FIRST YEAR
12. STUDY AND EVALUATION SCHEME

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
1.1	*English & Communication Skills-1	2	2	2+1=3	40	40	80	60	60	120	200
1.2	*Applied Mathematics -1	4	-	4+0=4	40	-	40	60	-	60	100
1.3	*Applied Physics-I	2	2	2+1=3	40	40	80	60	60	120	200
1.4	* Applied Chemistry	3	2	3+1=4	40	40	80	60	60	120	200
1.5	*Engineering Graphics	-	6	0+3=3	-	40	40	60	-	60	100
1.6	Plumbing Services	2	-	2+0=2	40	-	40	60	-	60	100
1.7	*General Workshop Practice	-	6	0+3=3	-	40	40	-	60	60	100
	#Student Centered Activities	-	4	-	-	-	-	-	-	-	-
	Total	**13**	**22**	**13+9=22**	**200**	**200**	**400**	**360**	**240**	**600**	**1000**

* Common with other diploma courses.

Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Games, Yoga, Human Ethics, Knowledge of Indian System, Hobby clubs e.g. Photography etc., Seminars, Declamation contests, Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

1.1 ENGLISH & COMMUNICATION SKILLS – I

	L	**P**
	2	**2**

RATIONALE

Language as the most commonly used medium of self-expression remains indispensable in all spheres of human life –personal, social and professional. This course is intended to break fresh ground in teaching of Communicative English as per the requirements of National Skill Quality Framework. This course is designed to help students to acquire the concept of communication and develop an ability or skills to use them effectively to communicate with the individuals and community.

COURSE OUTCOMES

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

CO1:   Identify the nuances of Communication, both Oral and Written.

CO2:   Acquire knowledge of the meaning of communication, communication process and Speaking skills.

CO3:   Acquire enhanced vocabulary and in-depth understanding of Grammatical Structures and their usage in the communication.

CO4:   Communicate effectively with an increased confidence to read, write and speak in English language fluently.

DETAILED CONTENTS

UNIT I
Reading

1.1   Techniques of reading: Skimming and Scanning

1.2   Extensive and Intensive Reading: Textual Study

1.3   Homecoming – R.N. Tagore

1.4   Life Sketch of Sir Mokshagundam Visvesvarayya

1.5   Life Sketch of Dr. Abdul Kalam

1.6   Narayan Murthy's speech at LBSNA, Dehradun

UNIT II
Fundamentals of Communication
2.1   Concept and Process of Communication,

2.2   Types of Communication (Verbal Communication)

2.3   Barriers to Communication

2.4   Speaking Skill: Significance and essentials of Spoken Communication

2.5   Listening Skill: Significance and essentials of Listening

UNIT III
Grammar and Usage
3.1   Nouns

3.2   Pronouns

3.3   Articles

3.4   Verbs(Main and Auxiliary)

3.5   Tenses

UNIT IV
Writing Skills
4.1   Significance, essentials and effectiveness of Written Communication

4.2   Notice Writing

4.3   Official Letters and E-mails.

4.4   Frequently-used Abbreviations used in Letter-Writing

4.5   Paragraph Writing

4.6   Netiquettes

PRACTICAL EXERCISES

1   Reading

Reading Practice of lessons in the Lab Activity classes.

i. Comprehension exercises of unseen passages along with the lessons prescribed.

ii. Vocabulary enrichment and grammar exercises based on the selected readings.

iii. Reading aloud Newspaper headlines and important articles.

2   Fundamentals of Communication

i. Introducing oneself, others and leave- taking(talking about yourself)

ii. Just a minute (JAM) sessions: Speaking extempore for one minute on given topics

iii. Situational Conversation: Offering-Responding to offers; Congratulating; Apologising and Forgiving; Complaining; Talking about likes and dislikes, Self-introduction Mock Interviews.

3   Grammar and Usage

i. Written and Oral Drills will be undertaken in the class to facilitate holistic linguistic competency among learners.

ii. Exercises on the prescribed grammar topics.

4   Writing Skills

i. Students should be given Written Practice in groups so as to inculcate team-spirit and collaborative learning .

ii. Group exercises on writing paragraphs on given topics.

iii. Opening an e-mail account, receiving and sending emails

RECOMMENDED BOOKS

1.   Alvinder Dhillon and Parmod Kumar Singla, "Text Book of English and Communication Skills Vol – 2", M/S Abhishek Publications, Chandigarh.

2.   V Sasikumar & PV Dhamija, "Spoken English", Tata MC Graw Hills, New Delhi, Second Edition.

3.   JK Gangal, "A Practical Course in Spoken English", PHI Learning Pvt. Ltd., New Delhi.

4.   NK Aggarwal and FT Wood, "English Grammar, Composition and Usage", Macmillan Publishers India Ltd., New Delhi.

5.   RC Sharma and Krishna Mohan, "Business Correspondence & Report writing", Tata MC Graw Hills, New Delhi, Fourth Edition.

