KURUKSHETRA UNIVERSITY KURUKSHETRA

Syllabus for

Under-Graduate Programme (Multidisciplinary)

Subject: Geology

(semester V & VI)

Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020 w.e.f. 2024-25

Session: 2024-25	
Part A - Introduction	
Subject	Geology
Semester	V
Name of the Course	GIS and Remote Sensing
Course Code	B23-GGY-501
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-5
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	N.A.
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand basic concepts of Remote sensing. 2. Understand basic concepts of Aerial photographs. 3. Learn about components of GIS. 4. Understand GIS data models. _____ 5*. Learn to read arial photographs and google earth imagery, basic GIS software.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5

Max. Marks: 100 (70 Th.+ 30 Pr.) Internal Assessment Marks: 30 (20 Th.+ 10 Pr.) End Term Exam Marks: 70 (50 Th.+ 20 Pr.)	Exam Time: 03 Hrs.

Part B- Contents of the Course

Instructions for Paper- Setter

Question No. 1 is compulsory and comprising short answer type questions spread over the entire syllabus, to be answered in 15-20 words. In addition to Question No. 1, there will be eight (08) questions, two (02) from each unit. A candidate has to answer four (04) questions, selecting at least one (01) question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Remote sensing - concept; Sources of remote sensing information; electromagnetic energy and spectrum; Remote sensing platforms; Atmospheric effects - absorption bands; Scale, brightness and tone, contrast ratio, spatial resolution and resolving power; Detectability, recognizability, signature, texture and interpretation key.	11

II	Atmospheric scattering; ground resolution; Photographic scale; Relief displacement, vertical exaggeration; Aerial photographs - their types and uses.	11	
III	GIS Definition and its Components: Computer hardware and software module, data, people and methods; Historical development and organizational aspects of GIS; GIS as a science and technology. Role of GIS in Geology.	12	
IV	GIS data models; Raster data models, vector data models, comparison with advantages and disadvantages of raster and vector data models; Spatial data structure: vector and raster; Basic concept data and information; Database and its types; Database management system.	11	
V*	Aerial Photography; Google earth imagery; Spatial data input in GIS format- scanning and georeferencing; Digitization and creation of layers: point, line and polygon.	30	

Suggested Evaluation Methods

Internal Assessment:	End Term Examination:
➢ **Theory** • Class Participation: **05 marks** • Seminar/presentation/assignment/quiz/class test etc.: **05 marks** • Mid-Term Exam: **10 marks**	**50**
➢ **Practicum** • Class Participation: **NIL** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 marks** • Mid-Term Exam: **NIL**	**20**

Part C-Learning Resources

Recommended Books/e-resources/LMS:
- Demers, M.N., 1997. Fundamentals of Geographic Information System, John Wiley & sons. Inc.
- J. Collins, B. Hoffmann-Wellenhof and H. Lichtenegger, 2001. GPS: Theory & Practice, Springer Wien New York.
- Jensen, J.R., 1996. Introductory Digital Image Processing: A Remote Sensing Perspective, Springer- Verlag.
- Lillesand, T. M. & Kiefer, R.W., 2007. Remote Sensing and Image Interpretation, Wiley.
- Richards, J.A. and Jia, X., 1999. Remote Sensing Digital Image Analysis, Springer-Verlag.

Session: 2024-25	
Part A - Introduction	
Subject	Geology
Semester	VI
Name of the Course	Hydrogeology
Course Code	B23-GGY-601
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-6/CC-M6
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	N.A.
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understanding of basic concepts of hydrogeology. 2. Understand the availability and occurrence of groundwater. 3. Understand about different types of wells and quality of groundwater. 4. Learn groundwater management. _____ 5*. Learn the calculation of physical parameters of water.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5

Max. Marks: 100 (70 Th.+ 30 Pr.) **Internal Assessment Marks: 30 (20 Th.+ 10 Pr.)** **End Term Exam Marks: 70 (50 Th.+ 20 Pr.)**	**Exam Time: 03 Hrs.**

Part B- Contents of the Course

Instructions for Paper- Setter

Question No. 1 is compulsory and comprising short answer type questions spread over the entire syllabus, to be answered in 15-20 words. In addition to Question No. 1, there will be eight (08) questions, two (02) from each unit. A candidate has to answer four (04) questions, selecting at least one (01) question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Basic concept, scope of hydrogeology and its relevance to the society; Introduction to hydrometeorological parameters: precipitation, evaporation, evapotranspiration, infiltration, runoff; Hydrologic cycle; Distribution of water on earth.	11

II	Occurrence of groundwater; Water bearing formations: classification and their characteristics; Classification of aquifers; Springs; Hydrogeological parameters: porosity, permeability, storage coefficient and transmissivity; Darcy's law.	11	
III	Water wells: dug wells, bored wells, driven wells and jetted wells; Water well drilling methods; Groundwater quality criteria for different uses; Contamination of groundwater; Groundwater exploration methods: Geochemical and surface Geophysical methods.	12	
IV	Conjunctive use and groundwater management; Water-logging and relative problems; Exploration and evaluation of groundwater potential; Rain water harvesting; Artificial recharge of groundwater.	11	
V*	Calculation of TDS; Calculating physical parameters of water- pH, turbidity, odor and colour, etc. Numerical based on Darcy law and Water balance equation.	30	

Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory** • Class Participation: **05 marks** • Seminar/presentation/assignment/quiz/class test etc.: **05 marks** • Mid-Term Exam: **10 marks** ➢ **Practicum** • Class Participation: **NIL** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 marks** • Mid-Term Exam: **NIL**	**End Term Examination:** **50** **20**	

Part C-Learning Resources
Recommended Books/e-resources/LMS: • Todd, D.K. and Mays, L.W., 2004. Groundwater hydrology. John Wiley & Sons. • Bowen, R., 1986. Groundwater. Springer Science & Business Media. • Fetter, Charles Willard. Applied hydrogeology. Waveland Press, 2018. • McWhorter, D.B. and Sunada, D.K., 1977. Ground-water hydrology and hydraulics. Water Resources Publication.

KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 1ST YEAR COMMON FOR ALL BRANCHES (w.e.f. 2024-25)

SEMESTER-I

S. No.	Course No./ Code	Subject	L: T: P	Hours/ Week	Credits	End Semester Exam	Internal Assessment	Practical Exam	Total	Duration of Exam (Hours)
1	B24-HSM-101 OR B24-BSC-106	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct / Biology	3:0:0	3	3	70	30	--	100	3
2	B24-BSC-101/ B24-BSC-102/ B24-BSC-103 OR B24-ESC-103/ B24-ESC-104	Semiconductor Physics / Introduction to Electromagnetic Theory/ Applied Physics (Only for B. Tech. Biotechnology) / Basic Electrical and Electronics Engineering/ Basic Electrical Engineering	3:1:0	4	4	70	30	--	100	3
3	B24-ESC-101 OR B24-BSC-104/ B24-BSC-105	Programming for Problem Solving / Engineering Chemistry/ Chemistry (Only for B. Tech. Biotechnology)	3:0:0	3	3	70	30	--	100	3
4	B24-HSC-101 OR B24-ESC-102	English for Technical Writing	2:0:0	2	2	70	30	--	100	3
		Engineering Graphics and Design	1:0:0	1	1	70	30	--	100	3
5	B24-BSC-107/ B24-BSC-109	Mathematics-I/ Applied Mathematics-I (Only for B. Tech. Biotechnology)	3:1:0	4	4	70	30	--	100	3
6	B24-BSC-111/ B24-BSC-112/ B24-BSC-113 OR B24-ESC-108/ B24-ESC-109	Semiconductor Physics Lab/ Electromagnetic Lab/ Applied Physics Lab (Only for B. Tech. Biotechnology) / Basic Electrical and Electronics Engineering Lab/ Basic Electrical Engineering Lab	0:0:2	2	1	--	40	60	100	3
7	B24-ESC-105 OR B24-BSC-114	Programming for Problem Solving Lab / Engineering Chemistry Lab	0:0:2	2	1	--	40	60	100	3
8	B24-HSC-103 OR B24-ESC-107 & B24-ESC-106	English Language Lab	0:0:2	2	1	--	40	60	100	3
		Manufacturing Processes Workshop	0:0:3	3	1.5	--	40	60	100	3
		Engineering Graphics and Design Lab	0:0:4	4	2	--	40	60	100	3
9	B24-VAC-101 & B24-VAC-102 OR B24-HSC-102	Personality Development and Soft Skills	2:0:0	2	1	--	100	--	100	-
		IDEA Workshop	0:0:3	3	1	--	100	--	100	-
		Design Thinking	0:0:3	3	1.5	--	100	--	100	-
		TOTAL		27/29	21/22	350/350	470/410	180/240	1000/1000	

Note:- 1. Students will study one of the subjects given at Sr. No. 1, 2, 3, 4, 6, 7, 8, and 9 as per the in SEMESTER-I/SEMESTER-II, which is to be decided by the concerned institution.
2. For serial no. 8 the subjects will be either B24-HSC-103 OR both (B24-ESC-107 & B24-ESC-106), whereas for Serial No. 9, either both (B24-VAC-101 & B24-VAC-102) OR B24-HSC-102.
3. The subjects should be chosen from given combinations/options at particular serial number so that the total number of credits for the first year 43.

KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 1ST YEAR COMMON FOR ALL BRANCHES (w.e.f. 2024-25)

SEMESTER-II

S. No.	Course No./ Code	Subject	L: T: P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hours)
						End Semester Exam	Internal Assessment	Practical Exam	Total	
1	B24-HSM-101 OR B24-BSC-106	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	3:0:0	3	3	70	30	--	100	3
		Biology								
2	B24-BSC-101/ B24-BSC-102/ B24-BSC-103 OR B24-ESC-103/ B24-ESC-104	Semiconductor Physics / Introduction to Electromagnetic Theory/ Applied Physics (Only for Biotechnology)	3:1:0	4	4	70	30	--	100	3
		Basic Electrical and Electronics Engineering/ Basic Electrical Engineering								
3	B24-ESC-101 OR B24-BSC-104/ B24-BSC-105	Programming for Problem Solving	3:0:0	3	3	70	30	--	100	3
		Engineering Chemistry/ Chemistry (Only for Biotechnology)								
4	B24-HSC-101 OR B24-ESC-102	English for Technical Writing	2:0:0	2	2	70	30	--	100	3
		Engineering Graphics and Design	1:0:0	1	1	70	30	--	100	3
5	B24-BSC-108/ B24-BSC-110	Mathematics-II/ Applied Mathematics-II (Only for Biotechnology)	3:1:0	4	4	70	30	--	100	3
6	B24-BSC-111/ B24-BSC-112/ B24-BSC-113 OR B24-ESC-108/ B24-ESC-109	Semiconductor Physics Lab/ Electromagnetic Lab/ Applied Physics Lab (Only for Biotechnology)	0:0:2	2	1	--	40	60	100	3
		Basic Electrical and Electronics Engineering Lab/ Basic Electrical Engineering Lab								
7	B24-ESC-105 OR B24-BSC-114	Programming for Problem Solving Lab	0:0:2	2	1	--	40	60	100	3
		Engineering Chemistry Lab								
8	B24-HSC-103 OR B24-ESC-107 & B24-ESC-106	English Language Lab	0:0:2	2	1	--	40	60	100	3
		Manufacturing Processes Workshop	0:0:3	3	1.5	--	40	60	100	3
		Engineering Graphics and Design Lab	0:0:4	4	2	--	40	60	100	3
9	B24-VAC-101 & B24-VAC-102 OR B24-HSC-102	Personality Development and Soft Skills	2:0:0	2	1	--	100	--	100	-
		IDEA Workshop	0:0:3	3	1	--	100	--	100	-
		Design Thinking	0:0:3	3	1.5	--	100	--	100	-
		TOTAL		27/29	21/22	350/350	470/410	180/240	1000/1000	

Note:- 1. Students will study one of the subjects given at Sr. No. 1, 2, 3, 4, 6, 7, 8, and 9 as per the in SEMESTER-I/SEMESTER-II, which is to be decided by the concerned institution.
2. For serial no. 8 the subjects will be either B24-HSC-103 OR both (B24-ESC-107 & B24-ESC-106), whereas for Serial No. 9, either both (B24-VAC-101 & B24-VAC-102) OR B24-HSC-102.
3. The subjects should be chosen from given combinations/options at particular serial number so that the total number of credits for the first year 43.

B24-BSC-101				Semiconductor Physics			
L	T	P	Credit	End Semester Exam	Internal Assessment	Total	Time
3	1	-	4	70	30	100	3 h
Purpose	To introduce the fundamentals of solid state physics and its applications to the students.						
Course Outcomes							
CO1	To make the students aware of basic terminology of crystal structure.						
CO 2	Introduce the elementary quantum mechanics, which will be useful in understanding the concepts of solid state physics.						
CO 3	Discussion of classical free electron theory, quantum theory and Band theory of solids.						
CO 4	Basics and applications of semiconductors.						

Unit - I

Crystal Structure: Crystalline and Amorphous solids, Crystal Structure: lattice translation vector, symmetry operations, space lattice, basis; Unit cell and Primitive cell, Fundamental types of lattices: two-dimensional and three dimensional Bravais lattices; Characteristics of Unit cells: Simple Cubic (SC), Body Centred Cubic (BCC), Face Centred Cubic (FCC), Hexagonal Close Packed (HCP) structure; Simple crystal structures: Sodium Chloride, Cesium Chloride, Diamond, Cubic Zinc Sulfide; Miller Indices, Bonding in Solids, Point defects in crystals: Schottky and Frenkel defects.

Unit – II

Quantum Theory: Need and origin of Quantum concept, Wave-particle duality, Phase velocity and group velocity, Uncertainty Principle and Applications; Schrodinger's wave equation: time-dependent and time –independent; Physical Significance of wave function .

Unit – III

Free Electron Theory: Classical free electron theory: electrical conductivity in metals, thermal conductivity in metals, Wiedemann-Franz law, success and drawbacks of free electron theory; Quantum free electron theory: wave function, eigen values; Fermi-Dirac distribution function, Density of states, Fermi energy and its importance.

Band theory of Solids: Bloch theorem, Kronig-Penney Model (qualitative), E versus k diagram, Brillouin Zones, Concept of effective mass of electron, Energy levels and energy bands, Distinction between metals, insulators and semiconductors, Hall effect and its Applications.

Unit –IV

Semiconductors: Conduction in Semiconductors, Intrinsic Semiconductors: Conductivity of charge carriers, Carrier concentration in intrinsic semiconductors; Extrinsic Semiconductors: n-type semiconductors, p-type semiconductors, charge carrier concentration in extrinsic semiconductors.

Semiconductor Devices: The p-n junction diode, Current-voltage characteristics of p-n junction; Half wave and full wave rectifier, The Transistor: NPN and PNP transistor, Basic configuration in common emitter, common base and common collector; Metal-Semiconductor Junction (Ohmic and Schottky).

Suggested Books:
1. Applied Physics for Engineers, Wiley India Pvt. Ltd.
2. Introduction to Solid State Physics, John Wiley & Sons. .
3. Concepts of Modern Physics (5th edition), Tata McGraw-Hill Publishing Company Limited.
4. Solid State Physics, New Age International (P) Limited.
5. A Textbook of Quantum Mechanics, McGraw Hill Education (India) Private Limited.Introduction to Nanotechnology, John Wiley & Sons.

Note: The paper setter will set the paper as per the question paper templates provided.

B24-BSC-111				Semiconductor Physics Lab				
L	T	P	Credit	Practical Exam	Internal Assessment	Total		Time
-	-	2	1	60	40	100		3h
Purpose	To acquaint the students with the basic phenomenon/concepts of solid state physics.							
Course Outcomes								
CO1	To make the students familiar with the basic phenomenon using practical aspects related with Semiconductor Physics.							
CO2	To impart the practical knowledge of the experiments related with quantum theory and Band theory of solids.							

Note: Student will be required to perform at least 10 experiments out of the following list.

1. To study the I-V characteristics of a p-n diode.
2. To find the value of Hall Coefficient of semiconductor.
3. To find the value of e/m for electrons by Helical method.
4. To find the band gap of intrinsic semiconductor using four probe method.
5. To find the flashing and quenching potential of Argon and to find the capacitance of unknown capacitor.
6. To find the value of Planck's constant by using photoelectric cell.
7. To find the temperature coefficient of resistance by using Pt resistance thermometer by post office box.
8. To find the ionization potential of Argon/Mercury using a thyratron tube.
9. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee'sapparatus.
10. To study the characteristics of (Cu-Fe, Cu-Constantan) thermocouple.
11. To calculate the hysteresis loss by tracing a B-H curve.
12. To find the frequency of ultrasonic waves by piezoelectric methods.
13. To verify Richardson thermionic equation.
14. To realize half wave and full wave diode rectifier using CRO.

Suggested Books:

1. C.L.Arora, B. Sc. Practical Physics, S. Chand.
2. B.L. Worshnop and H, T, Flint, Advanced Practical Physics, KPH.
3. S.L. Gupta & V. Kumar, Practical Physics, Pragati Prakashan.

B24-BSC-102				Introduction to Electromagnetic Theory			
L	T	P	Credit	End Semester Exam	Internal Assessment	Total	Time
3	1	-	4	70	30	100	3 Hrs.
Purpose	To introduce the fundamentals of electromagnetic theory to the students for applications in Engineering field.						
Course Outcomes							
CO 1	Introduce the basic concepts of Electrostatics in vacuum.						
CO 2	Introduce the basic concepts of Magnetostatics in vacuum.						
CO 3	Discuss electrostatics and magnetostatics in linear dielectric medium.						
CO 4	Basics of Maxwell's equations and electromagnetic waves.						

Unit - I

Electrostatics in Vacuum: Calculation of Electric Field: Coulomb's law, Continuous charge distribution; Divergence and Curl of Electrostatic Fields: Field lines, flux, Gauss's law, Applications of Gauss's law; Electrostatic Potential: Comments on potential, Poisson's and Laplace's Equation, the potential of a localized charge distribution; Electrostatic Boundary Conditions; Work and Energy in Electrostatics: the work done to move a charge, the energy of a point and continuous charge distribution, Conductors: basic properties, induced charges.

Unit - II

Electrostatics in a Linear Dielectric Medium: Polarization: dielectrics, induced dipoles, alignments of polar molecules; The field of a Polarized Object: bound charges and its physical interpretation; The Filed Inside a Dielectric; The Electric Displacement: Gauss's law in the presence of dielectrics, A deceptive parallel, Boundary conditions; Linear Dielectrics: Susceptibility, Permittivity, dielectric constant, Boundary value problems with linear dielectrics, Energy in dielectric systems, Forces in dielectrics.

Unit - III

Magnetostatics: The Lorentz Force Law: magnetic fields, magnetic forces, currents; Biot- Savart law, Divergence and Curl of magnetic filed, Magnetic Vector Potential: vector potential, magnetostatic boundary conditions, multiple expansion of vector potential.

