3. F.E Syllabus

Theme: Smart & Sustainable mechanism for Metropolitan Cities

Aligned with UNSDG Goals: - 3: Good Health and Well-being, 4: Quality Education, 7: Affordable and Clean Energy, 9: Industry, Innovation, and Infrastructure, 11: Sustainable Cities and Communities.

Keywords: *Energy conservation, Water management, Waste handling, Environmental monitoring, Efficient resource management in housing societies*

Description:

This semester's theme, "**Smart & Sustainable Mechanisms for Metropolitan Cities**," explores the integration of intelligent technologies and environmentally conscious practices to create efficient, resilient, and livable urban environments. It focuses on how electronics, computing, and applied sciences can be leveraged to address the complex challenges faced by large urban centers. This includes developing innovative solutions that optimize resource consumption **"Smart"** while ensuring long-term ecological balance and societal well-being **"Sustainable"**. The theme aims to equip students with the skills to design systems that contribute to a higher quality of life, reduced environmental impact, and enhanced urban resilience in metropolitan areas.

Students will tackle real-world urban challenges such as energy conservation, water management, waste handling, environmental monitoring, and efficient resource management in housing societies. Through interdisciplinary projects, students will connect theoretical knowledge with practical applications, fostering early-stage engineering thinking and preparing them to develop impactful solutions for sustainable urban development.

Alignment with UNSDG Goals:

UNSDG 3: Good Health and Well-being: The curriculum supports this goal by enabling students to develop foundational smart mechanisms for urban health and safety, such as basic air quality monitoring, noise level detection, or fundamental safety alert systems, contributing to healthier and safer metropolitan living environments.

UNSDG 4: Quality Education: The curriculum fosters quality education by providing hands-on, problem-based learning related to real-world urban challenges. Students gain relevant skills in electronics, computing, and applied sciences, preparing them for careers that contribute to sustainable development.

UNSDG 7: Affordable and Clean Energy: Projects focused on energy conservation, such as smart lighting, directly contribute to more efficient energy use and promote cleaner energy solutions within urban environments.

UNSDG 9: Industry, Innovation, and Infrastructure: This goal is directly addressed by encouraging students to innovate at a foundational level, designing basic components for smart urban infrastructure like traffic flow logic, parking occupancy indicators, and energy monitoring. This fosters early skills crucial for building resilient, sustainable, and technologically advanced city systems.

UNSDG 11: Sustainable Cities and Communities: The overarching theme directly targets this goal by exploring mechanisms for better water management, waste handling, environmental monitoring, and efficient resource management in housing societies, all crucial for creating inclusive, safe, resilient, and sustainable cities.

Problem Statement:

1.Metropolitan areas like Mira Bhayandar face a major challenge with energy waste in common building areas (entrances, lobbies) due to continuously operating traditional lighting. This leads to high costs, light pollution, and a larger carbon footprint, undermining urban sustainability**. (UNSD Goal 11: Sustainable Cities and Communities)**

2.Despite growing adoption of residential solar panels in metropolitan areas like Mira Bhayandar, homeowners lack affordable, real-time monitoring tools for DC power output. This prevents them from effectively tracking energy contribution, identifying inefficiencies, or valuing their clean energy, hindering informed energy management and devaluing renewable investments. (**UNSD Goal 7: Affordable and Clean Energy)**

3. Metropolitan areas like Mira Bhayandar face significant traffic congestion and safety issues due to inefficient traffic control systems. This leads to increased travel times, accident risks, and fuel consumption/emissions, undermining urban mobility, economic productivity, and overall smart/sustainable city development. **(UNSD Goal 11: Sustainable Cities and Communities)**

4.In metropolitan areas like Mira Bhayandar, urban air pollution in public parks poses an invisible threat. The lack of accessible, real-time air quality information prevents public awareness of health risks during outdoor activities, impacting public health and undermining sustainable urban living initiatives. (**UNSD Goal 3: Good Health and Well-being)**

5.In metropolitan areas, escalating parking demand leads to wasted time, fuel, and increased traffic congestion/emissions due to a lack of real-time occupancy information. This hinders efficient urban mobility and undermines smart, sustainable city infrastructure. **(UNSD Goal 9: Industry, Innovation, and Infrastructure)**

6.In dense metropolitan areas like Mira Bhayandar, homes and small businesses lack fundamental, low-cost security monitoring for entry points. This creates vulnerabilities to unauthorized entry, resulting in property loss, disruption, and a diminished sense of safety, as conventional systems are often too expensive or complex for smaller establishments. **(UNSD Goal 11: Sustainable Cities and Communities)**

Theme: Connected Communities through Intelligent Systems and Sustainable Design.

- UNSDG 3: Good Health and Well-being
- UNSDG 6: Clean Water and Sanitation
- UNSDG 7: Affordable and Clean Energy
- UNSDG 9: Industry, Innovation and Infrastructure
- UNSDG 11: Sustainable Cities and Communities
- UNSDG 16: Peace, Justice, and Strong Institutions

Keywords: *Digital entry system, FSM (Finite State Machine), Keypad access, Affordable security, Residential automation, Community safety, Sustainable Cities*

Description:

The theme "Connected Communities through Intelligent Systems and Sustainable Design" emphasizes the development of low-cost, scalable technologies that foster smarter and more inclusive suburban living. In suburban areas across Mumbai—such as Mira Road, Dombivli, Vasai, and Kurla communities face everyday challenges ranging from insecure entry systems in housing societies, to unmanaged traffic signals, water overflow in tanks, and food wastage in schools and hostels. These localized issues, often overlooked, stem from a lack of simple, tech-enabled solutions rooted in community needs. By integrating digital logic, sensor-based automation, and Python-driven control systems, students work toward solving these real-world problems. This theme directly supports UN Sustainable Development Goals focused on clean energy, sustainable cities, quality education, clean water, and community well-being—driving engineering practice toward socially responsible innovation.

Problem Statements:

1. In many densely populated suburban and urban areas, residential communities often lack automated entry systems. Manual gate operations and the high cost of commercial security solutions pose challenges for these neighborhoods in adopting modern and efficient security measures.
2. Intersections in many suburban and urban areas often experience traffic congestion and safety issues due to outdated or manually operated traffic control systems. This results in irregular traffic flow, longer commute times, and a higher risk of accidents.
3. In areas with unreliable electricity supply, such as Vasai and Nalasopara, streetlights are frequently left on during daylight hours due to the lack of automated control systems. This results in unnecessary energy wastage and higher maintenance and operational costs.
4. In many urban neighborhoods, overflow from overhead water tanks is a common problem, causing substantial water wastage and potential structural damage due to dampness.
5. Educational institutions in many areas struggle to maintain timely class schedules due to dependence on manual bell systems. This often leads to time mismanagement and interruptions in the academic routine.
6. In many suburban regions, students who commute by bicycle often encounter a lack of secure parking facilities on educational campuses. The absence of proper locking infrastructure raises the risk of theft and discourages the use of environmentally friendly transportation options.

R-2025- F.E Electronics and Telecommunication Engineering

Course Code	Course Name	Teaching Scheme (Contact Hours Per week)			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14111101	Linear Algebra and Calculus	2	1	--	30	15	--	45	90	3

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Semester Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
14111101	Linear Algebra and Calculus	20	20	40	60	2.5	25	--	125

Rationale:

A solid mathematical foundation is crucial for first-year Electronics and Telecommunication Engineering students to effectively analyze and design complex engineering systems. The integrated study of matrices and linear equations enables students to model and solve multiple simultaneous relationships frequently encountered in circuit analysis and communication systems, such as in MIMO wireless technologies. Understanding eigenvalues, eigenvectors, and matrix diagonalization provides essential insights into system stability, natural frequencies, and the simplification of dynamic system models used extensively in control engineering and signal processing. Partial differentiation equips students to analyze how system parameters vary with respect to multiple variables, which is fundamental in studying electromagnetic fields, sensor operations, and signal variations in space and time. Moreover, the use of complex variables and analytic functions forms the basis for representing and analyzing alternating current (AC) circuits and sinusoidal signals through phasors, thereby facilitating impedance analysis, resonance, and wave propagation critical to telecommunication networks. Collectively, these mathematical tools prepare students to address practical engineering challenges and lay the groundwork for advanced studies in electronics and telecommunication engineering.

R-2025- F.E Electronics and Telecommunication Engineering

Course Objectives:

1. To introduce matrix operations used in modeling systems and digital circuits.
2. To equip students with techniques to solve systems of linear equations used in circuit analysis and network theory.
3. To develop the ability to compute eigenvalues and eigenvectors used in stability analysis and signal processing.
4. To understand matrix diagonalization for simplifying complex systems in filter design and digital signal processing (DSP).
5. To introduce partial differentiation for analyzing functions with multiple variables, common in electromagnetic field theory.
6. To understand analytic functions and their properties for applications in signal modulation and AC circuit analysis.

Course Outcomes:

1. Students will be able to solve matrix problems and apply them and use SCILAB to system representations such as MIMO antenna systems.

2. Students will be able to solve systems of linear equations and apply them and use SCILAB to analyze electrical networks.

3. Students will be able to determine eigenvalues/eigenvectors and apply them and use SCILAB in system stability and filter design.

4. Students will be able to diagonalize matrices and use them and use SCILAB to simplify system behavior in control and DSP applications.

5. Students will be able to apply partial derivatives to analyze functions and use SCILAB in fields such as electromagnetics.

6. Students will be able to identify and construct analytic functions, and apply them and use SCILAB to model AC circuit behavior using phasors.

Prerequisite:

1. Addition, multiplication, transpose, and inverse of a matrix**.**

2. Review of Complex Numbers-Algebra of Complex Numbers, Cartesian, polar and exponential form of complex number.

R-2025- F.E Electronics and Telecommunication Engineering

DETAILED SYLLABUS: total six module for each subject (15 Weeks)

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
I	Matrices	Types of Matrices (Symmetric, Skew- symmetric, Hermitian, Skew-Hermitian, unitary, orthogonal matrices and properties of matrices).	05	CO1
		Rank of a matrix using Echelon form, reduction to normal form and PAQ form.		
		Application of matrices to Coding and De-coding		
		Self-learning Topics: 1. PAQ form for rectangular matrices. 2. Reduction to normal form. 3. Theorems on sum of symmetric and skew symmetric matrices and similar theorems. 4. Properties of transpose, conjugate of matrices	07	
II	System of Linear Equations	System of Linear homogeneous and non–homogeneous equations, their consistency and solutions using rank.	05	CO2
		Linear dependence and independence of vectors. Linear combination of vectors		
		Solution of a system of linear algebraic equations, by (i) Gauss Jacobi Iteration Method, (ii) Gauss Seidel Iteration Method.		
		Self-learning Topics: 1. Vector Spaces 2. Linear Transformations. 3. Rank -Nullity theorems.	08	

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III	Eigen values and Eigen vectors	Eigenvalues & eigenvectors of all types of matrices (symmetric, skew symmetric, orthogonal, triangular) and its properties (without proof).	05	CO3
		Cayley-Hamilton Theorem (without proof), verification and reduction of higher degree polynomials		
		Self-learning Topics: 1. Quadratic forms. 2. Reduction to quadratic forms 3. Rank, signature and index of a quadratic forms	08	
IV	Similarity and diagonalization of matrix	Similar matrices, diagonalizable matrices, orthogonally diagonalizable matrices and functions of square matrix.	05	CO4
		Minimal polynomial, Derogatory and non-derogatory matrices.		
		Singular value decomposition (SVD)		
		Self-learning Topics: 1. Functions of Square Matrix 2. Orthogonally diagonalization.	07	
V	Partial Differentiation	Function of two and three variables, Partial derivatives of first and higher order. Differentiation of composite function.	05	CO5
		Maxima and Minima of a function of two independent variables.		
		Lagrange's Multiplier method with one condition.		
		Self-learning Topics: 1. Euler's Theorem on Homogeneous functions with two independent variables. 2. Euler's Theorem on Homogeneous functions with three independent variables.	08	

		3. Deductions from Euler's Theorem. 4. Total differentials 5. Implicit Functions		
VI	Complex Variables – Differentiation	Circular functions of complex number and Hyperbolic functions. Analytic function, necessary and sufficient conditions for f(z) to be analytic (without proof),		
		Cauchy-Riemann equations in Cartesian coordinates (without proof, Polar form not included)	05	CO6
		Milne-Thomson method to determine analytic function f(z) when real (u)or imaginary part (v) is given.		
		Harmonic function, Harmonic conjugate, and orthogonal trajectories.		
		Self-learning Topics: 1. Expansion of $\sin^n\theta$, $\cos^n\theta$ in terms of sines and cosines of multiples of θ and Expansion of sinnθ, cosnθ in powers of sinθ, cosθ. 2. Powers and Roots of a complex number. 3. Logarithm of Complex Number 4. Inverse Hyperbolic Functions. Separation of real and imaginary parts of all types of Functions.	07	

Text Books:

1. Grewal B. S.: "Higher Engineering Mathematics", Khanna Publishers, 44th Ed., 2021.

2. Kreyszig E.: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

3. Dass H. K.: "Higher Engineering Mathematics", S Chand & Company Ltd, 12th Ed., 2004.

4. Narayan S.: "Differential Calculus", S.Chand Publications, 30th Ed., 2005.

References:

1. Strang G.: "Linear Algebra and its Applications", Cengage Publications, 4th Ed. 2022.
2. Stewart J.: "Multivariable Calculus" Cengage Publications, 7th Ed., 2019.
3. Jain M.K., Iyengar SRK, Jain R K,: "Numerical Methods for Scientific and Engineering Computation", New Age International Publishers, 6th Ed., 2007.
4. Bali N.P and Goyal M.: "A Textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
5. Williams G.: "Linear Algebra with Applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.
6. Wylie C. R, Barrett L.C..: "Advanced Engineering Mathematics" McGraw Hill Book Co., New York, 6th Ed., 2017.
7. Ramana B.V.: "Higher Engineering Mathematics", Tata McGraw-Hill Publishing Company Limited, 1st Ed., 2006.
8. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education, 2015.
9. Lay D. C: "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
10. Pal S. & Bhunia S. C.: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016

Online References:

Sr. No.	Website Name
1.	https://www.math.ucdavis.edu/~daddel/linear_algebra_appl/Applications/applications.html
2.	https://onlinelibrary.wiley.com/doi/10.1155/2016/4854759
3.	https://archive.nptel.ac.in/courses/111/108/111108066/
4.	https://archive.nptel.ac.in/courses/111/104/111104092/

Assessment:

Term work (TW) for 25 marks:

1. Batch-wise tutorials are to be conducted.

2. Students must be encouraged to write SCILAB Programs in tutorial class only. Each Student has to write **at least 5 SCILAB tutorials** (including print out) and **at least 10** class tutorials on entire syllabus.

3. SCILAB Tutorials will be based on entire syllabus

The distribution of Term Work marks will be as follows –

1. Regularity and active involvement (Theory and Tutorial) 05 marks

2. Class Tutorials on entire syllabus 10 marks

3. SCILAB Tutorials 10 marks

R-2025- F.E Electronics and Telecommunication Engineering

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					
		L	T	P	L	T	P	SL	Notional Learning Hour	Total Credits (C) Notional Learning Hour/30
14111102	Basics of Semiconductor Physics	2		--	30	-	--	30	60	2

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
14111102	Basics of Semiconductor Physics	20	20	40	60	2.5	--	--	100

Rationale: The syllabus for Electronics and Telecommunication Engineering (EXTC) and Electronics and Computer Science (ECS) branches is structured to provide a strong theoretical and practical foundation in semiconductor physics, electronic devices, circuit analysis, and emerging technologies. Core topics such as diodes, transistors, FETs, and nanotechnology are included to help students understand the working principles of modern electronic systems. The inclusion of device applications and modern trends like MOSFETs and Hall Effect ensures students are aligned with current industry practices and prepared for advanced studies in communication systems, embedded electronics, and computational electronics.

Course Objectives:

1. To introduce the fundamental concepts of semiconductors and carrier behaviour in intrinsic and extrinsic materials.
2. To explain the working principles and characteristics of p-n junction diodes.
3. To familiarize students with the construction, types, and applications of special-purpose diodes.
4. To study the operation, characteristics, and switching behaviour of Bipolar Junction Transistors (BJTs).
5. To understand the structure, functioning, and application of Field Effect Transistors (JFETs and MOSFETs).
6. To introduce nanotechnology concepts, material properties at the nanoscale, and their applications in electronics.

Course Outcomes:

1. **EXPLAIN** how charge carriers behave in intrinsic and extrinsic semiconductors and **CALCULATE** their concentrations using basic formulas.
2. **DESCRIBE** how a p-n junction is formed, **DERIVE** the diode equation, and **ANALYZE** how current and voltage change in different bias conditions.
3. **CLASSIFY** different special-purpose diodes and **EXPLAIN** how they work and where they are used.
4. **INTERPRET** how BJTs work in different circuits and **EXPLAIN** their role in amplification and switching.
5. **COMPARE** JFET and MOSFET structures and **APPLY** MOSFETs in simple switching applications.
6. **SUMMARIZE** the basics of nanotechnology and **IDENTIFY** how it's used in making modern electronic devices.

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
	Prerequisite	Basic understanding of atomic structure and energy bands in solids Knowledge of conductors, insulators, and semiconductors Familiarity with Ohm's Law, resistance, and electrical circuits Concept of current, voltage, power, and energy in electrical systems Basic idea of magnetic fields and electromagnetic induction		
	Introduction to Semiconductors	Direct and Indirect Semiconductors, Carrier Concentration in Intrinsic Semiconductors, Fermi Level of Intrinsic Semiconductors, Variation of Fermi Level of Intrinsic Semiconductors with respect to Temperature, Extrinsic Semiconductors, Fermi Level of Extrinsic Semiconductors, Variation of Fermi Level of Extrinsic Semiconductors with respect to Temperature and Impurity Concentration, Equation of Conductivity with Current Flow, Hall Effect, Calculation of Hall Voltage.	06	CO1
		Self-Learning: Energy band diagrams of metals, insulators, and semiconductors Drift current and diffusion current in semiconductors Applications of Hall Effect in sensor design and material characterization Real-life examples of intrinsic and extrinsic semiconductors (e.g., Silicon, Germanium, GaAs), Basics	06	

		of semiconductor material fabrication (crystal growth, doping techniques)		
2	Junction Diode Physics and Characteristics	Formation of p-n junction, calculation of barrier potential Diode equation, p-n junction in forward Bias, p-n junction in Reverse bias, Current- voltage curve for p-n junction diode, Derivation of barrier potential.	05	CO2
		Self-Learning: Breakdown mechanisms in p-n junctions: Zener and Avalanche breakdown, Diode dynamic (AC) resistance and static (DC) resistance Capacitance effects in p-n junctions (transition and diffusion capacitance) Applications of diodes in logic circuits and voltage multipliers	05	
3	Functional Diodes and Optoelectronic Devices	Study of concept and working of various important diodes such as Zener diode, Light Emitting Diode (LED), Photodiode, Solar Cell, Varactor diode, Gunn diode, Tunnel diode, Schottky diode, PIN diode, Avalanche diode, Laser diode, Shockley diode, and Step Recovery diode.	05	CO3
		Self-Learning: Material science behind LED color variations (bandgap and emission spectrum), photodiode response time and noise characteristics, applications of varactor diodes in frequency modulation and tuning circuits, negative resistance property in Gunn and Tunnel diodes, PIN diode usage in RF attenuators and switches, use of avalanche diodes in ESD	05	

		(Electrostatic Discharge) protection circuit.		
4	Transistor Operation and Applications	BJT Structure and Operation - BJT structure, Modes of operation,CB, CE I-V characteristics BJT Amplification and Switching - Current gain, BJT as a switch	05	CO4
		Self-Learning: Configurations (CB, CE, CC) and their comparisons, load line analysis and Q-point stability, transistor biasing techniques and their practical importance BJT switching speed and delay factors, real-life applications of BJT in amplifier and logic circuits.	05	
5	Field Effect Transistors	Field Effect Transistors – Introduction to FETs, types of FETs: JFET and MOSFET, structure and operation. Detailed study of MOSFETs – MOSFET structure, enhancement mode and depletion mode operation, threshold voltage. Applications of MOSFET – MOSFET as a switch.	06	CO5
		Self-Learning: Comparison between JFET and MOSFET characteristics, graphical analysis of transfer and output characteristics of FETs, significance of threshold voltage in switching applications, CMOS basics and role of MOSFETs in CMOS logic circuits.	06	
6	Nanotechnology	Introduction to Nanotechnology, Properties (optical, Electrical, Structural, Mechanical) Importance of surface to Volume ratio, nanofabrication techniques such as chemical vapor deposition,	03	CO6

		Application: Lithography, Single Electron Transfer (SET), Spin Valves.		
		Self-Learning: Difference between bulk and nanoscale materials, effect of reduced dimensions on physical properties, classification of nanomaterials (0D, 1D, 2D, 3D), role of quantum confinement in optical and electrical behavior of nanomaterials, real-world applications of SET and spintronics devices, basics of nanolithography and its use in semiconductor industries.	03	
	Total		60	

Text Books:

1. Engineering Physics by D.K Bhttacharya, PoonamTandon - Oxford University Press
2. Solid State Electronic Devices – B. G. Streetman – Pearson
3. Electronic Devices and Circuits – Homas Floyd – Pearson
4. Electronic Devices and Circuits – David A. Bell – Oxford University

References:

1. Semiconductor Physics and Devices – Basic Principles – Donald Neamen – McGraw Hill
2. Physics of Semiconductor Devices - S.M. Sze, Kwok K. Ng - John Wiley & Sons
3. Electronic Devices and Circuit Theory - R. Boylestad, L Nashelsky - Pearson

Online References:

Sr. No.	Website Name
1.	https://archive.nptel.ac.in/courses/108/108/108108122/
2.	https://onlinecourses.nptel.ac.in/noc22_ee97/preview
3.	https://www.optima.ufam.edu.br/SemPhys/Downloads/Neamen.pdf

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					
		L	T	P	L	T	P	SL	Notional Learning Hour	Total Credits (C) Notional Learning Hour/30
14121103	Basic Electrical and Electronics Engineering	3		--	45	-	--	45	90	3

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
14121103	Basic Electrical and Electronics Engineering	20	20	40	60	2.5	--	--	100

Rationale: This course provides foundational knowledge of electrical and electronic principles essential for all engineering disciplines. It covers basic circuit theory, electrical machines, and electronic components like diodes, transistors. Understanding these fundamentals enables students to analyze and troubleshoot simple electrical systems and prepares them for advanced topics in automation, communication, and embedded systems. The course supports interdisciplinary learning and develops essential problem-solving skills for real-world engineering applications.

