
3   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 OUTCOMES

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

- Select units of various physical quantities for use in engineering solutions.
- Represent physical quantities as scalar and vector.
- Use the concepts of force and motion to solve problems.
- Solve problems related to friction, work, power and energy,
- Comprehend properties of matter.
- Comprehend modes of heat transfer.
- Make measurements with accuracy.

DETAILED CONTENTS

1.   Units and Dimensions   (9 hrs)

Physical quantities Units - fundamental and derived units, systems of units (FPS, CGS and SI units)
Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, stress, strain)
Principle of homogeneity of dimensions
Dimensional equations and their applications, conversion of units from one system to another for density, force, pressure, work, power, velocity and acceleration.
Checking of dimensional equations
Limitations of dimensional analysis

2.   Force and Motion   (10 hrs)

Scalar and vector quantities   – examples, representation of vector, types of vectors
Addition and Subtraction of Vectors, Triangle and Parallelogram law(Statement only), Scalar and Vector Product.
Resolution of Vectors
Force, Momentum, Statement of Conservation of linear momentum, its applications
Impulse and its Applications
Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period.
Relation between linear and angular velocity, linear acceleration and angular acceleration (Only Formula), Angular momentum and torque (definition only)
Concept of centripetal and centrifugal forces and their applications with examples such as banking of roads

3.   Work, Power and Energy   (8 hrs)

Work: and its units, examples of zero work, positive work and negativework
Friction: concept, types, laws of limiting friction
Energy and its units: Kinetic energy and gravitational potential energy with examples and their derivation
Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.
Power and its units, calculation of power in numerical problems

4.   Properties of Matter   (9 hrs)

Elasticity: definition of stress and strain, Modulii of elasticity (Only definition, No derivation) , Hooke's law, significance of stress strain curve
Pressure: definition, its units, atmospheric pressure, gauge pressure,absolute pressure
Surface tension: concept, its units, angle of contact, applications of surface tension, effect of temperature on surface tension
Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law

5.   Thermometry   (9 hrs)

        Difference between heat and temperature
Modes of transfer of heat (Conduction, convection and radiation withexamples)
Different scales of temperature and their relationship
Expansion of solids, liquids and gases, coefficient of linear, surface andcubical expansions and relation amongst them
Concept of Co-efficient of thermal conductivity

LIST OF PRACTICALS (to perform minimum 8 experiments)

1.   To find volume of solid sphere using a vernier caliper.

2.   To find internal diameter and depth of a beaker using a vernier caliper 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 determine the atmospheric pressure at a place using Fortin's Barometer

8.   To determine the viscosity of glycerin by Stoke's method

9.   To determine the coefficient of linear expansion of a metal rod

10.   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. 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. Verma, HC, 'Concepts in Physics Vol. I & II ', Bharti Bhawan Ltd. New Delhi

4. 'Comprehensive Practical Physics, Vol, I & II ', JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi

5. Naik, PV, 'Engineering Physics ', Pearson Education Pvt. Ltd, New Delhi

6. Banwait, RA & R, Dogra, 'Applied Physics I & II ', Eagle Parkashan, Jalandhar

7. Bhhatacharya, DK & Poonam Tandan, "Engineering Physics", Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1.	9	10
2.	10	12
3.	8	8
4.	9	10
5.	9	10
Total	**45**	**50**

1.4   APPLIED CHEMISTRY

L   P

3   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 diploma holders to develop scientific temper and appreciate importance of chemistry. Hence the subject of Applied Chemistry.

LEARNING OUTCOMES

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

- Interpret both qualitative and quantitative aspects of simple chemical substances.
- Substantiate the laws and principles on which structure of atom is established.
- Understand types of bonds in chemical substance and their influence on the properties of chemical substances.
- Prepare solution of required concentrations.
- Understand qualitatively and quantitatively pH and buffer solutions.
- Significance of pH and buffer solutions and their industrial applications (in the process such as electrolysis, electrochemical machining of materials etc).
- Explain cause and factors adversely affecting natural water quality and remedial measures available for water purification to achieve water quality standards required for domestic, agricultural and industrial applications.
- Appreciate and practice the water conservation techniques.
- Identify and classify the substance based on the electric behavior.
- Realize the laws/principles efficiently used in development of electrochemical cells towards the greener energy.
- Identify most efficient fuel for the engine and engineering applications.
- Understand the elementary idea of polymers and plastics
- Distinguish different type of plastics and their applications.

