Course Code	Course Name				Credits
J1BST121	**LINEAR ALGEBRA AND CALCULUS**				**3**
Regulation	2026	L: T:P:H:S	3:0:0: 0:4.5	Notional Learning Hours/Semester	90
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	TC	Course delivery Mode			Theory
Scheme of Evaluation		CIE: 40 Marks	ESE: 60 Marks	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	Basic knowledge in single variable calculus and matrix operations				

COURSE OBJECTIVE	
1	To introduce the foundational principles of linear algebra and calculus, including systems of linear equations, the matrix eigenvalue problem, ordinary differential equations and series representations of functions.
2	To develop analytical and problem-solving skills for evaluating multiple integrals, solving second-order differential equations and constructing Taylor and Fourier series through structured study.
3	To enable the application of linear-algebraic and calculus-based techniques to model and solve real-world engineering problems using modern computational methods.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Apply Gauss elimination and eigenvalue methods to solve linear systems and reduce quadratic forms to canonical form.	K3
2	Solve homogeneous and non-homogeneous second-order ordinary differential equations using the methods of undetermined coefficients and variation of parameters	K3
3	Compute areas and volumes by evaluating double and triple integrals in Cartesian, polar and cylindrical coordinate systems.	K3
4	Construct Taylor, Maclaurin and Fourier series representations of functions for engineering analysis applications.	K3

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	2	2	-	-	-	-	-	3	2	-	-	2	-	-	-	-	-	2			
2	3	2	2	2	-	-	-	-	-	3	2	-	-	2	-	-	-	-	-	2			
3	3	2	2	2	-	-	-	-	-	3	2	-	-	2	-	-	-	-	-	2			
4	3	2	2	2	-	-	-	-	-	3	2	-	-	2	-	-	-	-	-	2			

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	Title	Topics	Hours
1	Linear Algebra	Linear systems of equations: Gauss elimination, Row echelon form, Linear Independence: rank of a matrix, Solutions of linear systems: Existence, Uniqueness (without proof), The matrix Eigen Value Problem, Determining Eigen values and Eigen vector, Diagonalization of matrices, Quadratic forms and their canonical forms. (Text 1: Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4)	11
2	Ordinary Differential Equations	Homogeneous linear ODEs of second order, Superposition principle, General solution, Homogeneous linear ODEs of second order with constant coefficients (Method to find general solution, solution of linear Initial Value Problem). Non homogenous ODEs (with constant coefficients) - General solution, Particular solution by the method of undetermined coefficients (Particular solutions for the functions $ke\gamma x$, kxn, $kcos\omega x$, $ksin\omega x$, $ke\alpha xcos\omega x$, $ke\alpha xsin\omega x$), Initial value Problem for Non-Homogeneous Second order linear ODE (with constant coefficients), Solution by variation of parameters (Second Order). Solution of Euler-Cauchy Equations (second Order only) (Text 1: Relevant topics from sections 2.1, 2.2, 2.5,2.7, 2.10)	12
3	Multiple Integrals	Double integrals, Reversing the order of integration in double integrals, change of coordinates in double integrals (Cartesian to polar), Evaluating areas using Double integrals, finding volumes using double integration, Triple integrals, Volume calculated as triple integral, Triple integral in Cartesian and cylindrical coordinates. (Text 2: Relevant topics from section 14.1, 14.2, 14.3, 14.5, 14.6)	12
4	Taylor and Fourier series	Taylor series representation (without proof, assuming the possibility of power series expansion in appropriate domains), Maclaurin series representation, Fourier series, Euler formulas, Convergence of Fourier series (Dirichlet's conditions), Fourier series of 2π periodic functions, Fourier series of $2l$ periodic functions, Half range sine series expansion, Half range cosine series expansion. (Text 1: Relevant topics from sections 11.1, 11.2, Text 2: Relevant topics from section 9.8)	10

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
SL.No.	**Name of Book**	**Name of Author/s**	**Publisher**	**Edition and Year**
1.	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10th edition,2016
2	Calculus	H. Anton, I.Biven,S.Davis	Wiley	12th edition,2024

REFERENCE				
SL.No	**Name of Book**	**Name of Author/s**	**Publisher**	**Edition and Year**
1	Thomas' Calculus	Maurice D. Weir, Joel Hass, Christopher Heil, Przemyslaw Bogacki	Pearson	15th edition, 2023
2	Essential Calculus	J. Stewart	Cengage	2nd edition, 2017
3	Elementary Linear Algebra	Howard Anton, Chris Rorres	Wiley	11th edition, 2019
4	Bird's Higher Engineering Mathematics	John Bird	Taylor & Francis	9th edition, 2021
5	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education	39th edition, 2023
6	Signals and Systems	Simon Haykin, Barry Van Veen	Wiley	2nd edition, 2002

VIDEO LINKS	
1	https://archive.nptel.ac.in/courses/111/107/111107164/
2	https://archive.nptel.ac.in/courses/111/104/111104031/
3	https://archive.nptel.ac.in/courses/111/106/111106139/
	https://archive.nptel.ac.in/courses/111/101/111101164/

VIRTUAL LAB/SIMULATION TOOLS	
1	Python
2	MATLAB

COURSE CONTENTS AND LECTURE SCHEDULE				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
1. Linear Algebra (11 Hrs)	Part 1	Linear System of Equations	Systems of linear equations, Solution by Gauss elimination	3
	Part 2	Solutions of Linear Systems	Row echelon form, finding rank from row echelon form, fundamental theorem for linear systems	2
	Part 3	The matrix Eigen Value Problem	Determining Eigen values and Eigen values, Diagonalization	3
	Part 4	Quadratic forms	Quadratic forms Transformation to Principal Axes. Conic Sections	3

2.Ordinary Differential Equations (12 hours)	Part 1	Homogeneous linear ODEs of second order,	Homogeneous linear ODEs of second order, Superposition principle, General solution, Homogeneous linear ODEs of second order with constant coefficients (Method to find general solution, solution of linear Initial value problems).	3
	Part 2	Non homogenous ODEs (with constant coefficients)	General solution, Particular solution by the method of undetermined coefficients (Particular solutions for the functions $ke\gamma x$)	3
	Part 3	Initial value Problem	Particular solution by the method of undetermined coefficients (Particular solutions for the functions kxn, $kcos\omega x$, $ksin\omega x$, $ke\alpha xcos\omega x$, $ke\alpha xsin\omega x$), Initial value Problem for Non-Homogeneous Second order linear ODE(with constant coefficients),	3
	Part 4	Method of Variation of Parameters and Cauchy -Euler ODE	Solution by variation of parameters (Second Order) Solution of Euler-Cauchy Equations (second Order only)	3
3.Multiple Integrals (12 hours)	Part 1	Double integrals	Double integrals over Rectangular regions, Reversing the order of integration in double integrals, change of coordinates in double integrals (Cartesian to polar).	3
	Part 2	Areas and Volume using Double integrals	Computing the area and volume using double integrals.	3
	Part 3	Triple integrals	Computing the volume using Triple integrals.	3
	Part 4	Triple integral in Cartesian and cylindrical coordinates	To obtain the volume of the solid using triple integrals.	3
4.Taylor and Fourier series (10 Hrs)	Part 1	Series representation of functions	Taylor series representation and Maclaurin series representation	2
	Part 2	Fourier series	Fourier series, Euler formulas, Convergence of Fourier series (Dirichlet's conditions)	3
	Part 3	Half Range Cosine Series	Fourier Cosine Series	3
	Part 4	Half Range Sine Series	Fourier Sine Series	2

SELF LEARNING ACTIVITIES (30 Hrs)							
Sl. No.	Activity	Description	Time	Module	CO	WK	PO
1	Eigenvalue Computation.	Implement Gauss elimination and eigenvalue/eigenvector computation in Python; verify diagonalization on sample matrices and document observations.	7	1	CO1	WK2, WK3	PO1, PO2
2	ODE Solver Study	Solve a set of second-order ODEs using undetermined coefficients and variation of parameters; cross-check with a symbolic solver and prepare a comparative write-up.	7	2	CO2	WK1, WK2, WK3	PO1, PO2
3	Multiple Integral Visualisation	Use a spreadsheet/Python to evaluate double and triple integrals numerically and visualise the regions of integration; compare with analytical results.	8	3	CO3	WK2, WK3, WK4	PO1, PO2, PO5, PO11
4	Fourier Series Approximation	Implement partial-sum Fourier series of standard periodic functions in Python; study convergence behaviour with plots.	8	4	CO4	WK2, WK3	PO1, PO2, , PO5, PO11

TERM WORK ACTIVITIES (15 Hrs)							
Sl. No.	Activity	Description	Time	Module	CO	WK	PO
1	Verification of Linear System Solutions using Determinant and Rank Conditions	Students will manually verify consistency of different linear systems using determinant and rank criteria. Compare the theoretical results with numerical verification using a calculator or Python (optional). Prepare a tabular summary showing consistent/inconsistent systems.	5 Hrs	1	CO 1	WK2, WK3	PO1, PO2, PO5
2	Differential Equations Assignment	Prepare a graded report solving non-homogeneous and Euler-Cauchy ODEs by hand, with engineering-context examples and verification of results.	5 Hrs	2	CO 2	WK1, WK2, WK3	PO1, PO2, PO5, PO11
3	Integrals and Series Mini-Report	Submit a graded mini-report applying multiple integrals to area/volume problems and Fourier/Taylor series to function approximation, with plots and analysis.	5 Hrs	3,4	CO 3, CO 4	Wk1, WK2, WK3, WK4	PO1, PO2, PO5, PO11

RUBRICS FOR TERM WORK EVALUATION						
Sl.No.	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Understanding of Concept	Clear, in-depth, demonstrates originality	Good clarity, minor gaps	Adequate but lacks depth	Partial understanding	Very limited understanding
2	Implementation & Coding	Correct, optimized, well-documented	Correct but not optimized	Basic implementation with errors	Incomplete with major errors	No attempt
3	Analysis & Interpretation	Strong analysis with metrics & insights	Good analysis, limited metrics	Basic interpretation	Minimal interpretation	No analysis
4	Report & Presentation	Well-structured, professional, references included	Clear, minor issues in organization	Average, lacks polish	Poorly structured	Not submitted
5	Teamwork & Engagement	Highly collaborative and proactive	Good participation	Moderate effort	Low effort	Absent

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**40%**
Learning Activity (Self Learning, Term Work, Assignments, Module Test, Tutorials)	40 %
Attendance	10 %
Internal Examination	50 %
Course Project	NA
End Semester Examination	**60%**
Total	100 %

TABLE OF SPECIFICATIONS FOR QUESTION PAPER DESIGN									
Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	**U**	**A**	**An**	**E**	**C**	
1	Linear Algebra	11	-	3	12				15
2	Ordinary Differential Equations	12	-	3	12				15
3	Multiple Integrals	12	-	3	12				15
4	Taylor and Fourier series	10	-	3	12				15
This shall be treated as a general guideline for students and teachers for distribution of marks.									