Course Objectives:

1. To enable students to **understand** the fundamental concepts of direct current (DC) circuits,

including Ohm's Law, Kirchhoff's Laws, and basic circuit components, and apply them to analyze and solve simple electrical networks.

2. To enable students to **explore** the principles of alternating current (AC) in single-phase and three-phase circuits, including the concepts of RMS value, power factor, and power measurement.
3. To enable students to **identify** the construction, working principle, and applications of a single-phase transformer, along with its efficiency
4. To enable students to **relate** the principles of electromagnetic induction to the operation of various electrical machines like DC machines, induction motors
5. To enable students to **promote** understanding of the working principles and applications of semiconductor devices like diodes and transistors, and their role in amplifier circuits.
6. To enable students to **encourage** to understand the basics of digital systems, including number systems and logic gates, to build a strong foundation in digital electronics

Course Outcomes:

1. **Apply** Ohm's Law, Kirchhoff's Laws, and network theorems like Thevenin's, Norton's, and Superposition to analyze DC circuits in electronic systems
2. **Analyze** single and three-phase AC circuits using phasor diagrams, impedance, and power factor to evaluate voltage, current, and power in various configurations.
3. **Explain** the construction, working principle, and equivalent circuit of a single-phase transformer, including its performance parameters such as efficiency
4. **Illustrate** the construction, working principles, and applications of basic electrical machines such as DC machines and AC motors.
5. **Evaluate** the characteristics and applications of semiconductor devices such as PN junction diode, Zener diode, and BJT in electronic circuits.
6. **Demonstrate** the operation of basic digital circuits using logic gates, Boolean algebra.

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
	Prerequisite	Resistance, inductance, capacitance, series and parallel connection of resistance, concept of voltage, current, power and energy and its units, magnetic circuit, mmf, magnetic field strength, reluctance.		

1	DC Circuits	D.C. circuits and network simplification: series and parallel circuits, Kirchhoff's laws, mesh and nodal analysis. star-delta transformation, Mesh and Nodal Analysis, Source transformation Superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem	14	CO1
		Self-Learning: Basic electrical quantities: voltage, current, resistance, and power. Ohm's Law, Kirchhoff's laws, and sign conventions Algebra and solving linear equations, basic network terms (node, branch, loop)	14	
2	AC circuits (Single phase and Three Phase system)	Generation of alternating voltage & current (AC), fundamentals of AC - waveforms, Phasor representation of AC quantities, definitions of time period, amplitude, frequency, phase, RMS value and average value, Peak factor and Form Factor. R, L, C in AC circuits, Series RL, RC and RLC circuits- phase difference and power factor, phasor diagram, series-parallel circuits, active, reactive, apparent power, series resonance. Generation of three-phase voltages, voltage & current relationships in star and delta connections.	16	CO2
		Self-Learning: **AC Waveforms & Parameters** – Sine wave, frequency, time period, amplitude **Phasor Representation** – Vector form of AC quantities **RMS & Average Values** – Definitions, formulas, practical significance	16	

		Peak Factor & Form Factor – Understanding waveform shapes		
3	Single Phase Transformers	Working principle of single-phase transformer, emf equation of a transformer, transformer losses, actual (practical) and ideal transformer, overview of efficiency	03	CO3
		Self-Learning: Working principle and EMF equation of a transformer Transformer losses: core and copper losses Ideal vs. practical transformer. Transformer efficiency and load conditions. Role of transformers in power systems.	03	
4	Electrical Machines	Construction, principle of operation, classification of DC machines, applications of DC generator, DC motor, equation of generated emf/back emf Fundamental principles of rotating machines, construction, working principle and applications of stepper and servo motor	03	CO4
		Self-Learning : Construction, operation, and classification of DC machines EMF and back emf equations in DC machines Basics of rotating machines Stepper and servo motors: construction, working, applications	03	
5	Semiconductor Devices	Semiconductor Basics, Construction, operation and characteristics of PN junction diode, zener diode and bipolar junction transistor.	04	CO5
		Self-Learning	04	

		Semiconductor fundamentals: types and properties PN junction diode: construction, operation, and I-V characteristics Zener diode: construction, operation, and voltage regulation Bipolar Junction Transistor (BJT): structure, working, and characteristics		
6	Fundamentals of digital circuits	Number System: Binary, octal, decimal, hexadecimal, their conversion, and arithmetic (binary addition, subtraction using 1's & 2's complement) Logic Gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR universal gates. Boolean algebra, DE Morgan's theorem	05	CO6
		Self-Learning: Number systems and conversions Binary addition and subtraction (1's & 2's complement) Boolean algebra basics	05	
	Total		90	

Text Books:

1. B. L. Theraja – Textbook of Electrical Technology, Prentice Hall of India (PHI)
2. B.R Patil – Basic Electrical Engineering, Oxford Higher Education
3. V. N. Mittal and Arvind Mittal – Basic Electrical Engineering, Tata McGraw Hill
4. V. K. Mehta – Principles of Electronics, S. Chand Publishing, New Delhi 7
5. R. S. Sedha – A Textbook of Applied Electronics, S. Chand Publishing, New Delhi
6. Digital Fundamental, 8th edition, Floyd and Jain, Pearson Education India, 2005
7. Electric Motors and Drives Fundamentals, Types and Applications, 3 rd Edition, Austin Hughes, Newnes Publisher.

References:

1. Introduction to Electrical Engineering, M. Naidu, S. Kamakshaiah, McGraw-Hill Education, 2004
2. S. N. Singh, "Basic Electrical Engineering" PHI, 2011

3. Electrical and Electronic Technology, 10th edition Edward Hughes, Pearson Education.

Online References:

Sr. No.	Website Name
1.	https://nptel.ac.in/courses/108108076
2.	https://www.nesoacademy.org/ec/04-analog-electronics/02-semiconductor-diode/01-pn-junction-diode-no-applied-bias
3.	https://onlinecourses.nptel.ac.in/noc21_ee55/preview
4.	https://onlinecourses.nptel.ac.in/noc20_ee60/preview
5.	https://archive.nptel.ac.in/courses/108/105/108105113/

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14121104	Engineering Graphics & Design	2	-	-	30	-	-	-	30	2

Course Code	Course Name	Theory					Term work	Prac / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
14121104	Engineering Graphics & Design	20	20	40	60	2.5	--	--	100

Rationale:

Engineering Graphics develops spatial visualization and technical drawing skills essential for modern computing applications. It bridges the gap between digital systems and the physical world, supporting areas like embedded systems, IoT, and robotics. The course enhances understanding of 3D modeling, essential for AR/VR, digital twins, and simulation-based tools. It prepares students to work effectively in interdisciplinary teams involving hardware-software integration. Concepts like projections and solid modeling are foundational for CAD software, PCB design, and interface development. It supports UI/UX development for 3D applications, gaming, and visualization platforms. Engineering graphics aids in documenting and communicating design ideas clearly and accurately. Overall, it fosters analytical thinking and design communication, crucial for innovation in intelligent computing systems.

Course Objectives

1	To impart and inculcate proper understanding of the theory of projection.
2	To impart the knowledge to read and interpret a drawing.
3	To improve the visualization skill.
4	To enable students to represent three-dimensional objects on a two-dimensional surface in a way that accurately conveys their shape, size, and orientation.
5	To acquaint students with representing internal features of a three-dimensional object by way of section that accurately conveys their internal orientation.

Course Outcomes

1	Apply basic concepts of geometrical constructions to create engineering curves.
2	Apply the basic principles of projections in Projection of Lines and Planes
3	Apply the basic principles of projections in Projection of Solids.
4	Apply the basic principles of sectional views in Section of solids.
5	Apply the basic principles of projections in converting pictorial views into orthographic Views.
6	Apply the basic principles of projections in converting orthographic views into isometric drawing.

Detailed Syllabus

Module no.	Module Name	Detailed content	Teaching hours	CO
	Prerequisite	To draw basic geometric shapes like circle, pentagon, hexagon, and square with different orientation. Divide a line, circle, etc. into equal number of parts.	01	
1	**Introduction to Engineering Drawing and Engineering curves**	**1.1** Introduction to Engineering Graphics and its significance in the Engineering domain. **1.2** Types of Lines, Dimensioning Systems as per IS conventions. **1.3 Engineering Curves**: Basic construction of Conics, Cycloid, Involutes and Helix (cylinder only). **Self-learning topic:** - Explore the concepts of eccentricity, focus, vertex, axis, directrix	03 03	CO 1

		- Explore other conics - ellipse, parabola and hyperbola using directrix-focus method		
2	**Projections of Points, Lines and Planes**	**2.1 Projections of points** in all four quadrants as well as lying on the planes. **2.2 Projections of lines** inclined to both the reference planes (Excluding Traces of lines). Simple application-based problems on projection of lines. **2.3 Projection of planes** (only standard geometrical shapes like square, triangle, pentagon, circle, etc.) inclined to one of the reference planes only. **Self-learning topic:** - Explore the projection of lines for mixed quadrants - Explore the projection of planes for planes inclined to both the reference planes	05 05	CO 2
3	**Projections of Solids**	**3.1** Projections of solids with the axis inclined to one reference plane include prism and cylinder **3.2** Projections of solids with the axis inclined to both reference planes include pyramid, and cone (Use change of position or Auxiliary plane method) **Self-learning topic:** - Explore the cuboid and tetrahedron solids inclined to one or both the reference planes. - Explore the applications of solid projection in machine components, structure, and packaging and manufacturing.	06 06	CO 3
4	**Sections of Solids and Development of Surfaces**	**Sections of Solids** Sections of Prism, Pyramid, Cylinder, & Cone cut by plane perpendicular to only one reference plane. Use change of position or Auxiliary plane method. **Self-learning topics:** - Explore the development of lateral surface for regular solids - Prism, Pyramid, Cylinder, & Cone - Explore the real-life application of solids cut with section planes inclined to one plane.	04 04	CO 4
5	**Orthographic and Sectional Orthographic Projections**	Fundamental concepts of orthographic and sectional orthographic projections like Positioning of quadrants, observer, horizontal, vertical and profile plane, symbol etc., Different orthographic views, First and Third angle method of projection, different section (cutting) plane, its		CO 5

		representation, importance of sectional views, rib and web in section. Views of simple machine parts as per the first angle projection method recommended by I.S. for Orthographic and Sectional Orthographic projection **Self-learning topics:** - Explore the third angle method of projection for orthographic views. - Explore half sectional and offset sectional views - Practice simple machine components with half section and offset section	06 06	
6	**Isometric Views**	Introduction to isometric projections and Fundamental concepts of Isometric projection - isometric and non-isometric lines, axes, and planes. Concept of isometric scale. Difference between isometric projection and isometric views. Conversion of orthographic views to isometric views **Self-learning topics:** - Explore the concepts of isometric scale and isometric projection - Practice isometric projection of simple objects using isometric scale - Explore the isometric views and projections of holes and slots on an inclined plane	05 05	CO 6

Text Books:

1. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt.
Ltd.
2. N.D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd.

References:

1. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publisher.
2. Prof. Sham Tickoo (Purdue University) & Gaurav Verma, "(CAD Soft Technologies).
3. Auto CAD 2012 (For engineers and Designers)", Dreamtech Press New Delhi.
4. Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill.

Online References:

Sr. No.	Website Name
1	https://archive.nptel.ac.in/courses/112/105/112105294/
2	https://nptel.ac.in/courses/112103019
3	https://archive.nptel.ac.in/courses/112/102/112102304/

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30)
		L	T	P	L	T	P	SL	Notional Learning Hour	
14121105	C and C++ Programming	3	--	--	45	--	--	45	90	3

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Prac / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration in Hrs.			
		IAT -1	IAT-2	Total					
14121105	C and C++ Programming	20	20	40	60	2.5	--	--	100

Rationale:

The C and C++ Programming course serves as a foundational pillar for first-year engineering students across all branches by developing essential problem-solving and programming skills. It introduces students to both structured and object-oriented programming paradigms, fostering logical thinking and algorithmic design. As C is widely used in system-level programming and C++ forms the basis for modern software development, this course ensures students gain proficiency in writing efficient, modular, and scalable code. Its relevance spans all engineering disciplines, supporting applications in simulation, automation, modeling, and control systems. By laying the groundwork for advanced subjects like data structures, algorithms, and embedded systems, the course prepares students for future academic and professional challenges in an increasingly digital and automated world.

Course Objectives:

1 **To introduce** the fundamentals of programming using C and C++, focusing on syntax, semantics, and program structure for developing simple, efficient solutions.

2 **To develop** the ability to apply control structures, functions, arrays, and strings in solving computational and real-world engineering problems.

3 **To enable** students to understand and implement user-defined data types such as structures, unions, and enumerations for effective data management.

4 **To build** foundational knowledge of pointers, memory management, and file handling to facilitate low-level programming and system-level applications.

5 **To provide** a conceptual and practical understanding of object-oriented programming features in C++, including classes, objects, inheritance, polymorphism, and abstraction.

6 **To prepare** students for advanced computing courses by enhancing their analytical thinking, debugging skills, and ability to write modular, maintainable, and reusable code.

Course Outcomes:

Upon successful completion of the course, the learner will be able to:

1. **Understand and apply** the basic concepts of C programming, including algorithm development, structured programming, data types, operators, control structures, and input/output operations, to develop simple programs.

2. **Apply and analyze** the concepts of functions, arrays, and strings in C to solve computational problems using modular and structured programming techniques.

3. **Apply and analyze** the use of pointers, structures, and file handling techniques to manage memory efficiently and perform structured data operations in C programming.

4. **Understand and apply** the fundamental concepts of object-oriented programming in C++, including classes, objects, encapsulation, constructors, and member functions to design modular programs.

5. **Analyze and apply** advanced object-oriented programming concepts such as polymorphism, inheritance, virtual functions, and abstraction in C++ to develop flexible and reusable software components.

6. **Understand and evaluate** best programming practices, debugging techniques, and industry standards like MISRA guidelines, and **relate** C/C++ programming to real-world applications and emerging technologies.

Detailed Syllabus:

M. No.	Module Name	Detail Topics	Hours	CO Mapping
0	**Prerequisite**	● Basic familiarity with **fundamental mathematical** and **logical reasoning skills**. ● **Understanding of basic computer operations** – such as using a keyboard, mouse, operating systems, and file handling. ● **Logical thinking and problem-solving ability** – including flowcharting, algorithmic thinking, and basic decision-making. ● **Basic English comprehension skills** – to read and write code, understand syntax, and follow programming logic.	**--**	**--**
1	**Fundamentals of C Programming**	● Introduction to Programming, algorithms and Flowcharts ● Program Development Life Cycle (PDLC) - Structure of a C Program, Compilation, Execution ● Concepts of Structured Programming in C ● Data Types, Program Statements, Token, Identifiers, Keywords, Constants, Assignment, Declaration and Initialization, Variables, Operators and Expressions, Lvalue and Rvalues, ● Input/Output Functions, Type Conversion and Typecasting ● Control Structures: if, else, switch-case, loops (for, while, do-while), break, continue, goto	**8**	**CO1**
		Self-Learning Topics: ● Write-up on history and evolution of programming languages ● Practicing Non-Formatted Input & Output functions – getchar( ), putchar( ), getch( ), getche( ), putch( ), gets( ), puts( ) ● Practicing Formatted Input & Output functions – printf( ) - % Format specifiers, formatting the output, escape sequences, Runtime	**8**	

		adjustment and precision – Input Function scanf() – format specifiers, formatted input. ● Preprocessor Directives in C ● Implement pattern generation programs and logic puzzles ● Research: Role of C in Embedded Systems ● Practicing program development logic using Combines Multiple Control Statements: Number guessing game, ATM simulation program, Login system with 3 attempts limit, **Magic** number finder, Menu-driven bank management functions		
2	**Functions, Arrays, and Strings**	● **Functions:** Prototype Declaration, Definition, Function Calling, Passing Parameters to the Function, Scope of Variables, Call by Value. ● **Storage Classes:** auto, static, register, extern ● Recursive Functions, Recursion Vs Iteration ● **Arrays**: 1D, 2D Arrays – Declaration, Initialization, Accessing Array Elements, Operations on Arrays, Applications ● **Strings**: Declaration, Initialization, String Operations, Array of Strings, String manipulation Functions in string.h	**8**	**CO2**
		Self-Learning Topics: ● Sorting an array, Binary searching ● Declaration and Initialization of a Multidimensional Array ● Matrix addition, multiplication ● Arrays of strings: Two-dimensional character array ● Passing Arrays to Functions ● Character manipulation in the String using character functions in <ctype.h> ● Implement recursive solutions (e.g., Fibonacci, Tower of Hanoi) ● Comparison of recursion and iteration (mini presentation)	**8**	

		• Industry application: Use of arrays/strings in data processing		
3	**Pointers, and Structures**	• **Pointers:** Basics, address operator (&), Declaring & initializing Pointer Variables, Indirection Operator and Dereferencing, Pointer Expressions and Pointer Arithmetic, Types of Pointers, Pointer to Pointers, Pointers and Arrays, Call. by value vs Call by address. • **Dynamic Memory Allocation** (malloc, calloc, realloc, free) • **Structures and Unions**, Declaring Structures and Structure Variables, Accessing the members of a structure, Initialization of Structures, typedef, Nested Structures, Arrays of Structures,	**7**	**CO3**
		Self-Learning Topics: • Call by address using pointers, returning more than one value from a function, returning pointer from a function, structures and pointers, passing structure to function • Structure versus Union, Enumeration types • Processing binary files • Write mini programs for file encryption/decryption • Technical write-up: Memory leaks and how to avoid them • Tools: Memory debugging using Valgrind (demonstration/presentation)	**7**	
4	**Introduction to Object-Oriented Programming (C++)**	• Differences between Procedural and Object-Oriented Programming • Introduction to C++, Structure of a C++ Program • Classes and Objects, Standard input and output stream objects, Access Specifiers, Data hiding and Encapsulation, Array of Objects • Constructors and Destructors • Friend Functions, Inline Functions	**7**	**CO4**
		Self-Learning Topics: • Explore syntax differences between C and C++	**7**	

		• Implement class-based programs (Employee Management System, Account Management banking system, Addition of Complex Numbers, student management) • Defining the member functions outside the class • Research: Applications of OOP in industry tools (e.g., game development, simulations)		
5	**Advanced OOP Concepts (C++)**	• **Inheritance:** Creating a Parent-Child relationship between Classes, Types of Inheritance, Implementing Multilevel and Hybrid Inheritance • **Polymorphism:** Introduction of Polymorphism, Types of Polymorphism, **Compile time Polymorphism:** Function overloading, operator overloading, Rules for operator overloading, **Run time polymorphism:** Virtual functions, rules for virtual functions, pure virtual function.	**8**	**CO5**
		Self-Learning Topics: • Working of Constructors with Multiple Inheritance Creating a "String" data type – An example using Operator and function overloading • Create inheritance-based applications (e.g., employee hierarchy system) • Mini project proposal based on OOP concepts • Read and summarize advanced topics like Templates or Exception Handling	**8**	
6	**Industry Applications and Programming Practices**	• Best Practices in Programming: Modularization, Comments, Code Reusability • Debugging Techniques, Error Handling • Applications in Embedded & Real-Time Systems • Introduction to Competitive Programming – Objectives, how it works, Benefits, platforms • Overview of Software Development Life Cycle (SDLC) • MISRA C and MISRA C++ Safe Coding Rules • Role of C/C++ in current technologies (AI, IoT, Game Development, System Software)	**7**	**CO6**

		Self-Learning Topics: ● Research paper or technical write-up on advanced use of C/C++ (e.g., real-time systems, kernel dev) ● Online platform practice (e.g., HackerRank, Codeforces, CodeChef, etc.) ● Seminar/presentation on any emerging tech using C/C++	7	

Text Books

1. "Programming in C", by Pradeep Dey and Manas Ghosh, Oxford University Press.
2. “Object Oriented Programming with C++” by E. Balagurusamy, McGraw Hill Education**.**
3. "Basics of Computer Science", by Behrouz Forouzan, Cengage Learning.
4. "Programming Techniques through C", by M. G. Venkateshmurthy, Pearson Publications.
5. "Programming in ANSI C", by E. Balagurusamy, Tata McGraw-Hill Education.
6. "Let Us C", by Yashavant Kanetkar, BPB Publications.