DETAILED CONTENTS

1. Basic Concept of Chemistry   (2 hrs)

    Symbols of elements and valency, writing of chemical formulae of simple compounds.

    Calculation of molecular masses of $CaCO_3$, $NaCl$, $CuSO_4$, $NaOH$, $Ca(OH)_2$, H_2SO_4, $C_2H_2O_4$. (Atomic mass of elements should be provided)

2. Atomic Structure and Chemical Bonding   (8 hrs)

    2.1   Bohr's model of atom (qualitative treatment only).

    Atomic number, atomic mass number isotopes and isobars.

    Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance,

    Au   fbau'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).

    Chemical bonding and cause of bonding and types of chemical bonding; bonds) Ionic bond (example $NaCl$) and Covalent bond (sigma (σ) and pi (π) with examples of H_2, O_2, N_2 and CH_4 Metallic bonding.

3. Solutions   (05 hrs)

    Definition of solution, solute and solvent with examples

    Methods to express the concentration of solution- molarity (*M*) and molality (m), mass percentage, volume percentage and mole fraction and related simple numericals.

    Arrhenius concept of acids and bases. pH of solution, simple numericals onpH and industrial applications of pH.

    Definition of buffer solution and types of buffer solutions with examples and industrial applications of buffers solutions.

4. Water   (10 hrs)

    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.

    Disadvantages caused by the use of hard water in domestic industry and boiler feed water.

    Removal of hardness -Permutit process and Ion-exchange process.

    Drinking water and characteristics of drinking water.

    Natural water sterilization by chlorine and UV radiation and reverse osmosis (elementary idea).

5. Electro Chemistry (6 hrs)

Electronic concept of oxidation, reduction and redox reactions
Definition of terms: electrolytes, non-electrolytes with suitable examples
Faradays laws of electrolysis and simple numerical problems.
Industrial Application of Electrolysis – Electroplating.
Application of redox reactions in electrochemical cells (qualitative idea only excluding reactions) - commercial dry cell (Primary) and elementary idea of secondary cell (Only lead storage battery)

6. Chemistry of Fuels and Lubricants (12 hrs)

6.1. Definition of fuel, classification of fuels (primary and secondary), characteristics of good fuel.

Calorific value-higher calorific value, lower calorific value, determination of calorific value of solid or liquid fuel using Bomb calorimeter and numerical examples.

Coal - proximate analysis of coal

Fuel rating Octane number and Cetane number, fuel-structural influence on Octane and Cetane numbers

Gaseous fuels chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas. (preparation/manufacture excluded)

Definition of Lubricant and characteristics of good lubricant

Classification of lubricants liquid lubricants, solid lubricants, semi-solid lubricants with examples

Properties of lubricant: Physical properties viscosity and viscosity index, cloud point and pour point, flash point and fire point, oiliness. Chemical properties-Total Acid Value or Number (TAV or TAN), carbon residue, saponification value.

7. Polymers and Plastics (02 hrs)

Definition of polymer, monomer and degree of polymerization

Brief introduction of plastics - thermo plastics and thermo setting plastics with suitable examples (PVC, PS, PTFE, Nylon 6, Nylon 66, bakelite) distinction between thermo and thermo setting plastics
Applications of polymers in industry and daily life
Introduction to nano materials and nano technology

LIST OF PRACTICALS

1. Preparation of standard solution of oxalic acid.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.

3. To determine TDS in given sample of water.
4. To prepare Mohr's salt from ferrous sulfate and ammonium sulfate.
5. Determination of pH of given solution using pH meter.
6. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution.
7. Gravimetric estimation of moisture in the given coal sample (proximate analysis).
8. Gravimetric estimation of ash content in the given coal sample (proximate analysis).
9. Determination of viscosity of given liquid using Redwood viscometers
10. To construct simple Daniel cell and measure its e.m.f. using voltmeter.
11. To estimate hardness of water using EDTA method.

