Jharkhand University of Technology
Ranchi, 834010

TENTATIVE SYLLABUS

For Diploma Program in
EE/EEE

(Effective from 2024-25)

Branch: EE/EEE

ENGINEERING MATHEMATICS

Subject Code: - BSC101 **(3-0-0)**

RATIONALE

Engineering Mathematics specification provides students with access to important mathematical ideas to develop the mathematical knowledge and skills that they will draw on in their personal and work lives. The course enable students to develop mathematical conceptualization, inquiry, reasoning, and communication skills and the ability to use mathematics to formulate and solve problems in everyday life, as well as in mathematical contexts. At this level, the mathematics curriculum further integrates the three content areas taught in the higher grades into three main learning areas: Algebra; Measurement of angles and Trigonometry and Calculus.

1. COURSE SKILL SET

Student will be able to:

1. Solve system of linear equations arise in different engineering fields
2. Incorporate the knowledge of calculus to support their concurrent and subsequent engineering studies
3. Adept at solving quantitative problems
4. Ability to understand both concrete and abstract problems
5. Proficient in communicating mathematical ideas
6. Detail-oriented

2. DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets.

UNIT NO	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 MATRICES AND DETERMINANTS	➢ Use algebraic skills which are essential for the study of systems of linear equations, matrix algebra and eigen values	1.1 Matrix and types 1.2 Algebra of Matrices (addition, subtraction, scalar multiplication and multiplication) 1.3 Evaluation of determinants of a square matrix of order 2 and 3. Singular matrices 1.4 Cramer's rule for solving system of linear equations involving 2 and 3 variables 1.5 Adjoint and Inverse of the non-singular matrices of order 2 and 3 1.6 Characteristic equation and Eigen values of a square matrix of order 2	

UNIT-2 STRAIGHT LINES	➢ Able to find the equation of a straight line in different forms ➢ Determine whether the lines are parallel or perpendicular	2.1 Slope of a straight line 2.2 Intercepts of a straight line 2.3 Intercept form of a straight line 2.4 Slope-intercept form of a straight line 2.5 Slope-point form of a straight line 2.6 Two-point form of a straight line 2.7 General form of a straight line 2.8 Angle between two lines and conditions for lines to be parallel and perpendicular 2.9 Equation of a straight line parallel to the given line 2.10 Equation of a straight line perpendicular to the given line	
UNIT-3 TRIGONOMETRY	➢ Use basic trigonometric skills in finding the trigonometric ratios of allied and compound angles ➢ Able to find all the measurable dimensions of a triangle	3.1 Concept of angles, their measurement, Radian measure and related conversions. 3.2 Signs of trigonometric ratios in different quadrants (ASTC rule) 3.3 Trigonometric ratios of allied angles (definition and the table of trigonometric ratios of standard allied angles say $90^0 \pm \Theta$, $180^0 \pm \Theta$, $270^0 \pm \Theta$ and $360^0 \pm \Theta$) 3.4 Trigonometric ratios of compound angles (without proof) 3.5 Trigonometric ratios of multiple angles 3.6 Transformation formulae	
UNIT-4 DIFFERENTIAL CALCULUS AND APPLICATIONS	Able to differentiate algebraic, exponential, trigonometric, logarithmic and composite functions Able to find higher order derivatives Understand and work with derivatives as rates of change in mathematical models Find local maxima and minima of a function	4.1 Derivatives of continuous functions in an interval (List of formulae) 4.2 Rules of differentiation 4.3 Successive differentiation (up to second order) 4.4 Applications of differentiation	
UNIT-5 INTEGRAL CALCULUS AND APPLICATIONS	➢ Understand the basic rules of integration and Evaluate integrals with basic integrands. 2. Identify the methods to evaluate integrands 3. Apply the skills to evaluate integrals representing areas and volumes	5.1 List of standard integrals and Basic rules of integration 5.2 Evaluation of integrals of simple function and their combination 5.3 Methods of integration 5.4 Concept of definite integrals 5.5 Applications of definite integrals	

4. DETAILED COURSE CONTENT

UNIT NO AND NAME	DETAILED COURSE CONTENT	CO	PO	CONTACTHRS	TOTAL
1 MATRICES AND DETERMINANTS	Definition and types of matrices				
	Algebra of Matrices (addition, subtraction and scalar multiplication) problems				
	Multiplication of Matrices(problems)				
	Evaluation of 2x2 ,3x3 determinants and Singular matrices and problems in finding unknown variable				
	Cramer's rule to solve system of linear equation with 2 and 3 variables				
	Cramer's rule to solve system of linear equation with 2 and 3 variables.problems				
	Minors, Cofactors of elements of square matrices of order 2 and 3				
	Adjoint of a square matrix(2x2 and 3x3),Inverse of a non singular square matrix				
	Adjoint of a square matrix(2x2 and 3x3),Inverse of a non singular square matrix and problems				
	Characteristic equation and eigen values of a 2x2 matirx and problems				
2 STRAIGHTLINES	Slope of the straight line(provided with inclination and two points on the line as well) and problems				
	Intercepts of a straight line and problems				
	Intercept form of a straight line and problems				
	Slope-intercept form of a straight line and problems				
	Slope-point form of the straight line and problems				
	Two-point form of a straight line and problems				
	General form of a straight line.problems on finding slope and intercepts.				
	Angle between two straight lines and conditions forthe lines to be parallel and perpendicular and problems				
	Equation of a line parellel to the given line and problems				
	Equation of a line perpendicular to the given line.problems				

3 TRIGONOMETRY	Concept of angles and their measurement. Radian measures and related conversions (degree to radian and vice-versa) and problems				
	Signs of trigonometric ratios in different quadrants (ASTC rule)				
	Trigonometric ratios of allied angles (definition andthe table of trigonometric ratios of standard allied angles say $90^0 \pm \Theta$, $180^0 \pm \Theta$, $270^0 \pm \Theta$ and $360^0 \pm \Theta$)				
	Problems on allied angles. (proving identities)				
	Problems on allied angles. (Finding values of x in an identity)				
	Trigonometric ratios of compound angles (without proof)				
	Trigonometric ratios of multiple angles (sin2A, cos2A, tan2A, sin3A, cos3A and tan3A)				
	Problems on multiple angles sin2A, cos2A, tan2A, sin3A, cos3A and tan3A				
	Transformation formulae (without proof) as sum to product. (Simple problems)				
	Transformation formulae (without proof) as productto sum. (Simple problems)				
4 DIFFERENTIAL CALCULUS ANDAPPLICATIONS	Definition of a derivative of a function. Listing the derivatives of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inverse trigonometric functions)				
	Addition and subtraction rule of differentiation and problems				
	Product rule and quotient rule of differentiation and problems				
	Product rule and quotient rule of differentiation and problems				
	Composite functions and their derivatives. (CHAIN RULE)				
	Composite functions and their derivatives. (CHAIN RULE). Problems				
	Successive differentiation up to second order				
	Slope of the tangent and normal to the given curve and their equations and problems				