Reference Books

1. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie,Prentice Hall.
2. “Programming: Principles and Practice Using C++” by Bjarne Stroustrup, Addison-Wesley
3. "C Programming: A Modern Approach" by K. N. King, W. W. Norton & Company.
4. "C Primer Plus" by Stephen Prata, Addison-Wesley Professional.
5. "Programming in C" by Stephen G. Kochan, Addison-Wesley Professional

Online Resources:

Sr. No.	Website Name
1	Learn C - This website offers a free, interactive tutorial to learn C programming, covering both basic and advanced topics.
2	Codecademy - Codecademy provides a comprehensive, interactive course for learning C, complete with real-world projects and skill paths.
3	Coursera - Coursera, in collaboration with Duke University, offers a specialization in C programming, including hands-on projects and a certificate upon completion.
4	edX - This course, offered by edX, covers C programming with a focus on Linux, including professional certification.

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14112106	Basics of Semiconductor Physics Lab	--	--	1	--	--	15	--	15	0.5

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical / Oral	Total
		Internal assessment			End Sem. Exam			
		IAT-1	IAT-2	Total				
14112106	Basics of Semiconductor Physics Lab	--	--	--	--	25	-	25

Lab Objectives:

1. To develop scientific understanding of the physics concepts.
2. To develop the ability to explain the processes and applications related to science subjects.
3. To apply skills and knowledge in real life situations.
4. To improve the knowledge about the theory concepts of Physics learned in the class.
5. To improve ability to analyze experimental result and write laboratory report.
6. To develop understanding about inferring and predicting.

Lab Outcomes:

Learners will be able to.

1. Understand the concepts of Hall effect.
2. Experimentally obtain I-V Characteristics of various junction diodes.
3. Experimentally obtain I-V Characteristics of transistors in various configurations.
4. Experimentally obtain I-V Characteristics of FET in configurations

5. Experimentally obtain I-V characteristics of special purpose diodes.
6. Use virtual lab effectively to perform experiments

List of Experiments. (Minimum five experiments required)

Sr No	List of Experiments	Hrs	LO
01	Measurement of Hall Voltage	01	LO1
02	Input – output characteristics of CE configuration	01	LO3
03	Input – output characteristics of CB configuration	01	LO3
04	I-V Characteristics of p-n junction diode	01	LO2
05	I-V Characteristics of Zener diode	01	LO5
06	I-V Characteristics of photo diode	01	LO5
07	Carrier concentration using Hall Effect	01	LO1
08	I-V characteristics of JFET	01	LO4
09	Carrier concentration using Hall Effect	01	LO1
10	Simulation experiments based on nanotechnology using open-source simulation	02	LO6
11	Any other experiment based on syllabus may be included, which would help the learner to understand concept, after defining a suitable LO	02	LO6

Text Books and References:

1. **C.L. Arora**, *B.Sc. Practical Physics*, S. Chand Publications
2. **M.N. Avadhanulu & P.G. Kshirsagar**, *A Textbook of Engineering Physics (Practical)*, S. Chand Publications
3. **A.K. Sawhney**, *Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai & Co
4. **S. Chattopadhyay, D. Rakshit**, *Practical Physics*, New Central Book Agency
5. **S. Salivahanan**, *Laboratory Manual for Electronic Devices and Circuits*, McGraw Hill Education

Online Resources:

Sr. No.	Website Name
1.	https://mpv-au.vlabs.ac.in/modern-physics/Hall_Effect_Experiment/
2.	https://www.electronics-tutorials.ws/diode/diode_2.html

3.	https://mevlsi-iitkgp.vlabs.ac.in/exp/n-channel-jfet/theory.html
4.	https://www.vlab.co.in/
5.	https://virtual-labs.github.io/exp-hall-effect-nitk/simulation.html
6.	https://www.youtube.com/watch?v=pxdHnXV0kWc

Assessment:

Term Work Marks: 25 Marks (Total marks) = 10 Marks (Experiment) + 10 Marks Project + 5 Marks (Attendance)

Project work: The project is to be completed within one semester. Students must execute the project as per the plan submitted at the beginning of the semester. The project outcome can be a working model, a simulation model, or a study report leading to the anticipated conclusion. Evaluation will be based on the quality of work and adherence to the submitted plan. A proper assessment rubric will be used for awarding marks.

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14122107	Basic Electrical and Electronics Engineering Lab	-	-	2	-	-	30	-	30	1

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT - 1	IAT-2	Total.					
14122107	Basic Electrical and Electronics Engineering Lab	-	-	-	-	-	25	25	50

Pre-requisite: Fundamentals of Physics and Mathematics
Lab Objectives:

Lab course aims to

1. To impart the basic concept of network analysis and its application
2. To provide the basic concept of AC circuit analysis and its application
3. To illustrate the operation of the transformer and machines
4. To demonstrate the behavior and application of special purpose diodes and transistors.
5. To implement and analyze transistor configuration
6. To introduce logic gates

Lab Outcomes:

1. Apply and experimentally verify various network theorems in DC circuits to analyze and simplify electrical networks.
2. Perform experiments on AC circuits to evaluate power factor and analyze phase relationships between voltage and current.
3. Demonstrate transformer operation and identify practical applications
4. Illustrate the performance and applications of motors in automation and peripheral devices.
5. Implement and analyze diode behavior.
6. Demonstrate basic logic gates and implement them using universal gates.

DETAILED SYLLABUS

Sr. No.	List of Experiments	Hours	LO Mapping
Prerequisite	**Fundamental Mathematics and Physics**		
1	Introduction to Laboratory Safety and Usage of Electrical Measuring Instruments	2	LO1
2	Verification of Mesh and Nodal analysis.	2	LO1
3	To verify the equivalence between Star and Delta networks.	2	LO1
4	Verification of DC network Theorems (Superposition. Norton's and Thevenin's)	2	LO1
5	To verify the equivalence of a Voltage Source in series with resistance and a Current Source in parallel.	2	LO1
6	Measurement of electrical parameters for alternating sinusoidal voltage (AC)	2	LO2
7	To calculate and compare Measurement of Active, Reactive and Apparent Power in AC Circuit	2	LO2

8	Observe three-phase voltage relationships in star and delta connections using simulation tools.	2	LO2
9	To simulate and analyze the performance of single-phase transformer	2	LO3
10	Study of DC machines	2	LO4
11	Forward & reverse bias characteristics of PN junction diode	2	LO5
12	Observe LED behavior and test various LED configurations for digital indicators.	2	LO5
13	Construct a BJT-based switch circuit	2	LO5
14	Study of application of Zener diode as Voltage Regulator	2	LO5
15	To simulate the implementation of Basic logic gates using universal gates	2	LO6

Online Resources:

Sr. No.	Website Name
1.	https://www.allaboutcircuits.com/
2.	https://www.tinkercad.com/
3.	https://www.circuitlab.com/

Sr No	List of Assignments / Tutorials	Hrs
1	Application and Analysis of DC Network Theorems: A Study through Theoretical Concepts and Numerical Problems	2
2	Comparative Analysis of DC Network Theorems and Their Extension to Single and Three-Phase AC Circuits: A Theoretical and Numerical Approach	2
3	Theoretical Understanding of Single-Phase Transformers: Principles, Construction, and Role in Modern Power Systems	2

4	Theoretical Insights into Electrical Machines: Working Principles, Construction, and Applications in Modern Industry	2
5	Industrial Applications of Semiconductor Devices: A Study on Diodes and Transistors in Power and Communication Systems	2
6	Design and Application of Basic Digital Circuits: A Study on Logic Gates, Boolean Algebra, and Real-World Implementations	2
7	Case Study 1: Integrated Power System Design: Analysis of DC and AC Circuits with Single-Phase Transformers and Electrical Machines for Smart Residential Applications	2
8	Case study 2: Application of Semiconductor Devices and Digital Electronics in Industrial Automation and Control of Electrical Machines	2

Assessment:

Term Work: Term Work shall consist of at least 8 to 10 practical's based on the above list. Also, Term work Journal must include at least 2 assignments.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Practical& Oral Exam: An Oral exam will be held based on the above syllabus.

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14122108	Engineering Graphics & Design Lab	-	-	2	-	-	30	-	30	1

Course Code	Course Name	Theory					Term work	Pract /Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
14122108	Engineering Graphics & Design Lab	--	--	--	--	--	25	25	50

Lab Objectives:

1 To impart and inculcate proper understanding of the theory of projection.

2 To impart the knowledge to read and interpret a drawing.

3 To improve the visualization skill.

4 To enable students to represent three-dimensional objects on a two-dimensional surface in a way that accurately conveys their shape, size, and orientation.

5 To acquaint students with representing internal features of a three-dimensional object by way of section that accurately conveys their internal orientation.

6 To impart basic AutoCAD skills.

Lab Outcomes:

1	Apply the concepts of Draw, Modify and basic concepts of ACAD to draw basic geometries and diagrams of simple engineering parts.
2	Apply the concepts of layers, and dimensions to create engineering drawing for a part drawing.
3	Create, Annotate, Edit and Plot drawings using basic AutoCAD commands and features.
4	Apply the basic principles of projections in 2D drawings using a CAD software.
5	Apply basic AutoCAD skills to draw different views of a 3D object.
6	Apply basic AutoCAD skills to draw the isometric view from the given two views.

List of Experiments:

Component: 01 – ACAD Print outs (activities to be completed in the CAD Laboratory - All printouts to be the part of Term Work.)

Sr. No.	List of Experiments	Hrs	CO mapping
1	Redrawing simple machine parts as given (05 problems)	04	CO1, CO2, and CO3
2	Orthographic projections (with and without section) (05 problems)	04	CO4 and CO5
3	Isometric Drawing – 3 problems.	04	CO6

Component: 02 – Drawing Sheets

01	Two problems on Engineering Curves	02	CO1
02	Two problems each on Projection of Lines and Planes	02	CO2
03	Two problems on Projection of Solids	02	CO3
04	Two problems on Section of Solids with DLS	02	CO4
05	Two problems each on Orthographic and Sectional Orthographic projection	02	CO5
06	Two problems on Isometric projection	02	CO6

Component: 03 – A3 size Sketch book

Sr No	List of Assignments / Tutorials	Hrs	CO mapping
01	Engineering Curves. (2 problems)	01	CO1
02	Projection of Lines and Planes (2 problems each)	02	CO2
03	Projection of solids. (2 problems)	02	CO3
04	Section of solids (2 problems)	02	CO4
05	Sectional Orthographic and Orthographic Projections (2 problems each)	04	CO5
06	Isometric Drawing. (3 problems)	03	CO6

Assessment:

Term Work: Term Work shall consist of at least 06 practicals based on the above list. Also, Term work Journal must include all the assignments listed above.

Term Work Marks: 25 Marks (Total marks) = 10 Marks (Drawing sheets and ACAD printouts) + 10 Marks (Assignments) + 5 Marks (Attendance)

Practical& Oral Exam: Practical exam on ACAD will be held based on the above syllabus.

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					
		L	T	P	L	T	P	SL	Notional Learning Hour	Total Credits (C) (Notional Learning Hour/30)
14122109	C and C++ Programming Lab	--	--	2	--	--	30	--	30	1

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical/ Oral	Total
		Internal assessment			End Sem. Exam			
		IAT-1	IAT-2	Total				
14122109	C and C++ Programming Lab	--	--	--	--	25	25	50

Lab Objectives:

1. To introduce students to the fundamental programming constructs of C and provide hands-on experience with writing, compiling, debugging, and executing simple programs using an IDE.
2. To enable students to develop modular and efficient C programs by exploring functions, recursion, and arrays, enhancing their understanding of data management.
3. To familiarize students with advanced C programming concepts such as structures, pointers, dynamic memory allocation, for effective data storage and manipulation.
4. To provide comprehensive exposure to object-oriented programming in C++ focusing on classes, objects, constructors, destructors.
5. To deepen understanding of advanced object-oriented concepts in C++ including inheritance, polymorphism, virtual functions, and abstract classes for designing flexible

software solutions.

6. To guide students in designing and implementing an object-oriented system in C++ that integrates key programming concepts for practical application.

Lab Outcomes: At the end of the course, the student will be able to

1. **Analyze and apply** fundamental programming constructs in C using Code::Blocks IDE to develop, compile, debug, and execute programs that implement input/output operations, operators, and control flow structures such as branching, looping, and nested decisions.
2. **Apply and evaluate** the use of functions, recursion, and arrays (including strings) in C programming to design modular and efficient programs that demonstrate data management and manipulation.
3. **Analyze and implement** advanced C programming concepts including structures, pointers with dynamic memory allocation, manage complex data efficiently in real-world applications.
4. **Apply and analyze** core object-oriented programming concepts in C++ including classes, objects, constructors/destructors, and implement polymorphism to develop reusable and efficient code.
5. **Analyze and implement** advanced object-oriented programming concepts in C++ including various inheritance types, virtual functions for runtime polymorphism, and abstract classes with pure virtual functions to create flexible and extensible software designs.
6. **Design, implement, and evaluate** a C++ object-oriented program that models an object-oriented system by applying advanced concepts for efficient data handling and processing.

Suggested list of Experiments:

Sr No	List of Experiments	Hrs.
01	To understand the structure and features of the Code: Blocks Integrated Development Environment (IDE) and to use it effectively for writing, compiling, debugging, and executing C and C++ programs, which will serve as the foundational tool for all further experiments in the lab.	2
02	a) Program to demonstrate operations of Data Input and Output – getchar( ), putchar( ), scanf( ), printf( ), gets( ), puts( ) b) Program to demonstrate Operators-Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise, Comma, other operators.	2
03	Program to demonstrate Branching - If statement, If-else Statement, Multiway decision.	2
04	Program to demonstrate Nested control structure- Switch statement, Continue statement, Break statement, goto statement	2
05	Program to demonstrate Looping – for and nested for loop	2
06	Program to demonstrate Looping – while, do-while	2

07	a) Implement an iterative function for factorial/ Fibonacci etc. b) Implement a recursive function for factorial/ Fibonacci etc.	2
08	Program to demonstrate Array 1D	2
09	Program to demonstrate Array 2D	2
10	Program to demonstrate String and arrays of string.	2
11	Program to demonstrate Structure: Write a program to store and display information of a student/employee etc. using structures a) Define a structure, b) Read and store details, c) Display the stored information.	2
12	Program to demonstrate call by value and call by reference.	2
13	Program to demonstrate the use of classes and objects, constructors and destructors in C++	2
14	Program to demonstrate Single, multilevel, and hybrid inheritance using classes	2
15	Create a system that stores and displays student records including name, roll number, marks for 3 subjects, and computes total marks, average, and grade. Implement the following: 1. A base class Person with attributes: name, roll_no 2. A derived class Student with: Subject marks (e.g., marks[3]) 3. Member functions to input and display data 4. Functions to calculate total, average, and assign grade 5. Use constructors for initialization and destructors to display a message upon object destruction. 6. Use function overloading for displaying summary (e.g., detailed vs short view). 7. Implement operator overloading (e.g., == to compare two students by roll number or marks). 8. Use virtual function in a base class ResultCalculator and override in Student class. 9. Use an array of objects to manage multiple student records.	2

Sr No	List of Assignments / Tutorials	Hrs
01	Flowcharts for programs, input/output operations, operators, and control flow structures such as branching, looping, and nested decisions	2
02	Use of functions, recursion, storage classes, and arrays (including strings) in C programming	2
03	Structures, pointers with dynamic memory allocation, and file handling	2

04	Core object-oriented programming concepts in C++	2
05	Advanced object-oriented programming concepts in C++ including various inheritance types, virtual functions for runtime polymorphism, and abstract classes with pure virtual functions	2
06	C++ object-oriented program that models an object-oriented system by applying advanced concepts for efficient data handling and processing	2

Text Books

1. "Programming in C", by Pradeep Dey and Manas Ghosh, Oxford University Press.
2. “Object Oriented Programming with C++” by E. Balagurusamy, McGraw Hill Education**.**
3. "Basics of Computer Science", by Behrouz Forouzan, Cengage Learning.
4. "Programming Techniques through C", by M. G. Venkateshmurthy, Pearson Publications.
5. "Programming in ANSI C", by E. Balagurusamy, Tata McGraw-Hill Education.
6. "Let Us C", by Yashavant Kanetkar, BPB Publications.

Reference Books

1. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie,Prentice Hall.
2. “Programming: Principles and Practice Using C++” by Bjarne Stroustrup, Addison-Wesley
3. "C Programming: A Modern Approach" by K. N. King, W. W. Norton & Company.
4. "C Primer Plus" by Stephen Prata, Addison-Wesley Professional.
5. "Programming in C" by Stephen G. Kochan, Addison-Wesley Professional

Online Resources:

Sr. No.	Website Name
1	Learn C - This website offers a free, interactive tutorial to learn C programming, covering both basic and advanced topics.
2	Codecademy - Codecademy provides a comprehensive, interactive course for learning C, complete with real-world projects and skill paths.
3	Coursera - Coursera, in collaboration with Duke University, offers a specialization in C programming, including hands-on projects and a certificate upon completion.
4	edX - This course, offered by edX, covers C programming with a focus on Linux, including professional certification.

Assessment:

- **Term Work:** Term Work shall consist of at least 10 to 12 practicals' based on the above list. Also, Term work Journal must include at least 2 assignments.

- **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

- **Practical & Oral Exam:** An Oral & Practical exam will be held based on the above syllabus.

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30)
		L	T	P	L	T	P	SL	Notional Learning Hour	
14122110	IDEA LAB -1 (Innovation Design Engineering and Apply)	**1**	**--**	**2**	**15**	**--**	**30**	**15**	**60**	**2**

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical/ Oral	Total
		Internal assessment			End Sem. Exam			
		IAT-1	IAT-2	Total				
14122110	IDEA LAB -1 (Innovation Design Engineering and Apply)	--	--	--	--	**50**	**50**	**100**

Rationale:

Aligned with the National Education Policy (NEP) 2020, the institution emphasizes experiential, interdisciplinary, and project-based learning through the IDEA Lab—a central hub for hands-on innovation.

To strengthen the undergraduate research ecosystem, the institution has adopted a theme-based academic model aligned with UN SGD. Each semester features six curated problem statements based on local need and aligned with core subjects in the same semester, enabling students to apply

classroom knowledge to real-world challenges. Every student selects one problem and develops an individual, subject-integrated solution—enhancing both academic understanding and research skills.

The IDEA Lab supports this initiative with facilities for design thinking, prototyping, and product development. Students maintain a project logbook throughout the semester to track their progress and reflections.

To ensure academic accountability, a two-tier assessment framework is implemented:

- Project Assessment based on standardized IDEA Lab rubrics.
- Subject-Based Term Work Assessment focused on the application of same-semester subject knowledge in the project.

Lab Objectives:

1. To promote experiential and project-based learning that bridges theoretical knowledge with real-world problem-solving.
2. To encourage interdisciplinary integration by enabling students to apply concepts from multiple subjects within a single cohesive project.
3. To develop innovation and design thinking skills through hands-on activities and iterative solution development.
4. To foster critical thinking and creativity by engaging students in open-ended problems with multiple solution pathways.
5. To enhance communication, collaboration, and documentation skills essential for professional engineering practice.
6. To build an entrepreneurial and research mindset by guiding students to develop scalable, socially-relevant, and technically viable prototype

Lab Outcomes: Student will be able to

1. Recall and articulate key concepts from core and allied subjects relevant to the assigned project.
2. Explain the interdisciplinary nature of the problem and the role of each subject in addressing it.
3. Apply appropriate tools, techniques, and theoretical knowledge to develop project components.
4. Analyze problem constraints and user requirements to structure a feasible and efficient solution.