Magnetostatics in a linear magnetic: Magnetization: Effect of magnetic field on atomic orbits; The Field of a Magnetized Object: Bound currents, Physical interpretation of bound currents; The Auxiliary Magnetic Field: Ampere's law in magnetized materials, A deceptive parallel, Boundary conditions; Linear and Nonlinear Media: magnetic susceptibility and permeability, ferromagnetism.

Unit - IV

Faraday's law: Electromotive Force: Ohm's law, Motional emf; Electromagnetic Induction: Faraday's law, The inducedelectric field, inductance, energy in magnetic fields.

Maxwell's Equations: Electrodynamics before Maxwell, How Maxwell fixed Ampere's law, Maxwell's equations, Maxwell's equations in matter.

Electromagnetic Waves: Electromagnetic Waves in Vacuum: the wave equation for electric and magnetic field; Electromagnetic Waves in Matter: propagation in linear media, Basic concepts of wave guide, Coaxial cables.

Suggested Books:
1. David J. Griffiths, Introduction to Electrodynamics, Pearson Education.
2. Halliday and Resnick, Physics
3. W. Saslow, Electricity, Magnetism and Light
4. Bhattacharya &Nag, Engineering Physics

Note: The paper setter will set the paper as per the question paper templates provided.

B24-BSC-112				Electromagnetic Lab			
L	T	P	Credit	Practical Exam	Internal Assessment	Total	Time
-	-	2	1	60	40	100	3h
Purpose	To acquaint the students with the basic phenomenon related to Electromagnetic Theory.						
Course Outcomes							
CO1	To make the students familiar with the experiments related with electromagnetism.						
CO2	To understand the basic concepts related to electromagnetic induction						

Note: Student will be required to perform at least 10 experiments out of the following list.

1. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee'sapparatus.
2. To study induced e.m.f. as a function of velocity of magnet.
3. To study the growth and decay of current in a LR circuit using magnetic core inductor.
4. To find the coefficient of self-inductance by Rayleigh's method.
5. To find the coefficient of mutual inductance of two coils.
6. To determine the magnetic induction field between the pole pieces of an electromagnet.
7. To study Bio-Savart's law.
8. To study the dependency of magnetic field on coil diameter and number of turns.
9. To investigate the equipotential liens of electric fields.
10. To draw the equipotential lines of bar electrode.
11. To draw the equipotential lines for ring electrode.
12. Verification of Farady and Lenz's law of induction by measuring the induced voltage as function of time.
13. Measurement of induced voltage impulse as a function of the velocity of magnet.
14. To determine the dielectric constant of different dielectric materials.
15. To measure the spatial distribution of the magnetic field between a pair of identical coils in Helmholtzarrangement.
16. To investigate the spacing between coils at which magnetic field is uniform and to measure its spatialdistribution.

Suggested Books:
1. C.L.Arora, B. Sc. Practical Physics, S. Chand.
2. B.L. Worshnop and H, T, Flint, Advanced Practical Physics, KPH.
3. S.L. Gupta & V. Kumar, Practical Physics, PragatiPrakashan.

B24-BSC-103				Applied Physics			
L	T	P	Credit	End Semester Exam	Internal Assessment	Total	Time
3	1	-	4	70	30	100	3h
Purpose	To introduce the basics of physics to the students for applications in Engineering field.						
Course Outcomes							
CO 1	Introduce the fundamentals of interference and diffraction and their applications.						
CO 2	To make the students aware of the importance of polarization and Ultrasonics.						
CO 3	Introduce the basics concepts of laser and its applications.						
CO 4	To familiarize with concepts of nuclear radiations and its biological effects.						

Unit I

Interference: Principle of Superposition, Conditions for interference, Division of wave-front: Fresnel's Biprism and Applications, Division of amplitude: Wedge-shaped film, Newton's rings and Applications, Michelson Interferometer and Applications.

Diffraction: Types of diffraction, Fraunhofer diffraction at a single slit, Intensity distributiondue diffraction grating, determination of wavelength; Dispersive power and resolving power of diffraction grating.

Unit II

Polarization: Polarization of transverse waves, Plane of polarization, Polarization by reflection, Double refraction, Nicol Prism, Quarter and half wave plate, Specific Rotation, Laurent 's half shade polarimeter, Biquartz polarimeter.

Ultrasonics: Ultrasonic waves, Properties of ultrasonic waves, Production of ultrasonic waves: Magnetostriction and Piezoelectric methods, Detection of ultrasonic waves, Measurement of velocity of ultrasonic waves, Applications of ultrasonic waves.

Unit III

Laser: Einstein's theory of matter radiation interaction and A and B coefficients; amplification
of light by population inversion, different types of lasers: gas lasers (He-Ne, CO_2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

Unit IV

Nuclear radiations and its Biological Effects: Classification of nuclear radiations, Interaction of charged particle (light and heavy) and gamma radiations with matter (basic concepts), Dosimetric units, Relative Biological Effectiveness (RBE), Typical doses from commons sources in the environment, Biological Effects, Maximum Permissible Dose, (MPD), Shielding, Radiation safety in the nuclear radiation laboratory.

Biomaterials: Introduction, Classification of biomaterials, Applications.

Suggested Books:

1. Applied Physics for Engineers, Wiley India Pvt. Ltd.
2. Concepts of Modern Physics (5th edition), Tata McGraw-Hill Publishing Company Limited.
3. A Textbook of Optics, S. Chand & Company Ltd.
4. Techniques for Nuclear and Particle Physics Experiments: A How-to Approach, Springer-Verlag.
5. Introduction to Nuclear and Particle Physics, PHI Learning Private Limited.
6. Biomaterials: The intersection of Biology and Materials Science, Pearson, New Delhi.

Note: The paper setter will set the paper as per the question paper templates provided.

B24-BSC-113	Applied Physics Lab						
L	T	P	Credit	Practical Exam	Internal Assessment	Total	Time
-	-	2	1	60	40	100	3h
Purpose	To impart the knowledge of basic concepts of Physics in Engineering.						
Course Outcomes							
CO1	To make the students familiar with the experiments related with interference and diffraction.						
CO2	To understand the basic phenomenon of polarization and ultrasonic						
CO3	To impart the practical knowledge of the experiments related with resistance using different methods						

Note: Student will be required to perform at least 10 experiments out of the following list.

1. To find the wavelength of monochromatic light by Newton's ring experiment.
2. To find the wavelength of sodium light by Michelson's interferometer.
3. To find the resolving power of telescope.
4. To find the wavelength of sodium light using Fresnel bi-prism.
5. To find the wavelength of various colours of white light with the help of plane transmission diffraction grating.
6. To find the specific rotation of sugar solution by using a Polarimeter.
7. To find the frequency of ultrasonic waves by piezoelectric methods
8. To verify Newton's formula and hence to find the focal length of the given convex lens.
9. To find the frequency of A.C. mains by using Sonometer and horse shoe magnet.
10. To find the resistance of a galvanometer by post office box.
11. To find low resistance by Carrey-Foster bridge.
12. To find the value of high resistance by substitution method.
13. To compare the capacitances of two capacitors by De-Sauty's bridge and hence to find the dielectric constantof a medium.
14. To convert a galvanometer into an ammeter of desired range and verify the same.

Suggested Books:
2. C.L.Arora, B. Sc. Practical Physics, S. Chand.
3. B.L. Worshnop and H, T, Flint, Advanced Practical Physics, KPH.
4. S.L. Gupta & V. Kumar, Practical Physics, Pragati Prakashan.

B24-BSC-104				Engineering Chemistry			
L	T	P	Credit	End Semester Exam	Internal Assessment	Total	Time
3	0	0	3	70	30	100	3h
Purpose	To acquaint the students with the basic phenomenon/concepts of chemistry, the student faces during course of their study in the industry and Engineering field						
CO1	An insight into atomic and molecular orbitals and bonding in molecules						
CO2	Knowledge of basic concept of spectroscopic techniques for identification of molecules						
CO3	To understand basics of thermodynamics and phase equilibria						
CO4	To understand nature of corrosion and its preventive measures						

UNIT -I

Molecular orbitals of diatomic molecules. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules (O_2, N_2, CO, NO, CN, HCl and HF). Pi-molecular orbitals of butadiene. Concept of aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT -II

Spectroscopic techniques and applications: Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational spectroscopy and its applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.

UNIT -III

Thermodynamic functions: Internal energy, entropy and free energy. Estimations of entropy and free energies. Free energy and EMF. Criteria for feasibility/spontaneity of a process, Chemical potential, Clausius – Clapeyron equation and its application, Numerical problems.

Phase equilibria: Phase rule and derivation of phase rule equation, terms involved in phase rule (phase, component, degree of freedom), one component system (Water system), two component system (Lead-silver system), application of phase equilibria.