6.   Kavita Tyagi & Padma Misra, "Professional Communication", PHI Learning Pvt. Ltd., New Delhi.

7.   Nira Konar, "Communication Skills for professionals", PHI Learning Pvt. Ltd., New Delhi.

8.   Krishna Mohan & Meera Banerji, "Developing Communication Skills", Macmillan Publishers India Ltd., New Delhi, Second Edition

9.   M. Ashraf Rizwi, "Effective Technical Communication", Tata MC Graw Hills, New Delhi.

10. Andrea J Rutherfoord, "Basic Communication Skills for Technology", Pearson Education, New Delhi.

INSTRUCTIONAL STRATEGY

This is practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required communication skills in the students. This subject contains four units of equal weight age.

1.2 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 logarithm, binomial theorem, matrices, t-ratios and co-ordinates 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.

COURSE OUTCOMES

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

CO1:   Understand the geometric shapes used in engineering problems by Co-ordinate Geometry and Trigonometry.

CO2:   Formulate engineering problems into mathematical formats with the use matrices, co-ordinate geometry and trigonometry

CO3:   Calculate the approximate value of roots of certain expressions in engineering problems by application of binomial theorem.

CO4:   Explore the idea of location, graph, and linear relationships between two variables.

CO5:   Learn about basic fundamentals about MATLAB/ SciLab and mathematical calculation with MATLAB/ SciLab software.

DETAILED CONTENTS

UNIT I
Algebra

1.1   Complex Numbers: definition of complex number, real and imaginary parts of a complex number, Polar and Cartesian Form and their inter conversion, Conjugate of a complex number, modulus and amplitude, addition subtraction, multiplication and division of complex numb

1.2   Logarithms and its basic properties

UNIT II
Binomial Theorem, Determinants and Matrices

2.1   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 up to 3 terms - without proof), first binomial approximation with application to engineering problems.

2.2   Determinants and Matrices – Evaluation of determinants (upto 2nd order), solution of equations (upto 2 unknowns) by Crammer's rule, definition of Matrices and its types, addition, subtraction and multiplication of matrices (upto 2nd order).

UNIT III
Trigonometry

3.1   Concept of angle, measurement of angle in degrees, grades, radians and their conversions.

3.2   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

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

UNIT-IV
Co-ordinate Geometry

4.1   Cartesian and Polar co-ordinates (two dimensional), Distance between two points, mid-point, centroid of vertices of a triangle.

4.2   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), intersection 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.

UNIT V
Geometry of Circle and Software
Circle

5.1   General equation of a circle and its characteristics. To find the equation of a circle, given:
    i.   Centre and radius
   ii.   Three points lying on it
  iii.   Coordinates of end points of a diameter

Software

5.2   **MATLAB Or SciLab software –** Theoretical Introduction, MATLAB or Scilabas Simple Calculator (Addition and subtraction of values –Trigonometric and Inverse Trigonometric functions) – General Practice

RECOMMENDED BOOKS

1.   R. D. Sharma, "Applied Mathematics – I & II for Diploma Courses", Dhanpat Rai Publications.
2.   "Mathematics for Class XI", NCERT Publication, New Delhi.
3.   "Mathematics for Class XII", NCERT Publication, New Delhi.
4.   H. K Dass, "Applied Mathematics for Polytechnics", CBS Publishers & Distributers.
5.   A Ganesh and G Balasubramanian, "Textbook of Engineering Mathematics – I", CBS Publisher, New Delhi.
6.   A Ganesh and G Balasubramanian, "Textbook of Engineering Mathematics –II", CBS Publisher, New Delhi.
7.   G. B. Thomas, R. L. Finney, "Calculus and Analytic Geometry", Addison Wesley, Ninth Edition.
8.   B S Grewal, "Elementary Engineering Mathematics", Khanna Publishers, Delhi, Thirty-fifth edition.
9.   R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House, New Delhi, Second Edition, 2003.
10. SS Sabharwal & Dr Sunita Jain, "Applied Mathematics Vol. I & II", Eagle Parkashan, Jalandhar.
11. S Kohli, "Engineering Mathematics Vol. I & II", IPH, Jalandhar.
12. Reena Garg & Chandrika Prasad, "Advanced Engineering Mathematics", Khanna Publishing House, New Delhi
13. R. Pratap, "Getting Started with MATLAB 7", Oxford University Press, Seventh Edition.
14. E-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1.   http://swayam.gov.in
2.   https://www.scilab.org

INSTRUCTIONAL STATREGY

This is theoretical subject and contains five units of equal weightage. Basic elements of algebra, trigonometry and co-ordinate 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. Students need to be taught the skills needed to use software tools built by experts through multiple problem solving based on the topics related to Algebra, Trigonometry and Coordinate Geometry that the industry requires. Examples to be used should be related to engineering. Useful software MATLAB or open source software SciLab can be taught theoretically by books/online literatures and basic operations can be shown practically with practical software laboratory or small mobile apps of these software or authentic Trial version of MATLAB/ SciLab software. Students should be able to relate to the actual use of these examples and the way mathematical calculations will help them in doing their job.