	Rate measure: velocity and acceleration at a point of time and problems				
	Local Maxima and Minima of a function				
	Local Maxima and Minima of a function. Problems				
5 INTEGRAL CALCULUS AND APPLICATIONS	Definition of an indefinite integral. Listing the Integrals of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inverse trigonometric functions)				
	Rules of Integration. Evaluation of integrals with simple integrands and their combinations				
	Rules of Integration. Evaluation of integrals with simple integrands and their combinations. Problems				
	Evaluation of integrals with simple integrands and their combinations. Problems				
	Evaluation of integrals by Substitution method				
	Evaluation of integrals by Integration by parts				
	Evaluation of integrals by Integration by parts. Problems				
	Definition of definite integrals and their evaluation				
	Evaluation of Definite integrals. Problems				
	Area enclosed by the curves by integral method				
	Volume generated by the curve rotated about an axisby integral method				

5. INSTRUCTIONAL STRATEGY

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes

1. Explicit instruction will be provided in intervention classes or by using different differentiation strategies in the main classroom.
2. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching method and media that are employed to develop the outcomes.
3. Observing the way their more proficient peers use prior knowledge to solve current challenges and persevere in problem solving will help struggling students to improve their approach to engaging with rich contextual problems.
4. Ten minutes a day in homeroom, at the end of class, or as a station in a series of math activities will help students build speed and confidence.
5. Topics will be introduced in a multiple representation.
6. The teacher is able to show different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
7. In a perfect world, teacher would always be able to demonstrate how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. When a concept cannot be applied in that manner, we can still share how it might be applied within mathematics.

6. SUGGESTED LEARNING RESOURCES:

Sl. No.	Author	Title of Books	Publication/Year
1	B.S. Grewal	Higher Engineering Mathematics	Khanna Publishers, New Delhi, 40th Edition,2007

2	G. B. Thomas, R. L.Finney	Calculus and Analytic Geometry	Addison Wesley, 9th Edition, 1995
3	S.S. Sabharwal, Sunita Jain, Eagle Parkashan	Applied Mathematics, Vol. I & II	Jalandhar.
4	Comprehensive Mathematics	Comprehensive Mathematics Vol. I & II	Laxmi Publications, Delhi
5	ReenaGarg &Chandrika Prasad	Advanced Engineering Mathematics	Khanna Publishing House, New Delhi

Engineering Chemistry

Subject Code: - BSC103 (3-0-0)

RATIONALE:

Chemistry is a basic science subject which is essential to all engineering courses. It gives knowledge of engineering materials, their properties, related applications & selection of materials for engineering applications.

Due to technological progress there are hazardous effects on environment & human life. The core knowledge of environmental effects will bring awareness in students about the precautions & preventions to be taken to reduce the ill effects.

This subject will generate curiosity of carrying out further development in engineering fields.

OBJECTIVES: The student will be able to:

1. Draw the orbital configuration of different elements.
2. Represent the formation of molecules schematically.
3. Describe the mechanism of electrolysis.
4. Identify the properties of metals & alloys related to engineering applications.
5. Identify the properties of non metallic materials, related to engineering applications.
6. Compare the effects of pollutants on environments & to suggest preventive measures &safety.

Atomic Structure

Definition of Atom, Fundamental Particles of Atom – their Mass, Charge, Location, Definition of Atomic no, Atomic Mass no., Isotopes & Isobars, & their distinction with suitable examples, Bohr's Theory, Definition, Shape of the orbitals & distinction between Orbits & Orbitals, Hund's Rule, Filling Up of the Orbitals by Aufbau's Principle (till Atomic no. 30), Definition & types of valency (Electrovalency & Covalency), Octet Rule, Duplet Rule, Formation of Electrovalent & Covalent Compounds e.g. Nacl, $CaCl_2$, MgO, $AlCl_3$, CO_2, H_2O, Cl_2, NH_3, C_2H_4, N_2, C_2H_2. Distinction between electrovalent & covalent compounds.

Electrochemistry

Definition & differentiation of Atom, Ion. Definition of Ionisation & Electrolytic dissociation, Arrhenius Theory of Ionisation,Degree of Ionisation & factors affecting degree of ionization. Significance of the terms involved in Electrolysis- Such as Conductors, Insulators , Dielectrics, Electrolyte, Non Electrolyte, Electrolysis, Electrolytic Cell, Electrodes. Mechanism of Electrolysis – Primary & Secondary Reactions at Cathode & Anode, concept of electrode potential such as reduction potential & oxidation potential. Electrochemical Series for Cations & Anions, Electrolysis of $CuSO_4$ Solution by using Cu Electrode & Platinum Electrode, Electrolysis of NaCl solution & fused NaCl by using carbon electrode, Faraday's first & second law of Electrolysis & Numericals, Electrochemical Cells & Batteries, Definition, types such as Primary & Secondary Cells & their examples.Construction, Working & Applications of Dry Cell & Lead – Acid Storage Cell, Applications of Electrolysis such as Electroplating & Electro refining, Electrometallurgy & Electrotyping.

Metals & Alloys

1. Metals

Occurrence of Metals, Definition of Metallurgy, Mineral, Ore,Gangue, Flux & Slag, Mechanical Properties of metals such as Hardness, Toughness, Ductility, Malleability, Tensile strength, Machinability, Weldability, Forging, Soldering, Castability. Stages of Extraction of Metals from its Ores in detail i.e. Crushing, Concentration, Reduction, Refining. Physical Properties & Applications of some commonly used metals such

as Fe, Cu, Al, Cr, Ni, Sn, Pb, Zn, Co, Ag, W.

2. Alloys

Definition of Alloy, Purposes of Making alloy. Preparation Methods, Classification of Alloys such as Ferrous & Non Ferrous & their examples. Composition, Properties & Applications of Alnico, Duralumin, Dutch Metal, GermanSilver / Nickel Silver, Gun Metal, Monel metal, Wood's Metal,
Babbittmetal.

Non Metallic Materials

1. Plastics

Definition of Plastic, Formation of Plastic by Addition & Condensation Polymerisation by giving e.g. of Polyethylene & Backelite plastic Respectively, Types of Plastic, Thermosoftening & Thermosetting Plastic, with Definition, Distinction & e.g., Compounding of Plastics – Resins, Fillers, Plasticizers, Acceleraters, Pigments & their examples, Engineering Applications of Plastic based on their properties.

2. Rubber

Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanisation of Rubber with Chemical Reaction.

Synthetic Rubber: Definition, & e.g, Distinction Between natural & synthetic rubber. Properties of rubber such as elasticity, tack, abrasion resistant,stress & strain and related engg.application.

3. Thermal Insulating Materials

Definition & Characteristics of Thermal insulators.