UNIT - IV

Corrosion and its prevention: Introduction, Galvanic cell, types of Galvanic cell (Chemical and concentration cell), Cell potentials, the Nernst equation and its applications, types of corrosion (Dry and wet corrosion), electrochemical theory of corrosion, Bimetallic corrosion, Pitting corrosion, Differential aeration corrosion, water -line corrosion, stree corrosion, factors affecting corrosion rate, preventive measures of corrosion (design of material, anodic and cathodic protection and protective covering)

Text/Reference Books:
1. AICTE's Prescribed Textbook: Chemistry – I with Lab Manual, Khanna Book Publishing.
2. Engineering Chemistry, by Manisha Agrawal.
3. University chemistry, by B. H. Mahan.
4. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane.
5. Fundamentals of Molecular Spectroscopy, by C. N. Banwell.
6. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.
AICTE Model Curriculum for UG Degree Course in Computer Science and Engineering 54

B24-BSC-114	Engineering Chemistry Lab						
L	T	P	Credit	Practical Exam	Internal Assessment	Total	Time
0	0	2	1	60	40	100	3h
Purpose	To acquaint the students with the knowledge of basic phenomenon/practicals of chemistry						
CO1	To make the students familiar with the titrametric methods for analysing strength of given sample						
CO2	To give exposure and training to handle different instruments used in various experiments of chemistry required in engineering/technological field						

Choice of 10-12 experiments from the following:
1.   Determination of surface tension of a given liquid by drop number method using Stalagmometer.
2.   Determination of relative viscosity by Ostwald viscometer.
3.   Determination of viscosity of lubricating oil by Redwood Viscometer.
4.   To synthesise drug molecule (Aspirin/ Paracetamol)
5.   Determination of refractive index of given organic liquid by Abbe's refractometer.
6.   Determination of Flash point and fire point of oil by Pensky Martin appratus.
7.   Determination of amount of Na and K in given water sample by Flame photometer.
8.   Determination of strength of given Hydrochloric acid solution by titrating it with NaOH   solution conduct metrically.
9.   Determination of strength of given Hydrochloric acid solution by titrating it with NaOH   solution using pH meter.
10.   Determination of concentration of given sample of $KMnO_4$ using spectrophotometer.
11.   Determination of alkalinity of a given water sample.
12.   Determination of Calcium and Magnesium hardness by EDTA method.
13.   Determination of Chloride content in given water sample.
14.   Determination of amount of dissolved oxygen in given water sample by Winkler's   method.
15.   Determination of total iron content present in a given iron ore solution by using $KMnO_4$ as oxidising agent.
16.   Determination of partition co-efficient of Iodine in carbon tetrachloride and water.
17.   To check the presence of a given compound in a mixture using thin layer chromatography.
Books:
1.   Engineering Chemistry with laboratory experiments by M. S. Kaurav, PHI learning   Private ltd.
2.   AICTE's Prescribed Textbook: Chemistry – I with Lab Manual, Khanna Book   Publishing

B24-BSC-105	Chemistry						
L	T	P	Credit	End Semester Exam	Internal Assesment	Total	Time
3	0	0	3	70	30	100	3h
Purpose	To acquaint the students with the basic phenomenon/concepts of chemistry, the student faces during course of their study in the industry and Engineering field						
CO1	An insight into atomic and molecular orbitals and bonding in molecules						
CO2	Knowledge of basic concept of spectroscopic techniques for identification of molecules						
CO3	To understand basics of thermodynamics and periodic properties						
CO4	To understand basics of stereochemistry and various organic reactions						

UNIT -I
Molecular orbitals of diatomic molecules. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules (O_2, N_2, CO, NO, CN, HCl and HF). Pi-molecular orbitals of butadiene. Concept of aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT -II
Spectroscopic techniques and applications: Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational spectroscopy and its applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.

UNIT -III
Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Thermodynamic functions: Internal energy, entropy and free energy. Estimations of entropy and free energies. Free energy and EMF. Cell potentials, the Nernst equation and its applications. Periodic properties - Effective nuclear charge, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries of CCl_4, PCl_5, H_2O, NH_3, SF_6, IF_7 (as per VSEPR theory).Hard soft acids and bases.

UNIT - IV
Stereochemistry: Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis (Ethane, Butane and cyclohexane).
Organic reactions : Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.

Text/Reference Books:
1. AICTE's Prescribed Textbook: Chemistry – I with Lab Manual, Khanna Book Publishing.
2. Engineering Chemistry, by Manisha Agrawal.
3. University chemistry, by B. H. Mahan.
4. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane.
5. Fundamentals of Molecular Spectroscopy, by C. N. Banwell.
6. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.
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7. Physical Chemistry, by P. W. Atkins.

B24-BSC-106				BIOLOGY			
Lecture	Tutorial	Practical Exam	Credit	End Semester Exam	Internal Assessment	Total	Time Hrs.
3	0	-	3	70	30	100	3
Purpose	To familiarize the students with the basics of Biology and Biotechnology						
Course Outcomes							
CO1	Introduction to Living world, Cell & Organisms.						
CO2	Introduction to Biomolecules and Biocatalyst						
CO3	Introduction of basic Concept of Genetics.						
CO4	Introduction of basic Concept of Genetic Engineering, & Role of Biology in Different Fields						

Unit – I

Introduction to living world: Concept and definition of Biology; Importance of biology in major discoveries of life Characteristic features of living organisms; Cell ultra-structure and functions of cell organelles like nucleus and endoplasmic reticulum. Difference between prokaryotic and eukaryotic cell. Difference between animal and plant cell.

Classification of Organisms: Classification of the organisms on the basis of Energy, Carbon Utilization, Nitrogen Excretion and Habitat.

Unit-II

Introduction to Biomolecules: Definition, general classification and important functions of carbohydrates, lipids, proteins, nucleic acids & Enzymes.

Enzymes as Biocatalysts: General characteristics, nomenclature and classification of Enzymes. Effect of temperature, pH and substrate concentrations on the activity of enzymes. Elementary concept of coenzymes. Mechanism of enzyme action.

Unit-III

Genetics:-Mendel's laws of inheritance, Cell Division- Mitosis & meiosis, Genetic Disorders: Single gene & Multiple genes disorders in human.

Human Traits: Genetics of blood groups, Diabetes Type I & II.

Unit-IV

Concepts of Genetic Engineering: Definition; Tools used in recombinant DNA Technology: Enzymes, Vectors & Passenger DNA.
Role of Biology: Role of Biology in Agriculture, Medicine, Forensic science & Bioinformatics.

Text Book:

1. Introduction to Biotechnology, By Deswal & Deswal, Dhanpat Rai Publications N.A

2. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2014.
3. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
D. L. Nelson and M. M. Cox, "Principles of Biochemistry", W.H. Freeman and Company, 2012.
4.G. S. Stent and R. Calendar, "Molecular Genetics", Freeman and company, 1978.

Note: The paper setter will set the paper as per the question paper templates provided
Suggested Books:
1. Molecular Biology of cell, 4th ed. Alberts, Bruce et al. Garland Science Publishing, New York.
2. Microbiology. Pelczar Jr., M.J.; Chan, E.C.S. and Krieg, N.R. Tata McGraw Hill, New Delhi.
3. Lehninger: Principles of Biochemistry, 3rd edition, by David L. Nelson and M.M. Cox. Maxmillan/ Worth publishers.
4. Genetics by Snusted& Simmons.
5. Molecular Biotechnology: Principles Application of Recombinant DNA. Glick, B. R. and Pasternak, J. J. ASM press
Washington DC.
6. Kuby's Immunology, Goldsby, R A,.Kindt, T.J, Osborne, B.A.(2003) W. H. Freeman and company, New York.
7. Recombinant DNA 2nd Edition. Watson, James D. and Gilman, M. (2001) W.H Freeman and Company, NewYork.

B24-BSC-107				MATHEMATICS-I			
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**1**	**-**	**4**	**70**	**30**	**100**	**3 h**
Purpose	**The primary objective of this course is to attain conceptual comprehension and preserve the core principles of classical calculus, through a syllabus tailored to equip students with fundamental mathematical tools for the purpose of mathematically modeling engineering problems and deriving solutions.**						
Course Outcomes							
CO1	To introduce the idea of applying differential and integral calculus to notions of improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.						
CO 2	To develop the tool of series for learning advanced Engineering Mathematics						
CO 3	To familiarize the student with calculus (derivative) of the functions of several variables that is essential in most branches of engineering.						
CO 4	To familiarize the student with calculus (integration) of the functions of several variables.						

UNIT-I (8 hrs)

Single Variable Calculus: Evaluation of definite and improper integrals: Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions; Indeterminate forms and L'Hospital's rule.

UNIT-II (10 hrs)

Sequence and Series: Convergence of sequence and series, tests for convergence (Comparison test, D'Alembert's Ratio test, Logarithmic test, Cauchy root test, Raabe's test).

Fourier series: Introduction, Fourier-Euler Formula, Dirichlet's conditions, Change of intervals, Fourier series for even and odd functions, Half range sine and cosine series.

UNIT-III (10 hrs)

Multivariable Calculus (differentiation): Taylor's series (for one and more variables), series for exponential, trigonometric and logarithm functions.

Partial derivatives, Total differential, Chain rule for differentiation, Homogeneous functions, Euler's theorem, Jacobian, Maxima, minima and saddle points; Method of Lagrange multipliers.

UNIT-IV (12 hrs)

Multivariable Calculus (Integration): Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar).

Applications: areas and volumes; Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

Suggested Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Erwin Kreyszig and SanjeevAhuja, Applied Mathematics- I, Wiley India Publication, Reprint 2015.
3. Reena Garg, Engineering Mathematics, Khanna Book Publishing Company, 2022.
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson.
5. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
6. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
7. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2023.

Note: The paper setter will set the paper as per the question paper templates provided.

B24-BSC-108				**MATHEMATICS-II**				
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**	
3	1	-	4	70	30	100	3 h	
Purpose	This course aims to provide prospective engineers with a comprehensive understanding of matrix operations, ordinary differential equations, and complex variables, enabling them to proficiently apply advanced mathematical concepts and tools to address complex problems.							
Course Outcomes								
CO1	To develop the essential tool of matrices and linear algebra in a comprehensive manner.							
CO 2	To introduce effective mathematical tools for the solutions of differential equations that model physical processes.							
CO 3	To acquaint the student with vector calculus to solve advance engineering problems.							
CO 4	Acquaint the students with the formation and solutions for multivariable differential equations and basics of Curve fitting for fitting of data originated from real world problems.							