1.3 APPLIED PHYSICS-I

L   P
2   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 technical fields are given prominence in the course content.

COURSE OUTCOMES

After completing this course, student should be able to:

CO1: Identify physical quantities, select their units and make measurements with accuracy.

CO2: Represent physical quantities as scalar and vector and identify type of motions, various forms of energy, their conversion and applications.

CO3: Elaborate scientific work, energy and power, forms of friction and solve problems related to them.

CO4: Comprehend properties of matter and effect of temperature on various matter and phenomenon.

CO5: Demonstrate the use of physical principles and analysis in various technical fields.

DETAILED CONTENTS

UNIT I
Unit and Dimensions

1.1   Definition of Physics, physical quantities- fundamental and derived

1.2   Units: fundamental and derived

1.3   System of units: CGS, FPS, MKS, SI

1.4   Dimension, dimensional formulae and SI units of physical quantities-distance, displacement, area, volume, density, velocity, acceleration, linear momentum, force, impulse, work, power, energy, pressure, surface tension, stress, strain)

1.5   Dimensional equations, principle of homogeneity of dimensional equation

1.6   Application of dimensional analysis: checking the correctness of physical equation, conversion of system of unit (force, work, acceleration)

UNIT II
Force and Motion

2.1   Scalar and vector quantities– definition and examples, representation of vector, types of vector (unit vector, position vector, co-initial vector, collinear vector, co-planar vector)

2.2   Vector algebra- addition of vectors, Triangle &Parallelogram law (statement and formula only),

2.3   Scalar and vector product (statement and formula only)

2.4   Force and its units, resolution of force (statement and formula only)

2.5   Newton's laws of motion (statement and examples)

2.6   Linear momentum, Law of conservation of linear momentum (statement and examples), Impulse

2.7   Circular motion: definition of angular displacement, angular velocity, angular acceleration, frequency, time period; Relation between linear and angular velocity, centripetal and centrifugal forces (definition and formula only), application of centripetal force in banking of road

2.8   Rotational motion: definition with examples

2.9   Definition of torque, angular momentum, moment of inertia and its physical significance

UNIT III
Work, Power and Energy

3.1   Work- definition, symbol, formula and SI unit, types of work (zero work, positive work and negative work) with example

3.2   Friction– definition and its simple daily life applications

3.3   Power- definition, formula and units

3.4   Energy- definition and its SI unit, examples of transformation of energy.

3.5   Kinetic energy- definition, examples, formulaand its derivation

3.6   Potential energy- definition, examples, formulaand its derivation

3.7   Law of conservation of mechanical energy for freely falling bodies (with derivation)

3.8   Simple numerical problems based on formula of Power and Energy

UNIT IV
Properties of Matter

4.1   Elasticity and plasticity- definition, deforming force, restoring force, example of elastic and plastic body

4.2   Definition of stress and strain, Hooke's law, modulus of elasticity

4.3   Pressure- definition, atmospheric pressure, gauge pressure, absolute pressure, Pascal's law

4.4   Surface tension- definition, SI unit, applications of surface tension, effect of temperature on surface tension

4.5   Viscosity: definition, unit, examples, effect of temperature on viscosity

UNIT V

Heat and Temperature

5.1   Definition of heat and temperature (on the basis of kinetic theory)

5.2   Difference between heat and temperature

5.3   Principle and working of mercury thermometer

5.4   Modes of transfer of heat- conduction, convection and radiation with examples.

5.5   Properties of heat radiation

5.6   Different scales of temperature and their relationship

PRACTICAL EXCERCISES

1.   Familiarization of measurement instruments and their parts (for example – Vernier caliper, screw gauge, sphere meter, travelling microscope etc.), and taking a reading. (compulsory to all students)

2.   To find diameter of solid cylinder using a Vernier caliper

3.   To find internal dia meter and depth of a beaker using a Vernier caliper and hence find its volume.

4.   To find the diameter of wire using screw gauge

5.   To find thickness of paper using screw gauge.

6.   To determine the thickness of glass strip using a sphero meter

7.   To determine radius of curvature of a given spherical surface by a sphero meter.

8.   To verify parallelgram law of force

9.   To determine the atmospheric pressure at a place using Fortin's Barometer

10.   To determine force constant of spring using Hooke's law

11.   Measuring room temperature with the help of thermometer and its conversion in different scale.

RECOMMENDED BOOKS

1.   "Text Book ofPhysics for Class XI (Part-I, Part-II)", N.C.E.R.T., Delhi.