Preparation, Properties & Applications of Thermocole & glasswool. Properties & Applications of Asbestos, Cork.

Environmental Effects (Awareness Level)

1. Pollution & Air pollution

Definition of pollution & pollutant, Causes of Pollution, Types of Pollution - Air & Water Pollution.

Air Pollution

Definition, Types of Air pollutants their Sources & Effects, Such as Gases, Particulates, , Radio Active Gases, Control of Air Pollution, Air Pollution due to Internal Combustion Engine& Its Control Methods, Deforestation their effects & control measures. Causes , Effects & control measures of Ozone Depletion & Green House Effects**.**

2. Water Pollution & Waste

Definition, Causes & Methods of Preventing Water Pollution, Types of Waste such as Domestic Waste, Industrial Waste, their Physical & Biological Characteristics, Concept & significance of BOD, COD, Biomedical Waste & E – Waste, their Origin, Effects & Control Measures. Preventive Environmental Management (PEM) Activities.

Engineering Chemistry Lab

Subject Code: - BSC103P **(0-0-2)**

01 – 07 Qualitative Analysis of **Seven Solutions,** Containing One Basic & One AcidicRadical Listed below.

Basic Radicals

Pb^{+2}, Cu^{+2}, Al^{+3}, Fe^{+2}, Fe^{+3}, Cr^{+3}, Zn^{+2}, Ni^{+2}, Ca^{+2}, Ba^{+2}, Mg^{+2}, K^{+}, NH_4^{+}.

Acidic Radicals

Cl^{-}, Br^{-}, I^{-}, CO_3^{-2}, SO_4^{-2}, NO_3^{-}.

08 To Determine E.C.E. of Cu by Using $CuSO_4$ Solution & Copper Electrode

09 To Determine the % of Fe in the Given Ferrous Alloy by $KMnO_4$ Method.

10 To Prepare a Chart Showing Application of Metals like Fe, Cu, Al, Cr, Ni,Sn, Pb, Co.

11 To Prepare Phenol Formaldehyde Resin (Backelite)

12 To Determine Carbon Monoxide Content in Emission from Petrol Vehicle.

13 To Determine Dissolved Oxygen in a Water Sample.

Learning Resources:

Reference Books:

Sr. No.	Author	Name of the book	Publisher
01	Jain & Jain	Engineering Chemistry	Dhanpat Rai and Sons
02	S. S. Dara	Engineering Chemistry	S. Chand Publication
03	B. K. Sharma	Industrial Chemistry	Goel Publication
04	S. S. Dara	Environmental Chemistry & Pollution Control	S. Chand Publication
05	Vedprakash Mehta	Polytechnic Chemistry	Jain brothers

Engineering Physics

Subject Code: - BSC102

(3-0-0)

RATIONALE:

Engineering is entirely meant for comfort of mankind. It includes varieties of disciplines like Mechanical Engg., Electrical Engg., Civil Engg., Electronics Engg., Computer Engg., etc. Theoverall growth of these disciplines is based on developments in fundamental sciences and their conceptual learning too.

For sustainable socio-economic development of the country, comprehensive researchtechniques in science and engineering are required. Regarding any problem to identify, understand and solve, the decision based on scientific facts and results is must.

Engineering, being the science of measurement and design, has been offspring of Physics that plays the primary role in all professional disciplines of engineering. The different streams of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics, Surface Physics, Nuclear physics, Energy Studies, Materials Science, etc. provide **Fundamental Facts, Principles, Laws, and Proper Sequence of Events** to streamline Engineering knowledge.

OBJECTIVES: Student will be able to:

- Measure given dimensions by using appropriate instruments accurately.
- Select proper measuring instrument on the basis of range, least count & precision requiredfor measurement.
- Select proper material for intended purpose by studying properties of materials.
- Identify good & bad conductors of heat.
- Analyze relation among pressure, volume and temperature of gas & to interpret the results
- Identify the effect of interference between light waves.
- Identify properties of laser light and photoelectric effect for engineering applications.
- Identify, analyze, discriminate and interpret logical sequence of field problems with thestudy of physics.

Course Content-

UNITS AND MEASUREMENTS

1) Need of measurement and unit in engineering and science, definition of unit , requirements of standard unit, systems of units-CGS,MKS and SI, fundamental and derived quantities and their units
2) Least count and range of instrument, least count of vernier caliper, micrometer screw gauge and sphereometer,
3) Definition of accuracy, precision and error, estisimation of errors -absolute error, relative error and percentage error, rules and identification of significant figures.

(Numericals on percentage error and significant figures)

GENERAL PROPERTIES OF MATTER

2.1 Elasticity

Deforming force, restoring force, elastic and plastic body,stress and strain with their types. elastic limit, Hooke's law,Young's modulus, bulk modulus, modulus of rigidity andrelation between them (no derivation), stress strain diagram.behavior of wire under continuously increasing load, yield point,

ultimate stress, breaking stress, factor of safety.

(Numericals on stress, strain and Young's modulus)

2.2 Surface Tension.

Molecular force, cohesive and adhesive force, Molecular range , sphere of influence, Laplace's molecular theory, Definition of surface tension and its S.I.unit,angle of contact,capillary action with examples, shape of meniscus for waterand mercury, relation between surface tension , capillary riseand radius of capillary (no derivation),effect of impurity andtemperature on surface tension.

(Numericals on relation between surface tension, capillary rise and radius)

2.3 Viscosity

Fluid friction, viscous force, Definition of viscosity, velocitygradient, Newton's law of viscosity, coefficient of viscosityand its S.I. unit, streamline and turbulent flow with examples, critical velocity, Reynolds's number and its significance, free fall of spherical body through viscous medium (no derivation), up thrust force, terminal velocity, Stokes law (statement and formula).

(Numericals on coefficient of viscosity, Reynoldsnumber and Stoke's formula)

HEAT

3.1 Transmission of heat and expansion of solids

Three modes of transmission of heat -conduction, convection and radiation, good and bad conductor of heatwith examples, law of thermal conductivity, coefficient ofthermal conductivity and its S.I. unit, Definition of linear,aerial and cubical expansion and relation between them.(noderivation)

(Numericals on law of thermal conductivity, and coefficientsof expansions)

3.2 Gas laws and specific heats of gases

Boyle's law, Charle's law, Gay Lussac's law, absolute zero temperature, Kelvin scale of temperature, general gas equation (statement only), specific and universal gas constant, Two specific heats of gas and relation between them(no derivation),Isothermal and adiabatic expansion of gas.

(Numericals on gas laws and specific heats)

LIGHT, LASER and SOUND

4.1 Properties of light

Reflection, refraction, snell's law, physical significance of refractive index, definition of dispersion, polarization and diffraction of light along with ray diagram, principle of superposition of waves, interference of light, constructive and destructive interference.

(Numericals on refractive index)

4.2 LASER

Properties of laser, spontaneous and stimulated emission,population inversion, optical pumping, construction and working of He-Ne laser.