5. Evaluate multiple design options and justify the chosen solution based on technical and practical considerations.
6. Create a functional prototype or solution that demonstrates innovation, utility, and integration of interdisciplinary knowledge

1) Guidelines for IDEA Project

a) Project Guidelines (Interdisciplinary Project Execution in IDEA Lab)

- Each student works on an individual interdisciplinary project aligned with the semester theme.
- Faculty in-charges for the IDEA Lab are assigned according to the complexity of the project and the capacity of the respective departments.
- Faculty in-charges mentor both the academic and technical aspects, and track weekly progress.
- Project assessment will be rubric-based, ensuring depth, innovation, documentation, and ownership.
- Students shall convert the best solution into working model using various components of their domain areas and demonstrate.
- Faculty in-charges must attend relevant FDPs to ensure uniformity in mentoring and evaluation.

b) Guidelines for same semester Subject Concepts Applied within the Project

- Term work for each subject will partially reflect how well a student applies subject-specific concepts in their interdisciplinary project.
- Internal assessment panel will collaborate to align project components with subject learning outcomes.

c) Role of Faculty In-Charges in IDEA Lab Projects

Faculty in-charges play a pivotal role in the success of interdisciplinary, theme-based projects under the IDEA Lab. Their responsibilities extend beyond technical supervision to include academic alignment, innovation facilitation, and active student engagement. Their key roles include:

1. **Motivating and Inspiring Students**

- Encourage students to take ownership of their learning and projects.
- Cultivate a mindset of curiosity, exploration, and social relevance.
- Foster an environment where students feel empowered to take creative risks.

2. **Conducting Brainstorming and Ideation Sessions**
   - Organize structured brainstorming sessions at the start of the semester to help students define their problem statements and solution pathways.
   - Promote collaborative thinking, design exploration, and interdisciplinary integration.
3. **Arranging Guest Lectures and Expert Talks**
   - Identify and invite industry experts, researchers, and innovators for guest lectures aligned with the semester's theme or subject areas.
   - Facilitate exposure to real-world challenges, current trends, and future opportunities.
4. **Ensuring Uniqueness and Originality of Projects**
   - Actively review proposed ideas to ensure **no duplication of solutions** across students.
   - Encourage students to explore novel approaches, technologies, and perspectives.
5. **Promoting Discussion and Collaborative Learning**
   - Create platforms for students to present, discuss, and receive peer and mentor feedback.
   - Facilitate idea refinement through regular discussions and group engagement.
6. **Aligning Subject Content Beyond Syllabus**
   - Faculty in-charges must **align subject content beyond the syllabus of the same semester** with the **IDEA Lab theme and assigned problem statements**.
   - This ensures relevance, depth, and meaningful interdisciplinary integration.
7. **Same Semester Faculty Requirement**
   - Faculty in-charges must be teaching subjects in the **same semester** as the students' project to ensure seamless academic integration and contextual understanding.
8. **Monitoring and Documentation**
   - Oversee project logbook maintenance, milestone tracking, and submission of progress reports.
   - Provide ongoing feedback and ensure project alignment with learning outcomes.
9. **Coordination with Subject Faculty**
   - Work in collaboration with other subject faculty to help students embed theoretical and practical aspects of their coursework into the project.
   - Facilitate subject-term mapping and contribute to termwork assessment based on evidence.

2) Implementation Strategy

a) Project Implementation in IDEA Lab

Aspect	Implementation Strategy
Faculty in-charges	**Faculty in-charges assigned based on project nature and department capacity.**
Mentoring Role	**Faculty in-charges oversee academic/technical development, interdisciplinary integration, and timely documentation.**
Capacity Building	**Faculty in-charges undergo workshops on design thinking, innovation, assessment rubrics, and outcome-based mentoring.**
Assessment Contribution	**Faculty in-charges contribute to 25 marks allocated for the IDEA Lab project term work. The remaining assessments are conducted by the external examiner.**
Recognition & Incentives	**Faculty in-charges receive workload credits or are formally acknowledged in performance reviews.**

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b) Implementation of Subject-Term Work Mapping within Projects

Aspect	Implementation Strategy
Mapping Subject Outcomes	**Faculty in-charges align their content beyond syllabus with the student's project by coordinating with the assigned project guide.**
Independent Evaluation	**Internal assessment panel evaluate students based on their application of subject-specific concepts within the project. This contributes to a** separate 25 marks allocated for term work based on subject **application.**
Evidence Sources	**Evaluation is supported by project logbooks, subject-specific deliverables (e.g., tools, simulations, models), and review presentation inputs.**
Outcome Assurance	**Ensures practical demonstration of subject understanding and its integration into the interdisciplinary solution.**

Implementation Notes:

- Guide faculty assess their course's contribution using specific evidence such as:
    - Logbooks

- Subject-specific outputs (e.g., simulations, designs)
- Paper publications or review presentations

2) Guidelines for Assessment

Two-tier rubrics are applied independently to evaluate subject concept application and innovation within the project.

a) Assessment of IDEA Lab Projects (Individual Interdisciplinary Projects) (25 Marks)

Presentation-Based Assessment Structure (Total: 25 Marks)

Assessment Month	Weightage	Marks
Month 1 (Formative 1)	20%	5 marks
Month 2 (Formative 2)	40%	10 marks
Month 3 (Formative 3)	40%	10 marks

Rubric-Based Evaluation Criteria

Criteria	Month 1 (5)	Month 2 (10)	Month 3 (10)
Problem Understanding	Connects problem to subjects	Defines interdisciplinary scope	Demonstrates deep conceptual grasp
Subject Knowledge Application	Identifies relevant concepts	Applies principles in design	Integrates multiple subject areas correctly
Innovation & Design Thinking	Proposes creative idea	Develops and tests feasible solution	Final solution shows originality and utility
Documentation & Presentation	Logbook initiated, plan presented	Mid-design log and visuals	Final report and demo completed
Progress & Ownership	Meets deadlines, shows planning	Demonstrates self-motivation	Completes project independently with reflection

b) Term Work Assessment of Subject Concepts Applied in Projects (25 Marks)

Applicable to All Subjects Integrated with Interdisciplinary Projects

To reflect meaningful application of subject knowledge, each subject will be assessed through the following rubric:

Criteria	**Marks**	**Description**
Subject Knowledge Application	8	Depth and accuracy of concept integration into the project
Practical Design or Tool Usage	5	Use of subject-specific hardware/software/simulation/tools
Documentation	4	Quality and clarity of subject-related logs and reports
Viva/Presentation	4	Ability to explain subject's relevance and role in the project
Continuous Engagement	4	Evidence of consistent participation via logbooks and feedback

c) Total Assessment Structure

Component	Marks	Assessed By
Term work – Project Execution	25 Marks	Project Guide
Term work – Application of Subject Concepts	25 Marks	IDEA Lab Panel
Viva Voce (Final Evaluation)	50 Marks	External Examiner

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					
		L	T	P	L	T	P	SL	Notional Learning Hour	Total Credits (C) (Notional Learning Hour/30)
14412111	Workshop-1	--	--	2	--	--	30	15	45	1.5

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical/ Oral	Total
		Internal assessment			End Sem. Exam			
		IAT-1	IAT-2	Total				
14412111	Workshop-1	--	--	--	--	25	—	25

Lab Objectives:

1. To learn the basic concepts in electronic circuits.
2. To learn and perform steps of PCB fabrication.
3. To develop foundational skills in computer hardware assembly.
4. To understand maintenance, troubleshooting, and managing computer networks.
5. To explore and develop proficiency in using Google Workspace tools and to create and publish a functional website using Google Sites.
6. To develop practical skills in using Microsoft Excel and to study and execute AI-powered features in Microsoft Excel.

Lab Outcomes: At the end of the course, the student will be able to

1. Able to understand basic components of electrical components.
2. Able to demonstrate the process of PCB fabrication.
3. Able to assembling and disassembling a personal computer.
4. Able to solve common trouble shooting problem and common hardware issues.
5. Able to navigate and utilize core google workspace and integrate google workspace tools into a google sites.
6. Able to use basic to advance excel function and to use AI-powered features in Excel.

Detailed Syllabus

Sr No	Name of Module	Detailed content	Hours	Lo
1	**Introduction to PCB**	Electronic Components and tools for measuring and debugging electronics circuits. ● Active and Passive components ● Breadboard to built simple circuits. ● Soldering Practices. ● Reading and interpreting circuit diagrams ● Multimeter ● Oscilloscope 8050 and DS0 ● Function generator ● Logic Probe/logic analyzer (demo) PCB Design and fabrication ● Wiring system ● Go-down wiring ● House Wiring ● Staircase wiring ● Introduction To PCB design Software ● Drawing a simple schematic ● PCB layout and routing techniques.	**6** **6**	**LO1, LO2**
		Self- Learning 1. Component Identification and Research (real –life example). 2. Resistor Color Code Practice (learn resistor color code system) 3. Datasheet Study (Download the	**5**	

		datasheet for any 1 component and identify write configuration) 4. Breadboard Familiarization (Watch a tutorial or read a guide on how a breadboard works.)		
2	**Hardware and Networking**	Introduction to Computer Hardware ● Computer Fundamentals Introduction to computers Types of computers Components of computer Input/output devices Storage devices ● Computer Hardware Motherboard architecture Processor types and features RAM types and installation Power supply and units Assembling a computer BIOS/UEFI Configuration Common Troubleshooting issues Installation of LINUX/WIN 11 (DUAL) VM WARE (Installation) Bootable PD (Installation) Google Workspace and Google sites ● Introduction to google Workspace ● Gmail, Email etiquette, labels, filters ● Google Drive: Upload, organize, share ● Google Docs/slides: Collaborate in real time, insert images, comments and tables. ● Google Forms ● Getting Start with Google Sites ● Building basic website ● Creating Multiple pages Microsoft Excel For Engineers and integrate with AI ● Excel interface, data entry, formatting basics ● Formulas and fabrication ● Charts and graphs ● Data sorting and filtering	**6** **4** **4** **4**	**LO3** **LO4** **LO5** **LO6**

		• Getting started with Excel • Data Analysis and visualization • AI in Excel		
		Self-Learning **1.** Study and Report on Motherboard Components and Layout **2.** Create a Maintenance Plan for a Personal Computer **3.** Research BIOS/UEFI Functions and Configuration Options (Provide screenshots and describe real-world use cases. **4.** Design a Small Office/Home Office **5.** Create and Share a Collaborative Google Doc **6.** Organize Files and Folders in Google Drive **7.** Design a Mini-Website for a School Club, Event, or Business Idea	**10**	

Reference Books

1. PCB Design for Beginners by Albert Kelly.
2. Computer Hardware and Networking by Rajiv Chopra.
3. Google Sheets for Beginners: A Practical Guide to Mastering Google Sheets by Nathan George.
4. Google Workspace User Guide by Oliver Kent.

Online Resources

Sr No	Reference
1	https://onlinecourses.swayam2.ac.in/cec25_cs10/preview Computer Fundamentals, By Prof. Sanjay Tanwani.
2	https://onlinecourses.swayam2.ac.in/nou25_cs01/preview -CIT-001: Fundamentals of Computer Systems, By Dr. Mangala Prasad Mishra
3	https://onlinecourses.swayam2.ac.in/aic20_sp59/preview -ESim - EDA tool for circuit design, simulation, analysis and PCB design, By Prof Kannan Moudgalya

4	https://onlinecourses.nptel.ac.in/noc25_ee163/preview -Electronic Systems Design: Hands-on Circuits and PCB Design with CAD, By Prof. Ankur Gupta
5	https://onlinecourses.swayam2.ac.in/imb25_mg206/preview Excel for Finance - From Basics to Advanced, By Dr. Premalatha K P

Suggested list of Experiments:

Sr No	List of Experiments	Hrs.
01	PCB Design and Fabrication.	6
02	Assembling and dissembling of computer. (Demonstration)	2
03	To solve Common Troubleshooting problem solving.	2
04	Installation of LINUX/WIN 11 (DUAL) (Demonstration)	2
05	To create a google form for simple survey or quiz.	2
06	To create grade sheets or expense tracker.	2
07	To build a basic website and make resume and published on site.	2
08	To use excel and ChatGPT/Copilot.	2

Assessment for Term Work (25 marks)

- **Term Work Marks:** 25 Marks (Total marks)
- **Job and Manual**: - 20 Marks
- **Regularity and active involvement: -** 5 Marks

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned					Total Credits (C)
		L	T	P	L	T	P	SL	Notional Learning Hour	(Notional Learning Hour/30
98461112	Universal Human Values	2	-	-	30		-	30	60	2

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
98461112	Universal Human Values	-	-	-	-	-	25	-	25

Rationale: The goal of the education system is to cultivate well-rounded individuals who are capable of rational thinking and action, as well as empathy and compassion. It strives to nurture ethical values and principles, shaping responsible citizens who can contribute to creating an inclusive, equitable, and diverse society, as envisioned by our Constitution. Education should focus not only on intellectual growth but also on developing social, ethical, and emotional intelligence. Ultimately, education is essential for unlocking human potential and fostering a just and fair society. A fair combination of holistic and multidisciplinary education would develop human beings wide intellectual, deep aesthetic, social, physical, emotional, and moral in an integrated manner. UHV courses are intended to help students to develop a holistic, humane world vision for adopting fair technological advancements. The modules structured are to be discussed is universal, rational, and verifiable, hence leads to harmony.

Course Objectives:

1. To develop a holistic perspective based on self-exploration about them (human being),

2. To understand the meaning of harmony in relationship family with reverence and compassion

3. To explore a wide range of social networking ensuring mutual happiness and prosperity

4. To identify the urge to establish global peace and harmony to make the world a better place to live.

5. To understand the threats posed by human activities to biodiversity, and provide solutions

6. To develop understanding in implementing technologies to serve mankind.

Course Outcomes:

After successful completion of the course learner will be able:

1. Identify innate humanistic virtues and abilities as fundamentals to work as an individual.

2. Explore solutions to behavioral conflicts through family, a society in miniature with empathy.

3. Develop understanding to maintain human-human relationship for mutual happiness for building great teams.

4. Adapt for global pursuits in a peaceful co-existence with the entire mankind for global society uplift.

5. Acquire awareness of maintenance and conservation of biodiversity to provide sustainable solutions.

6. Evaluate the knowledge of 'Real Self 'augmenting universal human order to develop holistic technologies and creating congenial work environments.

Prerequisite: There is no prerequisite for this course.

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	There is no prerequisite for this course.		
I	Holistic Growth of Individual	Understanding the Human Being: Body, mind, and self – their roles and needs, Distinction between the self (conscious entity) and the body, Importance of self-reflection and self-awareness Developing clarity about personal goals and values, Emotional intelligence: managing thoughts and feelings. Lifestyle choices that support well-being Integrating knowledge with ethics and values **Self-Learning Topics**: Analyze yourself thoroughly and discover your personality traits: Behavioral, Habitual and Acquired traits and record the significance of the traits in handling diverse situations in your past and present life.	4 4	CO1
II	Self-Harmony & Family Values	Prosperity - a right identification of needs and fulfillment through right means What is *naturally acceptable* (permanent, universal) vs. what is acquired or conditioned. Family - a space for value cultivation and emotional support, Mutual fulfillment addressing Common Family Issues: Balancing individuality and togetherness, Misunderstandings due to Assumptions, Generational gaps and communication barriers. Trust empathy, and open communication in family relationships. Family as a Basic Unit of Society, Joint versus nuclear family structures and their social impact. **Self-learning Topics**: Importance of Respect and. Compassion in families, relations, neighborhood, how family harmony helps to progress and attain a worthy and respectable social and financial status. Togetherness and advancement, Conflict and resolution	4 4	CO2
		Human-Human relationship, Respecting others and their perspectives, Understanding the difference between *intention* and *competence*. Vision of a		

III	Social Equilibrium	universal human order (Sarvabhauma Vyavastha) based on trust and mutual prosperity. Promotion of dialogue, cooperation, and peaceful coexistence. Individuals and groups work together for common goals and shared well-being. Visualizing a universal harmonious order in society- Undivided Society, Universal Order from self to community Mutual Prosperity. Support and empower marginalized communities **Self-Learning Topic:** A positive and unbiased Mediation and dialogue, and its importance Different communities' views for creating better communities & societies. Incidents happening around you which urgently require social equilibrium as a vision.	5 5	CO3
IV	Shared Values of Mankind	Values accepted and upheld by all human beings regardless of background, peaceful coexistence and global harmony. Role in addressing global challenges like conflict, inequality, and environmental crises, Philosophical and spiritual traditions worldwide. Human rights frameworks (e.g., Universal Declaration of Human Rights). Sensitizing individual towards Contemporary World Issues **Self-Learning Topic:** India's relationships with other countries. Promoting peace and harmony hence preventing conflict situations. Conflict situations throughout the world where India as a one who maintained its integrity by following its traditional, philosophical and ethical standard.	6 6	CO4
IV	Human-Nature Relationship	Humans as caretakers of the Earth, not conquerors. Ethical choices like wildlife conservation, habitat preservation, and reducing pollution. Promoting humane treatment in agriculture, research, entertainment, and daily life. Sustainable living: reducing waste, recycling, and using renewable energy. Educating communities about the importance of biodiversity and ecosystem health. **Self-Learning Topics**: Practices adopted in ancient India for preserving the environment, Importance of rivers, trees, water mentioned in Indian	6	CO5

		scriptures and culture. Modern technologies/practices favoring ecosystem preservation. (Past Practices Vs, Present Practice)	6	
VI	Integrating universal human values in the workplace	Meaningful and Purposeful Work: Encouraging dignity in all types of jobs. Human creativity and contribution to society. Equal opportunities without discrimination. Prioritizing human well-being over mere profit. Technical education is enriched with ethics and human-centric values. Ethical behavior includes not exploiting others for personal gain—whether as employers or consumers. Ability to identify and develop appropriate technologies and management patterns for production systems. Case studies of typical holistic technologies, management models and production systems. **Self-Learning Topics:** Contemporary workplace scenario Confronting challenges like globalization, technological advancement/disruption cultural diversity, workplace prejudice. unconscious bias. Hampering output and how universal human values helps erasing these complexities.	5 5	CO6

References:

1. Gaur, R. R., Sangal, R., & Bagaria, G. P. (2009). *A Foundation Course in Human Values and Professional Ethics*. New Delhi: Excel Books.
2. Ravindran, P. S. (2007). *Essence of Human Values and Professional Ethics*. Chennai: Sri Ramakrishna Math.
3. Gaur, R. R. (2011). *Human Values and Professional Ethics*. New Delhi: Dhanpat Rai Publishing Company.
4. Chitkara, M. G. (2002). *Education and Human Values*. New Delhi: A.P.H. Publishing Corporation.
5. Martin, M. W., & Schinzinger, R. (2005). *Ethics in Engineering* (4th ed.). New York: McGraw-Hill.
6. Gandhi, M. K. (1927). *The Story of My Experiments with Truth*. Ahmedabad: Navajivan Publishing House.
7. Vivekananda, S. (Compilation). (2001). *I and My Nation*. Kolkata: Advaita Ashrama.

8. AICTE (2020). *Towards a Holistic Development: A Collection of Good Practices in UHV*. New Delhi: All India Council for Technical Education.

Online References:

Sr. No.	Website Name
1.	https://uhv.org.in/

Term Work: 25 Marks

Assignments – 20 Marks

Attendance 5 Marks

Conduct Group Speaking Activities to explore and comprehend the basic human and global society issues.

(In group speaking activity, especially, conduct discussions on Contemporary World Issues, Contemporary workplace challenges enabling students to think and suggest solutions on humanitarian ground)

List of Assignments (Answer the questions about in 500 words)

1. Explain the process, content, and natural outcome of self-exploration with a neat diagram and two examples from your life.

2. Analyze the impact of compassion on mental health. Describe the role of family in the development of an individual.

3. Describe the concept of an undivided society and the universal order and explain how both these can help to create a world family.

4. What do we mean by holistic technologies, management models, and production systems? How are these useful for mankind?

5. Explain the concept of co-existence in nature. How can this be understanding help in addressing environmental issues?

6. Design a program to promote respect in the workplace where people treat each other with respect and have equal opportunities for growth.