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. Kuricose, J.C. and J. Rajaram, "Chemistry in Engineering", Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Jain, P.C. & Monika Jain, "Engineering Chemistry", Dhanapat Rai Publishing Company, New Delhi.
3. Ahuja, S. C. and G. H. Hugar, "Eagle's Applied Chemistry (I and II)", Eagle Prakashan, Jalandhar.
4. Rao, C N R, "Understanding Chemistry", Universities Press (India) Pvt Ltd., 2011
5. Chopra, H. K. & A. Parmar, "Engineering Chemistry – A Text Book", Narosa Publishing House, New Delhi.
6. Pandey, Dr. Himanshu, "Engineering Chemistry", Goel Publishing House, Meerut, India.

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (hrs)	Marks Allotted (Out of 50)
1.	02	03
2.	08	08
3.	05	06
4.	10	12
5.	06	06
6.	12	12
7.	02	03
Total	**45**	**50**

BASICS OF INFORMATION TECHNOLOGY

L   P
-   2

RATIONALE

Information technology has great influence on all aspects of life. 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 office automation tools using MS Office/Open Office/Libre Office, and internet concepts. This exposure will enable the students to enter their professions with confidence.

LEARNING OUTCOMES

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

- Identify computer hardware components, network components and peripherals.
- Install application and utility software.
- Use word processing software to prepare document.
- Use spreadsheet software to create workbook and automate calculation.
- Use presentation software to create interactive presentation.
- Browse information on the Web.

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.

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1.   Basic Concepts of IT and Its Application

      Information Technology concept and scope, applications of IT.

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, tracks and sectors, optical disk (CD , DVD & Blue Ray Disk.), USB/Flash Drive, HDD, SSD

3. Software Concepts and Programming:

System software, Application software, Virtualization software and Utility software, Introduction of Operating System, Installation of Application software, Features of OPEN OFFICE/MS OFFICE(MS word, Excel, PowerPoint).
Flow chart using algorithm development, Input Output statement, Control structures

4. Internet Concepts:

Basics of Networking – LAN, WAN, PAN, MAN, and sharing of printers and other resources, Concept of IP addresses, 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, WWW (World Wide Web), hyperlinks, introduction to Anti-virus.

LIST OF PRACTICAL EXERCISES

1. Given a PC, identify its basic hardware components, network components and peripherals. List their functions .

2. Installation of various application software and utility software.

3   Installation of I/O devices like scanner, printer and plotter.

4. Practice on various features/functions of Windows Operating System..

Word Processing (MS Word/Open Office Writer/Libre Office Writer)

5. Creating/opening, saving and printing a document
6. Editing and formatting a document
7. Setting paragraph and page margins.
8. Adding header, footer and page numbering
9. Creating, inserting and formatting a table.
10. Spell checker, inserting date, time, special symbols, importing graphic images, drawing tools.

Spread Sheet Processing (MS Excel/Open Office Calc/Libre Office Calc)

11   Creating/opening, saving and printing a worksheet.
12   Editing and formatting of worksheets including changing colour, size, font, alignment of text and cell formatting.
13   Using statistical functions like sum, avg, min, max, if, count and countif, lookup.
14   Creating and formatting a chart, Using charts to analyse data. Use of filters.

Presentation Software (MS Power Point/Open Office Impress/Libre Office Impress)

15. Creating, saving, opening and printing a presentation.
16. Different views of a slide.
17. Using slide layout and template.
18. Editing and formatting slides by adding titles, subtitles, text, background, watermark, table, charts, images and sound.
19. Viewing the slide show with slide transition, animation effect, timing and order.

Programming

20. Printing of name 100 times using loop statement.

Internet and its Applications

21. Creating an e mail account. Sending and receiving e-mail.
22. Browsing and down loading of information from internet.
23. Surfing different websites like institute website, State Board PSBTE website, DTE website, NITTTR, Chandigarh website, AICTE website, various search engines like google, bing etc.