2.   Dr.HH Lal, "Applied Physics, Vol.I and Vol.II", TTTI Publications, Tata McGraw Hill, Delhi.

3. AS Vasudeva, "Applied Physics – I", Modern Publishers, Jalandhar.
4. R A Banwait, "Applied Physics – I", Eagle Prakashan, Jalandhar.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/ HSBTE/ NITTTR.
6. C. L. Arora, "Practical Physics", S Chand Publication.

SUGGESTED WEBSITES

1. http://swayam.gov.in
2. The Physics Classroom
3. https://www.khanacademy.org/science/physics

INSTRUCTIONAL STATREGY

This is hands-on practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units of equal weightage.

Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. Students need to be exposed to use of different sets of units and conversion from one unit type to another. Software may be used to solve problems involving conversion of units. 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. 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. Working in different sets of units can be taught through relevant software.

1.4 APPLIED CHEMISTRY

L   P
3   2

RATIONALE

The regular use of a variety of chemistry based materials and processes in diverse technical and engineering fields have repeatedly proven the importance of Applied Chemistry and its role in current and future technological advancements. Ever increasing use of chemical materials in the emerging engineering applications demands engineers and technocrats to acquire an in-depth knowledge of Applied Chemistry to be able to choose the best suited materials to meet their needs while maintaining the environment sustainability. An understanding of the principles of Applied Chemistry will develop scientific attitude in the budding engineers to understand the physical and chemical properties of the available materials for engineering applications as well as an ability to design new and effective materials.

COURSE OUTCOMES

After studying this course, students will be able to:
CO1: Classify the elements into metals, non-metals and metalloids.
CO2: Explain the extraction of metals from ores, their mechanical properties and modification of properties by alloy formation.
CO3: Classify fuels and lubricants and apply them in different engineering applications.
CO4: Identify the polymeric materials, assess their properties and design suitable polymeric materials for current and future applications.
CO5: Apply effective methods for corrosion prevention

DETAILED CONTENTS

UNIT 1
Atomic Structure, Periodic Table and Chemical Bonding.
1.1 Bohr's model of atom (qualitative treatment only), dual character of matter: derivation of de-Broglie's equation, Heisenberg's Principle of Uncertainty, modern concept of atomic structure: definition of orbitals, shapes of s, p and d-orbitals, quantum numbers and their significance. Electronic configuration: Aufbau and Pauli's exclusion principles and Hund's rule, electronic configuration of elements up to atomic number 30.

1.2 Modern Periodic law and Periodic table, classification of elements into s, p, d and f-blocks, metals, non-metals and metalloids (periodicity in properties excluded).

1.3 Chemical bonding: cause of bonding, ionic bond, covalent bond, and metallic bond (electron sea or gas model), Physical properties of ionic, covalent and metallic substances.

UNIT II
Metals and Alloys

2.1 Metals: mechanical properties of metals such as conductivity, elasticity, strength and stiffness, luster, hardness, toughness, ductility, malleability, brittleness, and impact resistance and their uses.

2.2 Definition of a mineral, ore, gangue, flux and slag. Metallurgy of iron from haematite using a blast furnace. Commercial varieties of iron.

2.3 Alloys: definition, necessity of making alloys, composition, properties and uses of duralumin and steel. Heat treatment of steel- normalizing, annealing, quenching, tempering.

UNIT III
Water, Solutions, Acids and Bases

3.1 Solutions: definition, expression of the concentration of a solution in percentage (w/w, w/v and v/v), normality, molarity and molality and ppm. Simple problems on solution preparation.

3.2 Arrhenius concept of acids and bases, strong and weak acids and bases, pH value of a solution and its significance, pH scale. Simple numerical problems on pH of acids and bases.

3.4 Hard and soft water, causes of hardness of water, types of hardness – temporary and permanent hardness, expression of hardness of water, ppm unit of hardness; disadvantages of hard water; removal of hardness: removal of temporary hardness by boiling and Clark's method; removal of permanent hardness of water by Ion-Exchange method; boiler problems caused by hard water: scale and sludge formation, priming and foaming, caustic embrittlement; water sterilization by chlorine, UV radiation and RO.