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week)			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
98421113	Enterprise Communication and Corporate Culture	1	-	-	15		-	15	30	1

Course Code	Course Name	Theory					Term Work	Pract /Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
98421113	Enterprise Communication and Corporate Culture	20	20	40	40	1.5	-	-	80

Rationale:

The course equips electronics and telecom engineers with effective technical and persuasive oral and written proficiencies essential for the environment to create high tech systems and services, Students will learn to decode complex technical ideas and messages, grasp foundational communication models, and develop hands-on expertise in verbal, nonverbal, and digital communication channels. These abilities are vital for professionals to interface with government bodies, private investors, infrastructure partners, and the general public. It helps enhance both a firm's brand identity and its reputation as these interactions are critical for the planning, implementation of various project ideas The curriculum strengthens all four LSRW competencies—Listening, Speaking, Reading, and Writing—to ensure engineers with the proficiency required to convey technical and non-technical information with accuracy, assurance, and professionalism in diverse professional contexts.

Course Objectives - The learners should be able to:

1. Effectively explore the dynamics of communication and navigate professional arenas
2. Competently acquire active listening skills by comprehending physical and digital content
3. Critically analyse communication barriers, audience and purpose to speak proficiently
4. Minutely comprehend extensive texts, technical and non-technical, to execute relevant tasks
5. Efficiently organize and create purposeful technical writing for professional transactions
6. Impactfully relate with other agencies with ethical standards to deliver synergistic solutions.

Course Outcomes - The learners will be able to:

1. Explore and adapt the dynamics of communication to navigate modern professional arenas.
2. Acquire active listening skills by practicing technical and business Speech Acts using direct and digital mode.
3. Analyze barriers, methods, audience and purposes for mastering individual and team speaking in professional & business settings.
4. Synthesize extensive technical and business texts for reflective learning through reading and summarization.
5. Design purposeful and ethical technical and business content, presentation using ICT enabled media.
6. Advocate technical excellence to propagate ethical & sustainable community solutions with a career-oriented approach.

Prerequisite: Basic knowledge of English language

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Basic knowledge of English language.		

I	Communication Dynamics	Foundations of Communication Dynamics: Objectives Linear vs. Transactional Models, Encoding, Decoding, and Feedback, Interpersonal Communication in Groups: Verbal interaction: Meetings & Presentations, Teleconferences & Calls and Non-Verbal Interactions: Proxemics, Haptics Oculesics, Kinesics Digital Interaction: virtual teams, video calls. Formal and Informal Communication Channels. Barriers: Physical Semantic Psychological & Emotional Barriers, Cultural & Contextual Barriers Silos mentality, Hierarchical layers, Rigid policies, unclear channels, and outdated technology. **Self-Learning Topics**: Communication at Workplace & Outer Agencies Internal communications: Regular email updates, Video conferencing and face to face sessions. External Communication Enterprise Social Media & Networking. Printed and environment Media, Industry collaboration readiness.	5 5	CO1
II	Active Listening	Active Listening: Discussions, and note-taking techniques. Audio-book listening, Understanding colleagues' and clients during meetings. Types of Listening Comprehensive Listening, Critical Listening and Reflective /Empathetic **Self-Learning Topics:** Listening kryptonite: Distractions and Preoccupations Semantic Jargons information overload, speaker pace, Pseudo listening & Interruptions Neglecting Nonverbal Cues, Knowledge Hiding & Siloed Departments	2 2	CO2

III	Conversational Proficiencies	Technical Communication Skills Technical Discussion, delivering technical oral presentations inside and outside organizations Q&A, Explaining Engineering Concepts in Simple Terms (Tips & Guidelines) Grooming and Self Development: **Self-Learning Topics**: Customer pitches and stakeholder meetings. Vendor evaluations or regulatory compliance., vendors as strategic partners, Vendor Negotiations or Demos, Risk & Contingency Planning, Consensus for brainstorm.	2 2	CO3
IV	Text Interpretation Expertise	Intensive Reading, Extensive Reading Skimming, Scanning, SQ5R Method *(Survey, Question, Reading, Recording, Recall, Review and Revise)* Industry Related Articles and Report, Summarizing text to Graphic Organizers (GO) Infographics, Process Flowcharts & Swimlane Diagrams SWOT analysis KWL Charts, Different Types of Organograms etc. Summarizing text in point form. Leveraging Online Resources like IEC standards Market Research Report, Business Case study, Tech Business News, Product Management & Development, Financial & Strategy Reading. **Self-Learning Topics**: Technical Vocabulary, Financial Reports of Electronics Companies' Annual Reports, Supply Chain & Manufacturing:	2 2	CO4
V	Technical & Corporate Writing Skills	Seven Cs of Business Writing Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness. Format & Types of Formal Letters: Cover Letter, Inquiry Letter Offer Acceptance / Rejection Letter Quotation Letters Grievance Service Change Notification, Recommendation Letter. Technical Writing for Professionals: Short and Long Reports	3	CO5

		Formatting Guidelines Tips for Text Chat user's manuals Standard Operating Procedures (SOP) Product Specification writing. Legal and compliance writing: Compliance Reports and License Agreement. Studio Activities **Self-Learning Topics:** Studio Activities: Content Creation for social media and e-Commerce Platforms Blogs, Vlog Keynote speeches Podcast titles Landing pages social media posts, Shor videos, YouTube video description	3	
VI	Community Communication and Ethics	Communicating clearly with non-technical users and stakeholders Building supportive networks Promoting innovation and problem-solving Participating in user groups or tech meetups Gain encouragement and advice on technical or career challenges. Sustainable smart urban infrastructure, Smart Waste Management Energy Efficiency & Management Communication Transparency and Honesty Accountability Avoiding Misuse of Information Uphold ethical standards in all written, verbal, and digital communication. **Self-Learning Topics:** Ethical use of technology, Sustainable Study Habits: Time Management and Responsibility Active participation in professional communities, forums, and collaborative platforms.	1 1	CO6

References:

1.Communication Skills by Sanjay Kumar & Pushp Lata
2. Business Communication with Writing Improvement Exercises. Hemphill, McCormick &Hemphill
3. Business Communication: Building Critical Skills by Locker, Kitty O. Kaczmarek, Stephen Kyo

4. Effective Business Communication by Herta Murphy
5. Technical Communication: Principles and Practice by Raman and Sharma
6. Effective Technical Communication: A Guide for Scientists and Engineers by Rizvi
7. Oxford Guide to Effective Writing & Speaking by John Seely
8. English Grammar by Raymond Murphy
9. Word Power Made Easy by Norman Lewis

Online References:

Sr. No.	Website Name
1.	https://bbclearningenglish.org
2.	https://www.bbc.co.uk/learningenglish
3.	https://www.anmconsultants.com/role-communication-indian-corporate-culture/
4.	https://venngage.com/blog/white-paper-examples/

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week)			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
98422114	Enterprise Communication and Corporate Culture LAB	-	-	2	-	-	30	-	30	1

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical/ Exam	Total
		Internal assessment			End Sem. Exam			
		IAT-1	IAT-2	Total				
98422114	Enterprise Communication and Corporate Culture LAB	--	--	--	--	25	-	25

Lab Objectives:

The learners should be able to:

1. Effectively explore the dynamics of digital communication in academic and professional arenas.
2. Positively acquire active listening skills through Speech Acts in different modes.
3. Thoroughly analyse communication barriers, audience and purpose to speak effectively at the workplace.
4. Minutely demonstrate technical and non-technical text to comprehend and discern the exact purposes

5. Efficiently organize and create purposeful technical and business writings using ICT enabled media.
6. Successfully manage teams and individual tasks by applying ethical standards to execute the tasks.

Lab Outcomes:

The learners will be able to:
1. Apply communication principles for excellence in academic and professional settings.
2. Test listening capabilities for advanced listening strategies in physical and digital mode.
3. Evaluate and present ideas precisely to the audience in a confident way.
4. Demonstrate reading proficiencies through practicing extensive technical and non-technical texts.
5. Design digital technical and business write ups for professional transactions
6. Implement interpersonal skills and professional ethics to provide fair and collaborative solutions.

DETAILED SYLLABUS

Sr. No.	Module	Detailed Content	Hours	LO Mapping
0	Prerequisite	Basic knowledge of English language and ICT enabled media		
I	Communication Dynamics	Application of Communication Dynamics. Key Components of Strategic Communication, Shannon-Weaver Model at workplace. Enterprise Communication: Industry Reports, and Articles, News Letter, Brand messaging, Multi stakeholders' collaborations. Private - Academic Partnerships	4	LO1
II	Active Listening	Comprehensive Listening and Applications: Technical or Business podcasts, YouTube lecture on academic stuff/ processes/ procedures/		LO2

		Development Plans. Critical Listening: Listen to an audio recording presentation, podcast Interviews and summaries in your words in an oral manner Reflective /Empathetic Listening: Paraphrase What You Hear, Reflect Emotions, Summarize Key Points, Review recorded calls.	4	
III	Conversational Proficiencies	Conversational Activities -I Self Introduction, Prepared Speech on Technical Topics and Impromptu Speech on General Topics Conversational Activities-II Simulation in communication: Role Play Activity for Conflict Resolution Negotiation, Handling complaints or angry customers through simulated phone or chat interactions. Conversational Activities -III customer Communication, Cross-Cultural communication, Marketing & Brand Communication Handling Q&A in Presentation.	8	LO3
IV	Text Interpretation Expertise	Practice Verbal Ability Test (GRE TOEFL and IELTS for grammar and vocabulary Prepare Diagram Organizers on: Summarizing text to Graphic Organizers (GO) Process Flowcharts & Swimlane SWOT analysis KWL Charts, Different Types of Organograms etc.as per the situations in the organizational setting. Summarizing text in point form after reading Market Research Report,	4	LO4

		Business Case study, Tech Business News		
V	Technical and Corporate writing	Technical content: Technical Blog Short and Long Reports (PPT using Canva) Installation Guides Writing Letters and emails, Inquiry Letter Quotation Letters Grievance Service Change Notification Letters Grievance Letter, Letter Standard users manuals Operating Procedures (SOP) Data Privacy Policy, Compliance Reports and License Agreement Content Creation for social media CMS - WordPress to create, manage and publish content. e-Commerce Platforms Blogs, Vlog Podcast titles, Landing pages social media posts	6	LO5
VI	Community Communication and Ethics	Local Area Visit, Field Visits. BSNL, MTNL training Centre Surveys & gaining knowledge on switching mechanism telecom network Feedback Analysis and Report Writing, Providing solutions for technical issues.	4	LO6

Reference Books:

1.Communication Skills by Sanjay Kumar & Pushp Lata
2. Business Communication with Writing Improvement Exercises. Hemphill, McCormick & Hemphill
3. Business Communication: Building Critical Skills by Locker, Kitty O. Kaczmarek, Stephen Kyo
4. Effective Business Communication by Herta Murphy
5. Technical Communication: Principles and Practice by Raman and Sharma
6. Effective Technical Communication: A Guide for Scientists and Engineers by Rizvi
7. Oxford Guide to Effective Writing & Speaking by John Seely
8. English Grammar by Raymond Murphy

9. Word Power Made Easy by Norman Lewis

Online Resources:

Sr. No.	**Website Name**
1.	https://bbclearningenglish.org
2.	https://www.bbc.co.uk/learningenglish
3.	https://www.anmconsultants.com/role-communication-indian-corporate-culture/

List of Experiments.

Sr. No	Name of Experiment	Hours
1.	Prepare a case study on Enterprise Communication strategies/Issues/ Achievements in Select Indian Companies, Tata Consultancy Services (TCS),Infosys,Reliance Jio Infocomm Industries, Bharti Airtel Ltd., Vodafone Idea. BSNL, Tata Communication etc	02
2	Listening Skill Activity Sheet containing minimum three types of listening activities from Lab Syllabus. (Technical Podcasts, Video/Audios of meeting collaboration. Processes and descriptions on You tube channels.	02
3	A.Continuous Evaluation of at least three types of the activities from Lab Syllabus for proficiency in oral communication/presentation	02
4.	a.Two Verbal Ability Test based on GRE, TOEFL, IELTS b. Summary report and Graphic Organizers for the relevant scenario or situation c.Powerpoint / Slide Preparation on business cases studies available online	02
5.	Three Types of Letters Writing in prescribed format (Full Block) along with impressive email messaging Digital Content Creation	02

	from Lab syllabus (Minimum two activities for writing skills should be done with documentation).	
6.	Conduct field visits to small scale business community / Government and non Government Agencies/ ,Metro Projects/ Local visit to MTNL and BSNL/ Traffic Management and ensure the implementation of your subject completely or partially for the smooth functioning of the system Conduct a Survey(Face to face, Kiosk /Mobile , QR Code/ SMS survey and get feedback from outside agencies regarding the future inputs for synergistic solutions.	02

Term Work - 25

Experiments/Practical's -20 marks

10 experiments from all six modules will be conducted using a language lab, open source and must be documented well for final submission as a part of term work at term end.

Attendance -5 Marks

R-2025- F.E Electronics and Telecommunication Engineering

Course Code	Course Name	Teaching Scheme (Contact Hours Per week)			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14111201	Differential Equations and Integral Calculus	**2**	**1**	**--**	**30**	**15**	**--**	**45**	**90**	**3**

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Semester Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
14111201	Differential Equations and Integral Calculus	**20**	**20**	**40**	**60**	**2.5**	**25**	**--**	**125**

Rationale:

In a first-year Electronics and Telecommunication Engineering (EXTC) course, foundational mathematical tools are essential for understanding signal behavior, circuit analysis, and system modeling. Higher-order linear differential equations are critical in analyzing RLC circuits, signal transmission lines, and system dynamics where voltage and current vary with time. Double and triple integrals are used in calculating electric field distributions, charge densities, and energy stored in 2D and 3D electromagnetic fields. Vector calculus, involving operations like gradient, divergence, and curl, is fundamental to understanding Maxwell's equations and electromagnetic wave propagation, which are at the core of wireless communication. Complex integration is applied in analyzing sinusoidal signals, resonance, and filter design using contour integration and residue theory. Numerical methods play a crucial role in solving differential equations and large matrix operations that arise in antenna analysis, signal processing algorithms, and circuit simulations where analytical solutions are difficult. These topics not only develop mathematical rigor but also prepare students to tackle practical engineering challenges in electronics, communication systems, and digital signal processing.

R-2025- F.E Electronics and Telecommunication Engineering

Course Objectives:

1. To introduce the application of higher-order differential equations in electrical circuit modeling and system analysis.
2. To explain the use of double integrals for calculating surface area and charge density in electronic components.
3. To demonstrate the use of triple integrals for volume and energy calculations in 3D fields.
4. To introduce vector operations for understanding electromagnetic field behavior and Maxwell's equations.
5. To teach complex integration techniques relevant to signal analysis and circuit theory.
6. To present numerical techniques for solving mathematical models in signal processing and circuit design.

Course Outcomes:

1. Students will be able to solve and analyze using SCILAB RLC circuits and communication systems modeled by differential equations.
2. Students will evaluate double integrals and use SCILAB to compute quantities such as capacitance or energy in 2D regions.
3. Students will apply triple integrals and use SCILAB to determine volume charge distributions and electromagnetic field energy.
4. Students will analyze electric and magnetic fields using gradient, divergence, and curl operations.
5. Students will solve problems in signal processing and interpret filter behavior using residue and contour integration.
6. Students will use numerical methods and SCILAB to approximate solutions for systems such as differential equations in filters or transmission lines.

Prerequisite:

1. Basics of integration and it's properties**.**

2**.** Linear differential equations

DETAILED SYLLABUS

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
I	Differential Equation	Exact differential Equations, Equations reducible to exact form by using integrating factors.	05	CO1
		Equation reducible to linear form, Bernoulli's equation.		
		Linear Differential Equation with constant coefficient-complementary function, particular integrals of differential equation of the type f(D)y = X where X is e^{ax} , sin(ax + b), cos(ax +b), x^m.		
		Self-learning topics: 1. Method of variation of parameter 2. Particular integrals for $e^{ax}V$ and xV. 3. Cauchy's homogeneous linear differential equation. 4. Legendre's differential equation. 5. Applications of first order and first degree and also Higher order differential equation.	08	
II	Multiple Integral-I	Beta and Gamma functions and its properties.	05	CO2
		Double integration-definition, Evaluation of Double Integrals. (Cartesian & Polar)		
		Change the order of integration (No Evaluation)		
		Self-learning topics:	07	

		1. Rectification of curves. (Cartesian, Polar and Parametric) 2. Application of double integrals to compute Area and Mass of lamina.		
III	Multiple Integral-II	Evaluation of double integrals by changing to polar coordinates	O5	CO3
		Evaluation of integrals over the given region (Cartesian and polar).		
		Triple integration definition and evaluation (Cartesian, cylindrical and spherical polar coordinates).		
		Self-learning topics: 1. Application of triple integrals to compute volume. 2. Triple integrals over a volume bounded by a plane. 3. Triple integrals over a volume bounded by a paraboloid. 4. Triple integrals over a volume bounded by a cone. 5. Triple integrals over a volume bounded by an ellipsoid.	07	
IV	Vector Calculus	Scalar and vector fields. Differentiation of vectors	05	CO4
		Directional derivative, Gradient, divergence and curl		
		Scalar potential function		
		Self-learning topics: 1. Line integrals – definition and problems. 2. Green's theorem in a plane, 3. Stokes' theorem (without Proof) 4. Gauss' Divergence theorem (without proof) and problems (only evaluation). 5. Angle between surfaces.	07	
V		Cauchy's Integral theorem and formula,	05	CO5

	Complex Integration	Taylor's series and Laurent's series - radius of convergence		
		Singularities and Poles, Cauchy Residue theorem.		
		Self-learning topics: 1. Line Integral in cartesian and parametric form. 2. Application of Residue Theorem to evaluate real integrations. 3. Conformal Mappings.	08	
VI	Numerical Methods	Numerical integration-by (a) Trapezoidal (b) Simpson's 1/3rd (c) Simpson's 3/8th rule (all without proof)	05	CO6
		Interpolation by Newton's and Lagrange polynomials		
		Numerical solutions of transcendental equations by Newton Raphson method and Regula –Falsi method.		
		Self-learning topics: 1. Indeterminate forms, L- Hospital Rule, 2. Gauss Elimination Method, Gauss Jordan Method. 3. Maclaurin Series 4. Numerical solution of ordinary differential equation using (a) Euler's method (b) Modified Euler method, (c) Runge-Kutta fourth order method	08	

Text Books:

1. Grewal B. S.: "Higher Engineering Mathematics", Khanna Publishers, 44th Ed., 2021.

2. Kreyszig E.: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

3. Dass H. K.: "Higher Engineering Mathematics", S Chand & Company Ltd, 12th Ed., 2004.

4. Narayan S.: "Differential Calculus", S.Chand Publications, 30th Ed., 2005.

References:

1. Stewart J.: "Multivariable Calculus" Cengage Publications, 7th Ed., 2019.
2. Jain M.K., Iyengar SRK, Jain R K,: "Numerical Methods for Scientific and Engineering Computation", New Age International Publishers, 6th Ed., 2007.
3. Bali N.P and Goyal M.: "A Textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
4. Wylie C. R, Barrett L.C..: "Advanced Engineering Mathematics" McGraw Hill Book Co., New York, 6th Ed., 2017.
5. Ramana B.V.: "Higher Engineering Mathematics", Tata McGraw-Hill Publishing Company Limited, 1st Ed., 2006.
6. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education, 2015.
7. Pal S. & Bhunia S. C.: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016

Online References:

Sr. No.	Website Name
1.	https://archive.nptel.ac.in/courses/111/105/111105122/
2.	https://www.youtube.com/watch?v=T6jHXD78dBI
3.	https://www.youtube.com/watch?v=KgItZSst2sU
4.	https://www.youtube.com/watch?v=w_KiHgultbM

Assessment:

Term work(TW) for 25 marks:

1. Batch-wise tutorials are to be conducted.

2. Students must be encouraged to write SCILAB Programs in tutorial class only. Each Student has to write **at least 05 SCILAB tutorials** (including print out) and **at least 10** class tutorials on entire syllabus.

3. SCILAB Tutorials will be based on entire syllabus.

The distribution of Term Work marks will be as follows –

1. Regularity and active involvement (Theory and Tutorial) 05 marks

2. Class Tutorials on entire syllabus 10 marks

3. SCILAB Tutorials 10 marks

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week)			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C)
		L	T	P	L	T	P	SL	Notional Learning Hour	(Notional Learning Hour/30)
14111202	Engineering Chemistry for electronics components and materials	2	--	--	30	--	--	30	60	2

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs.)			
		IAT-1	IAT-2	Total					
14111202	Engineering Chemistry for electronics components and materials	20	20	40	60	2.5	--	--	100

Rationale:

1. Chemical science has contributed in many ways to most of the Engineering branches where "Applied Chemistry" is the modern approach to learn impact of Technology on habitat and can be common to all Core Groups,
2. "Engineering Materials" can be prerequisites to impact of corrosion on metals as many civil engineering materials is the important area of concern.
3. "Advanced polymers and ceramics" are the matter of general approach to all but especially to electronics group as an emerging development in this sector
4. Chemical science has contributed in many ways to most of the Engineering branches where "Applied Chemistry" such as water, polymers, corrosion, electro chemistry, alloys and ceramics, can be prerequisites to many subjects of all core groups from the perspective of applications as a build material for structural as well as maintenance component in electronics.