UNIT-I (8 hrs)

Matrices: Rank of a matrix, elementary transformations, elementary matrices, Gauss Jordon method to find inverse using elementary transformations, normal form of a matrix, linear dependence and independence of vectors, consistency of linear system of equations, linear and orthogonal transformations, Eigen values and Eigenvectors, properties of eigenvalues, Cayley – Hamilton theorem and its applications.

UNIT-II (10 hrs)

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x.

Ordinary differential equations of higher orders:

Second order linear differential equations with constant coefficients, method of variation of parameters, Cauchy and Legendre's linear differential equations.

UNIT-III (11hrs)

Vector Calculus-Differentiation: Introduction, Scalar and Vector point functions, Gradient, divergence & Curl and their properties, Directional derivative.

Vector Calculus-Integration: Line integrals, surface integrals, volume integrals, Theorems of Green, Gauss and Stokes (without proof).

UNIT-IV (11 hrs)

Partial Differential Equations: Formation of Partial Differential Equations, Solution to homogenous linear partial differential equations (with constant coefficients) by complimentary function and particular integral method.

Curve fitting by the method of least squares: Introduction, Fitting of a straight line, fitting of second degree curve, fitting of a polynomial of degree m, fitting of a geometric or power curve of the form $y = ax^b$, fitting of an exponential curve of the form $y = ab^x$.

Suggested Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Erwin kreyszig and SanjeevAhuja, Applied Mathematics- II, Wiley India Publication, 2015.
4. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary ValueProblems, 9th Edn., Wiley India, 2009.

5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

6. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

7. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice HallIndia, 1995.

8. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.

9. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill,2004.

10. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

11. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

12 S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993. AICTEModel Curriculum in Mathematics.

13. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.

14. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.

15. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010.

Note: The paper setter will set the paper as per the question paper templates provided.

B24-BSC-109				APPLIED MATHEMATICS-I			
L	T	P	Credit	End Semester Exam	Internal Assessment	Total	Time
3	1	-	4	70	30	100	3 h
Purpose		This course aims to acquaint Biotechnology Engineers with fundamental concepts and tools in Limit, Continuity, Differential & Integral Calculus, and Complex Numbers, enabling them to progressively develop their mathematical proficiency for tackling advanced mathematical principles and applications relevant to their field.					
Course Outcomes							
CO1	To introduce the idea of sets, relations, functions, trigonometric functions, inverse trigonometric functions, these concepts are prerequisite to learn the concepts of differentiation and integration.						
CO 2	To introduce the Complex numbers which is fundamental to solve any kind of quadratic equations, Limit is precondition to understand the concept of rate of change and derivative.						
CO 3	To develop the essential tool of Continuity and Differentiability needed in evaluating higher order derivatives of functions.						
CO 4	To introduce the tools of Indefinite and Definite integrals of functions in a comprehensive manner that are used in various techniques dealing engineering problems.						

UNIT-I (10 hrs)

Sets, Relations, Functions

Sets and its types: Operations on sets, complement of a set, Cartesian Product of sets, relations , functions, types of functions, **Trigonometric functions:** Introduction, Trigonometric functions, Trigonometric functions of sum and difference of two angles, Trigonometric equations, **Inverse Trigonometric functions:** Introduction, basic concepts and its properties.

UNIT-II (10 hrs)

Pre-Calculus

Complex Numbers: Introduction, Algebra of Complex Numbers, Modulus and the conjugate of a complex number, quadratic equations,

Limits and Derivatives: Introduction, Limits, Limits of Trigonometric Functions, Derivatives (single variable).

UNIT-III (10 hrs)

Differential Calculus

Continuity and Differentiability: Introduction, Continuity, Differentiability, Exponential and Logarithmic functions, Logarithmic differentiation, Derivatives of functions in parametric forms, second order derivatives, **Application of Derivatives (single variable)**: Increasing and decreasing functions, Maxima and Minima.

UNIT-IV (10 hrs)

Integral Calculus

Integrals: Introduction, Integration as an Inverse process of Differentiation, Method of Integration, Integration by Partial Fractions, Integration by Parts, **Definite Integrals**: Fundamental theorem of Calculus, Evaluation of Definite Integrals by Substitution, properties of Definite Integrals.

Suggested Books:
1. G. B. Thomas, R. L. Finney: Calculus and Analytic Geometry, Pearson Education.
2. Mathematics Textbook for Class 11th& 12th by NCERT.
3. Howard Anton: Calculus, Wiley Publication.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2023

Note: The paper setter will set the paper as per the question paper templates provided.

B24-BSC-110				APPLIED MATHEMATICS-II			
L	T	P	Credit	End Semester Exam	Internal Assessment	Total	Time
3	1	-	4	70	30	100	3 h
Purpose	This course aims to equip the students with standard concepts and tools that will serve them well towards tackling more advanced level of mathematics while familiarizing them with essential tool of linear algebra, solution of differential equation, utility of higher order derivatives in engineering domain. More precisely, the objectives are as under:						
Course Outcomes							
CO1	To introduce the essential tool of matrices and linear algebra in a comprehensive manner to solve the large system of linear equations.						
CO 2	To introduce effective mathematical tools for the solutions of first order differential equations that model physical processes.						
CO 3	To develop the way to solve the ordinary differential equation with higher orders.						
CO 4	To extend some concept of differential calculus for more than one variables.						

UNIT-I (10 Hrs)

Linear Algebra:
Introduction to matrices, its types, algebraic operations, transpose, determinant, minors and adjoint of a matrix. Elementary transformations, Inverse of a square matrix: Cramer's rule, Rank of a matrix, elementary matrices, Gauss Jordon method to find inverse using elementary transformations.
System of Linear equations: General representation, Homogeneous and Non-homogeneous system of linear equations, Consistency of linear system of equations, Gauss Elimination method to solve the system of linear equations.

UNIT-II (10 Hrs)

First order Ordinary differential equations:
Introduction, order and degree of the differential equation, Formation of differential equation, Solution of the differential equation, Solution of the differential equation with variables separable and differential equations reducible to variable separable form, exact differential equation, and equations reducible to exact differential equations, linear and Bernoulli's equations.

UNIT-III (10 hrs)

Ordinary differential equations of higher orders
Introduction, complementary function, particular integrals, solution of second and third order linear differential equations with constant coefficients.

UNIT-IV (10 hrs)

Multivariable Calculus:
Partial derivatives, Total differential, Chain rule for differentiation, Partial derivatives of higher orders, Homogeneous functions, Euler's theorem on homogeneous functions, differentiation of an implicit function, Jacobian, Maxima and minima of a function of two variables, Lagrange's method of undetermined multipliers.

Suggested Books:
1. G. B. Thomas, R. L. Finney: Calculus and Analytic Geometry, Pearson Education.
2. H. Anton, Irl C Bivens, Stephen Davis: Calculus 10th Edition, John Wiley & Sons.
3. E. Kreyszig: Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. E. Kreyszig and S. Ahuja, Applied Mathematics-II, Wiley India Publication, Reprint 2015.
5. Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford University Press.
6. Mathematics Textbook for Class 11th & 12th by NCERT.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2023

Note: The paper setter will set the paper as per the question paper templates provided.

B23-ESC-101	Programming for Problem Solving						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Total	Exam Time
3	0	`-	3	70	30	100	3 Hour

Course Outcomes	
CO 1	To learn the fundamentals of computers and to understand the various steps in program development.
CO 2	To learn the syntax and semantics of C programming language. To learn the usage of structured programming approach in solving problems.
CO 3	To learn the usage of structured programming approach in solving problems.
CO 4	To analyze the output based on the given input variables.

UNIT-I

Introduction to Programming; Introduction to components of a computer system (Disks, Memory, Processor, Operating System, Compilers etc.), Algorithm Writting, Flowchart, Pseudocode with examples. From algorithms to programs.

UNIT-II

C language variables and data types, Syntax and Logical Errors in compilation, object and executable code. Operator (arithematic, relational, logical, bitwise operator) and Precedence, Conditional Branching and Loops.

UNIT-III

Arrays, Arrays (1-D, 2-D), Character arrays and Strings, Structures, Defining structures and Array of Structures, Pointers, Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation) , Function, Functions (including using built in libraries), Parameter passing in functions, call by value.

UNIT-IV

Idea of call by reference, Recursion, Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, File handling in different mode

Suggested Books:
1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language,
Prentice Hall of India.

Note: Note: An approved question paper template is to be provided to the paper setter.

B24-ESC-105				Programming for Problem Solving Lab			
L	T	Practical	Credit	Internal Assessment	Practical	Total	Exam Time
0	0	2	1	40	60	100	3 Hrs
Purpose	To understand the various steps in program development, syntax of C programming language and usage of structured programming approach in solving problems.						
	Course Outcomes						
CO1	To Familiarize with programming environment						
CO 2	To solve Problems involving if-then-else structures						
CO 3	To define and declare Simple functions to add, multiply etc						
CO 4	To call Recursive functions and implement factorial, Fibonacci series						

LIST OF EXPERIMENTS

1. To Familiarize with programming environment

2. Simple computational problems using arithmetic expressions

3. Problems involving if-then-else structures

4. Iterative problems (e.g., sum of series)

5. 1D Array manipulation

6. Matrix problems (Addition and Multiplication)

7. String operations

8. Simple functions to add, multiply etc...

9. Programming for solving Numerical methods problems

10. Recursive functions factorial, Fibonacci series

11. Pointers and structures

12. File operations (to read from file and write into file)

Note: At least 9 experiments to be performed during the semester.