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN					
No: of Sections in the Question paper		2			
Part	**No. of Questions/Module**	**Total No. of Questions**	**Max. marks/ Question**	**Part Summary**	**Total Marks**
A	2 (No choice)	8	3	8 x 3	24
B	2 (Including Choice)	8	9	4 x 9	36
TOTAL MARKS					**60**

Course Code	Course Name				Credits
J1BSP122	**PHYSICS FOR ELECTRICAL SCIENCE**				**4**
Regulation	2026	L: T:P:H:S	3:0:2:0:5.5	Notional Learning Hours/Semester	120
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	TP	Course delivery Mode		Theory + Practical	
Scheme of Evaluation		CIA: 60 Marks	ESE:40 Marks	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	Plus Two Physics - Electrostatic potential and capacitance, Dual nature of radiation and matter, Semiconductor electronics: materials, devices and simple circuits				

COURSE OBJECTIVE	
1	To provide students with a solid background in the fundamentals of Physics and to impart this knowledge in Electrical Science disciplines.
2	To develop scientific attitudes and enable students to correlate Physics concepts with their core programs.
3	To equip students with practical knowledge that complements their theoretical studies and develop their ability to create practical applications and solutions in engineering based on their understanding of Physics.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Apply the comprehended knowledge about laser and fibre optics in various engineering applications	K3
2	Explain Superconductivity and basic theory of dielectrics	K2
3	Explain the fundamentals of Semiconductor Physics.	K2
4	Apply the behaviour of semiconductor materials to explain the functioning of semiconductor devices	K3
5	Apply basic knowledge of principles and theories in physics to conduct experiments.	K3

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	-	-	-	3	-	-	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
3	3	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	3	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	3	2	-	-	-	3	2	-	-	3	-	-	-	2	-	-	-	-	-

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	**Title**	**Topics**	**Hours**
1	**Laser & Fiber Optics**	Optical processes - Absorption, Spontaneous emission and stimulated emission, Properties of laser, Principle of laser - conditions for sustained lasing – Population inversion, Pumping, Metastable states, Basic components of laser - Active medium- Optical resonant cavity, Construction and working of Ruby laser, Semiconductor Laser (Qualitative), Applications of laser. Optical fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres, Numerical aperture –Derivation, Applications of optical fibres - Fibber optic communication system (block diagram)	9
2	**Superconductivity & Dielectrics**	Super conductivity, Transition temperature, Critical field, Meissner effect, Type I and Type II Super conductors, Applications of superconductors. Dielectric constant, Polarization, Permittivity- relative permittivity, Relation between polarization and dielectric constant, Types of Polarization, Internal fields in liquids and solids, Clausius Mossotti Relation, Dielectric loss(qualitative), Dielectric breakdown (qualitative)	9
3	**Semiconductor Physics**	Intrinsic semiconductor, Derivation of density of electrons in conduction band and density of holes in valence band, Intrinsic carrier concentration, Variation of Intrinsic carrier concentration with temperature, Extrinsic semiconductor (qualitative) Formation of p-n junction, Fermi level in semiconductors- intrinsic and extrinsic, Energy band diagram of p-n junction - Qualitative description of charge flow across a p-n junction - Forward and reverse biased p-n junctions, V-I Characteristics of p-n junction	9
4	**Semiconductor Devices**	Semiconductor devices - Rectifiers- Full wave and Half wave, Zener diode - V-I characteristics - Zener breakdown and Avalanche breakdown, Tunnel diode - V-I characteristics, Applications of Zener and Tunnel diodes. Photonic devices (qualitative) - Photo detectors (Junction and PIN photodiodes), Applications, Solar cells- V-I Characteristics, Efficiency, Stringing of Solar cells to solar panel, Light Emitting Diode, Applications of LED	9

LIST OF EXPERIMENTS (24 hours)		
Instructions Minimum 10 Experiments		
Sl. No.	**Experiment**	**CO**
1	Diode characteristics	4, 5
2	Zener diode – V I characteristics	4, 5
3	Half wave rectifier	4, 5
4	Characteristics of LED	4, 5

5	Solar Cell – V I and Intensity Characteristics	4, 5
6	Laser – Determination of wavelength using diffraction grating	4, 5
7	Laser- To measure the wavelength using a millimetre scale as a grating	4, 5
8	CRO -Measurement of frequency and amplitude of wave forms	5
9	Photo diode - V-I Characteristics	4, 5
10	Numerical aperture of optical fibre	5
11	Tunnel diode –V-I characteristics	4, 5
12	Voltage regulation using a Zener diode	4, 5
13	Full wave rectifier	4, 5
14	Determination of band gap energy of a semiconductor	3, 5

NSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
SL.	Name of Book	Name of Author/s	Publisher	Year
1.	Concepts of Modern Physics	Arthur Beiser	Tata McGraw Hill Publications	6th Edition, 2003
2	Engineering Physics	H K Malik , A.K. Singh,	McGraw Hill	2nd Edition, 2017
3	A Textbook of Engineering Physics	MN Avadhanulu, P G Kshirsagar, TVS Arun murthy	S. Chand	11th Edition, 2018
REFERENCE				
SL.	**Name of Book**	**Name of Author/s**	**Publisher**	**Year**
1	Semiconductor Devices Fundamentals	Robert F Pierret	Pearson Education	1995
2	Advanced Semiconductor Fundamental	Robert F Pierret	Pearson Education	2nd Edition, 2002
3	Solid State Electronic Devices	Ben G Streetman and Sanjay Kumar Banerjee	Pearson Education 6/e	2010
4	Solid State Physics	S.O. Pillai	New age international publishers	10th Edition, 2022
5	Introduction to Solid State Physics	Charles Kittel	Wiley India Edition	2019
6	Advanced Engineering Physics	Premlet B	Phasor Books	10th Edition ,2017
7	A Text Book of Engineering Physics	I. Dominic and. A. Nahari,	Owl Books Publishers	Revised Edition, 2016
VIDEO LINKS (NPTEL, SWAYAM…)				
1	https://nptel.ac.in/courses/108106181			
2	https://nptel.ac.in/courses/108108112			
3	https://nptel.ac.in/courses/115103108			
4	https://nptel.ac.in/courses/115102124			

Course Contents and Lecture Schedule				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
1- Laser & Fibber Optics	Part 1	Lasers and Optical Amplification	Optical processes – Absorption-Spontaneous emission and stimulated emission, Principle of laser - conditions for sustained lasing - Population inversion- Pumping-Metastable states, Basic components of laser - Active medium - Optical resonant cavity	2
	Part 2	Types and Applications of Lasers	Construction and working of Ruby laser, Semiconductor Laser (Qualitative), Applications of laser.	2
	Part 3	Fundamentals of Optical Fibers	Optical fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres	2
	Part 4	Optical Fiber Parameters and Applications	Numerical aperture –Derivation, Applications of optical fibres - Fibber optic communication system (block diagram)	3
2- Superconductivity & Dielectrics	Part 1	Superconductivity & Key Properties	Super conductivity, Transition temperature, Critical field, Meissner effect,	2
	Part 2	Superconductor Types & Applications	Type I and Type II Super conductors, Applications of superconductors.	2
	Part 3	Dielectric Properties of Materials	Dielectric constant, Polarization, Permittivity- relative permittivity, Relation between polarization and dielectric constant, Types of Polarization	3
	Part 4	Behaviour of Dielectrics in Electric Fields	Internal fields in liquids and solids, Clausius Mossotti Relation, Dielectric loss(qualitative), Dielectric breakdown (qualitative)	2
3-Semiconductor Physics	Part 1	Intrinsic semiconductor	Intrinsic semiconductor, Derivation of density of electrons in conduction band and density of holes in valence band	2
	Part 2	Carrier Concentration & Extrinsic Semiconductors	Intrinsic carrier concentration, Variation of Intrinsic carrier concentration with temperature, Extrinsic semiconductor (qualitative)	3
	Part 3	P-N Junction & Energy Bands	Formation of p-n junction, Fermi level in semiconductors-intrinsic and extrinsic, Energy band diagram of p-n junction - Qualitative description of charge flow across a p-n junction	2
	Part 4	P-N Junction Bias & I-V Characteristics	Forward and reverse biased p-n junctions, Diode equation (Derivation), V-I Characteristics of p-n junction	2

4-Semiconductor Devices	Part 1	Rectifiers & Zener Diode	Semiconductor devices - Rectifiers- Full wave and Half wave	2
	Part 2	Tunnel Diode & Semiconductor Laser	Zener diode - V-I characteristics - Zener breakdown and Avalanche breakdown, Tunnel diode - V-I characteristics, Applications of Zener and Tunnel diodes.	2
	Part 3	Photonic devices – LED & Photodetectors	Photonic devices (qualitative) - Photo detectors (Junction and PIN photodiodes), Applications	2
	Part 4	Solar cell	Solar cells- V-I Characteristics, Efficiency, Stringing of Solar cells to solar panel, Light Emitting Diode, Applications of LED	3