4.3 Sound

Definition of wave motion, amplitude, period, frequency, and wavelength, relation between velocity, frequency and wavelength , equation of progressive wave (no derivation), longitudinal and transverse wave, definition of stationary wave , node and antinode, forced and free vibrations, definition of resonance with examples, formula for velocityof sound with end correction (no derivation)

(Numericals on relation $v = n\lambda$ and resonance)

MODERN PHYSICS

5.1 Photo electricity

Concept of photon**,** Plank's hypothesis, properties of photon, photo electric effect, Characteristics of photoelectric effect, work function, Einstein's photoelectric equation(no derivation), photoelectric cell-construction ,working and applications.

(Numericals on Energy of photon, work function,photoelectric equation)

5.2 X-rays

Introduction to x-rays, types of x-ray spectra-continuous andcharacteristics, production of x-rays using Coolidge tube, minimum wavelength of x-rays, properties of x-rays, engineering, medical and scientific applications.

(Numericals on minimum wavelength of x-rays)

Engineering Physics Lab

Subject Code: - BSC102P **(0-0-2)**

List of Experiments

1. To know your Physics Laboratory.
2. To use Vernier Caliper for the measurement of dimensions of given object.
3. To use Micrometer Screw Gauge for the measurement of dimensions (Length,Thickness, Diameter) of given object.
4. To verify Hooke's Law by Searle's method and to calculate Young's modulus ofelasticity of steel wire.
5. To study capillarity phenomenon and to verify that the height of liquid in capillary is inversely proportional to the radius of capillary.
6. To determine coefficient of viscosity of given fluid (Glycerin) using Stoke's Method.
7. To calculate the Linear Thermal coefficient of expansion for copper by using Pullinger's apparatus.
8. To Verify Boyle's law and to find out atmospheric pressure in the laboratory usinggraph.
9. To determine the velocity of sound by using resonance tube.
10. To verify characteristics of photoelectric cell.
11. Use of Thermocouple as a thermometer for the measurement of unknown temperature(Boiling Point of Water)
12. To determine the divergence of He-Ne laser beam.

Reference Books:

Sr. No.	Name of book	Author	Publisher & Address
1.	Physics-I	V. Rajendran	Tata McGraw- Hill raw- Hill publication, New Delhi
2.	Applied physics	Arthur Beiser	Tata McGraw- Hill raw- Hill Publication, New Delhi
3.	Engineering Physics	by R.K.Gaur and S.L.Gupta	Dhanpat Rai Publication,New Delhi.
4.	Fundamentals of Physics	Resnick ,Halliday & Walker	Wiley India Pvt. Ltd.

Basics of Electrical Power System

Subject Code: - EEE101

(0-0-3)

RATIONALE

A power system comprises of the various subsystems that include generation, transmission, and distribution and Load. Basic knowledge of Electrical Power System **is essential for student of diploma in electrical Engineering** to work in Generation, transmission and distribution field. An electrical engineering diploma student must be knowledgeable about various sources of energy, construction and operation of conventional and non-conventional power plants, economics of power generation and techniques of transmission and distribution. The study of basic concepts of electrical power generation will help the student to understand various issues associated with Generation, transmission and Distribution.

COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching –learning experiences

- **Select the site** for Hydroelectric, Thermal, Nuclear, Wind and Solar power plants.
- **Construction and operation** of conventional and non-conventional power plants.

DETAILS OF COURSE CONTENT

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

Session No.	Contents	Class Hour L:T:P
Unit-I	**Hydroelectric and Thermal power plants**	
1	Power sector scenario including generation, transmission, and distribution scenario of India	
2	**Introduction-**Importance of electrical power generation. Sources of energy available in nature. Conventional and non-conventional sources.	
3	**Hydro power plant** -Factors to be considered for selection of site and Classify hydroelectric power plants based on the available head of water, plant capacity, load and construction.	
4	General layout of hydro power plant and explain of its components. Meaning of water hammer and its effect.	
5	Advantages and Disadvantages of Hydroelectric power plant. Environmental Impact of Hydel power plant	
6	**Thermal power plant-** Factors to be considered for selection of site. General layout of thermal (steam) power plant.	
7	Working of thermal power plant. Advantages and disadvantages of Thermal power plant. Environmental Impact of Thermal power plants	
8	**Activity based Learning** on Hydroelectric and Thermal power plant	
Unit-II	**Nuclear, Diesel and Gas turbine power plants**	

9	**Nuclear power plant-**Factors to be considered for selection of site and Schematic diagram of nuclear power plant.	
Session No.	**Contents**	**Class Hour L:T:P**
10	Construction andworking of Nuclear power plant.	
11	Nuclear power plant impacts such as Health physics, nuclear wastes and nuclear waste disposal. Comparison between thermal power plant with nuclear power plant.	
12	**Diesel power plant**-Schematic diagram of a Diesel generator unit and main components. Advantages and Disadvantages of Diesel power plant	
13	**Gas turbine power plant-** Schematic diagram of a Gas turbine power plant. Advantages and Disadvantages of Gas turbine plant	
14	**Activity based Learning** onNuclear, Diesel and Gas turbine power plants	
Unit-III	**Solar photovoltaic system and Wind Power plant**	
15	Photovoltaic effect, solar power, Construction of solar cell, solar photovoltaic module with block diagrams.	
16	Construction of photovoltaic panel and PV array with block diagrams. Materials used in solar cells and Solar cells Applications.	
17	Classification of solar photovoltaic systems.	
18	Stand-alone and grid interactive solar PV system with block diagram	
19	Advantages and dis-advantages of PV systems and environmental impacts of solar PV system on environment.	
20	Importance of Wind Energy. Explain the origin of Global and local winds.	
21	Factors affecting distribution of wind energy on surface of the earth. Factors to be considered for site selection.	
22	Nature of winds with neat sketches.	
23	Classification of wind turbine generator, Comparison between horizontal axis and vertical axis wind turbine generator Environmental Impact of wind plants.	
24	**Activity based Learning**onSolar PV system and Wind Power plant	
Unit-IV	**Biomass Power, Fuel cell and Hybrid PV systems**	
25	**Urban waste to energy conversion-** Block diagrammunicipal solid waste (MSW) to energy incineration plant.	