Course Objectives:

1. To study effect of hardness of water on various materials used in electronics.
2. To introduce important properties of polymers as Engineering material.
3. To study the effect of corrosion by different mechanisms on metals and methods of corrosion control
4. To study electrochemistry for give a general idea on various basic theories in used in electronics.
5. To recognize importance of alloys and can apply the phase rule on it to study the effect of temperature and composition
6. To study the ceramics as an important part as a structural component used in electronics.

Course Outcomes: Student will be able to –

1. determine the hardness of water and various method of water hardness removal.
2. use the polymers for specific engineering applications on the basis of the properties.
3. understand the causes of corrosion and apply different methods to minimize corrosion.
4. determine the electrochemical reactions and their impact.
5. understand the various alloys and to Interpret various phase transformations of alloy using thermodynamics.
6. Understand the role, purpose and use of ceramics as a structural component used in electronics.

Prerequisite: (For Theory **Course**)

1. Knowledge about basic concept of hardness of water.
2. Knowledge of basic properties of polymers.
3. Knowledge of basic concept of electrochemistry and corrosion mechanism.
4. Knowledge of concepts of nanomaterial.
5. Knowledge of basic difference of ferrous and nonferrous alloys.
6. Knowledge of constituents of materials used in electronics equipment.

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Knowledge about basic concept of hardness of water, properties of polymers, concepts of Electrochemistry and corrosion mechanism, nanomaterials and its application, properties of metals and nonmetals and purpose of making alloys, Constituents of materials used in electronics equipment.		
I	Water	1. Impurities in water, Hardness of water 2. Determination of hardness of water by EDTA method and numerical problems, 3. softening method of water and numerical based on it –i) Ion exchange process ii) electro dialysis iii) reverse osmosis iv) ultrafiltration. 4. Definition, significance and numerical problems based on BOD and COD.	05	CO1

		Self-learning Topics: **1.** Industrial water treatment in semiconductor manufacturing. **2.** Environmental impact of electronic industry wastewater. **3.** Water purification technologies in PCB fabrication. **4.** BOD & COD monitoring in electronics waste management. **5.** Innovations in reverse osmosis and nano-filtration systems.	05	
II	Advanced polymers.	**1.** Macro-molecular science, i) basic concept of polymers, ii) Chemical bonding in polymers, iii) Classification of Polymers. **2.** Properties of Polymers: - i) Molecular weight - Number average molecular weight, Weight average molecular weight, Numerical, ii) Crystallinity - Crystalline and amorphous polymers – Glass transition temperature. **3.** Advanced polymers: i) Conducting polymers: ICP, DCP, ECP, Coordination conducting polymers, ii) Application of conducting polymers.	05	CO2
		Self-learning Topics: **1.** Conducting polymers in flexible electronics	05	

		2. Application of intrinsically conductive polymers (ICPs) in sensors and OLEDs. **3.** Biodegradable polymers in electronic packaging **4.** Glass transition temperature and its role in 3D printing of electronic devices **5.** Polymer nanocomposites in EMI shielding.		
III	Corrosion	**1.** Introduction: Definition, Types of Corrosion – i) Dry or Atmospheric Corrosion, ii) Wet or Electrochemical corrosion (In Acidic medium, In Neutral medium) **2.** Factors affecting rate of corrosion: i) Position of metal in galvanic series, ii) Purity of Metal, iii) Nature of Corrosion product, iv) Temperature, v) pH of medium, vi) concentration of medium, vii) moisture, viii) Relative Cathodic and Anodic area, ix) overvoltage **3.** Methods to control corrosion: i) Selection of metal, ii) Proper Designing, iii) Cathodic protection, iv) Use of Corrosion Inhibitors, v) Metallic Coating- metal cladding, galvanization, tinning, metal spraying	05	CO3
		Self-learning Topics: **1.** Corrosion issues in microelectronics and circuit boards	05	

		2. Corrosion protection in wearable electronics. **3.** Nano coatings and corrosion-resistant materials in sensors. **4.** Electrochemical corrosion testing techniques. **5.** Corrosion in lithium-ion batteries.		
IV	Important Engineering materials: Nano materials:	**1.** Nano materials: fullerene – properties and uses **2.** carbon nano tubes- properties, method of preparation. **3.** applications of CNTs	04	CO4
		Self-learning Topics: **1.** Applications of carbon nanotubes in VLSI and NEMS/MEMS. **2.** Fullerene-based drug delivery and biosensors. **3.** Synthesis methods for nanomaterials (sol-gel, hydrothermal). **4.** Toxicological impact of nanomaterials in electronics. **5.** Graphene in transparent electronics and photonics.	04	
V	Alloys	Alloys: **1.** Ferrous alloys – i) Plain-carbon steels ii) Heat and Shock resisting steels iii) Stainless steels iv) Effect of the alloying element- Ni, Cr, Co, Mn, Mo, W and V. **2.** Non-Ferrous alloys: A) Aluminum alloys – Composition, properties and uses of i) Duralumin, ii) Magnalium	06	CO5

		B) Copper alloys – Composition, properties and uses of a) Brass – i) Dutch Metal ii) German Silver b) Bronze – i) Gun metal ii) Nickel bronze. C) Alloys of Pb – Composition, properties and Uses of i) Wood's metal ii) Tinman's solder. **3.** Numerical: i) based on Composition, ii) based on density iii) based on weight of an alloy. **4.** Smart alloys: Types, composition and application of smart alloys in electronics		
		Self-learning Topics: **1.** Smart alloys in actuators and MEMS devices. **2.** Ferrous vs. non-ferrous alloys in electronics heat sinks. **3.** Solder alloys in surface mount technology (SMT). **4.** Effect of alloying elements on electrical conductivity. **5.** Shape memory alloys in micro positioning systems.	06	
VI	Important Electronics Engineering materials	**1.** Introduction, **2.** Materials required in electronics component: i) Silicon and related materials, **ii)** Germanium and related materials, iii) Gallium compounds, iv) Carbon based materials, v) Conductive and insulating materials, vi) Magnetic materials	05	CO6

		3. Etching materials: i) Hydrofluoric acid ii) Phosphoric acid, iii) Chlorine and fluorine-based gases.		
		Self-learning Topics: **1.** Silicon purification process in IC fabrication. **2.** Gallium arsenide and its use in RF and microwave devices. **3.** Germanium-based materials for IR detection. **4.** Magnetic materials in transformers and storage devices. **5.** Etching gases and safety protocols in cleanrooms.	05	

References:

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publication
2. A textbook of Engineering Chemistry, S. S. Dara, S. Chand and Company
3. Polymer science: Vasant Gowarikar, Wiley Estern Ltd, new Delhi
4. Green Chemistry: V. K. Ahluwalia
5. Textbook of Polymer science: F.W. Billmeyer
6. Fundamentals of Polymer science & Engineering- Anilkumar & S K Gupta, Tata McGraw Hill, New Delhi
7. Engineering Chemistry, O. G. Palana, Tata McGraw Hill Publication
8. Environmental Chemistry, A. K. De, Tenth edition, New Age International,
9. P. W. Atkins, Physical Chemistry, Oxford University Press, 7th edition. 5. J. D. Lee Concise Inorganic Chemistry, Oxford University Press, 5 th edition

Online References:

Sr. No.	Website Name
1.	https://archive.nptel.ac.in/courses/103/106/105106205/
2.	https://courses.nptel.ac.in/noc20ch41/preview
3.	https://www.researchgate.net/
4.	https://www.sciencedirect.com/topics/engineering/polymer-material
5..	https://www.sciencedirect.com/topics/chemistry/nanomaterial

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14121203	Engineering Mechanics	2	-	-	30	-	-	-	60	2

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT -1	IAT -2	Total					
14121203	Engineering Mechanics	20	20	40	60	2.5	--	--	100

Rationale:

Engineering mechanics is a branch of science that deals with the behaviour of solid bodies when subjected to external forces or loads and the effects of these forces on the bodies. Engineering Mechanics plays a vital role for students of Electronics - Telecommunication and Computer Science - Engineering by bridging the gap between software, electronics, and the physical world. It supports the understanding of mechanical behaviour in electromechanical systems such as sensors, actuators, antennas, and robotic communication systems. With the growing integration of IoT, embedded systems, and cyber-physical technologies, a solid grasp of mechanics is essential for designing reliable, efficient, and physically robust systems. The subject contributes to vibration analysis, structural hardware design, and the simulation of physical behaviours, enabling students to develop smart, adaptive systems in advanced applications like automation, control systems, AR/VR, and digital twins.

Course Objectives

1 To acquaint with basic principles of Centroid and its real-life significance
2 To familiarize with the concepts of force, moment, couple, resultant and system of coplanar and non-coplanar forces.

3	To familiarize with the concepts loads, beams, equilibrium conditions, friction and their real-life applications.
4	To understand the motion parameters required for quantification of Kinematics of Particle and Rigid body.
5	To understand the combination of force and motion parameters required for quantification of Kinetics of rigid body.
6	To acquaint with the basics of Robot kinematics

Course Outcomes

1	Demonstrate the understanding of Centroid and MI and locate the same.
2	Determine the resultant and equivalent force-couple system for a given system of forces.
3	Illustrate the concept of loads, supports, beams, conditions of equilibrium, and friction and apply the same in two dimensional systems with the help of FBD.
4	Determine the position, velocity, and acceleration of particle and rigid body using principles of kinematics for rectilinear, curvilinear and general plane motion.
5	Apply the principles of force and acceleration, work-energy and impulse-momentum to particles in motion.
6	Establish the relation between robot joints and parameters

Prerequisite: Student shall have passed HSC (Higher Secondary Certificate) along with basic understanding of physics and mathematics in following topics:-

1. **Basic Vector Algebra**
   – Understanding of vector addition, subtraction, scalar and vector products.
   – Ability to resolve vectors into components.
2. **Fundamentals of Classical Physics**
   – Concepts of force, motion, Newton's laws, equilibrium, and gravity.
   – Understanding of mass, weight, friction, and types of motion.
3. **Basic Trigonometry and Geometry**
   – Familiarity with sine, cosine, tangent functions.
   – Knowledge of angles, triangles, and coordinate systems.
4. **Problem-Solving and Logical Reasoning Skills**
   – Ability to approach real-world physical problems logically.
   – Basic analytical thinking and spatial reasoning.

Detailed Syllabus

Module no.	Module Name	Detailed content	Teaching hours	CO
0	**Prerequisite**	Statics, Dynamics, Kinetics, Kinematics, Rigid body, Deformable body, applying trigonometric functions, resolution of a vector (Force vector), Law of triangle, Polygon law of forces, Newton's laws of motion	01	

		Velocity, acceleration, displacement, Uniform velocity and accelerated motion, Law of conservation of Energy, Law of conservation of Momentum, work-energy principle, impulse and momentum principle, and Co-efficient of restitution		
1	**Centroid**	i. Characteristics, and real-life significance for Centroid ii. Centroids of primary geometrical shapes and plane laminas **Self-learning topic:** - Centroid for area with sector and real-life application - Exploring Moment of Inertia for primary geometrical shapes and plane laminas	03 03	CO 1
2	**Force and System of Forces**	i. Principle of transmissibility, Moment of force about a point and concept of couple ii. Classification of force systems iii. Resultant of coplanar system of forces and Varignon's Theorem iv. Resultant of non-coplanar system of forces **Self-learning topic:** - Exploring force and a couple system and real-life application of a force and a couple system - Resultant of non-coplanar parallel and general system of forces	05 05	CO 2
3	**Equilibrium and Friction**	i. Conditions of equilibrium for system of forces and free body diagrams, Types of beams, loads, and support and its reaction ii. Equilibrium of beams, rollers, and system of bodies iii. Laws of friction. Cone of friction. angle of repose, and angle of friction iv. Application of equilibrium with friction on blocks on horizontal and inclined planes and ladders **Self-learning topic:**	07	CO 3

		- Equilibrium of connected bodies (beam and sphere), two force and three force members, beams connected using internal hinges - Application of equilibrium with friction - Wedge and block	07	
4	**Kinematics of particles and rigid bodies**	i. Motion along plane curved path, Variable acceleration for rectilinear motion, projectile motion ii. Introduction to General plane motion, problem based on Instantaneous centre (ICR) method for general plane motion (up to 2 linkage mechanism and roller) **Self-learning topic:** - Application of motion graph for real-life problems - ICR for rollers, wheels and three links problems - ICR for system of rigid bodies	06 06	CO 4
5	**Kinetics of particles**	i. Introduction to D'Alembert's Principle (DAP), inertia force, dynamic equilibrium, Work done by active forces, impact and collision ii. Problems on DAP (single and double block), and WEP (single block) **Self-learning topic:** - Application of WEP to the real-life problems - Explore the concept of impact and collision for rigid bodies	04 04	CO 5
6	**Introduction to Robot Kinematics**	i. Fundamental of Robot Mechanics, Degree of Freedom, D-H Parameters, robot kinematics (Forward) ii. Homogeneous transformation (limited to 2 DOF Serial robot) **Self-learning topic:** - Derive and Analyze - Manual derivation of forward kinematics using D-H parameters	04 04	CO 6

		- Explore online simulation tools such as MATLAB Robotics Toolbox Online and refer https://kinematicsplayground.org/ - Solve 2 numerical problems involving: Assigning D-H parameters and finding of end-effector pose using transformation matrices		

Text Books:

1. Engineering Mechanics by A K Tayal, Umesh Publication.
2. Engineering Mechanics by Kumar, Tata McGraw Hill
3. Engineering Mechanics by Beer &Johnston, Tata McGraw Hill

References:

1. Engineering Mechanics by R. C. Hibbeler.
2. Engineering Mechanics by F. L. Singer, Harper& Raw Publication
3. Engineering Mechanics by Macklin & Nelson, Tata McGraw Hill

Online References:

Sr. No.	Website Name
1	https://archive.nptel.ac.in/courses/112/106/112106286/
2	https://archive.nptel.ac.in/courses/112/106/112106180/

R-2025- F.E Electronics and Telecommunication Engineering

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14211204	Elements of Telecommunication	3	--		45	--	–	45	90	3

Course Code	Course Name	Examination Scheme							
		Theory Marks					Term Work	Practical / Oral	Total
		Internal assessment			End Sem. Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
14211204	Elements of Telecommunication	20	20	40	60	2.5	–	–	100

Rationale:

This course introduces students to the fundamental principles of communication systems, including analog, digital, mobile, optical, satellite, and computer networks. It builds a foundational understanding essential for advanced studies and applications in modern Electronics and Telecommunication Engineering.

Course Objectives:

1 Understand the fundamental principles and components of analog communication systems, including modulation and demodulation techniques.
2 Comprehend digital communication techniques such as PCM and digital modulation schemes, and their advantages in modern systems.
3 Gain insights into computer communication networks, including topologies, protocols, transmission media, and switching.
4 Explore the architecture and evolution of mobile and wireless communication systems, including emerging 5G and IoT technologies.
5 Understand the basic principles, structure, and applications of fiber optic communication systems.
6 Learn the essential concepts of satellite communication, including orbits, subsystems, frequency bands, and real-world applications.

Course Outcomes:

1. Describe the basic structure and working of analog communication systems and compare AM and FM techniques. *(Understand)*
2. Explain the principles of digital communication systems and analyze digital modulation techniques like ASK, FSK, and PSK. *(Understand, Analyze)*
3. Identify the fundamental components of computer communication networks and differentiate between topologies and transmission methods. *(Understand)*
4. Illustrate the working of mobile communication systems and recognize the features of 1G to 5G, Wi-Fi, Bluetooth, and IoT protocols. *(Understand, Apply)*
5. Demonstrate an understanding of fiber optic communication systems, including components, propagation mechanisms, and applications. *(Understand, Apply)*
6. Explain satellite communication fundamentals, including orbits, subsystems, frequency bands, and their role in global connectivity. *(Understand)*

Prerequisite: Physics , Mathematics

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Basic understanding of physics concepts such as **waves, frequency, electromagnetic spectrum**, and **electrical fundamentals** (voltage, current, resistance). Familiarity with **mathematical concepts** like **trigonometry and basic calculus** is helpful for analyzing signals and communication systems.		
I	Fundamentals of Analog Communication	Introduction to Communication Systems: Elements, Types (Analog, Digital), Need for Communication Characteristics of Signals: Analog vs. Digital, Frequency Spectrum, Need for Modulation, Amplitude Modulation (AM): Principle, Generation, Demodulation, Applications Frequency Modulation (FM): Principle, Generation, Demodulation, Applications Comparative Study of AM, FM Self-Learning Topic: Applications of Modulation in Broadcasting and Aviation Communication, Explore how AM and FM are used in practical systems like radio, aircraft communication, and two-way radios	7 7	CO1

II	Principles of Digital Communication	Basics of Digital Communication: Benefits, Noise Immunity, Multiplexing, Sampling Theorem and Aliasing, Quantization and Encoding, Pulse Code Modulation (PCM): Block Diagram, Advantages, Applications, Digital Modulation Techniques: Basics of ASK, FSK, PSK with Waveform Diagrams and Applications, Introduction to Bit Error Rate (BER) and Bandwidth Efficiency Self-Learning Topic: Role of Error Detection and Correction Techniques in Digital Communication, Understand the basics of parity checks, Hamming codes, and CRCs in reliable data transfer.	8 8	CO2
III	Computer and Data Communication Networks	Introduction to Computer Networks and Network Classifications: PAN, LAN, MAN, WAN, Network Topologies: Features and Use Cases, ISO-OSI and TCP/IP Protocol Stack – Role of Each Layer, Transmission Media, Data Communication Basics: Serial and Parallel Transmission, Synchronous and Asynchronous, Introduction to Switching Techniques: Circuit, Packet, and Message Switching Self-Learning Topic: Wireshark Basics: Capturing and Analyzing Network Packets-Learn how to inspect real-time data packets to understand TCP/IP protocol behavior using a free tool	7 7	CO3

IV	Mobile and Wireless Communication Systems	Basic Concepts: Cell, Frequency Reuse, Handoff, Roaming, Evolution of Mobile Communication: 1G to 5G, Mobile Operating Systems and Platforms (Android, iOS basics), Introduction to Wi-Fi (IEEE 802.11), Bluetooth, and IoT Communication Protocols (Zigbee, LoRa), Application Areas: Mobile broadband, smart cities, mobile health Self-Learning Topic: Evolution and Applications of 5G Technology- Study the architecture and key features of 5G and how it impacts IoT, autonomous vehicles, and smart cities.	8 8	CO4
V	Fiber Optic Communication and Photonics Applications	Review of Light Propagation Principles: Reflection, Refraction, Dispersion, Structure and Types of Optical Fibers (SMF, MMF), Optical Sources and Detectors (LED, Laser Diodes, Photodiodes), Optical Communication Link: Transmitter, Channel, Receiver, Modern Applications: FTTH (Fiber to the Home), Optical Sensors, Smart Grid, Medical Imaging, Challenges: Losses, Bending, Attenuation Self-Learning Topic: Use of Optical Fibers in Biomedical Imaging (Endoscopy, OCT)-Investigate how fiber optics enables non-invasive diagnostics in medical fields.	8 8	CO5

VI	Satellite and Space Communication	Introduction to Satellite Communication and Orbits (LEO, MEO, GEO), Satellite Subsystems: Payload, Power, Attitude Control, Telemetry, Frequency Bands: C, Ku, Ka – Use Cases and Limitations, VSAT and DTH Systems: Architecture and Operation, GNSS (GPS, GLONASS, IRNSS/NavIC): Principles and Applications, Emerging Trends: CubeSats, Starlink, Satellite-IoT Convergence Self-Learning Topic: LEO Satellite Constellations and Internet Services (e.g., Starlink)-Learn how Low Earth Orbit satellites are transforming global broadband access.	7 7	CO6

Text Books:

1. "Electronics Communications System" by George Kennedy.
2. “Optical Fiber Communications” by Gerd Keiser, 5th Edition
3. "Data Communications and Networking" by Behrouz A. Forouzan, Fifth Edition TMH, 2013.
4. T. Pratt, C. Bostian, and J. Allnutt, Satellite Communications, 2nd ed., Wiley, 2002.

References:

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2004.
2. Optical Fiber Communication: Principles and Practice, John M. Senior, 3rd edition.
3. M. Richharia and L. K. T. S. Mhurchu, Satellite Communications Systems: Systems, Techniques and Technology, 6th ed., Wiley, 2020.