SELF LEARNING ACTIVITIES (30 Hrs)							
Sl.	Activity	Description	Time	Module	CO	WK	PO
1	Laser Principles Study	Watch SWAYAM/NPTEL video on laser working principles, spontaneous and stimulated emission, and population inversion.	3	4	CO 1	WK2 WK3 WK8	1,3,9
2	Optical Fiber Communication	Draw and explain the block diagram of a fibre optic communication system, showing propagation and numerical aperture concept.	3	4	CO 1	WK3 WK4 WK8	1,3,9
3	Superconductivity Research	Collect recent advancements and applications (MRI, maglev trains, quantum computing). Prepare short presentation.	3	3	CO 2	WK3 WK5 WK7	1,3
4	Dielectric Constant Measurement (Virtual)	Perform a virtual lab experiment to calculate dielectric constant and study its variation with frequency.	3	3	CO 2	WK4 WK5 WK6	1,3
5	Semiconductor Theory Exploration	Study intrinsic and extrinsic semiconductors, carrier concentration, and Fermi level variation using NPTEL videos and textbook exercises.	6	1	CO 3	WK1 WK2 WK3	1,3
6	p-n Junction Simulation	Use online simulator to visualize forward and reverse bias characteristics and current–voltage relationships.	3	1	CO 3	WK2 WK3 WK4	1,3
7	Device Application Study	Research practical uses of Zener diode and Tunnel diode in modern electronics (voltage regulation, high-speed circuits).	3	2	CO 3	WK3 WK4 WK6	1,3
8	Solar Energy Case Study	Prepare a mini report on the working of solar panels, focusing on solar cell efficiency and connections.	3	2	CO 4	WK4 WK6 WK7	1,3
9	Laboratory Correlation Report	Relate any two physics lab experiments (e.g., diode and laser) to theoretical principles learned in class.	3	1–4	CO 5	WK3 WK5 WK6 WK9	1,3,5
10	Mini Seminar Presentation	Each student selects one advanced topic (e.g., quantum tunnelling, Hall effect, or superconductors) and prepares a short presentation/report.	3	3	CO 5	WK5 WK7 WK8 WK9	1,3,5

TERM WORK ACTIVITIES (30 Hrs)							
Sl.	**Activity**	**Description**	**Time**	**Module**	**CO**	**WK**	**PO**
1	Semiconductor Device Characterization Report	Prepare a report comparing V–I characteristics of diode, Zener, and Tunnel diode with simulation/lab results.	6	3,4	CO3, CO5	WK2 WK3 WK4 WK6	1,3,5
2	Laser and Fiber Optics Experiment Correlation	Record observations for laser wavelength determination and fibre NA experiment; interpret data and create comparison chart.	3	1	CO1, CO5	WK3 WK5 WK6	1,3,9
3	Semiconductor Application Mini Project	Design a mini circuit using Zener or LED for a given application (voltage regulator, indicator circuit, etc.) with working explanation.	4	3,4	CO4, CO5	WK3 WK4 WK6 WK7	1,3,5
4	Dielectric and Superconductivity Case Review	Prepare a comparative review report on dielectric materials vs. superconductors and their engineering relevance.	3	2	CO2	WK3 WK5 WK7	1,3
5	Experimental Data Analysis Practice	Perform error analysis and graphical interpretation for any two experiments (e.g., Hall effect, Band gap).	3	2,3,4	CO5	WK4 WK5 WK6	1,3,5
6	Virtual Simulation Activity	Use virtual lab/NPTEL tools to replicate a semiconductor or laser-based experiment and record screenshots with results.	3	1,3	CO1, CO4	WK2 WK4 WK8	1,3,9
7	Technical Poster Presentation	Prepare a poster summarizing experimental learning outcomes and physics principles behind them.	3	1–4	CO5	WK7 WK8 WK9	1,3,5
8	Group Discussion and Peer Review	Team discussion on experimental observations; peer review and feedback on lab reports.	3	1–4	CO5	WK7 WK8 WK9	1,3,5

RUBRICS FOR TERM WORK EVALUATION						
Sl.	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Understanding of Concept	Clear, in-depth, demonstrates originality	Good clarity, minor gaps	Adequate but lacks depth	Partial understanding	Very limited understanding
2	Implementation & Coding	Correct, optimized, well-documented	Correct but not optimized	Basic implementation with errors	Incomplete with major errors	No attempt

3	Analysis & Interpretation	Strong analysis with metrics & insights	Good analysis, limited metrics	Basic interpretation	Minimal interpretation	No analysis
4	Report & Presentation	Well-structured, professional, references included	Clear, minor issues in organization	Average, lacks polish	Poorly structured	Not submitted
5	Teamwork & Engagement	Highly collaborative and proactive	Good participation	Moderate effort	Low effort	Absent

Lab Evaluation Rubrics							
Sl.	**Criteria**	**Weightage**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Preparation & Pre-Lab Work	30%	Come fully prepared with pre-lab work completed; demonstrates clear understanding of objectives and procedure.	Minor gaps in pre-lab preparation; understands most objectives and procedures.	Partial pre-lab work done; limited understanding of objectives.	Minimal preparation; weak understanding of experiment.	No preparation; unable to explain objectives/procedure.
2	Experimental Skills & Performance	40%	Performs experiment independently with precision, follows correct procedure	Performs experiment with minor guidance; procedure mostly correct.	Needs frequent guidance; some procedural errors.	Struggles with procedure; requires constant help.	Unable to perform experiment correctly even with help
3	Analysis, Interpretation and Documentation	30%	Analyse, Interpret and Document results correctly	Minor interpretation issues.	Some errors in analysis; interpretation superficial.	Major errors in calculations; misinterprets results. Errors in Documentation	No meaningful analysis/interpretation.

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**60%**
Lab Evaluation	30 %
Learning Activity (Self Learning, Term Work, Assignments,)	10%
Attendance	10 %
Internal Examination	50 %
Course Project	NA
End Semester Examination	**40%**
Total	100

TABLE OF SPECIFICATIONS FOR ESE QUESTION PAPER DESIGN									
Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	U	A	An	E	C	
1	Laser & Fiber Optics	9	2	6	2				10
2	Superconductivity & Dielectrics	9		6	4				10
3	Semiconductor Physics	9	2	6	2				10
4	Semiconductor Devices	9	4	6					10
This shall be treated as a general guideline for students and teachers for distribution of marks.									

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN					
No: of Sections in the Question paper			2		
Part	No. of Questions/ Module	Total No. of Questions	Max. marks/ Question	Part Summary	Total Marks
A	1 (No choice)	4	3	4 x 3	12
B	2 (Including Choice)	8	7	4 x 7	28
TOTAL MARKS					**40**

Course Code	Course Name				Credits
J1ESP103	**ALGORITHMIC THINKING WITH PYTHON**				**4**
Regulation	2026	L:T:P:H:S	3:0:2:0:5.5	Notional Learning Hours/Semester	120
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	TP	Course delivery Mode		Theory + Practical	
Scheme of Evaluation		CIE: 60 Marks	ESE: 40 Marks	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	NIL				

COURSE OBJECTIVE	
1	To develop problem-solving skills using structured programming techniques
2	To write, test, and debug Python programs using control structures and functions.
3	To handle data using data structures.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Utilize computing as a model for solving real-world problems.	K2
2	Apply problem-solving techniques to design algorithms and pseudocode for simple computational problems.	K3
3	Develop Python programs using variables, data types, operators, and control structures.	K3
4	Implement modular and recursive solutions using user-defined functions and utilize Python data structures	K4

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	2	3	2	-	-	2	-	-	-	3	2	-	-	2	-	-	-	-	-	-	2	3	-
2	2	3	2	-	-	2	-	-	-	3	2	-	-	2	-	-	-	-	-	-	-	3	2
3	2	3	2	-	-	2	-	-	-	3	2	-	-	2	-	-	-	-	-	-	-	3	2
4	2	3	2	2	-	2	-	-	-	3	3	2	-	2	-	-	-	-	-	-	-	3	3

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	**Title**	**Topics**	**Hours**
1	**Problem Solving Strategies and process**	Problem-solving strategies defined, Importance of understanding multiple problem-solving strategies, Trial and Error, Heuristics, Means-Ends Analysis, and Backtracking (Working backward). Computer as a model of computation, Understanding the problem, Formulating a model, Developing an algorithm, Writing the program, Testing the program, and Evaluating the solution.	9
2	**Algorithm, Pseudocode and Flowchart**	Algorithm and its need, Meaning and Definition of Pseudocode, Reasons for using pseudocode, The main constructs of pseudocode - Sequencing, selection (if-else structure, case structure) and repetition (for, while, repeat-until loops), Sample problems Symbols used in creating a Flowchart - start and end, arithmetic calculations, input/output operation, decision (selection), module name (call), for loop (Hexagon), flow-lines, on-page connector, off-page connector.	9
3	**Python Essentials**	Creating and using variables in Python, Numeric and String data types in Python, Using the math module, Using the Python Standard Library for handling basic I/O - print, input, Python operators and their precedence. Selection and Iteration: if-else, elif, for loop, range, while loop.	9
4	**Modularization, Recursion and Sequence Data Types**	Problem decomposition as a strategy for solving complex problems, Modularization, Motivation for modularization, Defining and using functions in Python. RECURSION:- Recursion Defined, Reasons for using Recursion, Programming Examples Sequence data types in Python - list, tuple, set, strings, dictionary, Creating and using Arrays in Python (using Numpy library).	9

LIST OF EXPERIMENTS (24 Hours)		
Instructions • Lab experiments must be implemented in Python • Minimum 12 Experiments are mandatory • Each student should maintain a record with Aim, algorithm, code, and output. • Programs should follow proper indentation and coding standards. • Continuous evaluation will be based on performance, timely submission, and viva.		
Sl. No.	**Experiment**	**CO**
1*	**Basic Input and Output Operations** – Read the name, address, email, and phone number of a person through the keyboard and print the details.	1
2	**Temperature Conversion** – Convert temperature values between Celsius and Fahrenheit.	2
3*	**Mathematical Calculations** – Write programs to find the area and perimeter of a circle and a rectangle. Write a program to calculate compound interest when principal, rate, and number of periods are given.	2
4*	**Simple Arithmetic Calculator** – Develop a simple desktop calculator using Python that performs five basic arithmetic operations.	3
5*	**Decision Making Programs** – Write Python programs to check whether a number is odd/even, check leap year, and find the largest among three numbers.	3,4
6*	**Grading System** – Display the grade of a student corresponding to the marks entered.	4
7*	**Number Operations** – Write programs to find the sum of *n* natural numbers, and check whether a number is an Armstrong number or palindrome.	4
8*	**Loops and Iterations** – Generate Fibonacci sequence using a while loop and display all prime numbers in a given interval.	4
9	**Pattern Generation** – Implement Floyd's triangle using nested loops.	4
10*	**Functions and Validation** – Write a Python program to: a) validate a password using a function with specific criteria (length, case, digit, special character). b) Check whether a given mobile number is valid or not using a function.	4
11*	**Recursion** – Write a Python program to find the factorial of a number using a recursive function.	4
12*	**List Manipulation** – Input two lists, merge them such that even numbers appear first (sorted), followed by odd numbers (sorted).Write a Python program to check whether a string is a palindrome or not.	4
13*	**Counting and Searching in Lists** – Write a python program to Count positive, negative, and zero values; find words starting with vowels in a list.	4
14*	**Dictionary Operations** – Perform various dictionary manipulations such as displaying student marks, finding highest marks, counting pass students, and modifying entries.	4
15	**Tuple Operations** – Write a Python program to perform operations on a tuple of marks — find highest, lowest, average, count above 75, create new tuple, and check for specific value.	4