UNIT IV
Fuels and Lubricants

4.1 Fuels: definition and classification of higher and lower calorific values, units of calorific value, characteristics of an ideal fuel. Petroleum: composition and refining of petroleum; gaseous fuels: composition, properties and uses of CNG, PNG, LNG, LPG; relative advantages of liquid and gaseous fuels over solid fuels. Scope of hydrogen as future fuel.

4.2 Lubricants- Functions and qualities of a good lubricant, classification of lubricants with examples; lubrication mechanism (brief idea only); physical properties (brief idea only) of a lubricant: oiliness, viscosity, viscosity index, flash and fire point, ignition temperature, pour point.

UNIT V

Polymers and Electrochemistry

5.1 Polymers and Plastics: definition of polymer, classification, addition and condensation polymerization; preparation properties and uses of polythene, PVC, Nylon-66, Bakelite; definition of plastic, thermoplastics and thermosetting polymers; natural rubber and neoprene, other synthetic rubbers (names only).

5.2 Corrosion: definition, dry and wet corrosion, factors affecting rate of corrosion, methods of prevention of corrosion—hot dipping, metal cladding, cementation, quenching, cathodic protection methods

5.3 Introduction and application of nanotechnology: nano-materials and their classification, applications of nanotechnology in various engineering applications (brief).

PRACTICAL EXERCISES

1. To prepare standard solution of oxalic acid.
2. To dilute the given $KMnO_4$ solution
3. To find out the strength in grams per litre of an unknown solution of sodium hydroxide using a standard (N/10) oxalic acid solution.
4. To find out the total alkalinity in parts per million (ppm) of a water sample with the help of a standard sulphuric acid solution.
5. To determine the total hardness of given water sample by EDTA method
6. To determine the amount of total dissolved solids(TDS) in ppm in a given sample of water gravimetrically
7. To determine the pH of different solutions using a digital pH meter.
8. To determine the calorific value of a solid/liquid fuel using a Bomb calorimeter.
9. To determine the viscosity of a lubricating oil using a Redwood viscometer
10. To prepare a sample of Phenol-formaldehyde resin (Bakelite)/Nylon-66 in the lab.

RECOMMENDED BOOKS

1. Textbook of Chemistry for class XI and XII (part I & II) NCERT, Delhi, 2017-18.

2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd, 2011.
3. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
4. Dr. G. H. Hugar& Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
5. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt. Ltd, 2014.
6. Applied Chemistry by Usha Raju.

SUGGESTED WEBSITES

1.www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2.www.visionlearning.com (Atomic structure and chemical bonding)
3. www.cheml.com (Atomic structure and chemical bonding)
4. https://www.wastewaterelearning.com/elearning/ (Water treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials) 6.www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf(Fuel and combustion)

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. This subject contains five units of equal weightage.

1.5 ENGINEERING GRAPHICS

L   P

-   6

RATIONALE

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawings 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.

COURSE OUTCOMES

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

CO1: Draw Orthographic views of different objects viewed from different angles.

CO2: Draw and interpret sectional views of an object which are otherwise not visible in normal view.

CO3: Draw Isometric views of different solids and develop their surfaces.

CO4: Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances /fittings.

CO5: Draw orthographic views of different objects by using basic commands of AutoCAD.

DETAILED CONTENTS

UNIT I

1. Introduction to Engineering Drawing and Graphics

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

1.2 Symbols and conventions-

    a) Conventions of Engineering Materials, Sectional Breaks and Conventional lines.

    b) Civil Engineering Sanitary fitting symbols

    c) Electrical fitting symbols for domestic interior installations.

1.3 Geometrical construction-geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagons, pentagons bisecting a line and arc , division of line and circle with the help of drawing instruments.

2. Technical Lettering of Alphabet and Numerals

Definition and classification of lettering, Free hand (of height of 5,8,12 mm) and instrumental lettering (of height 20 to 35 mm): upper case and lower case, single and double stroke, vertical and inclined (Gothic lettering) at 75 degree to horizontal and with suitable height to width ratio 7:4.

3. Dimensioning

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

3.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., countersunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches.

4. Scales

4.1 Scales –Needs and importance (theoretical instructions), Type of scales, Definition of Representative Fraction (R.F.) and Length of Scale.

4.2 To draw/construct plain and diagonal scales.

UNIT II

1 Orthographic Projections

1.1 Theory of orthographic projections (Elaborate theoretical instructions).

1.2 Three views of orthographic projections of different objects of given pictorial view of a block in 1st and 3rd angle.

1.3 Projection of Points in different quadrant

1.4 Projection of Straight Line (1st angle)

    i.   Line parallel to both the planes.

    ii. Line perpendicular to any one of the reference plane and parallel to others

    iii. Line inclined to any one of the references and parallel to another plane.