Online References:

Sr. No.	Website Name
1.	Analog Communication By Prof. Goutam Das (IIT Kharagpur); https://swayam.gov.in/nd1_noc20_ee69/preview
2.	https://nptel.ac.in/courses/108/101/108101113/
3.	https://nptel.ac.in/courses/117/101/117101050/
4	http://nptel.ac.in/courses/117104099/ - (Advanced 3G and 4G Wireless Mobile communications)
5	https://www.iitg.ac.in/psm/qip2015/material/Subir_Bandyopadhyay_Lecture1.pdf
6	https://archive.nptel.ac.in/courses/117/105/117105131/

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week)			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30)
		L	T	P	L	T	P	SL	Notional Learning Hour	
14112205	Engineering Chemistry for electronics components and materials Lab	--	--	1	--	--	15	--	15	0.5

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total.					
14112205	Engineering Chemistry for electronics components and materials Lab	-	-	-	-	-	25	--	25

Lab Objectives:

1. To apply knowledge acquired during the theory class in carrying out the experiments for qualitative and quantitative determination.
2. To analyze experimental results and write laboratory report.

Lab Outcomes: After completion of experiment, the learners will be able to

1. Estimate the type of water hardness and calculate it.
2. Synthesize UF/PF resin at laboratory level.
3. Learn the effect of various factors on the rate of corrosion.
4. Understand the significance of electrochemistry principles
5. Learn various volumetric quantitative analytical techniques to determine % of elements from alloy samples and concept of smart alloys used in electronics
6. Learn various instrumental quantitative analytical techniques to determine % of elements from alloy samples and concept of smart alloys used in electronics.

List of Experiments:

Sr No	List of Experiments	Hrs
01	Determination of Total, Temporary and Permanent hardness of water by EDTA method	**01**
02	Estimation of chloride content in the given water sample.	**01**
03	Synthesis of Urea formaldehyde Resin.	**01**
04	Synthesis of Phenol formaldehyde resin.	**01**
05	To compare the rate of corrosion of various metals in acidic medium.	**01**
06	Determination of % purity of iron.	**01**
07	Determination of Sn from solders volumetrically.	**01**
08	Determination of unknown concentration of Cu in the given sample by colorimetry	**01**
09	Determination of unknown concentration of Fe in the given sample by colorimetry	**01**
10	Determine the unknown PH of sample by PH meter	**01**

List of Assignments:

Sr No	List of Assignments	Hrs
01	Numerical on determination of hardness of water and on determination of BOD and COD	**01**
02	Short note on advanced polymers used in electronics.	**01**
03	Short note on various corrosion control techniques	**01**
04	Short note on CNT.	**01**
05	Short note on smart alloys: some examples of smart polymers with their properties and uses.	**01**
06	Short note on Etching materials.	**01**

References:

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publication
2. A textbook of Engineering Chemistry, S. S. Dara, S. Chand and Company
3. Polymer science: Vasant Gowarikar, Wiley Eastern Ltd, new Delhi
4. Green Chemistry: V. K. Ahluwalia
5. Textbook of Polymer science: F.W. Billmeyer
6. Fundamentals of Polymer science & Engineering- Anilkumar & S K Gupta, Tata McGraw Hill, New Delhi
7. Engineering Chemistry, O. G. Palana, Tata McGraw Hill Publication
8. Environmental Chemistry, A. K. De, Tenth edition, New Age International,
9. P. W. Atkins, Physical Chemistry, Oxford University Press, 7th edition. 5. J. D. Lee Concise Inorganic Chemistry, Oxford University Press, 5 th edition.

Online Resources:

Sr. No.	Website Name
1.	https://archive.nptel.ac.in/courses/103/106/105106205/
2.	https://courses.nptel.ac.in/noc20ch41/preview
3.	https://www.researchgate.net/

4.	https://www.sciencedirect.com/topics/engineering/polymer-material
5.	https://www.sciencedirect.com/topics/chemistry/nanomaterial

Assessment:

Term Work: Term Work shall consist of at least 10 practicals based on the above list. Also, Term work Journal must include at least 6 assignments.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14122206	Engineering Mechanics Lab	-	-	2	-	-	30	-	30	1

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total.					
14122206	Engineering Mechanics Lab	--	--	--	--	--	25	25	50

Lab Objectives:

1 To acquaint with basic principles of Centroid and its real-life significance
2 To familiarize with the concepts of force, moment, couple, resultant and system of coplanar and non-coplanar forces.
3 To familiarize with the concepts loads, beams, equilibrium conditions, friction and their real-life applications.
4 To understand the motion parameters required for quantification of Kinematics of Particle and Rigid body.
5 To understand the combination of force and motion parameters required for quantification of Kinetics of rigid body.
6 To acquaint with the basics of Robot kinematics

Lab Outcomes:

1 Demonstrate the understanding of Centroid locate the same.
2 Determine the resultant and equivalent force-couple system for a given system of forces.
3 Illustrate the concept of loads, supports, beams, conditions of equilibrium, and friction and apply the same in two dimensional systems with the help of FBD.
4 Determine the position, velocity, and acceleration of particle and rigid body using principles of kinematics for rectilinear, curvilinear, and general plane motion.
5 Apply the principles of force and acceleration, work-energy and impulse-momentum to particles in motion.
6 Establish the relation between robot joints and parameters

List of Experiments:

Minimum six experiments from the following list of which a minimum one should be from dynamics.

Sr. No.	List of Experiments	Hrs	CO mapping
1	Verification of Polygon law of coplanar forces (Universal force table apparatus)	02	CO2
2	Verification of the Principle of Moments (Bell crank lever)	02	CO2
3	Determination of Centroid of plane lamina made up of standard geometrical shapes	02	CO1
4	Determination of support reactions of a Simply Supported Beam.	02	CO3
5	Determination of coefficient of friction using inclined plane	02	CO3
6	Verification of the equations of equilibrium for non-concurrent non-parallel (General) force system.	02	CO3
7	Kinematics of particles. (Uniform motion of a particle, Projectile motion, motion under gravity)	02	CO4
8	Collision of elastic bodies (Law of conservation of momentum).	02	CO5
9	Kinetics of particles. (collision of bodies)	02	CO5

Sr No	List of Assignments / Tutorials	Hrs	CO mapping
01	Centroid of composite plane laminas (3 Numerical)	01	CO1
02	Resultant of coplanar and non-coplanar system of forces (2 Numerical)	01	CO2
03	Equilibrium of beam, rollers, bodies on inclined plane with friction and ladders with friction (6 Numerical).	03	CO3
04	Kinematics of particles and rigid bodies (7 Numerical)	03	CO4
05	Kinetics of particles (3 Numerical)	01	CO5
06	Homogeneous transformation, and Direct Kinematics of robot (5 Numerical)	02	CO6
07	Resultant of Co-planar system of forces for concurrent system of forces using C programming language.	02	CO1
08	Equilibrium of beam for support reactions using C programming language	02	CO3

Assessment:

Term Work: Term Work shall consist of at least 06 practicals based on the above list. Also, Term work Journal must include all the assignments listed above.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Practical& Oral Exam: An Oral & Practical exam will be held based on the above syllabus.

R-2025- F.E. Electronics and Telecommunication Engineering

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30)
		L	T	P	L	T	P	SL	Notional Learning Hour	
14122207	Programming Lab (Python)	2	--	2	30	--	30	--	60	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term work	Practical / Oral	Tut.	Total
		Internal assessment			End Sem. Exam				
		IAT-1	IAT-2	Total					
14122207	Programming Lab (Python)	--	--	--	--	25	25	--	50

Lab Objectives: To familiarize learners with Python's basic syntax, variables, data types, operators, and input/output functions.

1. To reinforce the understanding and application of conditional statements, loops, and functions in Python programming.
2. To instill learners on file handling, exception management, and Python packaging.
3. To introduce object-oriented programming principles and their application in Python.
4. To explore advanced topics such as regular expressions, pattern matching, and GUI development.
5. To introduce and demonstrate the use of popular Python libraries for data handling.

Lab Outcomes: After completion of experiment, the learners will be able to

1. Demonstrate the proficiency in basic python programming or create and perform various operations on data structures like list, tuple dictionaries and strings.
2. Apply Control Flow and Functions for efficient coding to solve problems.
3. Demonstrate proficiency in handling file operations, managing exceptions, and developing Python packages and executable files for modular programming.
4. Illustrate the concept of Object-Oriented Programming used in python.
5. Design Graphical User Interface (GUI) applications, utilizing appropriate Python libraries to create user-friendly interfaces.
6. Investigate and apply popular python libraries to conduct efficient data handling tasks.

Prerequisite:

1. Logical Thinking & Problem Solving: Ability to break down problems into smaller parts. Basic understanding of flowcharts or algorithmic thinking.
2. Mathematical Reasoning: Basic arithmetic operations (addition, subtraction, multiplication, division).
3. Understanding of variables, functions, and formulas (from school-level math).
4. Analytical Skills: Ability to spot patterns, debugs issues, and evaluates outputs.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Comment (Prerequisite syllabus should not be considered for paper setting)	**01**	
1	Introduction to Python	1.1 Evolution of Python & its role in modern tech stacks, Python in web development, data science, automation, AI.	**05**	**CO1**

		1.2 Basic Syntax and Data Types - Variables and data types, Operators, Input and output, 1.3 Real-world data modeling with Python data types (int, float, str, list, tuple, dict, set) 1.4 Operators with hands-on examples from finance, gaming, etc., Industry Task: Build a basic expense tracker using lists and dictionaries		
2	Control Flow and Functions	2.1 Conditional Statements: if-elif-else in decision- based apps 2.2 Loops (for, while) in automation & report generation, 2.3 Loop control: break, continue, pass 2.4 Functions- Defining functions, Parameters and return values, Scope and lifetime of variables	**05**	**CO2**
3	File Handling, Packaging, and Debugging	3.1 File Handling- Reading and writing files, 3.2 Exception handling 3.3 Creating Python Packages, Modules and executable files 3.4 Dealing with Syntax Errors, Runtime Errors and Scientific Debugging	**05**	**CO3**
4	Object-Oriented Programming (OOP) in Python	4.1 Introduction to OOP: Classes and objects, 4.2 Encapsulation, inheritance, and polymorphism 4.3 Creating Classes and Objects: Class attributes and methods Constructor and destructor.	**05**	**CO4**

		4.4 Type of Inheritance: Single, multiple and multilevel inheritance		
5	Advanced Python Concepts	5.1 Regular Expressions, Pattern matching, Regex functions in Python 5.2 GUI Development using any Python GUI framework	**05**	**CO5**
6	Python Libraries	6.1 Introduction to Popular Libraries 6.2 NumPy for numerical computing, 6.3 Pandas for data manipulation. 6.4 Matplotlib for data visualization functional ceramics, ceramic coatings.	**05**	**CO6**

Text Books:

1. Core Python Programming, Dr. R. Nageswara Rao, Second Edition, Dreamtech Press.
2. Beginning Python: Using Python 2.6 and Python 3.1. James Payne, Wrox Publication.
3. Python Programming, Anurag Gupta and G. P. Biswas, First Edition,McGraw-Hill

Reference Books:

1. Learn Python the Hard Way, Zed Shaw, Third Edition, Addison-Wesley.
2. Python Projects, Laura Cassell,Alan Gauld, First Edition, Wrox Publication.
3. Introduction to computing and problem-solving using python, Balagurusamy, First Edition, McGraw Hill Education.

Online Resources:

Sr. No.	Website Name
1.	https://nptel.ac.in/courses/106106145
2.	https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

3.	https://www.researchgate.net/
4.	https://www.sciencedirect.com/science/article/pii/S2666920X24001127
5.	https://www.sciencedirect.com/search?qs=python%20programming

Suggested List of Experiments: (Expected Minimum 15 Experiments to be performed)

Sr No	List of Experiments	Hrs
01	To understand the structure and features of the Code: Blocks Integrated Development Environment (IDE) and to use it effectively for writing, compiling, debugging, and executing python programs, which will serve as the foundational tool for all further experiments in the lab.	**02**
02	Personalized Greeting Generator - Write a python code to generate Personalized Greeting.	**02**
03	Calculating Areas of Geometric Figures - Write a python program to calculate areas of any geometric figures like circle, rectangle and triangle.	**02**
04	Calculating Gross Salary of an Employee: Write a Python program to calculate the gross salary of an employee. The program should prompt the user for the basic salary (BS) and then compute the dearness allowance (DA) as 70% of BS, the travel allowance (TA) as 30% of BS, and the house rent allowance (HRA) as 10% of BS. Finally, it should calculate the gross salary as the sum of BS, DA, TA, and HRA and display the result.	**02**
05	Task List Manager: Develop a Python program to manage a task list using lists and tuples, including adding, removing, updating, and sorting tasks.	**02**
06	Student Record Keeper: Write a Python program to create, update, and manipulate a dictionary of student records, including their grades and attendance.	**02**

07	Triangle Pattern Generator Using Loops: Write a Python program to print a triangle pattern (give any), emphasizing the transition from C to Python syntax.	**02**
08	Number Type Identifier: Develop a Python program that takes a numerical input and identifies whether it is even or odd, utilizing conditional statements and loops.	**02**
09	**Grade Evaluator:** Develop a Python program that takes marks and evaluates grade using if-elif-else	**02**
10	**Fibonacci Sequence Generator:** Write a Python program to generate the first N terms of the Fibonacci series using loops.	**02**
11	Multiplication Table Generator: Write a Python program to take a numerical input from the user and generate its multiplication table using loops.	**02**
12	Extracting Words from Text File: Develop a Python program that reads a text file and prints words of specified lengths (e.g., three, four, five, etc.) found within the file.	**02**
13	Basic Exception Handling: Write a Python program that takes two numbers as input and performs division. Implement exception handling to manage division by zero and invalid input errors gracefully.	**02**
14	Online ATM System: Develop classes for ATM. Include methods for withdraw, deposit and check balance.	**02**
15	Password Strength Checker: Write a Python script that prompts the user to enter a password. Use regular expressions to validate the password based on these criteria: At least 8 characters long, Contains at least one uppercase letter, one lowercase letter, one digit, and one special character.	**02**

Assessment:

Term Work: Term Work shall consist of at least 15 practical based on the above list. Also, Term work Journal must include 1 mini project based on above syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (mini project) + 5 Marks (Attendance).

Practical & Oral Exam: An Oral & Practical exam will be held based on the above syllabus

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30)
		L	T	P	L	T	P	SL	Notional Learning Hour	
14122208	IDEA LAB -2 (Innovation Design Engineering and Apply)	1	--	2	15	--	30	15	60	2

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical/ Oral	Total
		Internal assessment			End Sem. Exam			
		IAT-1	IAT-2	Total				
14122208	IDEA LAB -2 (Innovation Design Engineering and Apply)	--	--	--	--	50	50	100

Rationale:

Aligned with the National Education Policy (NEP) 2020, the institution emphasizes experiential, interdisciplinary, and project-based learning through the IDEA Lab—a central hub for hands-on innovation.

To strengthen the undergraduate research ecosystem, the institution has adopted a theme-based academic model aligned with UN SGD. Each semester features six curated problem statements based on local need and aligned with core subjects in the same semester, enabling students to apply

classroom knowledge to real-world challenges. Every student selects one problem and develops an individual, subject-integrated solution—enhancing both academic understanding and research skills.

The IDEA Lab supports this initiative with facilities for design thinking, prototyping, and product development. Students maintain a project logbook throughout the semester to track their progress and reflections.

To ensure academic accountability, a two-tier assessment framework is implemented:

- Project Assessment based on standardized IDEA Lab rubrics.
- Subject-Based Term Work Assessment focused on the application of same-semester subject knowledge in the project.

Lab Objectives:

1. To promote experiential and project-based learning that bridges theoretical knowledge with real-world problem-solving.
2. To encourage interdisciplinary integration by enabling students to apply concepts from multiple subjects within a single cohesive project.
3. To develop innovation and design thinking skills through hands-on activities and iterative solution development.
4. To foster critical thinking and creativity by engaging students in open-ended problems with multiple solution pathways.
5. To enhance communication, collaboration, and documentation skills essential for professional engineering practice.
6. To build an entrepreneurial and research mindset by guiding students to develop scalable, socially-relevant, and technically viable prototype

Lab Outcomes: Student will be able to

1. Recall and articulate key concepts from core and allied subjects relevant to the assigned project.
2. Explain the interdisciplinary nature of the problem and the role of each subject in addressing it.
3. Apply appropriate tools, techniques, and theoretical knowledge to develop project components.
4. Analyze problem constraints and user requirements to structure a feasible and efficient solution.

5. Evaluate multiple design options and justify the chosen solution based on technical and practical considerations.
6. Create a functional prototype or solution that demonstrates innovation, utility, and integration of interdisciplinary knowledge

1) Guidelines for IDEA Project

a) Project Guidelines (Interdisciplinary Project Execution in IDEA Lab)

- Each student works on an individual interdisciplinary project aligned with the semester theme.
- Faculty in-charges for the IDEA Lab are assigned according to the complexity of the project and the capacity of the respective departments.
- Faculty in-charges mentor both the academic and technical aspects, and track weekly progress.
- Project assessment will be rubric-based, ensuring depth, innovation, documentation, and ownership.
- Students shall convert the best solution into working model using various components of their domain areas and demonstrate.
- Faculty in-charges must attend relevant FDPs to ensure uniformity in mentoring and evaluation.

b) Guidelines for same semester Subject Concepts Applied within the Project

- Term work for each subject will partially reflect how well a student applies subject-specific concepts in their interdisciplinary project.
- Internal assessment panel will collaborate to align project components with subject learning outcomes.

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c) Role of Faculty In-Charges in IDEA Lab Projects

Faculty in-charges play a pivotal role in the success of interdisciplinary, theme-based projects under the IDEA Lab. Their responsibilities extend beyond technical supervision to include academic alignment, innovation facilitation, and active student engagement. Their key roles include:

1. **Motivating and Inspiring Students**
   - Encourage students to take ownership of their learning and projects.
   - Cultivate a mindset of curiosity, exploration, and social relevance.
   - Foster an environment where students feel empowered to take creative risks.
2. **Conducting Brainstorming and Ideation Sessions**
   - Organize structured brainstorming sessions at the start of the semester to help students define their problem statements and solution pathways.
   - Promote collaborative thinking, design exploration, and interdisciplinary integration.
3. **Arranging Guest Lectures and Expert Talks**
   - Identify and invite industry experts, researchers, and innovators for guest lectures aligned with the semester's theme or subject areas.
   - Facilitate exposure to real-world challenges, current trends, and future opportunities.
4. **Ensuring Uniqueness and Originality of Projects**
   - Actively review proposed ideas to ensure **no duplication of solutions** across students.
   - Encourage students to explore novel approaches, technologies, and perspectives.
5. **Promoting Discussion and Collaborative Learning**
   - Create platforms for students to present, discuss, and receive peer and mentor feedback.
   - Facilitate idea refinement through regular discussions and group engagement.
6. **Aligning Subject Content Beyond Syllabus**
   - Faculty in-charges must **align subject content beyond the syllabus of the same semester** with the **IDEA Lab theme and assigned problem statements**.
   - This ensures relevance, depth, and meaningful interdisciplinary integration.
7. **Same Semester Faculty Requirement**
   - Faculty in-charges must be teaching subjects in the **same semester** as the students' project to ensure seamless academic integration and contextual understanding.
8. **Monitoring and Documentation**
   - Oversee project logbook maintenance, milestone tracking, and submission of progress reports.
   - Provide ongoing feedback and ensure project alignment with learning outcomes.
9. **Coordination with Subject Faculty**
   - Work in collaboration with other subject faculty to help students embed theoretical and practical aspects of their coursework into the project.
   - Facilitate subject-term mapping and contribute to termwork assessment based on evidence.