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. Arora, Vipan, "Computer Fundamentals and Information Technology ,"Eagle Parkashan, Jalandhar

2. Sinha, PK, "Computer Fundamentals", BPB Publication, New Delhi

3. Rajaraman V, "Fundamentals of Computer", Prentice Hall of India Pvt. Ltd., New Delhi

4. Saxena, Sanjay, "MS Office for Everyone", Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

5. Leon and Leon, "Fundamentals of Information Technology", Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

ENGINEERING DRAWING - I

L   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 at least 3 sheets on AutoCAD.
iii)   Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students.

LEARNING OUTCOMES

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-CUM- PRACTICAL EXERCISES

1. Introduction to Engineering Drawing   (03 sheets)

    Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards.

    Different types of lines in Engineering drawing as per BIS specifications

    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.

    Free hand and instrumental lettering (Alphabet and numerals) upper ease (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)

    Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)

    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)

    Scales their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale

    Drawing of plain and diagonal scales

4. Orthographic Projections   (06 sheets)

    Theory of orthographic projections (Elaborate theoretical instructions)

    Projection of Points in different quadrant

    Projection of Straight Line (1st and 3rd angle)
    Line parallel to both the planes
    Line perpendicular to any one of the reference plane
    Line inclined to any one of the reference plane.

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

Three views of orthographic projection of different objects. (At least one sheet in 3rd angle)

Identification of surfaces

5.   Sections   (02 sheets)

Importance and salient features

Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.

Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections

Orthographic sectional views of different objects.

6.   Isometric Views   (02 sheets)

Fundamentals of isometric projections and isometric scale.

Isometric views of combination of regular solids like cylinder, cone, cube and prism.

7.   Common Symbols and Conventions used in Engineering   (02 sheets)

Civil Engineering sanitary fitting symbols

Electrical fitting symbols for domestic interior installations

*8.   Introduction to Computer Aided Drafting   (03 sheets)

Basic introduction and operational instructions of various commands in Computer Aided Drafting. At least three 2 D drawings using Computer Aided Drafting of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.

* Computer aided 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. Singh, Surjit, "A Text Book of Engineering Drawing", Dhanpat Rai & Co., Delhi

2. Gill, PS, "Engineering Drawing", SK Kataria & Sons, New Delhi

3. Bhatt, ND, "Elementary Engineering Drawing in First Angle Projection ", Charotar Publishing House Pvt. Ltd., Anand

4. Layall, JS, "Engineering Drawing I & II", Eagle Parkashan, Jalandhar

5. Goel, DK, "Engineering Drawing I ", GBD Publication.

1.7   GENERAL WORKSHOP PRACTICE – I

L   P
-    6

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practical. General workshop practical included in the curriculum in order to provide hands-on practical knowledge of different tools and basic manufacturing processes. Basic knowledge of workshop technology and practical in various workshops develop the attitude of team working, safety awareness and development of right attitude. This subject provides miniature industrial environment in the educational institute.

LEARNING OUTCOMES

After completing the course the students will be able to:

- Identify shop wise tools and equipment, their types, specifications and use with proficiency.
- Identify different types of materials, their uses and to maintain tools, equipment etc.
- Use and take measurements with the help of basic measuring tools/instrument.
- Select proper tools for a particular operation and use hand tools in different workshops with predefined outcome.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same according to drawing.
- Operate various tools and equipment in different workshops with predefined outcome, performance, standards.
- Follow the safety procedures and precautionary measures in different workshop with zero accidents.

DETAILED CONTENTS-CUM- PRACTICAL EXERCISES

Note: The students are supposed to come in proper workshop uniform 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 workshops will be explained for conduct of practical. The students should prepare sketches of various tools/jobs sequence of operations etc. 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 or Additive Manufacturing Shop- I

1.   WELDING SHOP – I

a.   Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction and importance of welding as compared to other material joining processes. Classification of welding processes. Specifications and type of welding machines, welding parameters, welding methods, welding joints and welding positions. Classification and coding of electrodes and functions of electrode coating ingredients.

b.   Demonstration of hand tools, arc welding machines, equipment and materials to be welded.