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
SL.	Name of Book	Name of Author/s	Publisher	Year
1	Fundamentals of Python : First Programs	Kenneth A Lambert.,	Cengage Publishing	2/e, 2019s
2	How to think like a Computer Scientist: Learning with Python	Downey, A. et al.	John Wiley	2022
3	Computer Fundamentals and Programming in C	Reema Thareja	Oxford University Press	2023
REFERENCE				
SL.	Name of Book	Name of Author/s	Publisher	Year
1	Problem solving & programming concepts	Maureen Sprankle, Jim Hubbard	Pearson	9/e, 2011
2	Python for Everyone	Cay S. Horstmann, Rance D. Necaise	Wiley	3/e, 2024
3	Python Programming: An Introduction to Computer Science	J. Zelle	Franklin, Beedle & Associates Inc.	2010s
5	Introduction to Computing & Problem Solving With PYTHON	Dr. P.Sojan Lal ,Jeeva Jose	Khanna Publishing House (New Delhi)	2016
VIDEO LINKS				
1	https://onlinecourses.nptel.ac.in/noc21_cs32/preview			
2	https://nptel.ac.in/courses/106106212			
VIRTUAL LAB/SIMULATION TOOLS				
1	Virtual Labs (MoE / IITs) (https://www.vlab.co.in/)			
2	Python Online Compiler / IDE (e.g., Replit, Programiz, Jupyter Notebook)			
3	Google Colab			

Course Contents and Lecture Schedule				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
Problem Solving Strategies and process	1	Problem Solving Strategies Introduction	Problem-solving strategies defined, Importance of understanding multiple problem-solving strategies	2
	2	Problem Solving Strategies	Trial and Error, Heuristics	2
	3	Problem Solving Strategies	Means-Ends Analysis and Backtracking (Working backward).	2
	4	Problem Solving Process	Computer as a model of computation, Understanding the problem, Formulating a model, Developing an algorithm, Writing the program, Testing the program, and Evaluating the solution.	3
Algorithm, Pseudocode and Flowchart	1	Algorithm and Pseudocode basics	Algorithm and its need, Meaning and Definition of Pseudocode, Reasons for using pseudocode,	2
	2	Constructs of Pseudocode: Sequence and Selection	The main constructs of pseudocode - Sequencing, selection (if-else structure, case structure) and	2
	3	Repetition	repetition (for, while, repeat-until loops), Sample problems	3
	4	Flowcharts	Symbols used in creating a Flowchart - start and end, arithmetic calculations, input/output operation, decision (selection), module name (call), for loop (Hexagon), flow-lines, on-page connector, off-page connector	2
Python Essentials	1	Python basics	Creating and using variables in Python, Numeric and String data types in Python, Using the math module,.	2
	2	Input & Output and Operators in Python	Using the Python Standard Library for handling basic I/O - print, input, Python operators and their precedence	2
	3	Selection	Selection: if-else, elif	2
	4	Iteration	Iteration: for loop, range, while loop.	3
Modularization, Recursion and Sequence Data Types	1	Modularization	Problem decomposition as a strategy for solving complex problems, Modularization, Motivation for modularization, Defining and using functions in Python.	2
	2	Recursion	RECURSION:- Recursion Defined, Reasons for using Recursion, Programming Examples	2
	3	Sequence Data Types: List & Tuple	Sequence data types in Python - list, tuple, set	2
	4	Sequence Data Types: String, Dictionary and Numpy	Strings, dictionary, Creating and using Arrays in Python (using Numpy library).	3

SELF LEARNING ACTIVITIES (30 Hrs)							
Sl.	Activity	Description	Time	Module	CO	WK	PO
1	**Problem Solving Strategies**	Compare two everyday problems (e.g., finding a lost item vs. planning a trip) and identify which strategy (Trial & Error, Heuristic, Means-Ends, Backtracking) best applies.	3	1	CO 1	WK1, WK2	PO1, PO2
2	**Problem Solving Process**	Take a real-world scenario (e.g., calculating electricity bill, student grade analysis, or bus fare system). Break it down into: • Understanding the problem • Formulating a model • Developing an algorithm • Writing a Python program • Testing and evaluating the solution	3	1	CO 1	WK2, WK4	PO1, PO2
3	**Algorithm and Flowchart Practice**	Design algorithms and draw flowcharts for basic computational problems (e.g., area, factorial, largest of three numbers) using online tools like draw.io.	4	2	CO 2	WK1, WK3	PO1, PO2
4	**Pseudocode Development**	Write structured pseudocode for real-world problems such as grading systems or ATM transactions, emphasizing sequencing, selection, and iteration.	3	2	CO 2	WK1, WK3	PO1, PO2
5	**Exploring Python Basics**	Practice Python fundamentals — data types, variables, operators, expressions, input/output, and type conversion — through simple coding exercises.	4	3	CO 3	WK2, WK3	PO1, PO5
6	**Debugging and Control Structures**	Develop and test Python programs using conditional and looping constructs; identify and fix syntax and logic errors.	4	3	CO 3	WK2, WK6	PO1, PO5
7	**Function-based Problem Solving**	Write user-defined and recursive functions to solve problems like factorial, palindrome, and Fibonacci sequence, emphasizing modularity and reusability.	5	4	CO 4	WK3, WK6	PO1, PO2, PO5
8	**Algorithm to Python Implementation**	Select a real-world problem (e.g., billing or student marks analysis). Develop the algorithm, flowchart, and pseudocode, then implement the solution in Python.	4	4	CO 4	WK3, WK6, WK8	PO2, PO3, PO5

TERM WORK ACTIVITIES (30 Hrs)							
Sl.	**Activity**	**Description**	**Time**	**Module**	**CO**	**WK**	**PO**
1	**Problem Solving Strategies**	Apply Trial & Error, Heuristics, Means-Ends Analysis, and Backtracking to a puzzle/problem and record outcomes.	4	1	CO1	WK1, WK2	PO1, PO2
2	**Problem Solving Process**	Model a real-world problem (e.g., grade analysis, electricity bill) into steps: understanding → model → algorithm.	3	1	CO1	WK1, WK4	PO1, PO2
3	**Algorithm Design**	Prepare algorithms for basic computational problems (e.g., area calculation, sum of numbers, temperature conversion) using standard notation tools.	4	2	CO2	WK1, WK3	PO1, PO2
4	**Pseudocode Writing and Representation**	Write well-structured pseudocode for real-world processes involving sequencing, selection, and repetition (e.g., ATM withdrawal, grading system).	3	2	CO2	WK1, WK3	PO1, PO2
5	**Python Fundamentals Practice**	Develop programs to perform input/output operations, work with variables, data types, operators, and expressions. Test for correct syntax and logic.	4	3	CO3	WK2, WK3	PO1, PO5
6	**Control Structures Implementation**	Implement programs using decision-making and looping constructs (if-else, for, while) with validation-based examples and user inputs.	4	3	CO3	WK2, WK6	PO1, PO5
7	**Function-Based Problem Solving**	Design and implement Python programs using user-defined and recursive functions for problems such as factorial, Fibonacci, and prime number checks.	3	4	CO4	WK3, WK6	PO1, PO2, PO5
8	**Data Structures and Modular Programming**	Work with sequence data types (list, tuple, dictionary) and apply modularization concepts using function calls for reusable code.	5	4	CO4	WK3, WK6	PO2, PO5

RUBRICS FOR TERM WORK EVALUATION						
**Sl. **	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	**Problem Solving Strategies and Process** *(Module 1)*	Clear understanding, innovative strategy, systematic process, optimized real-world solution, well-documented.	Good understanding, workable strategy, mostly correct process, relevant solution, fairly documented.	Partial understanding, basic strategy, process with gaps, functional but less refined solution, adequate documentation.	Limited understanding, vague strategy, incorrect process, weak solution, poor documentation.	No understanding, no clear strategy, no process, irrelevant solution, no documentation.
2	**Algorithm Design & Pseudocode Representation** *(Module 2)*	Accurate and logical algorithms and well-structured pseudocode	Minor logical or formatting issues; generally correct structure.	Basic algorithm and pseudocode with partial accuracy.	Incomplete or unclear steps; lacks logical sequence.	Incorrect or missing algorithm/pseudocode.
3	**Python Fundamentals & Control Structures** *(Module 3)*	Strong command of Python syntax, variables, data types, operators, and control statements; programs execute correctly without errors.	Mostly correct implementation with minor syntax or logic errors.	Basic understanding of syntax; occasional mistakes in execution.	Frequent coding or logical errors; incomplete program flow.	Unable to demonstrate basic coding concepts or logic.
4	**Functions, Modularity & Problem Solving** *(Module 4)*	Applies modular programming effectively using user-defined and recursive functions; demonstrates problem-solving through reusable code.	Function design mostly correct with minor logical errors.	Partial modularization; functions used but not efficiently structured.	Weak logic or poor understanding of function-based programming.	No use of functions or incorrect implementation.

Lab Evaluation Rubrics							
Sl.	**Criteria**	**Weightage**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	**Understanding & Conceptual Clarity**	40%	Demonstrates complete understanding of concepts; applies theory correctly; shows deep comprehension	Good understanding; minor conceptual gaps; mostly correct application	Basic understanding; some confusion; limited application	Weak understanding; major gaps; incorrect application	No understanding; unable to explain concepts
2	**Experimental/ Programming Skills**	30%	Flawless execution; optimal approach; error-free; efficient solution; exceeds requirements	Good execution; minor errors; effective approach; meets requirements	Basic execution; several errors; simple approach; partially meets requirements	Poor execution; major errors; inefficient approach; barely meets requirements	Unable to execute; non-functional; does not meet requirements
3	**Analysis, Interpretation, and Documentation.**	30%	Professional quality; comprehensive; accurate results; well-structured; exceeds expectations	Good quality; mostly accurate; clear structure; meets expectations	Acceptable quality; some inaccuracies; basic structure; minimal expectations met	Poor quality; many inaccuracies; weak structure; below expectations	Unacceptable quality; incorrect; no proper structure

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**60%**
Lab Evaluation	30 %
Learning Activity (Self Learning, Term Work, Assignments,)	20%
Attendance	10 %
Internal Examination	40 %
Course Project	NA
End Semester Examination	**40%**
Total	100

TABLE OF SPECIFICATIONS FOR ESE QUESTION PAPER DESIGN									
Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	U	A	An	E	C	
1	Problem Solving Strategies and process	5		3	7				10
2	Algorithm, Pseudocode and Flowchart	5	3	7					10
3	Python Essentials	6	3		7				10
4	Modularization, Recursion and Sequence Data Types	5		3	7				10
This shall be treated as a general guideline for students and teachers for distribution of marks.									