26	**Bio Energy-**Describe biomass and sources, conversion process. Importance of biomass energy and its scope. Factors to be considered for site selection. Line diagram of biomass power plant. Benefits of biomass. Biomass briquetting	

Session No.	Contents	Class Hour L:T:P
27	Bio fuels, electricity generation using biomass. Biogas plants, mention types of biogas plants.	
28	**Chemical Energy source:** fuel cells**,** working of fuel cells, classification, applications	
29	Hybrid PV systems-Types of hybrid PV systems.	
30	Block diagram PV-Wind hybrid system and, PV-fuel cell hybrid system.	
31	**Activity based Learning**onBiomass Power, Fuel cell and Hybrid PV systems	
Unit-V	**Economics of Power Generation**	
32	Related terms: connected load, firm power, cold reserve, hot reserve, spinning reserve.	
33	Base load and peak load plants; Load curve, load duration curve, integrated duration curve	
34	Cost of generation: Average demand, maximum demand, demand factor, plant capacity factor, plant use factor, diversity factor, load factor and plant load factor.	
35	Simple problems on Cost of generation	
36	Choice of size and number of generator units, combined operation of power station.	
37	**Activity based Learning**onEconomics of Power Generation	
Unit-VI	**Basics of Transmission and Distribution**	
38	**Transmission:** AC transmission and distribution system with typical Single line diagrams with components of the electric supply transmission and distribution systems.	
39	Classification of transmission lines: Primary and secondary transmission; standard voltage level used in India	
40	Classification of transmission lines: based on type of voltage, voltage level, length and others, Characteristics of high voltage for power transmission.	
41	HVDC transmission lines-block diagram, list and explain the functions of main components of HVDC transmission system	
42	**AC Distribution**: Components classification, requirements of an ideal distribution system, primary and secondary distribution system.	
43	Connection schemes of distribution system- radial, ring main and interconnected systems. Distinguish between Feeder, distributor and service main.	
44	Substation and receiving station and their functions, Classification of substations.	
45	Single Line diagram (layout) of 66/11KV Substation,Symbols and functions of their components.	
46	Single Line diagram (layout) of 11KV/400V Sub-Station Symbols and functions of their components.	

Session No.	Contents	Class Hour L:T:P
47	Causes and Impact and reasons of Grid system fault: State grid, national grid, brownout and black out, Sample blackouts at national and international level	
48	Explain Black start Restoration	
49	Explain Demand side Management	
50	Functions of Load Dispatch Centre	
51	Functions of Power Generation and Distribution Companies Different electric distribution companies and their functions (BESCOM, MSCOM, HESCOM etc.)	
52	**Activity based Learning**onBasics of Transmission and Distribution	
	TOTAL	

SUGGESTED LEARNING RESOURCES

Reference Books:

Principles of power system by V.K.Mehta and Rohit Mehta S.CHAND
Generation of Electrical Energy, by B.R.Gupta, publisher S.chand& company LTD, New Delhi
Electrical Power Generation, Transmission and Distribution. - S.N.Singh. PHI Publications.
Elements of power station design-M V Deshpande-PHI Publications
Power Plant Engineering **-** A. K. Raja, New Age International Publisher
Generation Distribution and Utilisation of electric energy by C.L. Wadwa, -New-Age International Publisher
Non-conventional Energy Resources - G.S.Sawhney, PHI publications, second Printing-2014, Delhi-110092.
Non-conventional Energy Resources-B.H.Khan 2 ^{d} Edition Tata McGraw hill PVT, New-Delhi.
Solar photovoltaic Technology and systems, - Chetan Singh Solanki, PHI, Delhi-110092.
Generation of Electrical Energy, by B.R.Gupta, publisher S.chand& company LTD, New Delhi
Transmission, distribution and utilization – vol 3 B.L Thereja and A.K.Theraja.
Transmission and Distribution of Electric Power by J.B Gupta Katsons Publications.
Energy Management by Dr. Umesh Rathod, Katson publications

E-resources:

1. https://en.wikipedia.org/wiki/Electricity_generation.
2. https://www.google.com/phindia.com//solarphotovoltaics.
3. https://www.schandgroup.com.
4. https://www.tatamcgrawhill.com
5. https://www.youtube.com/watch?v=daeyoS-PCUA (Generation, distribution and transmission of electrical power)
6. https://www.youtube.com/watch?v=IdPTuwKEfmA (Thermal power plant)
7. https://www.youtube.com/watch?v=zcWkEKNvqCA (Gas turbine power plant)

8. https://www.youtube.com/watch?v=-hooifWJ1jY (Hydroelectric power plant)
9. https://www.youtube.com/watch?v=bQ23kCvokAc (Nuclear power plant)
10. https://www.youtube.com/watch?v=eAX fK c8Mc (Diesel power plant)
11. https://www.youtube.com/watch?v=ZLgOoMSlS3Y (Solar)
12. https://www.youtube.com/watch?v=qSWm nprfqE (wind)
13. https://www.youtube.com/watch?v=VkTRcTyDSyk (Tidal)
14. https://www.youtube.com/watch?v=sZuc4LMtHoY (Wave)
15. https://www.youtube.com/watch?v=OL26yYFmDHU (Ocean thermal)
16. https://www.youtube.com/watch?v=3UafRz3QeO8 (Biogas)
17. https://www.youtube.com/watch?v=nVl17JLn u0 (Biomass)
18. https://www.youtube.com/watch?v=bXHwnKMchkk (Fuel cell)
19. https://www.youtube.com/watch?v=qjY31x0m3d8 (Transmission lines)
20. https://www.youtube.com/watch?v=WUHcVXjfsxs (Transmission and distribution)
21. https://www.youtube.com/watch?v=R HGnc63QKU (Power blackout)
22. https://www.pbs.org/wgbh/nova/labs/lab/energy/1/1/ (Alternative energy)

Engineering Workshop

Subject Code: -MEC101P **(0-0-3)**

1. Identify fire extinguisher according to their specification.
2. Perform mock drill session in group of minimum 10 students for extinguishing fire.
3. Identify different tools used in workshop.
4. Prepare job using following operations: part 1 a. Marking operation as per drawing b. punching operation as per drawing c. Filing operation as per drawing d. sawing operation as per drawing e. drilling operation as per drawing f. tapping operation as per drawing.
5. Prepare T joint pipe fitting job as per given drawing (individually).
6. Prepare elbow joint pipe fitting job as per given drawing (individually).
7. Prepare bill of material for given pipeline layout (individually).
8. Practice different safety rules in welding shop as per given instruction.
9. Prepare lap joint using gas welding as per given drawing (individually).
10. Prepare butt joint using gas welding as per given drawing (individually).
11. Prepare utility job (like stool, benches, tables or similar jobs) involving arc welding and artificial wood as per given drawing (in group of 4 to 5 students) Fabrication operation involve measuring, marking, cutting, edge preparation, welding.
12. Prepare sheet metal utility job using following operations a. Cutting and Bending b. Edging c. End curling d. Lancing e. Soldering f. Riveting.
13. Draw sketches of various ancient tools.

Suggested Learning Materials / Books

1. Gupta, J.K.; Khurmi, R.S., A Textbook of Manufacturing Process (Workshop Tech.), S.Chand and Co. New Delhi ISBN:81-219-3092-8.
2. Hajra; Choudhary, Elements of Workshop Technology, Media Promoters and Publishers Mumbai, 2009, ISBN: 10-8185099146.
3. Sarathe, A.K., Engineering Workshop Practice, Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-51-6.
4. Raghuwansi, B.S; Workshop Technology, Dhanpat Rai & Co.