B24-ESC-102	ENGINEERING GRAPHICS AND DESIGN (B. Tech. Semester-I/II)						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Total	Time (Hrs.)
1	-	-	1	70	30	100	3
Purpose	To draw and interpret various projections of 1D, 2D and 3D objects. To understand the basics of AUTOCAD and perform exercises.						
Course Outcomes							
CO 1	Students will be able to draw the projections of points and straight lines						
CO 2	Students will be able to understand and draw the projections of planes and regular solids.						
CO 3	Students will be able to understand the sectioning of solids and development of surfaces.						
CO 4	Students will be able to draw the isometric projections and know different commands used in AUTOCAD.						

UNIT-I

Introduction, Projection of Points:

Introduction to Engineering Equipment's, Elements of Engineering Drawing, Types of Lines, Various types of projections, First and third angle systems of orthographic projections.

Projections of points in different quadrants.

Projections of straight lines – parallel to one or both reference planes, contained by one or both planes, perpendicular to one of the planes, inclined to one plane but parallel to the other plane, inclined to both the planes, true length of a line and its inclinations with reference planes, traces of a line.

UNIT-II

Projection of planes:

Introduction, types of planes, Projection of planes by change of position method only, projection of plane perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other plane.

Projection of Regular Solids:

Types of solids, Projections of Polyhedra Solids and Solids of Revolution – in simple positions with axis perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other.

UNIT-III

Sections and Sectional Views of Right Regular Solids:

Sectional views of simple right regular solids like prism, pyramid, Cylinder and Cone.

Development of Surfaces:

Development of surfaces of Right Regular Solids-Prism, Pyramid, Cylinder and Cone;

UNIT-IV

Isometric/Orthographic Projections and CAD commands:

Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Solid works basics; Basic Commands: Line, Point, Rectangle, Polygon, Circle, Arc, Ellipse, Polyline

Basic editing Commands: Extrude Bose, Revolve Bose, Copy, Offset, Fillet, Chamfer, Trim, Extend, Mirror Display Commands: Zoom, Pan, Redraw, and Regenerate Simple dimensioning and text, simple exercises.

Text Book

1. Engineering Graphics using AUTOCAD 2000: T. Jeyapoovan, Vikas Publishing House.

2. Machine Drawing: Dr Basudeb Bhattacharyya, Oxford University Press, New Delhi

Reference Books

1. Engineering Drawing: Amar Pathak, Dreamtech Press, New Delhi.
2. Engineering Drawing: Plane and Solid Geometry: N.D. Bhatt and V.M. Panchal, Charotar Publishing House.
3. Thomas E. French, Charles J. Vierck, Robert J. Foster, "Engineering drawing and graphic technology", McGraw Hill International Editions.
4. Engineering Graphics and Drafting: P.S. Gill, Millennium Edition, S.K. Katariaand Sons.
5. A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum.

B24-ESC-107	Manufacturing Processes Workshop (B.Tech. Semester-I/II)							
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Practical	Total	Time (Hrs.)
0	0	3	1.5	0	40	60	100	3
Purpose	To make student gain a hands on work experience in a typical manufacturing industry environment.							
Course Outcomes								
CO 1	**Students will be explain** different manufacturing operations used in industries and work on CNC machine and 3D printer.							
CO 2	**Students will be able to know operations and working** in Fitting shop and Electrical and Electronics shops.							
CO 3	**Students will be able to perform** on Carpentry operations.							
CO 4	**Students will be able to explain m**etal casting and welding jobs operations.							

List of Experiments
A)   Manufacturing Operations
1.   To study various manufacturing methods.
2.   To study different machine tools used in manufacturing industries.
3.   To prepare a job on a lathe involving facing, outside turning taper turning, step turning, radius making and parting-off. **(Practice)**
4.   To prepare a job involving side and face milling on a milling machines. **(Practice)**

B)   CNC machining, Additive manufacturing
1.   To study basics of CNC Machine tool.
2.   To study the basics of additive manufacturing.
3.   To write and simulate CNC Part program for a CNC Milling machine.**(Practice)**
4.   To write and simulate CNC Part program for a CNC Turning machine.**(Practice)**
5.   Modelling and converting CAD models into STL files, and Fabrication of one simple component using 3D printer from CAD models using polymers.**(Practice)**

C)   Fitting operations
1.   To Study various Fitting operations and tools used in Fitting shop.
2.   To make a V-groove and V-notch in MS flat.**(Practice)**

D)   Electrical and Electronics operations
1.   To study basics of house wiring
2.   To Make an electrical connection to demonstrate domestic voltage and current sharing. **(Practice)**
3.   To perform Soldering of a resistor on a PCB. **(Practice)**

E)   Carpentry operations
1.   To study steps various tools used in Carpentry shop.
2.   To make wooden halving joint (or Cross-Joint) of soft wood.**(Practice)**

F)   Metal Casting operations
1.   To study various components of Sand Mould and operations involved in the casting process used in Foundry shop.

2.	To test different properties of Sand mould.**(Practice)**

**G)	Welding operations**
1.	To study various processes and tools used in welding shop.
2.	To make a Butt joint using the given two M.S pieces by arc welding.**(Practice)**
3.	To make a Lap joint using the given two M.S pieces by arc welding.**(Practice)**

Note: At least one experiment may be performed from each of the categories from A to G (Preferably from Practice type). In total at least 8 experiments need to be performed by the students.

Text Books
1.	Workshop / Manufacturing Practices (with Lab Manual) by Veerana D.K(AICTE Prescribed Text book as per model curriculum)
2.	Veerana D.KKalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",7th edition, Pearson Education India Edition.
3.	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., " Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

Reference Books
1.	Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.
2.	Roy A. Lindberg, " Processes and Materials of Manufacture" , 4th edition, Prentice Hall India, 1998
3.	Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw-Hill House, 2017.

B24-ESC-103	Basic Electrical and Electronics Engineering						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Total	Exam Time
3	1	`-	4	70	30	100	3 Hour
Course Outcomes							
CO 1	Deals with DC networks, AC fundamentals & AC response of RLC circuits.						
CO 2	Deals with introductory Balanced Three Phase Power System analysis, magnetic circuits and Single-Phase Transformer.						
CO 3	Explains the Basics of Electrical Machines (AC/DC).						
CO 4	Study of Introduction to Analog Electronics & Digital Electronics Fundamentals.						

UNIT-I

Review of D.C. circuits: Ohm's Law, junction, node, circuit elements classification: Linear & nonlinear, active & passive, lumped & distributed, unilateral & bilateral with examples. KVL, KCL, Nodal analysis, Star-Delta transformation of set of resistors.

DC Network Theorems: Superposition, Thevenin's, Norton's theorems in DC networks containing both voltage and current sources and Maximum power transfer theorem in a resistive network.

AC Fundamentals & AC Circuit: AC signal, Average and RMS values of sinusoidal AC, polar & rectangular form of representation phasor quantities. Addition & subtraction of two or more phasor sinusoidal quantities using the component resolution method. Steady-state AC response of R/L/C, RL, RC series ckts, P.F., active, reactive & apparent power. Qualitative analysis of Frequency response of series & parallel RLC circuit.

UNIT-II

Balanced 3-Phase AC Circuits: Advantages of 3-phase system, Star and Delta connections and their Line and Phase voltage/current relationships, three-phase power & its measurement using the 2-wattmeter method.

Single phase transformer (only qualitative analysis): MMF, Reluctance and flux flow in a magnetic circuit. Transformer: Principle – Construction - Emf equation - Phasor diagram and Equivalent Circuit, Losses in a transformer, Maximum efficiency condition, OC/SC Test & direct load test.

UNIT-III (Only Qualitative Analysis)

Principle of Dynamo for generation of AC. Relation between synchronous speed, number of field poles and frequency. Principle of motoring. Torque & Mechanical Power developed at a rotating shaft & B.H.P.

DC Machines: Constructional parts & principles of working of DC Machines, Generated and back EMF, Types of DC machines, Speed Control of DC shunt Motor, applications.

3-Phase Induction Motor: Basic working principle & construction of a 3- phase Induction motor, slip & advantages. Phase sequence and its importance.

Synchronous Machines: Basic principle of working of Alternator and synchronous motor.

UNIT-IV

Analog Electronics Basics (Only Qualitative Analysis): PN junction diode characteristics: forward and reverse bias, breakdown – barrier potential, Zener diode, Basic Rectifier circuits: half wave and full wave, Introduction to BJT: characteristics curve and region of operation.

Digital Fundamentals: Diode as a binary switch, decimal to binary number representation, addition subtraction and basic Boolean algebra, Basic Logic Gates with truth table.

Suggested Books:
1. Basic Electrical Engg: A complete Solution by Vijay Kumar Garg, Wiley India Ltd.
2. Electrical Engg. Fundamentals by Rajendra Prasad, PHI Pub.
3. Basic Electrical and Electronics Engg. by S.K. Sahdev, Dhanpat Rai & Co./Pearson.
4. A.K. Maini, Digital Electronics, Wiley India

Note: An approved question paper template is to be provided to the paper setter.