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN					
No: of Sections in the Question paper				2	
Part	No. of Questions/ Module	Total No. of Questions	Max. marks/ Question	Part Summary	Total Marks
A	1 (No choice)	4	3	4x 3	12
B	2 (Including Choice)	8	7	4 x 7	28
TOTAL MARKS					**40**

Course Code	Course Name				Credits
J1EST104	**ENGINEERING MECHANICS**				**3**
Regulation	2026	L:T:P:H:S	2:1:0:0:3.5	Notional Learning Hours/Semester	90
(L: Lecture, T: Tutorial, P: Practical, H: Project: S: Self Learning and Term work (SL&TW))					
Course Type	TC	Course delivery Mode			Theory
Scheme of Evaluation		CIE: 40 Marks	ESE: 60 Marks	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	Nil				

COURSE OBJECTIVE	
1	**Introduce fundamental principles and laws** of mechanics governing the behaviour of particles and rigid bodies under the action of forces.
2	**Develop the ability to analyze and solve problems** involving equilibrium of force systems, friction, centroid, and moment of inertia.
3	**Explain the concepts of** kinematics and kinetics of particles and rigid bodies under different types of motion.
4	**Apply the principles of** rotational motion and mechanical vibrations to analyze the motion and stability of engineering systems.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Explain the fundamental principles of mechanics force systems, moments, and equilibrium of particles and rigid bodies.	K2
2	Apply equilibrium equations and laws of friction to analyze forces acting on connected and contact bodies.	K4
3	Determine the centroid and moment of inertia of simple and composite plane areas using standard theorems.	K3
4	Analyze the motion and stability of particles, rigid bodies, and engineering systems using the principles of kinematics, kinetics, rotational dynamics, and mechanical vibrations under various motion conditions.	K4

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	2	2	-	-	-	-	-	-	3	2	2	-	-	-	-	-	-	-	-	-	-	-
2	3	3	3	2	-	-	-	-	-	3	3	2	2	-	-	-	-	-	-	-	-	-	-
3	2	3	3	2	2	-	-	-	-	3	2	2	2	-	-	-	-	-	-	-	-	-	-
4	2	2	3	3	2	2	-	-	-	3	3	2	3	2	-	-	-	-	-	-	-	-	-

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	**Title**	**Topics**	**Hours**
1	**Fundamentals of Statics and Equilibrium, Friction**	Fundamentals of mechanics and its branches – force systems and rectangular components – resultants and conditions of equilibrium – system isolation and free body diagrams – moments, Varignon's theorem, and couples – resolution of a force into a force and couple – Fundamentals of friction: laws, coefficient, cone of friction, angle of friction and angle of repose – ladder and block friction – simple friction problems.	12
2	**Structural Mechanics- Trusses and beams Centroid, and Moment of Inertia**	Introduction to structural mechanics types of beams and loading – support reactions of cantilever and simply supported beams (point load and UDL only) – trusses and analysis of simple trusses using method of joints and method of sections – Centroid of areas and composite areas – concept of Pappus–Guldinus theorems – moment of inertia – parallel and perpendicular axis theorems – polar moment of inertia and radius of gyration – mass moment of inertia of ring and disc (derivation only).	11
3	**Kinematics and Kinetics of Particles and Rigid Bodies & Mechanical Vibrations**	Kinematics of rectilinear motion – equations of motion – kinetics and D'Alembert's principle – motion on horizontal and inclined surfaces – motion of connected bodies – Introductory concepts of work–energy and impulse–momentum (No problems required)– Mechanical Vibrations**:** Fundamentals of free vibrations, degree of freedom, simple harmonic motion, spring–mass systems, stiffness and natural frequency, time period, and numerical problems on single-degree-of-freedom systems.	11
4	**Curvilinear translation and Combined motion of translation and rotation**	Curvilinear translation and projectile motion – kinematics of rotational motion – equations of motion for a rigid body about a fixed axis – rotational kinetics under constant moment. Combined motion of translation and rotation – instantaneous centre – motion of connecting rod and crank in reciprocating machines.	11

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
SL.	Name of Book	Name of Author/s	Publisher	Year
1.	Engineering Mechanics (Statics and Dynamics)	S. Timoshenko & D. H. Young	McGraw-Hill Education	2017
2	Engineering Mechanics	R. C. Hibbeler	Pearson Education	2022
REFERENCE				
SL.	Name of Book	Name of Author/s	Publisher	Year
1	Engineering Mechanics	S. S. Bhavikatti & K. G. Rajasekharappa	New Age International	2016
2	Vector Mechanics for Engineers – Statics and Dynamics	F. P. Beer & E. R. Johnston Jr.	McGraw-Hill Education	2018
3	Engineering Mechanics Statics	J. L. Meriam, L. G. Kraige	Wiley	2020
VIDEO LINKS				
1	https://onlinecourses.nptel.ac.in/noc23_me74			
2	https://nptel.ac.in/courses/112106286			
3	https://nptel.ac.in/courses/112103108			
VIRTUAL LAB/SIMULATION TOOLS				
1	PhET simulation or Python/Scilab			
2	https://vlab.amrita.edu/index.php?sub=1			

Course Contents and Lecture Schedule				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
1. Fundamentals of Statics and Equilibrium, Friction (12 Hrs)	Part 1	**Introduction to Mechanics and Force Systems**	Introduction to branches and laws of mechanics – concept of rigid body – characteristics of a force – principles of transmissibility and superposition – representation of force systems – resolution of forces into rectangular components – parallelogram law of forces – resultants of force systems in two dimensions.	3
	Part 2	**Equilibrium of Forces and Free-Body Diagrams**	Conditions of equilibrium for coplanar force systems – Lami's theorem – analytical equilibrium equations in 2D – system isolation and construction of Free-Body Diagrams (FBD) – applications to particles and rigid bodies under different loading conditions.	3
	Part 3	**Moments and Couples**	Concept of moment and principle of moments – Varignon's theorem – couple and its characteristics – moment of a couple – reduction of a force system to an equivalent force and couple – simple applications and numerical problems.	3
	Part 4	**Introduction to Friction and it's applications**	Definition and types of friction – laws of dry friction – limiting friction – coefficient, angle, and cone of friction – angle of repose – equilibrium of bodies on rough horizontal and inclined planes – ladder friction – simple contact friction problems.	3

2. Structural Mechanics, Centroid, and Moment of Inertia (11 Hrs)	Part 1	**Introduction to beams and support reactions**	Types of beams and supports – types of loads (point load and uniformly distributed load) – determination of support reactions for cantilever and simply supported beams under point loads and UDLs – simple numerical problems.	3
	Part 2	**Trusses and analysis of trusses**	Introduction to trusses- analysis of simple trusses- method of joints- method of sections.	2
	Part 3	**Centroid of Areas**	Concept and definition of centroid – centroid of simple geometrical figures – centroid of composite plane areas (no derivations) – Pappus–Guldinus theorems (conceptual treatment only) – simple problems on centroid of composite areas.	3
	Part 4	**Moment of Inertia**	Concept and definition – moment of inertia of plane areas – parallel and perpendicular axis theorems – polar moment of inertia and radius of gyration – mass moment of inertia of ring and disc (derivation only) – simple numerical problems involving plane areas and sections.	3
3. Kinematics and Kinetics of Particles and Rigid Bodies and Mechanical Vibrations (11 Hrs)	Part 1	**Kinematics of Particles**	Kinematics of rectilinear motion – displacement, velocity, and acceleration – equations of motion for constant acceleration – simple numerical problems.	2
	Part 2	**Kinetics of Particles and Rigid Bodies**	Concept of kinetics – Newton's second law of motion –Analysis of Lift motion- D'Alembert's principle – motion on horizontal and inclined surfaces – motion of connected bodies – simple numerical problems.	3
	Part 3	**Work–Energy, Impulse–Momentum and Mechanical Vibrations**	Introductory concepts of work–energy and impulse–momentum principles (no numerical problems) – basics of mechanical vibrations – types of vibrations – degree of freedom – simple harmonic motion – displacement, velocity, and acceleration in SHM.	3
	Part 4	**Spring–Mass Systems and Free Vibrations**	Spring–mass systems – stiffness – time period – natural frequency of free vibrations – effect of mass and stiffness on frequency – simple numerical problems on single-degree-of-freedom (SDOF) systems.	3
4. Curvilinear translation (11 Hrs)	Part 1	**Curvilinear Motion and Projectile Motion**	Curvilinear translation – position, velocity and acceleration in curvilinear motion – projectile motion and its applications – simple numerical problems.	3
	Part 2	**Kinematics and Kinetics of Rotational Motion**	Kinematics of rotational motion – angular displacement, angular velocity and angular acceleration – equations of rotational motion for a rigid body about a fixed axis – rotational kinetics under constant moment – simple numerical problems.	3
	Part 3	**Combined Translation and Rotation**	Combined motion of translation and rotation – rolling motion of rigid bodies – relationship between linear and angular motion – simple numerical problems.	2
	Part 4	**Instantaneous Centre and Applications**	Instantaneous centre of rotation – determination of velocity using instantaneous centre – motion of connecting rod and crank mechanism in reciprocating machines – engineering applications.	3

SELF LEARNING ACTIVITIES (30 Hrs)							
Sl.	Activity	Description	Time	Module	CO	WK	PO
1	NPTEL Video Review	Watch NPTEL lectures on *Force Systems and Equilibrium* (IIT Madras) and summarize key concepts with examples.	6	1	CO1	WK, WK3	PO1, PO2
2	Problem Solving Practice	Solve 10 numerical problems on Support Reactions, Free Body Diagrams, and Moments and Couples from standard textbooks or past exams.	6	1	CO2	WK, WK3	PO2, PO3
3	Case Study – Friction in Machines	Study and prepare a short report on applications of friction in brakes, clutches, and belt drives.	6	2	CO2	WK, WK4	PO1, PO6
4	Centroid and MOI Visualization	Use PhET simulation or Python/Scilab to visualize centroid and moment of inertia for composite sections.	6	2	CO3	WK, WK4	PO5, PO2
5	Mini Research / Article Review	Review an engineering article on *vibration control in mechanical systems* and present a summary connecting it to course concepts.	6	3	CO5	WK, WK6	PO1, PO7