1.3   Jobs to be prepared:

Job I   Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat) and Practice of depositing beads at different current levels. (Minimum 4 beads on M.S. flat at four different setting of current level).

Job II   Making a lap joint using arc welding (SMAW) on MS Flat.

Job III   Making a butt joint using arc welding (SMAW) on MS Flat. (100 mm long).

Job IV   Making a T shape Joint using arc welding (SMAW) on M.S. Flat (100mm x 6 mm).

2.   FITTING SHOP – I

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction, functions, classification, specification and use of various types of holding, cutting, marking and measuring tools used in fitting shop like-Bench vice, V block, C clamp, Ball peen hammer, scriber, punches, files, hacksaw, surface plate, try square, calipers, steel rule, Vernier calliper, Micrometre and Vernier height gauge etc. Identification of materials like-Iron, Copper, Stainless Steel, Aluminium etc.), Identification of various steel sections like-flat, angle, channel, bar etc.). Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

Demonstration of various types of holding, cutting, marking and measuring tools used in fitting shop.

Jobs to be prepared:

Job I To make a rectangular job by performing the operations: Sawing, Marking, filing on MS work piece (75 x 50 x 6 mm) by making sides at 90 degree and surface flatness at 180 degrees and to maintain dimensions within an accuracy of 0.25 mm.

Job II To make a job by performing the operations: Sawing, Marking, corner circular/radius filing on MS work piece (75 x 50 x 6 mm) by measuring dimensions with the help of Vernier Calipers within the tolerance of 0.1mm.

Job III To Make 'V' type cut-out profile from a square piece of MS flat using hand hacksaw, filing, marking and measuring operations.

3. SHEET METAL SHOP – I

3.1. Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction and functions of various types of tools used in sheet metal shop: - snips, hand shearing, measuring tools, marking tools, striking tools and bending tools including types of stakes. Introduction and importance to different types of joints and fasteners used in sheet metal work. Introduction and purpose of different metals used in sheet-metal work-black iron, galvanized iron, aluminium and stainless steel. Introduction of different types of Rivets, types of riveted joints, advantages, disadvantages and applications.

Demonstration of various types of holding, cutting, marking and bending tools used in fitting shop. demonstration of various raw materials used in sheet metal shop e.g. black-iron sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.

Jobs to be prepared:

Job I Shearing and bending practice on a sheet using hand shears/snips and stakes.

Job II To fabricate different types of sheet metal joint such as lap joint-single seam/double seam.

Job III To fabricate riveted lap joint (chain or zig zag type).

Job IV To fabricate single cover plate chain type, zig-zag type and single rivetted butt Joint.

4. ELECTRIC SHOP - I

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction, functions and specifications of different

types of tools, wires, cables, switches, fuses, cleats, clamps, allied items, and accessories used in Electric shop. Introduction to battery charger and its functioning. Introduction to common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc. Introduction to lead acid battery and nickel cadmium battery.

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. Demonstration of common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc. Demonstration of lead acid battery and nickel cadmium battery.

Job Practice:

Job I Identification of phase, neutral, earth wires for connection to domestic electrical appliances and their connections to three pin plugs.

Job II Practice in making series and parallel circuit. Make one lamp control by one switch circuit.

Job III Practice on house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping, conduit and concealed wiring.

Job IV Installation of battery and connecting two or three batteries in series and parallel.

Job V Charging a battery and testing with hydrometer and cell tester

5. CARPENTRY SHOP – I

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction to wood, timber their properties, uses & defects and their joints. Seasoning of wood and its advantages. Introduction, specifications and function of various types of tools used in carpentry (such as different types of Saws, C-Clamp, Chisels, Carpenter's vice, Mallets, Marking gauges, Scriber, Try-square, Steel tape, Wooden plane, Metallic Jack plane, Rulers) by segregating as cutting tools, supporting tools, holding tools, measuring tools etc. Types of wooden joints. Techniques/method of sharpening of jack plane cutter/blade.
Demonstration of wood/timber, seasoning, various types of tools used in carpentry shop. Types of wooden joints.