IT SKILLS

Subject Code: -CSE101P **(0-0-3)**

1. RATIONALE

Information Technology is crucial to the majority of the business and has a great influence oninnovation and engineering. Every branch of engineering and every organization opt for computers and IT skills for business automation, communication/connectivity, resource planning, work automation and securing information etc. All engineering diploma students must be conversant with the basic IT skills which empower them to learn new technologies, adapt to changes, businessdevelopment, communication etc.

2. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching –learning experiences.

Perform jobs related to web design and maintenance, business process automation tool management, cyber security and safety and program assistant.

3. DETAILS OF COURSE CONTENT

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

UNIT NO	Topics/Sub topics	Unit skill set/Learning outcomes (In cognitive domain)	Hours L-T-P
1	**UNIT 1 - INTRODUCTION TO BASICS OF CODING**		
	a) Introduction to computer programming b) Algorithms –With sufficient examples c) Flowcharts – With sufficient examples d) Execute simple programs **Note: Below listed or any other suitable online/offline coding platforms should be used to demonstrate and provide coding experience to students.** **a. https://scratch.mit.edu/**	1. Understand computer programming 2. Create and write Algorithm for programmable problems. 3. Design Flowchart for programmable problems. 4. Develop simple Android application.	

	b. https://studio.code.org/projects Suggested programs are listed in Table 1 e) Introduction to Application development **f)** Simple android application development (No knowledge of programming language is required). **Note:** ***i. The purpose of application development is to ignite and promote programming skills.*** ***ii. Application development should be done using any App builder platforms such as*** ***iii. MITApp Inventor: https://appinventor.mit.edu/*** ***iv. Thunkable: https://thunkable.com/*** ***v. ibuildapp: https://ibuildapp.com/*** ***vi. The student should be introduced to the android application development environment for further research and learninghttps://developer.android.com/*** g) Activity: create a simple Android application (Unique for each student) publish on the learning management system.		
2	**UNIT 2 - DESIGN AND DEVELOP WEB PAGES**		
2	a) Basic web technologies ▪ Browser ▪ Web –Server ▪ Client-Server Model ▪ URL ▪ SEO techniques ▪ Domain names and domain name system. b) Creating Web-pages with HTML5 - Static	1. Understand and examine basic web technologies 2. Creating static web pages 3. Formatting Webpages with cascading style sheets (CSS) 4. Creating Dynamic web pages with JavaScript	

	web pages. ▪ Introduction, Editors ▪ Tags, Attributes, Elements, Headings ▪ Links, Images, List, Tables, Forms ▪ Formatting, Layout, Iframes. 2.3 Formatting web pages with style sheets (CSS3). ▪ Introduction to CSS ▪ Inline CSS, Internal CSS, Classes and IDs ▪ div, Color, Floating, Positioning ▪ Margins, Padding, Borders ▪ Fonts, Aligning Text, Styling Links 2.4 Creating a web page dynamic using JavaScript. ▪ Dynamic web page and Introduction to JS ▪ Basic syntax ▪ Functions ▪ Events Note: Refer https://www.w3schools.com **2.6** Creating dashboards in websites. **2.6 Activity: Personal website design and launch with a free platform or Create a Blogging website.** ▪ **Online platforms (Learning and executing)** ▪ **https://www.w3schools.com/** ▪ **https://studio.code.org** ▪ **https://www.khanacademy.org** **Note:** **1) The student must be introduced to website development platforms - worldpress.com.** **2) The student must be made familiar**	5. Creating and launching dashboard based personal website.	

	with launching websites . Certification available: • HTML - W3schools • CSS - W3schools • JavaScript - W3schools		
3	**UNIT 3 -BUSINESS PROCESS AUTOMATION/ERP**		
3	6.2 Introduction to business process automation. 6.3 Organization structure and functions composition-Properties and applications ▪ Structure ▪ Types ▪ Functional Units **Note: Students should be made familiar with organization, types and components of a big enterprise to make him understand the working of organization keeping him as part of org.** 6.4 Workflows ▪ Introduction ▪ Components ▪ Use and use cases **Note: Use free and open-source platform to demonstrate and create workflows.** **Example:** **https://airflow.apache.org/** **https://taverna.incubator.apache.org/** **https://trello.com/** **https://www.processmaker.com/** 6.5 Enterprise resource planning ▪ History ▪ Evolution ▪ Uses of ERP ▪ ERP software tools.	1. Identify and examine the needs of business process automation. 2. Understand Organization structure and functions 3. Create and use workflows 4. Use Enterprise resource planning in workplace.	

	Note: The student should be introduced into Enterprise resource planning software tools to understand importance of ERP. **Examples:** ▪ **https://erpnext.com/** ▪ **www.bitrix24.com** ▪ **https://www.odoo.com/** **3.5 Activity:** ▪ **Project plan for summer internship - use open source ERP Software** ▪ **Identify different components of nearby organization with recourse plan and workflow design.** ▪ **Identify types of ERP software available with their market share.**		
4	**UNIT 4 - INTRODUCTION TO CLOUD AND IOT CONCEPTS**		
	4.1 Fundamentals of cloud 4.2 Cloud service models ▪ IaaS (Infrastructure-as-a-Service) ▪ PaaS (Platform-as-a-Service) ▪ SaaS (Software-as-a-Service) 4.3 Cloud deployment types ▪ Public, ▪ Private, ▪ Hybrid ▪ Community Cloud 4.4 Cloud services: ▪ Google Drive - file storage and synchronization service developed by Google; ▪ Google docs- bring your documents to life with smart editing and styling tools to help you easily format text and paragraphs; ▪ Google Co-lab (Usage of Jupyter Notebook): *Colab* notebooks allow you to combine	1. Understand Cloud concepts 2. Identify and use Cloud services 3. UnderstandIoT concepts 4. Identify IoT applications	

	executable code and rich text in a single document, along with images, HTML, LaTeX, and more. ▪ Google App Engine: Google App Engine is a Platform as a Service and cloud computing platform for developing and hosting web applications in Google-managed data centers. Applications are sandboxed and run across multiple servers. **Note: Above cloud services are not compulsory for all branches; teacher can recommend other cloud service based on need of engineering branch.** 4.5 Working of IoT and IoT components (Only brief introduction and demonstration through videos) 4.6 Explain concept of Internet of Things with examples ▪ Smart home ▪ Smart city ▪ Smart farming **Note:** **a. Teacher can also select specific area of work where Things (autonomous computing devices) could be interconnected over TCP/IP to establish IoT.** **b. The students should be introduced to the IoT environment for further research and study**. **Example:** ▪ **https://www.raspberrypi.org/** ▪ **https://www.arduino.cc/**		