TERM WORK ACTIVITIES (15 Hrs)							
Sl.	Activity	Description	Time	Module	CO	WK	PO
1	Laboratory Demonstration / Simulation	Perform virtual lab experiments (IIT Delhi/Amrita VLABS) on *Equilibrium of Forces*, *Ladder Friction*, and *Beams with Loads*. Submit an observation sheet.	5	1, 2	CO1, CO2	WK, WK4	PO4, PO5
2	Group Assignment	Prepare a group assignment on *Applications of D'Alembert's Principle* and *Lift Motion* using real-life case examples.	5	3	CO4	WK, WK4	PO2, PO10
3	Mini Project / Model	Develop a simple working or 3D model (e.g., beam with loads, spring–mass system) or simulation using Python/MATLAB to demonstrate vibration principles.	5	3	CO5	WK, WK6	PO3, PO5, PO11

RUBRICS FOR TERM WORK EVALUATION						
Sl.	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Understanding of Concept	Clear, in-depth, demonstrates originality	Good clarity, minor gaps	Adequate but lacks depth	Partial understanding	Very limited understanding
2	Implementation & Coding	Correct, optimized, well-documented	Correct but not optimized	Basic implementation with errors	Incomplete with major errors	No attempt
3	Analysis & Interpretation	Strong analysis with metrics & insights	Good analysis, limited metrics	Basic interpretation	Minimal interpretation	No analysis
4	Report & Presentation	Well-structured, professional, references included	Clear, minor issues in organization	Average, lacks polish	Poorly structured	Not submitted
5	Teamwork & Engagement	Highly collaborative and proactive	Good participation	Moderate effort	Low effort	Absent

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**40%**
Learning Activity (Self Learning, Term Work, Assignments, Module Test, Tutorials)	40 %
Attendance	10 %
Internal Examination	50 %
Course Project	NA
End Semester Examination	**60%**
Total	100 %

TABLE OF SPECIFICATIONS FOR QUESTION PAPER DESIGN									
Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	**U**	**A**	**An**	**E**	**C**	
1	Fundamentals of Statics and Equilibrium	11	3	3	9				15
2	Friction, Centroid, and Moment of Inertia	12	3	3	9				15
3	Kinematics and Kinetics of Particles and Rigid Bodies	11		3	12				15
4	Rotational Motion and Mechanical Vibrations	11	3	3	9				15
This shall be treated as a general guideline for students and teachers for distribution of marks.									

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN					
No: of Sections in the Question paper		2			
Part	**No. of Questions/Module**	**Total No. of Questions**	**Max. marks/ Question**	**Part Summary**	**Total Marks**
A	2 (No choice)	8	3	8 x 3	24
B	2 (Including Choice)	8	9	4 x 9	36
TOTAL MARKS					**60**

Course Code	Course Name				Credits
J1EST115	**INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING**				**4**
Regulation	2026	L: T:P:H:S	4:0:0:0:6	Notional Learning Hours/Semester	120
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	TC	Course delivery Mode			Theory
Scheme of Evaluation		CIE: 40 Marks	ESE: 60 Marks	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	Nil				

COURSE OBJECTIVE	
1	To describe the fundamental principles of electrical and magnetic circuits.
2	To explain the analysis of DC and AC electrical circuits.
3	To explain the basic principles and operation of electronic components and circuits used in simple electronic systems.
4	To introduce the fundamentals of digital electronics and communication systems and familiarize students with emerging technologies such as ZigBee, WiMAX, PAN, 5G, 6G, and IoT.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits	K3
2	Apply the principles of electromagnetic induction and AC systems to analyze circuits and calculate voltage, current, power, and power factor in single-phase and three-phase circuits.	K3
3	Explain and analyze the basic functions of passive and active electronic components and examine the operation and characteristics of BJTs, FETs, and operational amplifiers in simple electronic circuits.	K4
4	Apply the principle of digital electronics and communication systems to analyze the functioning and applications of wired and wireless technologies such as AM, FM, GSM, Bluetooth, ZigBee, WiMAX, PAN, 3G–6G, and IoT.	K3

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	3	3	-	-	-	-	-	-	3	2	-	-	-	-	-	-	-	-	-	3	-	-
2	-	3	3	3	-	-	-	-	-	3	3	-	2	-	-	-	-	-	-	-	3	2	-
3	3	1	3	2	-	2	-	-	-	3	3	-	-	2	-	-	-	2	-	2	3	-	-
4	3	-	3	-	-	-	-	-	-	3	2	-	-	2	-	-	-	2	-	2	3	-	-

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	**Title**	**Topics**	**Hours**
1	**DC Electric Circuits and Magnetic Circuits**	**Elementary Concepts of DC Electric Circuits:** Current and Voltage Division Rule - Ohms Law and Kirchhoff's laws - Capacitors & Inductors: V-I relations and Energy stored - numerical problems. **Star-delta Conversion and Source Transformation:** Star-delta conversion (resistive networks only - derivation not required) - numerical problems. Voltage and Current Sources - Source Transformation - numerical problems. **Analysis of DC Electric Circuits:** Mesh current method - matrix representation - solution of network equations - numerical problems. Node voltage methods - matrix representation - solution of network equations by matrix methods, numerical problems. **Elementary Concepts of Magnetic Circuits:** Basic Terminology of Magnetic Circuits - MMF - field strength - flux density - reluctance, Comparison between electric and magnetic circuits	15
2	**AC Circuits**	**Electromagnetic Induction:** Faraday's laws, Lenz's law, statically induced and dynamically induced emf, Self inductance and mutual inductance, coefficient of coupling (numerical problems not needed) **Alternating Current Fundamentals:** Generation of alternating voltages, Representation of sinusoidal waveforms: frequency - period - average value - RMS value and form factor - numerical problems. Phasor representation of sinusoidal quantities, Complex Forms - Trigonometric, Rectangular and Polar forms. **Analysis of Simple AC Circuits:** Purely resistive, inductive & capacitive circuits - numerical problems. RL, RC and RLC series circuits - concept of impedance - power factor - active, reactive and apparent power, Voltage, Impedance and Power Triangle - numerical problems. **Three Phase AC Systems:** Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents, computation of three phase power (balanced only) - numerical problems	15
3	**Introduction to Electronic devices**	Introduction to Electronic devices: Passive and active components in electronics (Resistor, Capacitor, inductor, Diode, BJT, FET). Block diagram of DC power supply. Construction, working and V -I Characteristics of BJT, Input output characteristics of CE configuration, Comparison of CE, CB and CC configurations. Transistor as a switch, Transistor Biasing- Fixed Biasing and Voltage Divider biasing, Transistor as an amplifier (Circuit diagram, working, Frequency response and gain bandwidth product). Operational amplifiers (Op Amps): The Op-Amp - Block diagram, Schematic Symbol and 741 IC Pin diagram.	13

4	**Digital Electronics and communication systems**	Modern Electronics and its applications: General block diagram of a Communication system, Concept of AM and FM, Block diagram of AM and FM super-heterodyne receiver. Basic concepts of Wired communication, Introduction to Wireless Communication, Evolution, Wireless LAN, Bluetooth, Zig-Bee and Personal Area Networks. Broadband Wireless Access-WiMax Technology, Wireless spectrum allocation and Standards. Block diagram of GSM, Comparison of 3G, 4G, 5G and 6G communication technologies. Number Systems- Decimal, Binary, Octal and hexadecimal, and their conversions. Logic gates, Boolean algebra and rules of simplification Introduction to IoT and its applications.	17

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION

TEXTBOOKS

SL.	Name of Book	Name of Author/s	Publisher	Year
1	Basic Electrical Engineering	D P Kothari and I J Nagrath	Tata McGraw Hill	4th Edition 2019
2	Schaum's Outline of Basic Electrical Engineering	J. J. Cathey and Syed A. Nasar	Tata McGraw Hill	3rd Edition 2010
3	Basic Electrical Engineering	V. K. Mehta & Rohit Mehta	S. Chand	6th Edition 2012
4	Basic Electronics and Linear Circuits	N N Bhargava D C, Kulshreshtha	McGraw Hill	2017
5	Electronic Communication Systems	Kennedy and Davis	McGraw Hill	2017
6	Basic Electrical and Electronics Engineering	S. K. Bhattacharya	Pearson	2012
7	Digital Fundamentals	Thomas L. Floyd	Pearson Education	2020
8	Introduction to Internet of Things (IoT)	Raj Kamal	McGraw Hill	2021
9	Basic Electronics and Linear Circuits	N N Bhargava D C, Kulshreshtha	McGraw Hill	2017

REFERENCE				
SL.	**Name of Book**	**Name of Author/s**	**Publisher**	**Year**
1	Basic Electrical Engineering	D. C. Kulshreshtha	Tata McGraw Hill	2nd Edition 2019
2	Electrical Engineering Fundamentals	Del Toro V.	Pearson Education	2nd Edition 2019
3	Basic Electrical Engineering	T. K. Nagsarkar, M. S. Sukhija	Oxford Higher Education	3rd Edition 2017
4	Electronics: A Systems Approach	Neil Storey	Pearson	2017
5	Electronic Devices and Circuit Theory	Robert L. Boylestad	Pearson	2015
6	Principles of Electronic Communication Systems	Frenzel, L. E	MGH	2016
7	Electronic Devices and Circuits	David A. Bell	Oxford University Press	5th Ed., 2017
8	Principles of Electronic Communication Systems	Louis E. Frenzel	McGraw Hill	5th Ed., 2023
9	Fundamentals of Digital Circuits	A. Anand Kumar	PHI Learning	2019
10	Basics of Internet of Things (IoT)	Arshdeep Bahga, Vijay Madisetti	Universities Press	2020

VIDEO LINKS	
1	Basic Electrical Technology, IIT Kharagpur - https://nptel.ac.in/courses/108105053
2	Fundamentals of Electrical Engineering, IIT Kharagpur - https://nptel.ac.in/courses/108105112
3	Introduction to Electrical Engineering , IIT Delhi https://youtube.com/playlist?list=PLp6ek2hDcoNCc3IgSGVjIsiMhM_Ll9FEn
4	Basic Electrical Technology: http://www.digimat.in/nptel/courses/video/108108076/108108076.html
5	NOC:Basic Electric Circuits: http://www.digimat.in/nptel/courses/video/108104139/108104139.html
6	NOC:Introduction to Electrical Engineering: http://www.digimat.in/nptel/courses/video/108102185/108102185.html
7	NOC:Network Analysis: http://www.digimat.in/nptel/courses/video/108105159/108105159.html
8	Digital Circuits (NPTEL) - https://nptel.ac.in/courses/108105132
9	Analog Circuits- NPTEL – Analog Electronic Circuits (IIT Kharagpur) - https://nptel.ac.in/courses/108105158
10	IoT Basics- NPTEL – Introduction to Internet of Things (IIT Kharagpur) https://nptel.ac.in/courses/106105166
11	MOSFET and Amplifier Basics, Electronics Tutorials – Transistor & MOSFET Explained (YouTube) https://www.youtube.com/@ElectronicsTutorials