Jobs to be Prepared :
Job 1 To make a rectangular wooden piece involving operations like-planing, marking, sawing and measuring.
Job II Iron jack plane blade/cutter sharpening and Chisel sharpening practice.

Job III To make a Half Lap Joint (cross, L or T shape – any one)
Job IV To make a Mortise and Tenon joint (T- shape Joint)

6.   **SMITHY SHOP – I**

6.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction to Smithy shop, different types of Hearths, its purpose, specifications, uses, types of various tools and equipment used in hand forging by segregating as cutting tools, supporting tools, holding tools, measuring tools etc. Types of fuel used and maximum temperature obtained, types of raw materials used in Smithy Shop , uses of Fire Bricks and Clays in Forging workshop.

6.3 Demonstration of different fuels used and maximum temperature obtained. Use of fire brick and clay in forging/ smithy shop. Practice of firing of hearth/Furnace, Temperature Control of Fire. Demonstration of different basic Smithy/Forging operations such as Cutting, Upsetting, Drawing down, Setting down, Necking, Bending, Fullering, Swaging, Punching and Drifting. Demonstration of Simple Heat treatment processes like Tempering, Normalizing Hardening etc

6.3   Jobs to be prepared:
Job I   Making a job of square shape from a M.S. rod by forging method.

Job II Making a square shape L hook from M.S. rod.

Job III Making a ring from MS rod by cold or hot forging process

Job IV Making a job using drawing down operation on round or flat section.

6.   **ADDITIVE MANUFACTURING SHOP - I**

Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction to digital design, Computer Aided Drafting (2D drawing) and Computer Aided Design (3D modelling), various CAD packages, basic 2D and 3D commands, basic geometrical shapes (both regular and irregular) etc. Introduction to Additive Manufacturing, identification of different types of materials used, applications and advantages. Identification of different types of geometrical shapes: regular shapes like sphere, prisms, pyramids, solids of revolution, irregular shapes like I section, L section, C section and T section etc.

Demonstration of 3D CAD package including software interphase, basic commands for drawing, editing, modelling etc., fabrication of 3D models, saving in .PRT file, conversion to .STL file, error identification and its rectification, working of 3D printer, 3D printing of simple components.

Jobs to be performed

Job I: 3D modelling of basic right regular geometrical shapes:

Prisms: Triangular, square. Rectangular, pentagonal and hexagonal

Pyramids: Triangular, square. Rectangular, pentagonal and hexagonal

Job II: 3D modelling of solids of revolution: Sphere, cylinder, cone and torus

Job III: 3D modelling of special shapes like I section, L section, C section and T section

Job IV: 3D modelling of machined parts using various 3D commands.

Note :

1. Workshop instructors will guide and help the students throughout the practical class in order to explain and complete the job according to syllabus and for providing necessary facilities to the students during performance of practical by observing the safety precautions

2. The Workshop Superintendent or Foreman Instructor or Foreman will demonstrate and deliver the theoretical instructions with regard to introduction, functions, classification and specification of tools, instruments, equipment, apparatus etc. of all the topics covered in the syllabus.

3. The Workshop Superintendent or Foreman Instructor will also conduct the mid-term test and final practical exam of this subject.

RECOMMENDED BOOKS

1. Singh, Swaran, "Workshop Practice", S. K. Kataria and Sons, New Delhi.
2. Bawa, H.S., "Workshop Practice", Tata McGraw Hill Publishers, New Delhi.
3. Hajra, SK, "Workshop Technology I, II, III", Choudhary and AK Choudhary Media Promoters and Publishers Pvt. Ltd. Mumbai.
4. Manchanda, "Workshop Technology Vol. I, II, III", India Publishing House, Jalandhar.
5. Raghuwanshi, B.S., " Workshop Technology", Dhanpat Rai and Co., 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