2) Implementation Strategy

a) Project Implementation in IDEA Lab

Aspect	Implementation Strategy
Faculty in-charges	**Faculty in-charges assigned based on project nature and department capacity.**
Mentoring Role	**Faculty in-charges oversee academic/technical development, interdisciplinary integration, and timely documentation.**
Capacity Building	**Faculty in-charges undergo workshops on design thinking, innovation, assessment rubrics, and outcome-based mentoring.**
Assessment Contribution	**Faculty in-charges contribute to 25 marks allocated for the IDEA Lab project term work. The remaining assessments are conducted by the external examiner.**
Recognition & Incentives	**Faculty in-charges receive workload credits or are formally acknowledged in performance reviews.**

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b) Implementation of Subject-Term Work Mapping within Projects

Aspect	Implementation Strategy
Mapping Subject Outcomes	**Faculty in-charges align their content beyond syllabus with the student's project by coordinating with the assigned project guide.**
Independent Evaluation	**Internal assessment panel evaluate students based on their application of subject-specific concepts within the project. This contributes to a** separate 25 marks allocated for term work based on subject **application.**
Evidence Sources	**Evaluation is supported by project logbooks, subject-specific deliverables (e.g., tools, simulations, models), and review presentation inputs.**
Outcome Assurance	**Ensures practical demonstration of subject understanding and its integration into the interdisciplinary solution.**

Implementation Notes:

- Guide faculty assess their course's contribution using specific evidence such as:
    - Logbooks

- Subject-specific outputs (e.g., simulations, designs)
- Paper publications or review presentations

2) Guidelines for Assessment

Two-tier rubrics are applied independently to evaluate subject concept application and innovation within the project.

a) Assessment of IDEA Lab Projects (Individual Interdisciplinary Projects) (25 Marks)

Presentation-Based Assessment Structure (Total: 25 Marks)

Assessment Month	Weightage	Marks
Month 1 (Formative 1)	20%	5 marks
Month 2 (Formative 2)	40%	10 marks
Month 3 (Formative 3)	40%	10 marks

Rubric-Based Evaluation Criteria

Criteria	Month 1 (5)	Month 2 (10)	Month 3 (10)
Problem Understanding	Connects problem to subjects	Defines interdisciplinary scope	Demonstrates deep conceptual grasp
Subject Knowledge Application	Identifies relevant concepts	Applies principles in design	Integrates multiple subject areas correctly
Innovation & Design Thinking	Proposes creative idea	Develops and tests feasible solution	Final solution shows originality and utility
Documentation & Presentation	Logbook initiated, plan presented	Mid-design log and visuals	Final report and demo completed
Progress & Ownership	Meets deadlines, shows planning	Demonstrates self-motivation	Completes project independently with reflection

b) Term Work Assessment of Subject Concepts Applied in Projects (25 Marks)

Applicable to All Subjects Integrated with Interdisciplinary Projects

To reflect meaningful application of subject knowledge, each subject will be assessed through the following rubric:

Criteria	**Marks**	**Description**
Subject Knowledge Application	8	Depth and accuracy of concept integration into the project
Practical Design or Tool Usage	5	Use of subject-specific hardware/software/simulation/tools
Documentation	4	Quality and clarity of subject-related logs and reports
Viva/Presentation	4	Ability to explain subject's relevance and role in the project
Continuous Engagement	4	Evidence of consistent participation via logbooks and feedback

c) Total Assessment Structure

Component	Marks	Assessed By
Term work – Project Execution	25 Marks	Project Guide
Term work – Application of Subject Concepts	25 Marks	IDEA Lab Panel
Viva Voce (Final Evaluation)	50 Marks	External Examiner

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
14212209	Elements of Telecommunication Lab	--	--	02	--	--	30	--	30	1

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical/ Oral	Total
		Internal assessment			End Sem. Exam			
		IAT-1	IAT-2	Total				
14212209	Elements of Telecommunication Lab	--	--	--	--	25	25	50

Lab Objectives:

1. To demonstrate generation and detection of analog modulation techniques.
2. To demonstrate generation and detection of digital modulation techniques.
3. To illustrate the different computer network topology.
4. To illustrate the use of various AT commands in GSM modules and to analyze key parameters of Wi-Fi networks.
5. To make use of modern tools for simulation of communication systems.
6. To provide practical experience in simulating satellite communication.

Lab Outcomes:

1) Demonstrate the concepts of AM and FM

2) Compare digital modulation techniques PCM, ASK, FSK
3) Simulate a computer network using various network components.
4) Use of AT Commands in mobile device
5) Setting up of optical fiber link
6) Simulate satellite communication scenarios.

Prerequisite: Physics and Basic Mathematics

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	LO Mapping
0	Prerequisite	Basic knowledge of **electronic components and circuits** (resistors, capacitors, transistors), Understanding of **signal types** (analog and digital) and basic waveform characteristics (frequency, amplitude, phase), Familiarity with **fundamental physics concepts** related to waves and electromagnetic spectrum, Basic computer literacy and exposure to **circuit simulation tools** (e.g., Multisim, MATLAB, Packet Tracer) is advantageous.		
I	Fundamentals of Analog Communication	Modulation and Demodulation Techniques like AM and FM.	6	LO1
II	Principles of Digital Communication	Digital Modulation technique like PCM, ASK, FSK	6	LO2
III	Computer and Data Communication Networks	Network topologies and devices. Implementation of above topologies using open-source soft wares	6	LO3

IV	Mobile and Wireless Communication Systems	AT commands for GSM. Demonstrate AT commands. To know and study various parameters of Wi-Fi / Access points	4	LO4
V	Fiber Optic Communication and Photonics Applications	Components of Fiber Optic Communication	4	LO5
VI	Satellite and Space Communication	Components of Satellite Communication	4	LO6

Text Books:

1. "Electronics Communications System" by George Kennedy.
2. “Optical Fiber Communications” by Gerd Keiser, 5th Edition
3. "Data Communications and Networking" by Behrouz A. Forouzan, Fifth Edition TMH, 2013.
4. T. Pratt, C. Bostian, and J. Allnutt, *Satellite Communications*, 2nd ed., Wiley, 2002.

References:

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2004.
2. Optical Fiber Communication: Principles and Practice, John M. Senior, 3rd edition.
3. M. Richharia and L. K. T. S. Mhurchu, *Satellite Communications Systems: Systems, Techniques and Technology*, 6th ed., Wiley, 2020.

Online Resources:

Sr. No.	Website Name
1.	Analog https://swayam.gov.in/nd1_noc20_ee69/preview
2.	https://nptel.ac.in/courses/108/101/108101113/
3.	http://nptel.ac.in/courses/117104099/ - (Advanced 3G and 4G Wireless Mobile communications)

List of Experiments.

Sr No	List of Experiments	Hrs
01	Simulation /Hands on modulation techniques AM	2
02	Simulation /Hands on modulation techniques FM.	2
03	Simulation /Hands on digital techniques PCM.	2
04	Simulation /Hands on digital techniques ASK.	2
05	Simulation /Hands on digital techniques FSK.	2
06	Simulation/Setting up of star topology using packet tracer (Open-Source Software).	2
07	Simulation/Setting up of ring topology using packet tracer (Open-Source Software).	2
08	Simulation/Setting up of mesh/tree topology using packet tracer (Open-Source Software).	2
09	Simulation/Setting up of bus topology using packet tracer (Open-Source Software).	2
10	Test the AT commands on mobile devices using open software.	2
11	To study parameters of Wi-Fi (IEEE 802.11)	2
12	Simulation of Satellite Communication System.	2
13	Setting up/ Simulate Analog fiber optic communication System using open-source software	2
14	Setting up/ Simulate Digital fiber optic communication System using open-source software	2

Sr No	List of Assignments / Tutorials	Hrs
01	Assignment based on Module 1, 2 &3	
02	Assignment based on Module 4, 5 &6	

Assessment:

Term Work: Term Work shall consist of at least 10 to 12 practicals' based on the above list. Also, Term work Journal must include at least 2 assignments.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Practical& Oral Exam: An Oral & Practical exam will be held based on the above syllabus.

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Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					
		L	T	P	L	T	P	SL	Notional Learning Hour	Total Credits (C) (Notional Learning Hour/30)
14412210	Workshop - 2	--	--	2	--	--	30	15	45	1.5

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical/ Oral	Total
		Internal assessment			End Sem. Exam			
		IAT-1	IAT-2	Total				
14412210	Workshop - 2	--	--	--	--	25		25

Lab Objectives:

1. To introduce students to basic IOT and embedded systems by programming a NODE MCU ESP8266 micro controller to blink an LED.
2. To understand the basic working principle infrared (IR) sensors and role in detecting line contrast.
3. To introduce students to fundamental robotics concepts through the assembly and programming of a basic line following robot.
4. To understand flight dynamics, sensor integration, remote control systems, and applications of drones in real-world.
5. To familiarize student with component and operation of 3D printer.
6. Identify different types of 3D printers (FDM, SLA, SLS) and their components.

Lab Outcomes: At the end of the course, the student will be able to

1. Able to collect data from sensors and control actuators using boards like Arduino, NodeMCU, or Raspberry Pi.
2. Able to Write and implement code to control robotic motion using microcontrollers like Arduino, Raspberry Pi, or other platforms.
3. Able to design, implement, and test a line following robot that autonomously follows a predefined path using infrared (IR) sensors.
4. Able to Perform printer setup, filament loading, calibration, and execute the printing process successfully.
5. Able to understand the fundamentals of additive manufacturing and to fabricate a physical 3D model using Fused Deposition Modeling (FDM) technology.
6. Able to operate a drone using a remote controller and execute programmed missions using waypoint navigation.

Detailed Syllabus

Sr No	Name of Module	Detailed content	Hours	Lo
1	**Introduction to IOT and Embedded system**	Programming a NodeMCU ESP8266 microcontroller to blink an LED. ● Introduction to NODE MCU and IOT. ● Circuit setup and IDE configuration. ● Setting up Arduino IDE for ESP8266. ● Experimenting Variation and Discussion Self Learning Connect the DHT sensor to the NodeMCU. Write and upload a program using Arduino IDE to read temperature data. Write and upload a program using Arduino IDE to read temperature data. Send the data to Thing Speak (or any IoT dashboard). Visualize the readings on a real-time graph.	**8** **4**	**LO1**
2	**Introduction to Robotics**	Programming a basic line following robots ● Introduction to robotics and components ● Assembling a line following robots ● Programming the robot. ● Testing and evaluation. Self Learning Build and Control a Basic Line-Following Robot (Modify the code to adjust speed based on curves.)	**8** **4**	**LO2** **LO3**

3	**Introduction to 3D Printing**	To design and print your first object ● Introduction and basics. ● 3d modelling ● Slicing and preparing the print ● Printing and reviewing. Self learning Explore process parameter of 3d printer Explore 2d and 3d drafting and modelling	**8** **2**	**LO5** **LO6**
4	**Introduction to drone technology**	Introduction to drone ● Components familiarizations ● Drone assembly ● Calibration and coding upload ● Flight testing and troubleshooting Self Learning Studying basic principle of drone Studying drone programming Basic drown fundamentals	**8** **3**	**LO4**

Reference Book

1. IoT: Building Arduino-Based Projects by Peter Waher.
2. Robotics: Modelling, Planning and Control by Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo.
3. 3D Printing: A Practical Guide for Librarians by Sara Russell Gonzalez, Denise Beaubien Bennett.
4. Make: DIY Drones for the Evil Genius by Ian Cinnamon.

Online Resources

Sr No	Reference
1	https://onlinecourses.nptel.ac.in/noc21_cs17 -Introduction to internet of things, by Prof. Sudip Misra , IIT Kharagpur
2	https://onlinecourses.nptel.ac.in/noc21_cs08 -Embedded Systems Design, By Prof. Anupam Basu, IIT Kharagpur
3	https://onlinecourses.nptel.ac.in/noc25_ae30/preview -Drone Systems and

	Control, By Prof. Suresh Sundaram, Dr. Rudrashis Majumder
4	https://onlinecourses.swayam2.ac.in/ntr25_ed66/preview - 3D Printing and Design for Educators, By Dr. Sharad K. Pradhan

Suggested list of Experiments:

Sr No	List of Experiments	Hrs.
01	Blinking LED with Node MCU.	8
02	Built and test basic Line following robot	8
03	Design and Print your first object.	8
04	To assemble and understand working of mini drone.	6

Assessment:

- **Term Work Marks:** 25 Marks (Total marks)
- **Job and Manual: -** 20 Marks
- **Regularity and active involvement:** - 5 Marks

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
98441211	Indian Knowledge System	2	--	--	30	--	--	30	60	2

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total.					
98441211	Indian Knowledge System	20	20	40	60	2.5	--	--	100

Rationale:

The Indian Knowledge System (IKS) is vital for preserving India's rich cultural heritage, fostering holistic and sustainable practices, and integrating ancient wisdom with modern science to address contemporary challenges and enrich global knowledge.

Course Objectives:

1. To explore and understand the evolution of Indian scientific thought
2. To evaluate the historical and modern educational systems in our country.
3. To analyse sustainable practices in in ancient India.
4. To know the richness of Indian Arts and Culture
5. To understand the contributions of Indian Scientists and Nobel Laureates
6. To understand the principles of good governance.

Course Outcomes:

1. Recognize the sources and concepts of the Indian knowledge system
2. Learn about our history of Indian ancient knowledge and its significance in the current scenario.
3. Demonstrate sustainable development in various fields like Science, Technology, agriculture, industry, architecture performing arts, etc.
4. Understand and appreciate the rich heritage that resides in literature
5. Learn about the ancient Bhartiya education system in comparison with the modern era
6. Showcase the multi-dimensional nature of IKS and its importance in modern

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	1.Students should have the foundational knowledge and skills necessary for a comprehensive understanding of IKS 2. Students should be familiar with the Indian Culture, Language, and History of Science and Technology in India.		
I	**Introduction to The Indian Knowledge**	Basic knowledge and scope of IKS, IKS in ancient India and modern india,, Preservation of culture, tradition and Dharma through education. Sources of Education, Aim of Education, Curriculum, methods of learning,	5	CO2

	System (I.K.S.)	Reviving, Knowledge (Ancient Scientific Discoveries) **Self-Learning Topics: Macaulay's Education Policy and Max Mullar Ideology in destroying Indian Tradition**	5	
II	**Development of Scientific Thoughts in Ancient India**	Development in Science, Technology, Astronomy, Mathematics, and Life Sciences – Life Science, Physiology, Ayurveda, etc. Discoveries during Ancient times **Self-Learning Topics: Technological Innovations in Ancient India, Architecture and Engineering**	5 5	CO1
IV	**Good Governance in Ancient India**	Introduction to Indian religions,Moral and Ethical Governance,Vishva Kalyan through Vasudhaiva Kutumbkam,Principles of Good Governance about Ramayana, Mahabharat, Artha Sastra and Kauṭilyan State,Scientific Explanation of Vedic or traditional system of society for Good Governance **Self-Learning Topics:Governance Models and Kingdoms, Court System and Judges, Crime, Punishment & Fairness**	5 5	CO6
V	**Contribution of Indian Scientist & Nobel Laureates**	Baudhayan, Aryabhatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna, Susruta, Kanada & Charak Rabindranath Tagore, C.V. Raman, Har Gobind Khorana, Mother Teresa, Subrahmanyan Chandrasekhar, Amartya Sen, V.S. Naipaul, Venkatraman Ramakrishnan, Kailash Satyarthi and Abhijit Banerjee **Self-Learning Topics: Indian Contributions to Global Science**	5 5	CO5

VI	**Sustainable Practices in Ancient India**	Agriculture, waste management, water conservation, forest conservation, architecture, urban planning, biodiversity preservation, etc Yoga, Pranayama, and meditation for health and well-being. **Self-Learning Topics: Vaastu Shastra Principles, Minimalism and Non-materialism**	5 5	CO3
		Total	60	

Text Books:

1. B. L. Theraja – Textbook of Electrical Technology, Prentice Hall of India (PHI)
2. B.R Patil – Basic Electrical Engineering, Oxford Higher Education
3. V. N. Mittal and Arvind Mittal – Basic Electrical Engineering, Tata McGraw Hill
4. V. K. Mehta – Principles of Electronics, S. Chand Publishing, New Delhi 7
5. R. S. Sedha – A Textbook of Applied Electronics, S. Chand Publishing, New Delhi
6. Digital Fundamental, 8th edition, Floyd and Jain, Pearson Education India, 2005
7. Electric Motors and Drives Fundamentals, Types and Applications, 3 rd Edition, Austin Hughes, Newnes Publisher.

References:

1. Introduction to Electrical Engineering, M. Naidu, S. Kamakshaiah, McGraw-Hill Education, 2004
2. S. N. Singh, “Basic Electrical Engineering” PHI, 2011
3. Electrical and Electronic Technology, 10th edition Edward Hughes, Pearson Education.

Online References:

Sr. No.	Website Name
1.	https://nptel.ac.in/courses/108108076
2.	https://www.nesoacademy.org/ec/04-analog-electronics/02-semiconductor-diode/01-pn-junction-diode-no-applied-bias
3.	https://onlinecourses.nptel.ac.in/noc21_ee55/preview

4.	https://onlinecourses.nptel.ac.in/noc20_ee60/preview
5.	https://archive.nptel.ac.in/courses/108/105/108105113/

Course Code	Course Name	Teaching Scheme (Contact Hours Per Week			Teaching Scheme (Contact Hours Per Semester)					Total Credits (C) (Notional Learning Hour/30
		L	T	P	L	T	P	SL	Notional Learning Hour	
98462212	NSS & Civil Defense	-	-	4*	-	-	60	-	60	2

*: Students need to complete 60 hours throughout the semester as it is not possible to get 4 hours /week due to the dynamic schedule of the Government agencies.

		Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		IAT-1	IAT-2	Total					
98462212	NSS & Civil Defense	--	--	--	--	--	25	--	25

Rationale:

The National Service Scheme (NSS) is a central sector scheme of the Government of India aimed at developing the personality of students through community service. The NSS syllabus is designed with a strong rationale that aligns with the educational, social, and developmental goals of the nation. The NSS syllabus promotes the all-round development of students by instilling values such as discipline, leadership, empathy, and teamwork. It encourages experiential learning beyond the classroom, complementing academic education.

Course Objectives:

1. To Introduce National Service Scheme to learners and explain how it is used in current social studies.

2. To make the students aware of the need of having a foundation in social science and NSS.
3. To develop the personality of NSS volunteers through community service. It can enhance the personal growth and social skills of students.
4. To introduce students to social concepts and issues in society, as well as to get involved in resolving social issues.
5. To equip NSS volunteers with basic skills in civil defense, first aid, fire safety, and crowd management, enabling them to act as first responders during emergencies.
6. To build awareness, preparedness, and responsiveness among NSS volunteers to effectively assist in disaster situations.

Course Outcomes:

1. **Describe** the fundamentals and history of the National Service Scheme (NSS), with specific reference to its role in social work and nation-building.
2. **Demonstrate** understanding of NSS-related procedures, including organizational structure, volunteer enrollment, and activity planning.
3. **Participate** in community-based social service activities such as voter awareness drives, campus cleanup, tree plantation, and cyber safety campaigns.
4. **Develop** leadership, team-building, and project management skills through planning and executing NSS activities.
5. **Explain** the basic concepts of civil defence and disaster response mechanisms.
6. **Apply** practical skills in fire safety, first aid, and emergency management during simulated and real-life situations.

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite			
I	Leadership & Personality development	Meaning, definition, qualities, and characteristics of a Leader. Meaning of personality, Dimensions of personality. Personality and Leadership nexus. Universal Human Values and Ethics for youths, Sustainable Development Goals	6	Co1

II	Activity Based programs	(Colleges can plan various social activities for learners and make a detailed report) Activities can be conducted throughout the academic year. Evaluation will be based on record keeping of the attendance of the learner.	10	CO2
III	Awareness based programs	Awareness Programs such as Rally, Seminar, Workshops, poster making, theme based rangoli making, essay writing, slogan writing, quizzes, Celebration of National and International days, Personality Development programs, Group Activities, etc.	10	CO3
IV	Area Based Projects	Visit to Adopted villages, Swatchatha \Program, Visit and Conserving Ancient monuments and heritage site, Socio Economic Survey of village/slum, Nature Camp, Environmental Education, Women Empowerment Program, Health and hygiene program and Blood donation, Legal awareness Program, Literacy Program, Cyber theft awareness Water Conservation Program and RWH, One Day Special Camp in a village (preferably in adopted village/Adopted areas/Slums/MR Schools etc.).	14	CO4
V	Introduction to Civil Defense and Disaster Management	Definition and objectives of civil defense, Structure and functions of the Civil Defense Organization, Types of disasters: natural and man-made, Phases of disaster management: prevention, preparedness, response, recovery, NDMA (National Disaster Management Authority) and its role, Role of youth in disaster management	10	CO5
VI	Basics of Fire Safety and First Aid	Types of fires and fire extinguishers, Basic fire-fighting techniques, First aid for common injuries: bleeding, fractures, burns, CPR, Emergency numbers and response protocol, Evacuation techniques	10	CO6
		Total	60	

Text Books:

1.National Service Scheme Manual 2006, Government of India

2. Salunkhe P.B. Ed, Chhatrapati Shahu the Pillar of Social Democracy

3. National Service Scheme Manual, Govt. of India

4. Training Programme on National Programme Scheme TISS

5. Orientation Courses for N.S.S. Programme Officers, TISS

Online References:

Sr. No.	Website Name
1.	https://nssmu.in
2.	https://nss.gymkhana.iitb.ac.in/home

Assessment:

Term work (TW) for 25 marks:

- Term Work (TW) will comprise a report submitted by the students, detailing the 60 hours of social service completed during the semester as per the assigned projects and activities.