	4.7 Activity: **Create your cloud service account and demonstrate using cloud services.** **Identify cloud service provider with respect to service models and deployment types.** **Identify areas where Internet of Things could bring positive changes.**		
5	**UNIT 5 - CYBERSECURITY AND SAFETY**		
	5.1 Introduction to Cyber security and cyber safety. ▪ Brief awareness on cyber safety measures ▪ Identification of basic security issues in mobile phones and personal computers ▪ Installation of Antivirus software ▪ Firewall concepts ▪ Browser settings ▪ Importance of privacy and Password policy (Best practices). 5.2 Common threats - Demonstration ▪ Phishing ▪ DoS attack ▪ Man in the middle attack ▪ Eavesdropping ▪ Spamming **5.3 Activity** ▪ **Identification of basic security issues in computers of your college and fixing the same.** ▪ **Visit nearby government organization.** ▪ **Identify basic cybersecurity issues and fixing the same** ▪ **Demonstrate the importance of cybersecurity, password policy, and cyber safety.**	1. Identify need for Cyber security and cyber safety 2. Identify basic security issues in mobile phones and personal computers 3. Examine Importance of privacy, Password policy 4. Implement best practices of cyber safety and security in work place	

4. SUGGESTED PRACTICAL SKILL EXERCISES

TABLE-I

Sl. No.	Practical Out Comes/Practical exercises	Unit No.	PO	CO
1	Write an algorithm for programmable problems Example for Reference: • Add/subtract two numbers • Find the largest/smallest of 3 numbers • Calculate and print sum of 'N' numbers	1		
2	Design a flowchart for programmable problems Example for Reference: Add/subtract two numbers Find the largest/smallest of 3 numbers Calculate and print sum of 'N' numbers	1		
3	Design and create simple game using MIT-scratch/Code.org	1		
4	Design and create simple android application (MIT App Inventor)	1		
5	Design and create webpage for displaying your poem (Title, header, paragraph, formatting tags)	2		
6	Design and create webpage for your wish list (What you want to do). Also list challenges and opportunities along with images to present your dreams (List ordered and unordered, Image, table)	2		
7	Design and create webpage using HTML and CSS about an awesome animal (Use necessary CSS tags)	2		
8	Design and create web page for a travel book/recipe book with more than 3 pages, table to list places/recipes (iframe, hyperlink)	2		
9	Design and create web page with JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient	2		
10	Design and create a personal webpage with dashboard	2		
11	Design and create web page about advantages of business process automation with respect to your branch of engineering	2,3		

12	Create a workflow for education loan approval in bank/diploma admission process (Use any tool)	3		
13	Demonstrate ERP with ERPNext Demo for manufacturing, retail and service sector (Use any other ERP tools)	3		
14	Create user account and demonstrate use of Google drive, Google docs, Google Co-lab (Usage of Jupyter Notebook)	4		
15	5.1 Demonstrate Internet of Things using with examples a. Smart home b. Smart city c. Smart farming Note: Teacher can also select specific area of work where Things (autonomous computing devices) could be interconnected over TCP/IP to establish IoT.	4		
16	Installation of Antivirus software	5		
17	Demonstration and hands on browser settings	5		
18	Demonstration and hands on privacy settings and password policy	5		
19	Demonstration of common security threats (using videos) 6. Phishing 7. DoS attack 8. Man in the middle attack 9. Spamming 10. Virus	5		

The suggested practical activities (TABLE-I) in this section are demonstrated for the attainment of the competency. These practical activities can also be used for the student assessment in portfolio mode for awarding CIE marks. **The lecturer can enhance the competency level of the students by sketching more practical exercises.**

NOTES:

1. It is compulsory to prepare log book/record of exercises. It is also required to get each exercise recorded in logbook, checked and duly dated signed by the teacher
2. Student activities are compulsory and are also required to be performed and noted in logbook.
3. Student activity is compulsory and part of skill assessment. The activity enable student to explore the course, help student to demonstrate creativity & critical thinking.
4. Student activity report is compulsory part to be submitted at the time of practical ESE
5. Term work report is compulsory part to be submitted at the time of practical ESE.

6. Student activity and student activity reports must be uploaded to Learning management system.
7. For CIE, students are to be assessed for Skills/competencies achieved.

Communication Skills

Subject Code: - BSC104P (0-0-3)

Course Outcomes:

Students will be able to achieve & demonstrate the following:

1. Construct grammatically correct sentences in English.
2. Compose paragraphs and dialogues on given situations.
3. Comprehend passages correctly.
4. Use contextual words in English appropriately.
5. Deliver effective presentations in English using appropriate body language.

Unit 1: Vocabulary

Phonetics: Vowels (12), Consonants (24), Diphthongs (8). Prefix & Suffix: Definition & Examples, List of common prefixes and suffixes. Synonyms & Antonyms: Vocabulary expansion, Context & Usage. Homophones: Identifying Homophones, Meaning & Context, Vocabulary Expansion. Collocations: Definition & identification, Types of collocations.

Unit 2: Paragraph and Dialogue Writing

Types of paragraphs: Technical, Descriptive, Narrative. Dialogue Writing: i Greetings ii. Development iii. Closing Sentence Phonetic

Unit 3: Comprehension (Seen and Unseen Passages)

Say No to Plastic bags, Interview of Dr. APJ Abdul Kalam, Maximum Achievements, Be Remarkable, Arunima Sinha: A Biography, Roses of Gratitude. Importance of Comprehension. Unseen Passages. Interpretation of passages in written and spoken form.

- Let not confined to specific text.
- Literature available on related topic on electronic media or print media.
- Q/A on this topic.
- Unseen Passage for comprehension.

Unit 4: Communicative Language

Technical objects: i. Heading ii. Description of technical objects. Picture Description: i. Situational picture ii. Describe in your own words. Diary Entry: i. Date ii. Content iii. Name of the writer. Translation of paragraph from English to Marathi/Hindi-Vice versa (Question not to be asked on Translation in Theory Examination).

Unit 5: Presentation Skills

Dressing & Grooming: i. Dressing for the occasion ii. Proper grooming. Speech Writing: i. Situation ii. Salutations iii. Introduction of the topic iv. Description/Body v. Conclusion. Power Point Presentation: i. Layout ii. Font size iii. Color combination. Kinesics: i. Facial expressions ii. Eye contact iii. Postures iv. Gestures.

Exercise

Any 12 out of 16 exercises are compulsory;

1. Write 20 words using phonetic transcription.
2. Practice pronunciation as per IPA using language lab.
3. Formulate 20 words using Prefix and Suffix.
4. Construct sentences using 20 collocations.
5. Write two paragraphs of 75 words each.
6. Compose situational dialogues (Any Two).
7. Enact Role Plays as per situation and context.
8. Describe any three technical objects using correct grammar.
9. Narrate anecdotes of various situations in English.
10. Describe a given picture (Any Two).
11. Introduce oneself and others.
12. Prepare a Power point presentation on a given topic.
13. Translate paragraph --English to Hindi (vice -Versa) (Any4).
14. Write your experience in 50 words on (Four) given situations (Diary Entry).
15. Respond to the questions based on the given passages.
16. Deliver oral presentations using correct grammar and appropriate body language.