B24-ESC-108		Basic Electrical and Electronics Engineering Lab					
L	T	Practical	Credit	Internal Assessment	Practical Exam	Total	Exam Time
-	-	2	1	40	60	100	3 Hrs
Purpose	To familiarize the students with introductory Electrical & Electronics Engineering practicals.						
	Course Outcomes						
CO1	Deals with various DC network theorems to analyse linear circuits. Deals with the steady-state frequency response of RLC circuit parameters solution techniques						
CO 2	Deals with introductory Single-Phase Transformer & 3 phase power measurement practicals						
CO 3	Deals with the introductory practicals of various types of motors.						
CO 4	Deals with various introductory experiments w.r.t Analog & Digital Electronics.						

LIST OF EXPERIMENTS
LIST-I

1. To verify KVL and KCL.
2. To verify the Superposition theorem on a linear circuit with at least one voltage & one current source.
3. To verify Thevenin's Theorem on a linear circuit with at least one voltage & one current source.
4. To verify Norton's Theorem on a linear circuit with at least one voltage & one current source.
5. To study frequency response characteristics of a series R-L-C circuit on CRO and determine BW, resonant frequency & maximum current.
6. To study frequency response characteristics of a parallel R-L-C circuit on CRO and determine resonant frequency & minimum current.
7. To perform O.C. and S.C. tests on a single-phase transformer.
8. To perform a direct load test on a single-phase transformer and plot load v/s efficiency characteristics.
9. Measurement of power of a 3-phase balanced load by two-wattmeter method.
10. To perform speed control of the DC shunt motor.
11. To study cut-section models of various generators and motors.
12. To perform starting & reversal of direction of a three-phase induction motor.
13. Starting and running of a 3-phase synchronous motor.
14. To study various Safety measures: Need of Earthing, prevention & precautions against electric shock and electric hazards, shock treatment. General Precautions followed in performing practicals in BEEE Lab.

LIST-II

15. To study the VI characteristics of the p-n diode in forward and reverse bias and find the threshold voltage from the VI curve.
16. To study the operation of half-wave and full-wave rectifiers and observe the output waveform.
17. To experimentally plot the input and output characteristics of a given BJT transistor in CE/CB/CC configuration.
18. Study and realization of Logic gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR (any four).

Note: At least 7 experiments from the List - I & 2 experiments from the List -II to be performed during the semester.

B24-ECS-104		Basic Electrical Engineering					
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Total	Exam Time
3	1	`-	4	70	30	100	3 Hour
Course Outcomes							
CO 1	Deals with the review of introductory topics and DC network theorems to analyse linear circuits.						
CO 2	Deals with AC fundamentals & AC response of RLC circuit combinations.						
CO 3	Deals with the introductory Balanced Three Phase Power System analysis, magnetic circuits and Single-Phase Transformer.						
CO 4	Explains the Basics of Electrical Machines (AC/DC).						

UNIT-I

Review of D.C. circuits: Ohm's Law, junction, node. Circuit elements classification: Linear & nonlinear, active & passive, lumped & distributed, unilateral & bilateral with examples. KVL, KCL, mesh & nodal analyses, Star-Delta transformation of set of resistors.

DC Network Theorems: Superposition, Thevenin's, Norton's theorems in DC networks containing both voltage and current sources and Maximum power transfer theorem in a resistive network.

UNIT-II

AC Fundamentals: AC signal, Average and RMS values of sinusoidal AC, polar & rectangular form of representation phasor quantities. Addition & subtraction of two or more phasor sinusoidal quantities using the component resolution method. Laws of EMI.

AC Circuit: Steady-state AC response of R/L/C, RL, RC series ckts, P.F., active, reactive & apparent power. Frequency response of series & parallel RLC circuit.

UNIT-III

Balanced 3-Phase AC Circuits: Advantages of 3-phase system, Star and Delta connections and their Line and Phase voltage/current relationships, three-phase power & its measurement using the 2-wattmeter method.

Single phase transformer (only qualitative analysis): MMF, Reluctance and flux flow in a magnetic circuit.Transformer: Principle – Construction - Emf equation - Phasor diagram and Equivalent Circuit, Losses in a transformer, Maximum efficiency condition, OC/SC Test & direct load test.

UNIT-IV(Only Qualitative Analysis)

Principle of Dynamo for generation of AC. Relation between synchronous speed, number of field poles and frequency. Principle of motoring. Torque & Mechanical Power developed at a rotating shaft & B.H.P. Need of starter.

DC Machines: Constructional parts & principles of working of DC Machines, generated and back EMF equation, excitation and types of DC machines, applications, speed Control of DC shunt Motor.

3-Phase Induction Motor: Basic working principle & construction of a 3- phase Induction motor, concept of slip, applications. Phase sequence and its importance in industries.

Synchronous Machines: Basic principle of working of Alternator and synchronous motor.

Suggested Books:
 1. Basic Electrical Engg: A complete Solution by Vijay Kumar Garg, Wiley India Ltd.
 2. Electrical Engg. Fundamentals by Rajendra Prasad, PHI Pub.
 3. Basic Electrical and Electronics Engg. by S.K. Sahdev, Dhanpat Rai & Co./Pearson.
 4. A.K. Maini, Digital Electronics, Wiley India

Note: An approved question paper template is to be provided to the paper setter.

B24-ESC-109				Basic Electrical Engineering Lab			
L	T	Practical	Credit	Internal Assessment	Practical Exam	Total	Exam Time
-	-	2	1	40	60	100	3 Hrs
Purpose	To familiarize the students with introductory Electrical & Electronics Engineering practicals.						
	Course Outcomes						
CO1	Deals with various DC network theorems to analyse linear circuits.						
CO 2	Deals with the steady-state frequency response of RLC circuit parameters solution techniques.						
CO 3	Deals with 3 phase power measurement practicals and introductory Single-Phase Transformer experiments.						
CO 4	Deals with the practicals of various types of motors & safety measures.						

LIST OF EXPERIMENTS

1. To verify KVL and KCL.
2. To verify the Superposition theorem on a linear circuit with at least one voltage & one current source.
3. To verify Thevenin's Theorem on a linear circuit with at least one voltage & one current source.
4. To verify Norton's Theorem on a linear circuit with at least one voltage & one current source.
5. To study frequency response characteristics of a series R-L-C circuit on CRO and determine BW, resonant frequency & maximum current.
6. To study frequency response characteristics of a parallel R-L-C circuit on CRO and determine resonant frequency & minimum current.
7. To perform O.C. and S.C. tests on a single-phase transformer.
8. To perform a direct load test on a single-phase transformer and plot load v/s efficiency characteristics.
9. Measurement of power of a 3-phase balanced load by two-wattmeter method.
10. To perform speed control of the DC shunt motor.
11. To study cut-section models of various generators and motors.
12. To perform starting & reversal of direction of a three-phase induction motor.
13. To perform block rotor test on a motor to find the BHP of the running shaft.
14. Starting and running of a 3-phase synchronous motor.
15. To study various Safety measures: Need of Earthing, prevention & precautions against electric shock and electric hazards, shock treatment. General Precautions followed in performing practicals in BEE Lab.

Note: At least 9 experiments to be performed during the semester.

B24-ESC-106			Engineering Graphics and Design Lab (B.Tech. Semester-I/II)					
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Practical Exam	Total	Time (Hrs.)
0	0	4	2	0	40	60	100	3
Purpose	To make student practice on engineering graphics and design software and provide exposure to the visual aspects of engineering design.							
Course Outcomes								
CO 1	Students will be able to understand the user interface and toolboxes in Solidworks software.							
CO 2	Students will be able to customize settings of Solidworks software and produce 2D drawings using Solidworks.							
CO 3	Students will be able to practice & learn performing various operations in Solidworks and create 3D designs.							
CO 4	Students will be able to make assembly and create a simple design project.							

Module 1: Overview of SolidWorks:
Listing the computer technologies that impact on graphical communication, Demonstrating Knowledge of the theory of SolidWorks software: the Menu Bar; the SOLIDWORKS Menus; Quick Access Tools; Command Manager; Feature Manager Design Tree; Heads-Up View Toolbar; Graphics Area; Task Pane; Status Bar; Quick Access Tools; The name of the currently open file; The search prompt (search Commands, Help, Files etc.); User login credentials; SOLIDWORKS Help; Application window options (minimize, maximize, close).

Module2: Customization & SolidWorks Drawing in 2D:
Setup of the drawing page and the printer, including scale settings, setting up of document units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Trim entities; convert entities.

Sketch; Evaluate; SOLIDWORKS Add-Ins; Producing drawings by using various coordinate input entry methods to draw line, rectangle, circle, slots, arcs, conic sections, spline, polygons etc; smart dimensions; applying annotations to drawings; modifying various entities (viz line, rectangle, circle, slots, arcs, conic sections, spline, polygons etc.); 2D Fillet and chamfer; 2D mirror; linear sketch pattern.

Module3: Miscellaneous operations and 3D designs:
Drawing; Annotation; Sketch; Markup; Evaluate; SOLIDWORKS Add-Ins; Sheet Format; Features (or Assembly, in an Assembly file);
3D entities (boss and cuts): Extrude boss/base/cut, revolve boss/base/cut, swept boss/base/ cut, Lofted boss/base/cut, Boundary boss/base/cut; 3D Fillet and Chamfer; 3D mirror; 3D linear and circular patterns; reference geometry.

Module4: Assembly & creating a simple design project:
Drawing annotation, Solidworks modelling of parts and assemblies; Geometry and topology of engineered components: creation of engineering models and their presentation in standard 3D; Use of SolidWorks software for creating parts and assemblies: Wheel support assembly, V-Block assembly etc. Applying colour coding to parts and assemblies; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing

Text Book
1. Beginner's Guide to SOLIDWORKS 2021 - Level II: Sheet Metal, Top Down Design, Weldments, Surfacing and Molds 1st Edition - by Alejandro Reyes; SDC Publications; 1st edition (March 4, 2021).
2. SOLIDWORKS 2021: A Step-By-Step Tutorial Guide for Beginners (Mixed Units) - by SDCAD Academy.