1.5 Projection of Plane – Different lamina like square rectangular, triangular, circle and Hexagonal pentagon. Trace of planes (HT and VT).

1.6 Identification of surfaces.

2. Sectioning

2.1 Importance and salient features

2.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections (theoretical only).

2.3 Orthographic sectional views of different objects.

UNIT III

1. Introduction of projection of right solids such as prism & pyramid (square, Pentagon, Hexagonal) cube, cone & cylinder (Axes perpendicular to H.P and parallel to V.P.)
2. Introduction of sections of right solids - Section planes, Sections of Hexagonal prism, pentagon pyramid, cylinder and cone (Section plane parallel to anyone reference planes and perpendicular to V.P. and inclined to H.P.)
3. Development of Surfaces – Development of lateral surfaces of right solids like cone, cylinder, pentagonal prism, pyramid and hexagonal pyramid (Simple problems)

UNIT IV

Isometric Views

1. Fundamentals of isometric projections and isometric scale.
2. Isometric views of different laminas like circle, pentagon and hexagon.
3. Isometric views of different regular solids like cylinder, cone, cube, cuboid, pyramid and prism.
4. Isometric views from given different orthographic projections(front, side and top view)

UNIT V

Introduction to AutoCAD

Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets of different objects on AutoCAD (given pictorial/isometric view of a block). AutoCAD skill of student is evaluated in internal assessment only not in external exam.

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.,Anands
4. Engineering Drawing and Graphics using AutoCAD by T. Jeyapoovan,Vikas Publishing House Pvt, Ltd Noida.
5. A Text Book of Engineering Drawing by S.R.Singhal and O.P.Saxena, Asian Publisher, Delhi
6. Engineering Drawing by RB Gupta, Satya Prakashan, New Delhi

INSTRUCTIONAL STRATEGY

Teacher should show model of regalia 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. First angle projection is to be followed. Minimum of 20 sheets to be prepared and at least 2 sheets on AutoCAD**.** Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students. This subject contains five units of equal weight age.

1.6 PLUMBING SERVICES

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RATIONALE

Plumbing is said to be the system of pipes, tanks, fittings, and other apparatus required for water supply, heating, and sanitation in a building. Plumbers install, repair, and maintain piping systems in residential, commercial and industrial buildings. These systems traditionally included water distribution and wastewater disposal, but because of new technology that combines water and gas pipes, plumbers can work with vent, residential fire, irrigation, and chemical systems as well. The duties of a plumber include: installing, repairing and maintaining pipes, fixtures, and other plumbing equipment; opening walls and floors to accommodate pipes and pipe fittings; welding, connecting, and testing pipes for leaks; preparing cost estimates; interpreting blueprints and designs. Plumbers must also be aware of safety procedures and follow them at all times.

Diploma holders in Civil Engineering who normally work in supervisory positions, must not only be well versed with plumbing procedures, processes, equipment, safety requirements etc. but also be able to demonstrate all practical aspects of plumbing to as to effectively lead team of plumbers and ensure execution of quality work and excellent end results.

This subject is therefore, aimed at instilling theoretical and practical knowledge among students studying civil engineering at diploma level.

COURSE OUTCOMES

After undergoing this course, the students will be able to:
CO1:   Identify and select proper tools and use them for the given plumbing work
CO2:   Select appropriate pipes and carry out pipe fitting after carrying out operations like cutting, bending, threading, joining, aligning and other necessary operations
CO3:   Erect simple water supply system. Trace leakage and repair water supply system
CO4:   Plan, prepare and inspect domestic drainage system
CO5:   Select and install sanitary appliances
CO6:   Install heating appliances like geyser, etc.

DETAILED CONTENTS

UNIT I

1.   Plumber's Tools

Selection, use and care of tools required for plumbing work, such as threading die, bit brace, ratchet brace, pipe wrench, spanner set, pipe cutter, pipe vice, hacksaw, chisel, files and other common hand tools, bench drilling machine, soldering iron

UNIT II

2.   Pipes and Pipe Fitting

Selection and use of different pipes like GI Pipes, Plastic pipes, PVC pipes, HDPE pipes, Cast iron pipes, Plumbing symbols; Bends, Elbows, Sockets, Tees, Unions, Pipe cutting, Pipe bending, Pipe Threading, Pipe joints, Pipe fitting, Alignment of pipes, Branching of pipes, Safety precautions.