Suggested Learning Materials / Books

1. Kumar, E. Suresh, Sreehari, P Savitri, Effective English with CD, Pearson Education.
2. Gnanamurli, English Grammar at a Glance, S. Chand.
3. CBSE, English Communicative (class X), Golden.
4. Dr. Anjana Tiwari, Communication Skills in English, Khanna Publishers, New Delhi.

Computer Aided Engineering Graphics

Subject Code: - CSE103P **(0-0-3)**

COURSE DETAILS:

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

Unit	Major Learning Topics and Sub-Topics	Outcomes (in cognitive domain)	Hours L-T-P
UNIT-1 **Basic elements of Drawing**	1.1 List the different drawing instruments and application 1.2 Convention of lines and its application (Thick, Thin, Axis etc.) 1.3 Practice use of drawing instruments 1.4 Representative fraction Scales - Full Scale, Reduced Scale and Enlarged Scale 1.6 Dimensioning a) Aligned system and Unidirectional system in the Sketches b) Chain dimensioning and Parallel dimensioning 1.7 Construct different polygons	1. Drawing equipment's, instruments and materials. 2. Equipment's-types, specifications, method to use them, applications. 3. Instruments-types, specifications, methods to use themandapplications. 4. Pencils-grades, applications, Different typesoflines. 5. Scaling technique used indrawing. 6. Dimensioningmethods. - Alignedmethod. Unilateral with chain, paralleldimensioning. 7. Constructions of geometrical figures	
UNIT-2 **CAD Interface**	22.1 Introduction to CAD- Hardware requirements. 2.2 Various CAD software available 2.3 Familiarization of CAD window - Commands like New file, Saving the file, opening an existing drawing file, Creating templates 2.4 Setting up new drawing: Units, Limits, Grid, Snap. Standard sizes of sheet. 2.5 Selecting Various plotting parameters such as Paper size, paper units, drawing orientation, plot scale, plot offset, plot area, print preview	1. CAD-Definition-Importance. 2. Familiarization with CAD Environment and utilities. 3. Setting up layout in CAD software's by taking plotting parameters	
UNIT-3 **Exposure to CAD Commands**	3.1 Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Dimensioning, Inserting text Applying constraints - horizontal, vertical, parallel, concentric, perpendicular, symmetric equal, collinear 3.2 Insert title block for the drawing and take the Print out 3.3 Create objects by applying constraints and convert the objects to full scale, reduced scale and enlarged scale 3.4 Apply copy, mirroring, array, fillet and trim on the object created	1. Computer graphics & its terminology. 2. CAD definition, concept & need. 3. Commands used in CAD 4. Functional areas of CAD. - Coordinate systems. 5. Familiarization of Cad commands 6. Draw simple Geometrical figures using CAD	

UNIT-4 **Orthographic projections**	4.1 Introduction to orthographic projection 4.2 Conversion of pictorial view into Orthographic Views	1. Types of projections- orthographicconcept and applications. 2 Various term associated with orthographic projections. (a) Theory of projection. (b) Methods of projection. (c) Orthographic projection. (d) Planes of projection. 3. Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection. Note : (1) Problem should be restricted up to - Front view/Elevation, Top view/Plan and Side views only. Use First Angle Method only.	
UNIT-5 **Isometric projections**	5.1 Introduction to Isometric Projections 5.2 Isometric Scales and Actual Scale 5.3 Isometric View and Isometric Projection 5.4 Conversion of Orthographic Views into Isometric	1. Isometric axis, lines and planes. 2. Isometric scales. 3. Isometric view and isometric drawing. 4. Difference between isometric projection and isometric drawing. 5. Illustrative problems limited to Simple elements	
UNIT-6 **CAD Drafting**	6.1 Draw different types of 2D/3D modeling entities using viewing commands, to view them (Problems solved in chapter no 3 and 4 i.e Orthographic, isometric projection). 6.2 2D/3D modeling for Branch specific components	1 Difference between 2D & 3D models. 2.2D/3D modeling – concept, Simple objects	
		TOTAL	

REFERENCE:-

1. Bureau of Indian Standards. *Engineering Drawing Practice for Schools and Colleges IS: Sp-46.* BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. Bhatt, N. D. *Engineering Drawing*
3. . Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93-80358-17-8.
4. Jain &Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi (ISBN: 978-93-86173-478)
5. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978- 0-07-064837-1
6. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-219- 1431-0.

SOFTWARE/ LEARNIG WEBSITE:-

1. https://www.autodesk.com/learn/catalog/Fusion
2. https://www.autodesk.com/learn/catalog/autoCAD
3. https://www.autodesk.com/education/edu-software/overview?sorting=featured&filters=class-lab#card-acdist
4. https://www.machinedesignonline.com

LIST OF PRACTICAL EXERCISES

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	1	1. Teacher will demonstrate a: Use of a. Drawing instruments. b. Planning and layout as per IS. c: Scaling technique.	**1-0-2**
		2. Draw following. Problem – 1 Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter. (Sketch book)	
		Problem – 2 Indicate different convention of lines on the drawing.(SketchBook)	**1-0-2**
		Problem – 3 Copy the sketch to the required scale and dimensioning adopting right system and positioning of dimensions using Tee and Set squares / drafter. (SketchBook) Problem 4. Draw regular geometric constructions Pentagon, Hexagon, Square, circle, Triangle and other shapes. (SketchBook)	**1-0-2**
2	2	Use of CAD commands, plotting the drawing	**4-0-8**
3	3	Problem 5: Drawing basic entities: Circle, Arc, Polygon, Ellipse, Rectangle, Multiline	**6-0-12**
4	4	Problem 6: Draw Orthographic views for the given object. (CAD Drawing) (Minimum 5 Problems)	**4-0-8**
5	5	Problem 7: Draw Isometric projections for the given Orthographic views(CAD Drawing) (Minimum 5 Problems)	**4-0-8**
6	6	Problem 8: Produce Orthographic (2D) Drawings in CAD – Chap 3 Problem 14: Produce Isometric and 3D Drawings in CAD – Chap 4 (CAD Drawings and Printout) (Minimum 5 Problems)	**2-0-4**
		Problem 9: create 3D models of Program specific Elements such as Panel box (Minimum 3 Problems related to Program specific)) (CAD Drawings and Printout)	**2-0-4**
		TOTAL	**26-0-52**

1 Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.
2 The dimensions of line, axes, distances, angle, side of polygon, diameter, etc. must be varied for each student in batch so that each student will have same problems, but with different dimensions.
3 The sketchbook has to contain data of all problems, solutions of all problems and student activities performed.
4 Students activities are compulsory to be performed.

*******THE END*******