Reference Books
1. SOLIDWORKS 2019: A Power Guide for Beginners and Intermediate User Paperback – March 6, 2019 by CADArtifex, John Willis, Sandeep Dogra.
2. Solidworks for Beginners: Getting Started with Solidworks Learn by Doing New Edition 2018 Paperback – October 8, 2018 by Arsath Natheem.

B24-HSC-101				English for Technical Writing			
L	T	P	Credit	End Semester Exam	Internal Assessment	Total	Time
2	-	-	2	70	30	100	3h
Purpose	To introduce the basics of communication and technical writing skill for the students of Engineering						
CO 1	Building up the vocabulary						
CO 2	Students will acquire basic proficiency in English including writing skills						
CO3	Students will be able to select the most appropriate mode of communication for a given situation and will be able to speak assertively and effectively.						
CO4	Students will be able to write effective reports, proposals and papers and present themselves professionally through effective resumes and interviews.						

UNIT- 1

Fundamentals of communication skills

Meaning and types of communication skills, Listening,Speaking, Reading and Writing, Importance of technical communication, Barriers in communication, Tools of effective communication.

UNIT- 2

Vocabulary Building

Word formation &Synonyms and Antonyms, One-word substitution, Abbreviations of scientific and technical words, phrasal verbs and Idioms.

UNIT- 3

Fundamentals of Writing Skills

Job application, CV writing, Business letter, Report writing and E-mail writing, redundancies, precise writing skill, Basics of grammar: uses of tenses, subject verb agreement, narration, active voice.

UNIT- 4

Fundamentals of Speaking skills

Speaking skills, Oral presentation, Body language, Group discussion, Technical Telephonic conversation. Introduction to phonetic sounds, symbol and articulation

Suggested Books:

- Practical English Usage. Michael Swan. OUP. 1995.
- Remedial English Grammar. F.T. Wood. Macmillan.2007
- On Writing Well. William Zinsser. Harper Resource Book. 2001
- Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
- Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Note: The paper setter will set the paper as per the question paper templates provided.

B24-HSC-103				English Language Lab			
L	T	P	Credit	Practical Exam	Internal Assessment	Total	Time
-	-	2	1	60	40	100	3h

OBJECTIVES

1. Listening comprehension
2. Pronunciation, intonation, stress and Rhythm
3. Communication at work place
4. Group Discussion
5. Interview
6. Writing skills: speech writing

B24-HSC-102	Design Thinking						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assesment	Total	Exam Hour
0	0	3	1.5	0	100	100	-
Course Outcomes							
CO1	Students will be able to understand the concept of Design Thinking						
CO2	Students will be able to empathize and define the problems						
CO3	Students will be able to ideate and prototype the proposed solution						
CO4	Students will be able to test and present the proposed solution						

List of Experiments

1. Introduction to Design Thinking
2. **Empathize** on real life problems
    1. Observe
    2. Engage
    3. Watch and Listen
3. **Define** the problem statement
    1. User
    2. Needs
    3. Insights
4. **Ideate** on problem statement
    1. Brainstorming
    2. Constraints
    3. Best solutions
5. **Prototype** the design solution
    1. Start building
    2. Timing of prototype
    3. Build a prototype
    4. Build with user in mind
6. **Test** the design solution
    1. User's hand on
    2. Create experiences
    3. Users to compare

   Case studies/Presentation on the proposed problem statement (based on engineering branch of student) embedding all points mentioned above may be considered for internal evaluation purpose.

B24-HSM-101	Universal Human Values II: Understanding Harmony and Ethical Human Conduct						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Total	Time
3	0	0	3	70	30	100	3h
Purpose	Purpose and motivation for the course, recapitulation from Universal Human Values-I						
Course Outcomes (CO)							
CO 1	To enable the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings						
CO 2	To facilitate the development of a Holistic perspective among students towards life and Profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence						
CO 3	To develop understanding Harmony in the Family and Society and the Vision for the Universal Human Order						
CO 4	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.						

Unit 1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education ; Continuous Happiness and Prosperity- A look at Basic Human Aspirations ; current scenario , Method to Fulfill the Basic Human Aspirations; concept of natural acceptance and ways to explore it.

Unit 2

Understanding Harmony in the Human Being

Understanding human being as a co-existence of the Self and Body ;

Understanding, exploring and distinguishing between the needs of Self and Body , Understanding the Body as an instrument of Self; Understanding Harmony in the Self, Exploring Sources of Imagination in the Self, Harmony of the Self with the Body, Program to ensure self-regulation and Health, Exploring Harmony of Self with the Body.

Unit 3

Understanding Harmony in the Family and Society

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, Exploring the Feeling of Trust, 'Respect' – as the Right Evaluation, Exploring the Feeling of Respect,Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order, Exploring Systems to fulfill Human Goals.

Unit 4

Understanding Harmony in the Nature and Existence, Implications of the Holistic Understanding – a Look at Professional Ethics:

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Exploring the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, the Holistic Perception of Harmony in Existence, Exploring Co-existence in Existence. Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct,Exploring Ethical Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Exploring Humanistic Models in Education,Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession, Exploring Steps of Transition towards Universal Human Order.

Note: The paper setter will set the paper as per the question paper templates provided.

READINGS:

Text Books:
   a. The Textbook - A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
   b. The Teacher's Manual- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53.
   c. Professional Ethics and Human Values, Premvir Kapoor, ISBN: 978-93-86173-652, Khanna Book Publishing Company, New Delhi, 2022.

Reference Books:

   1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
   2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
   3. The Story of Stuff (Book).
   4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
   5. Small is Beautiful - E. F Schumacher.
   6. Slow is Beautiful - Cecile Andrews.
   7. Economy of Permanence - J C Kumarappa.
   8. Bharat Mein Angreji Raj – Pandit Sunderlal.
   9. Rediscovering India - by Dharampal
   10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
   11. India Wins Freedom - Maulana Abdul Kalam Azad
   12. Vivekananda - Romain Rolland (English)

B24-VAC-101	Personality Development and Soft Skills							
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Practical Exam	Total	Time
2	0	0	1	---	100	---	100	3
Program Objective (PO)	To become a person with stable mind, pleasing personality and determination in order to achieve the highest goal.							
Course Outcomes (CO)								
CO1	Students become aware about leadership.							
CO2	Students will learn how to improve communication skills							
CO3	Understand the team building and conflict							
CO4	Student will learn how to manage the time.							

Unit I

Leadership Introduction to Leadership, Leadership Power, Leadership Styles, Leadership in Administration. Interpersonal: Introduction to Interpersonal Relations, Analysis Relations of different ego states, Analysis of Transactions, Analysis of Strokes, Analysis of Life position.

Unit II

Communication: Introduction to Communication, Flow of Communication, Listening, Barriers of Communication, How to overcome barriers of communication.

Stress: Introduction to Stress, Causes of Stress, Impact Management Stress, Managing Stress.

Unit III

Group Dynamics and team Building: Importance of groups in organization, Interactions in group, Group Decision Taking, Team Building, Interaction with the Team, How to build a good team?

Conflict: Introduction to Conflict, Causes of Conflict, Management Managing Conflict.

Unit IV

Time Management: Time as a Resource, Identify Important Time Wasters, Individual Time Management Styles, Techniques for better Time Management.

Motivation: Introduction to Motivation, Relevance and types of Motivation, Motivating the subordinates, Analysis of Motivation.

Suggested reading

- E.Berne, Games People Play, Grove Press Inc., 1964; Penguin, 1968.
- Hargreaves, G. Stress Management, Marshall Publishing, London 1998
- Barker D, TA and Training, Gower Publishing Company Ltd., 1982.
- Jongewardm D & Seyer P C, Choosing Success, John Wiley & Sons Inc.1978
- Arnold, JHC Feldman, D.C. Organizational Behaviour IRWIN/McGRAW-HILL 1986
- Chandan, J.S., Organizational Behaviour. Vikas Publishing House PVT LTD 1994
- Statt, D.A. Using Psychology in Management Training, Taylor and Francis Inc.2000
- Luthans F., Organisational Behaviour, IRWIN/McGRAW-HILL 1998

B24-VAC-102	Idea Workshop						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assesment	Total	Exam Hour
0	0	3	1	0	100	100	-
Course Outcomes							
CO1	Students will be able to earn skill of PCB Designing						
CO2	Students will be able to earn skill of 3-D Modeling and Printing						
CO3	Students will be able to earn skill of Artificial Intelligence						

List of Experiments

1. To design and fabricate PCB for electronic circuits as micro project (any one)
   a) Power Supply
   b) 555 Timer based circuits
   c) Op-amp based circuits
   d) Amplifiers
   e) Any other circuit of similar nature
2. To design and fabricate 3-D models for 3-D printing as micro project (any one)
   a) Cube
   b) Cone
   c) Sphere
   d) Cuboid
   e) Any other shape of similar nature
3. To deploy and generate AI models to implement various tasks (any two)
   a) Image classification
   b) Voice swap
   c) Image generation
   d) Neural style transfer
   e) Video to text conversion
   f) Graphics design generation
   g) Music generation
   h) any other application of similar nature

The students are required to undertake one/two task from each of the experiments in the above list and demonstrate it to score marks in the evaluation. All the projects can be undertaken on open source platforms. Any other emerging area projects may be added to the list as per the availability of resources and expertise in the college.