VIRTUAL LAB/SIMULATION TOOLS		
1	Virtual Labs: https://bee-iitk.vlabs.ac.in/ https://bes-iitr.vlabs.ac.in/ https://vlab.amrita.edu/index.php?sub=1&brch=75	To perform experiments on Kirchhoff's rules, measurement of voltage, current, power and power factor, study of series RLC circuit.
2	MultisimLive https://www.multisim.com	Create Circuits and Simulate with the Power of SPICE
3	Circuit Lab - Circuit Simulation and Schematics https://www.circuitlab.com/	Interactive browser-based tool for real-time electronic circuit visualization.
4	Virtual Labs – IIT Bombay - https://www.vlab.co.in/	To perform experiments on diode and transistor characteristics, rectifiers, and filters.
5	TINA-TI / Multisim Simulation	To simulate and analyze analog and digital electronic circuits.
6	Falstad Circuit Simulator	Interactive browser-based tool for real-time electronic circuit visualization.
7	NI Multisim / Multisim Live	For both analog and digital circuit simulation; useful for logic gate verification, Boolean simplification, and waveform analysis.
8	Proteus Design Suite	For digital circuit implementation, simulation, and verification of logic and sequential circuits.
9	TinkerCAD Circuits (Autodesk)	For basic IoT and embedded system demonstrations using virtual Arduino-based circuits and sensors.

COURSE CONTENTS AND LECTURE SCHEDULE				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
1. DC Electric Circuits and Magnetic Circuits (15 Hrs)	Part 1	Elementary Concepts of DC Electric Circuits	Current and Voltage Division Rule - Ohms Law and Kirchhoff's laws - Capacitors & Inductors: V-I relations and Energy stored - Numerical problems.	3
	Part 2	Star-delta Conversion and Source Transformation	Star-delta conversion (resistive networks only - derivation not required) - numerical problems. Voltage and Current Sources - Source Transformation - numerical problems.	3
	Part 3	Analysis of DC Electric Circuits	Mesh current method - matrix representation - solution of network equations - numerical problems. Node voltage methods - matrix representation - solution of network equations by matrix methods - numerical problems.	6
	Part 4	Elementary Concepts of Magnetic Circuits	Basic Terminology of Magnetic Circuits - MMF - field strength - flux density - reluctance, Comparison between electric and magnetic circuits.	2
2. AC Circuits (15 Hrs)	Part 1	Electromagnetic Induction	Faraday's laws, Lenz's law, statically induced and dynamically induced emf, Self inductance and mutual inductance, coefficient of coupling (numerical problems not needed)	2
	Part 2	Alternating Current Fundamentals	Generation of alternating voltages, Representation of sinusoidal waveforms: frequency – period - average value - RMS value and form factor - numerical problems. Phasor representation of sinusoidal quantities, Complex Forms - Trigonometric, Rectangular and Polar forms.	4
	Part 3	Analysis of Simple AC Circuits	Purely resistive, inductive & capacitive circuits - numerical problems. RL, RC and RLC series circuits - concept of impedance - power factor - active, reactive and apparent power, Voltage, Impedance and Power Triangle - numerical problems.	6
	Part 4	Three Phase AC Systems	Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents, computation of three phase power (balanced only) - numerical problems	3

3. Introduction to Electronic devices (13 Hrs)	Part 1	Electronic Components and Power Supply	Passive and active components: Resistors, Capacitors, Inductors, Diodes, BJTs, FETs. Block diagram of a DC power supply.	3
	Part 2	Transistor Characteristics and Configurations	Construction, working, and V–I characteristics of BJT. Input and output characteristics of CE configuration. Comparison of CE, CB, and CC configurations.	3
	Part 3	Applications of Transistor	Transistor as a switch, Transistor Biasing- Fixed Biasing and Voltage Divider biasing, Transistor as an amplifier (Circuit diagram, working, Frequency response and gain bandwidth product).	5
	Part 4	Operational Amplifiers (Op-Amps)	Operational amplifiers (Op Amps): The Op-Amp - Block diagram, Schematic Symbol and 741 IC Pin diagram.	2
4. Digital Electronics and communication systems (17 Hrs)	Part 1	Communication Systems Fundamentals	General block diagram of a Communication system, Concept of AM and FM, Block diagram of AM and FM super-heterodyne receiver.	3
	Part 2	Wired and Wireless Communication	Basic concepts of Wired communication, Introduction to Wireless Communication, Evolution, Wireless LAN, Bluetooth, Zig-Bee and Personal Area Networks. Broadband Wireless Access-WiMax Technology, Wireless spectrum allocation and Standards.	5
	Part 3	Cellular and Advanced Communication Systems	Block diagram of GSM, Comparison of 3G, 4G, 5G and 6G communication technologies. Introduction to IoT and its applications.	4
	Part 4	Digital Electronics Fundamentals	Number Systems- Decimal, Binary, Octal and hexadecimal, and their conversions. Logic gates, Boolean algebra and rules of simplification.	5

SELF LEARNING ACTIVITIES (36 Hrs)							
Sl.	Activity	Description	Time	Module	CO	WK	PO
1	Simulation/ Virtual Lab	Simulation tutorials on Ohm's Law and KCL/KVL using software like Multisim, PSpice, Falstad or any other Circuit Simulator.	4 Hrs	1	CO1		
2	Solution of Matrix	Write MATLAB/Octave/Scilab code to solve mesh or nodal equations using matrix methods.	4 Hrs	1	CO1		
3	Simulation/ Virtual Lab	Simulate RLC series circuits in Multisim and study phase difference between voltage and current.	4 Hrs	2	CO2		
4	Technical Video Presentation	Watch video simulations of 1-pahse and 3-phase generation, rotation of phasors.	2 Hrs	2	CO2		
5	Self Study/ Simulation	To plot/simulate the graphical representation of various electrical parameters (voltage, current and power) for different AC circuits.	4 Hrs	2	CO2		
6	Exploratory Virtual Lab Study	Independently explore online virtual labs (IITB, Falstad, or TINA-TI) to observe the behavior of basic electronic components such as diodes, transistors, and operational amplifiers. Record key observations related to voltage/current characteristics and performance trends. *(Focus: concept familiarization, no formal evaluation)*	6 Hrs	1	CO3	WK3	PO1, PO2
7	Mini Project / Case Study	Undertake a small simulation-based study demonstrating any one digital or communication concept — for example, logic gate operations, AM modulation, or a simple IoT application concept. Submit a short summary of objectives, circuit/simulation results, and observations. *(Focus: creative application and self-driven learning)*	5 Hrs	2	CO4	WK5, WK6	PO2, PO3, PO4
8	Technical Review & Presentation	Prepare a concise report or presentation on emerging technologies such as ZigBee, WiMAX, PAN, 5G, 6G, or IoT, highlighting their key features and relevance in modern communication systems. *(Focus: independent research and communication skills)*	4 Hrs	2	CO4	WK6, WK7	PO4, PO10

TERM WORK ACTIVITIES (30 Hrs)							
Sl.	Activity	Description	Time	Module	CO	WK	PO
1	Hardware Experiment	Build a simple DC resistive network using resistors and measure voltages/currents using a multimeter to verify KVL/KCL.	6 Hrs	1	CO1		
2	Hardware Experiment	Demonstrate electromagnetic induction using a coil, magnet, and galvanometer.	1 Hrs	2	CO2		
3	Hardware Experiment	Use a function generator and oscilloscope to measure amplitude, frequency, and RMS of AC signals.	3 Hrs	2	CO2		
4	Hardware Experiment	Demonstrate star and delta connections using a 3-phase resistive load bank; measure line, phase voltages/currents and also power consumption.	2 Hrs	2	CO2		
1	Analog Circuit Simulation and Verification	Simulate and verify the performance of analog circuits such as half-wave, full-wave rectifiers, filters, and transistor amplifiers using Multisim or TINA-TI. Compare simulated waveforms with theoretical predictions and submit a lab report. *(Focus: structured analysis and performance evaluation)*	5	1	CO3	WK3, WK4	PO1, PO2
2	Digital Circuit Implementation	Design and simulate basic digital logic circuits and Boolean expressions using logic gates. Verify truth tables and timing responses through software simulation. *(Focus: formal design verification and documentation)*	5	2	CO4	WK5	PO1, PO3
3	Communication System Simulation	Simulate the block diagram of a basic AM or FM transmitter-receiver, or a GSM model, using TINA-TI or equivalent tool. Analyze input/output waveforms and modulation behavior. *(Focus: applied understanding and result interpretation)*	5	2	CO4	WK6, WK7	PO2, PO3, PO4

RUBRICS FOR TERM WORK EVALUATION						
Sl.	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Understanding of Concept	Clear, in-depth, demonstrates originality	Good clarity, minor gaps	Adequate but lacks depth	Partial understanding	Very limited understanding
2	Implementation & Simulation	Correct, optimized, and complete implementation with proper documentation.	Implementation mostly correct; minor optimization issues.	Partial implementation with minor errors.	Incomplete or contains major functional errors.	No valid implementation attempted.
3	Analysis & Interpretation	Strong analysis with metrics & insights	Good analysis, limited metrics	Basic interpretation	Minimal interpretation	No analysis
4	Report & Presentation	Well-structured, professional, references included	Clear, minor issues in organization	Average, lacks polish	Poorly structured	Not submitted
5	Teamwork & Engagement	Highly collaborative and proactive	Good participation	Moderate effort	Low effort	Absent

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**40%**
Learning Activity (Self Learning, Term Work, Assignments, Module Test, Tutorials)	40 %
Attendance	10 %
Internal Examination	50 %
Course Project	NA
End Semester Examination	**60%**
Total	100 %

TABLE OF SPECIFICATIONS FOR QUESTION PAPER DESIGN										
Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	**U**	**A**	**An**	**E**	**C**	
1	DC Electric Circuits and Magnetic Circuits	15	3	3	9				15
2	AC Circuits	15	3	3	9				15
3	Introduction to Electronic Devices	13	6	9					15
4	Digital Electronics & Communication Systems	17	3	6	6				15
This shall be treated as a general guideline for students and teachers for distribution of marks.									