UNIT III

3.   Water Supply System

Sources of water; Rainwater harvesting; Water supply systems in a town; Water distribution systems; Distribution reservoirs; Pumps; Valves; Fire hydrants; Storage of water in buildings; Types of tanks; Laying water supply pipe lines

UNIT IV

4.   Domestic Drainage

Drainage system (two pipe, one pipe, single stack and other systems), Trap, Cesspool, Sceptic tank, Cleaning blocked pipes and drains, Laying sanitary and sewer pipes, Manholes, Inspection and testing (pressure & leakage test, testing straightness of pipes, ball test etc.); Fixing accessories, Problems in drainage and their solution

UNIT V

5.   Sanitary Appliances

Flush toilet, Squat toilet, Wash basin, Sink, Floor traps, Urinal, Bathtub, Shower, Bidet, Mixing tap, Popup waste

Heating System

Heat transfer, Water heater, Geyser, Domestic hot water supply system, Central heating, Solar water heater

RECOMMENDED BOOKS

1. Plumber by G. S. Sethi; Computech Publications Ltd, New Delhi (Available in English and Hindi)
2. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

During instructions, teacher should explain the use of various plumbing tools and demonstrate how to handle them properly. Liberal use of audio-visual aids may be made. Students may be asked to prepare models of different piping systems. Visit may be arranged for students to see how town water supply is arranged and managed. Detailed explanation with the help of actual sanitary appliances may be given about their use and method of installing them. This subject contains five units of equal weightage.

1.7 GENERAL WORKSHOP PRACTICE

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RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General Workshop Practice is 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.

COURSE OUTCOMES

After completing the course, the students will be able to:

CO1: Identify tools, equipment and materials used in preparing jobs.

CO2: Take measurements with the help of basic measuring tools/equipment.

CO3: Select materials, tools, and sequence of operations to make a job as per given specifications/drawing.

CO4: Prepare simple jobs independently and inspect the same.

CO5: Use safety equipment and Personal Protection Equipment (PPE).

CO6: Maintain good housekeeping practices.

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 and Plumbing Shop I
3. Sheet Metal Shop I

4. Carpentry Shop I

5. Painting Shop I

6. Electric and Electronics Shop I

1.   Welding Shop – I

1.1 Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

1.2 Introduction and importance of welding process as compared to other material joining processes. Specifications and type of ARC welding machines, parts identification, classification, selection and coding of electrodes, welding parameters, welding joints and welding positions. Common weldable materials, safety precautions in welding shop, use of Personal Protective Equipment, Use of welding screens, Hazards and remedies during welding, Elementary symbolic representations, demo of tools, equipment, sample jobs prepared, set up of Gas welding apparatus, and welding defects.

1.3 Jobs to be prepared

Job I   Practice of striking arc and depositing uniform and straight beads on flat at different current levels. (Minimum 4 beads on M.S. flat at four setting of current level using shielded metal arc welding and differentiating their characteristics).

Job II Edge Preparation and welding lap joint using shielded metal arc welding (SMAW) process.

Job III Edge Preparation and welding butt joint using shielded metal arc welding process.

Job IV Edge Preparation and welding T Joint using shielded metal arc welding (100mm x 6 mm M.S. Flat).

Job V   To make a simple job using oxy acetylene gas welding.

2.   Fitting and Plumbing Shop – I

2.1 Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

2.2   Introduction and Function of holding/ clamping devices, hand tools and cutting tools,

2.3   Practical applications of fitting and plumbing

2.4 Introduction, function and types of marking and measuring tools and instruments (surface plate, try square, caliper, steel rule, scriber and Vernier caliper)

2.5 Identification of materials. (Iron, Copper, Stainless Steel, Aluminum etc.) and identification of various steel sections (flat, angle, channel, bar etc.).

2.6 Introduction to various types of pipes (eg water, steam, gas etc.) and functions of various pipe fitting items (GI pipe fittings, CPVC pipe fittings), Methods of pipe joints

2.7   Introduction to various types of threads (internal and external)

2.8   Description and demonstration of various types of drills, taps and dies.

2.9   Jobs to be prepared:

Job I   To fit hacksaw blade in its frame and perform hacksawing operation by using marking media and marking tool and straight sawing practice.

Job II To perform filing on MS workpiece (75 * 50 * 6 mm) for giving it a perfect rectangular shape and drilling, tapping operation.

Job III To perform step filing operation at right angle on MS workpiece.

Job IV   Making external threads on a pipe by using die and to make a PVC/GI pipe connection using nipple and socket.

Job V   Fitting of all components of wash basin and ball valve in a tank.

3.   Sheet Metal Shop I

3.1. Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

3.2 Demonstration of various power tools, apparatus, equipment, hand tools used in sheet metal shop.

3.5 Jobs to be prepared

Job I   Prepare a seam joint by using hand tools on GI sheet.

Job II   To prepare riveted lap joint (single/double) on GI sheet.

Job III To fabricate a funnel of GI sheet using operations of shearing, flattening and bending.

Job IV To fabricate a conduit joint using various sheet metal operations.

Job V   To fabricate a utility job (eg soap case/file tray/canister box) of thin GI sheet.

4.   Carpentry Shop - I

4.1 Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

4.2   Introduction and industrial applications of carpentry jobs.

4.2.1   Name and use of raw materials used in carpentry shop: wood & alternative materials (board, plywood)

4.2.2 Introduction to wood, timber and their identification, shapes and specifications, their properties, applications & defects. Study of the joints in roofs, doors, windows   and furniture, seasoning of wood

4.2.3   Names, uses, and types of hand tools such as 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.

4.2.4 Specification of iron jack plane used in carpentry shop.

4.3 Practice

4.3.1 Practices for Basic Carpentry Work

4.3.2 Sawing practice using different types of saws

4.3.3 Assembling jack plane — planning practice including sharpening and blade adjustment of jack plane cutter

4.3.4 Chiselling practice using different types of chisels including sharpening of chisel

4.3.5 Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.

4.3.6 Housekeeping practices and instructions.

4.4   Jobs to be Prepared

Job 1 Prepare a rectangular wooden block involving operations like Marking, sawing, planning to size, chiseling.

Job II Prepare a Half Lap Joint (cross, L or T – any one).

Job III Prepare a Mortise and Tenon joint (T-Joint).

Job IV Prepare a Dove tail Joint (Half lap dovetail joint.

Job V Prepare a Bridle Joint.

5.   **Painting Shop**

5.1   Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

5.2   Introduction to paints, varnishes, primers and their types, General properties of paints, Constituents of paints, polishes, their advantages and applications.

5.3   Introduction of powder coating and spray painting with their uses. Different types of tools and equipment used in polishing and painting.

5.4   Preparation of different colours of the paints by using prime colours, Practical demonstration of powder coating and spray painting on a utility object

5.5   Jobs to be Prepared

Job I Prepare wooden surface for painting such as cleaning, sanding, applying putty, filling procedure and application of primer coat and brush paint the same.

Job II Painting on wooden and metallic surfaces by spray gun.

Job III   Practice of lettering: name plates / sign board.

Job IV   Practice of dip painting/powder coating.

Job V   Prepare wooden surface for polishing, apply French polish on wooden surface.

6. **Electrical and Electronics Shop - I**

6.1 Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

6.2 Demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, MCB & ELCB, fuses, cleats, clamps and allied items, tools and accessories.

6.3 Identification of phase, Neutral and Earth wires for connection to domestic electrical appliances and their connections to three pin plugs. Difference between series and parallel wiring.

6.4 Jobs to be performed

Job I Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping. Demo of conduit wiring through junctions.

Job II To prepare a three level Godown wiring circuit with PVC conduit wiring system.

Job III Installation of Solar Panel, inverter and batteries.

6.5 Identification and familiarization with the following tools used in electronic shop such as Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron, soldering wire, flux and their demonstration and uses. Identification and familiarization with multimeter (analog and digital). Various types of protective devices such as wire fuse, cartridge fuse etc. Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors (audio, video).

6.6 Jobs to be performed

Job IV Practice in the use of tools and instruments used in electronic shop. For this a small experimental set up may be done.

Job V Cut, strip, join an insulated wire with the help of soldering iron (repeat with different types of wires).

RECOMMENDED BOOKS

1. SK Hajra Choudhary and AK Choudhary, "Workshop Technology I, II, III", Media Promoters and Publishers Pvt. Ltd., Mumbai, Fifteenth Edition, 2016.
2. RK Jain, "Workshop Technology Vol I& II'', Khanna Publishers, New Delhi, First Edition, 2021.
3. Manchanda, "Workshop Technology Vol. I, II, III", India Publishing House, Jalandhar.
4. S.S. Ubhi, "Workshop Training Manual Vol. I, II'', Katson Publishers, Ludhiana.
5. K Venkata Reddy, "Manual on Workshop Practice", MacMillan India Ltd., New Delhi, Sixth Edition, 2020.
6. "General Workshop Manual (Diploma Jobs)", Khanna Publishers, First Edition, 2021.
7. T Jeyapoovan, "Basic Workshop Practice Manual", Vikas Publishing House (P) Ltd., New Delhi.

8. B. S. Raghuvanshi, "Workshop Technology, Vol. I", Dhanpat Rai and Sons, Delhi, Eleventh Edition, 2017.

9. Kannaiah K L, Narayana, "Workshop Manual", Scitech Publications, Chennai, Second Edition 1998.

10. H S Bawa, "Workshop Practice", Tata McGraw Hill Publication, First Edition, 2004

INSTRUCTIONAL STRATEGY

This is hands-on practice based workshop for development of required skills in the students.