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN					
No: of Sections in the Question paper		2 (Each Sections has the following Question Pattern with Part A and Part B)			
Part	**No. of Questions/Module**	**Total No. of Questions**	**Max. marks/ Question**	**Part Summary**	**Total Marks**
A	2 (No choice)	4	3	4 x 3	12
B	2 (Including Choice)	4	9	2 x 9	18
TOTAL MARKS					**30**

Course Code	Course Name				Credits
J1HWP126	**HEALTH AND WELLNESS**				**1**
Regulation	2026	L:T:P:H:S	1:0:1:0:2	Notional Learning Hours/Semester	30
(L: Lecture, T: Tutorial, P: Practical, H: Project: S: Self Learning and Term work (SL&TW)					
Course Type	TP	Course delivery Mode			Theory & practical
Scheme of Evaluation		CIE:100 Marks	ESE: 0 Marks	Total Marks:100	
Pre-requisite	Nil				

COURSE OBJECTIVE	
1	To provide essential knowledge on physical activity, health, and wellness**.** To ensure students understand body systems, exercise principles, nutrition, mental health, and disease management.
2	To educate students on the benefits of yoga, the risks of substance abuse and basic first aid skills. To equip students with the ability to lead healthier lifestyles.
3	To enable students to design effective and personalized exercise programs.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Apply the FITT principle to design a basic exercise programme by relating the functions of the respiratory, cardiovascular, and musculoskeletal systems to the components of health-related physical fitness and appropriate exercise intensity levels.	K3
2	Apply principles of balanced nutrition and wellness to evaluate dietary choices and recommend appropriate lifestyle modifications for improving physical and mental health.	K3
3	Apply yogic practices and lifestyle management strategies to prevent and manage common hypokinetic diseases and musculoskeletal disorders, and assess the health consequences of psychoactive substance abuse.	K3
4	Describe first aid procedures, including primary survey, CPR, and the Heimlich maneuver, to manage common sports injuries and medical emergencies effectively.	K2

COURSE ARTICULATION MATRIX																								
CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1		2	2	-	-	-	-	-	-	-	2	1	-	-	-	2	1	-	1	1			
2	-	1	2	2	-	-	2	-	1	-	1	2	2	-	-	3	2	2	2	2			
3	1	1	2	-	-	-	2	-	2	1	1	1	-	-	-	3	2	3	1	1			
4	2	-	2	1	-	2	2	-	1	-	1	1	1	-	1	3	-	2	2	2			
Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"																							

Module	Title	Topics	Hours
1	Introduction to Physical Activity and Body Systems	Introduction of the importance of physical activity in daily life. Human Body Systems related to Physical activity and its functions: Respiratory System - Cardiovascular System. Musculoskeletal System and the Major Muscle groups of the HumanBody. Quantifying Physical Activity Energy Expenditure and Metabolicequivalent of task (MET) Exercise Continuum: Light-intensity physical activity, Moderate - intensity physical activity, Vigorous -intensity physical activity. Defining Physical Activity, Aerobic Physical Activity, Anaerobic Physical Activity, Exercise and Health-Related Physical Fitness. FITT principle to design an Exercise programme Components of Health related Physical Fitness: - Cardiorespiratory Fitness- Muscular strength- Muscular endurance- Flexibility- Body composition.	5
2	Health, Wellness, and Nutrition	Concept of Health and Wellness: Health and wellness differentiation, Factors affecting health and wellness. Mental health and Factors affecting mental health. Sports and Socialization: Sports and character building - Leadership through Physical Activity and Sports Diet and nutrition: Exploring Micro and Macronutrients: Concept of Balanced diet, Carbohydrate & the Glycemic Index Animal & Plant - based Proteins and their Effects on Human Health Dietary Fats & their Effects on Human Health Essential Vitamins and Minerals	3
3	Yoga, Lifestyle Diseases, and Substance Abuse	Lifestyle management strategies to prevent / manage common hypokinetic diseases and disorders - Obesity - cardiovascular diseases (e.g., coronary artery disease, hypertension) - Diabetes Osteoporosis, Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis, lordosis, flat foot, Knock knee).Meaning, Aims and objectives of yoga - Classification and importance of of Yogic Asanas (Sitting, Standing, lying) Pranayama and Its Types - Active Lifestyle and Stress Management Through Yoga Understanding on substance abuse and addiction - Psychoactive substances & its ill effects- Alcohol- Opioids- Cannabis -Sedative - Cocaine -Other stimulants, including caffeine -Hallucinogens - Tobacco -Volatile solvents.	4

4	First Aid and Sports Injuries	First aid and principles of First Aid: Primary survey: ABC (Airway, Breathing, Circulation). Qualities of a Good First Aider First aid measures for: - Cuts and scrapes - Bruises - Sprains - Strains - Fractures - Burns - Nosebleeds. First Aid Procedures: Cardiopulmonary Resuscitation (CPR) - Heimlich Maneuver - Applying a sling Sports injuries: Classification (Soft Tissue Injuries - Abrasion, Contusion, Laceration, Incision, Sprain & Strain)	3

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION

TEXTBOOKS

Sl.No.	Name of Book	Name of Author/s	Publisher	Year
1	Foundations of Nutrition	Bhavana Sabarwal	Commonwealth Publishers	1999
2	Anatomy and physiology in health and illness.	Ross and Wilson	Waugh, A., & Grant, A.	2022

REFERENCE

Sl.No.	Name of Book	Name of Author/s	Publisher	Year
1	Fit to be Well Essential Concept	Thygerson, A. L., Thygerson, S. M., & Thygerson, J. S.	Jones & Bartlett Learning.	2018
2	Introduction to physical education, fitness, and sport.	Siedentop, D., & Van der Mars, H.	Human kinetics.	2022
3	Substance Use Disorders. Manual for Physicians.	Lal, R., & Ambekar, A. (2005).	National Drug Dependence TreatmentCentre, New Delhi	2005
4	The exercise health connection-how to reduce your risk of disease and other illnesses by making exercise your medicine.	Nieman, D. C., & White, J. A	Public Health	1998
5	ACSM's resource manual for guidelines for exercise testing and prescription.	Lippincott Williams& Wilkins.	American College ofSports Medicine.	2012
6	Exercise Physiology: energy, nutrition and human performance.	Katch, F. I., Katch, V. L., & McArdle, W. D.	Lippincott Williams & Wilkins	2010

VIDEO LINKS

1	https://youtu.be/GdyGcPCl5cs?si=LYHNNxDt1D7p4lpq
2	https://youtu.be/Zlk2BvPtySo?si=-2rCDuIwiUanCcM4

COURSE CONTENTS AND LECTURE SCHEDULE				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
1.Introduction to Physical activity and Body systems (5 Hrs)	Part 1	Introduction to Physical activity	Major benifits of physical activity, Essential measures before and after exercise	1
	Part 2	Respiratory system and vital exercise performance	Anatomy and Physiology of the respiratory system, Vital exercise for respiratory health	1
	Part 3	Cardio Vascular system and Exercise	Anatomy and Physiology of Cardio vascular system, Cardio vascular health and Exercise.	1
	Part 4	Musculoskeletal system and Exercise	Anatomy and physiology Musculoskeletal system, Musculoskeletal system and Exercise	1
	Part 5	FITT principle to design an Exercise programme	Components of Health related Physical Fitness: - Cardiorespiratory Fitness- Muscular strength- Muscular endurance- Flexibility- Body composition.	1
2.Concept of Health and Wellness (3 Hrs)	Part 1	Concert of health and wellness	Health and wellness differentiation, Factors affecting health and wellness. Mental health and Factors affecting mental health.	1
	Part 2	Human welfare and sports, Concept of balanced Diet	Sports and Socialization: Sports and character building - Leadership through Physical Activity and Sports Diet and nutrition: Exploring Micro and Macronutrients: Concept of Balanced diet	1
	Part 3	Different Dietary options and essential Vitamins and minerals	Carbohydrate & the Glycemic Index Animal & Plant - based Proteins and their Effects on Human Health Dietary Fats & their Effects on Human Health Essential Vitamins and Minerals	1
3. Yoga and Substance abuse (4 Hrs)	Part 1	lifestyle management through Yoga	Lifestyle management strategies to prevent / manage common hypokinetic diseases and disorders - Obesity - Cardiovascular diseases (e.g., coronary artery disease, hypertension) - Diabetes - Osteoporosis - Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis, lordosis , flat foot, Knock knee)	2
	Part 2	Yoga - Meaning, Aim and objectives	Meaning, Aims and objectives of yoga - Classification and importance of of Yogic Asanas (Sitting, Standing, lying) Pranayama and Its Types - Active Lifestyle and Stress Management Through Yoga	1
	Part 3	Understanding substance abuse	Understanding on substance abuse and addiction - Psychoactive substances & its ill effects- Alcohol- Opioids- Cannabis -Sedative - Cocaine -Other stimulants, including caffeine -Hallucinogens - Tobacco -Volatile solvents.	1

4.First aid and sports injuries (3 Hrs)	Part 1	First Aid	First aid and principles of First Aid: Primary survey: ABC (Airway, Breathing, Circulation). Qualities of a Good First Aider	1
	Part 2	Different first aid measures	First aid measures for: - Cuts and scrapes - Bruises - Sprains - Strains - Fractures - Burns - Nosebleeds. First Aid Procedures: Cardiopulmonary Resuscitation (CPR) - Heimlich Maneuver - Applying a sling	1
	Part 3	Sports injuries: Classification	Sports injuries: Classification (Soft Tissue Injuries - Abrasion, Contusion, Laceration, Incision, Sprain & Strain	1

SELF LEARNING ACTIVITIES (30 Hrs)

Sl No.	Activity	Description	Time	Module	CO	WK	PO
1	NPTEL video analysis and submission of case study	Submission of a case study in the topic of Exercise in children and adolescents or Role of Exercise in disease management	6	1	CO1	WK1, WK2, WK3	PO1, PO2, PO5
2	Dietary Analysis and Nutrition Journal	Maintain a 7-day food diary and analyze macronutrient and micronutrient intake using online tools; submit a written report on dietary habits and suggested improvements.	6	2	CO2	WK4, WK6	PO1, PO6, PO8
3	Yoga and Mindfulness Practice Log	Practice a set of yogic asanas and pranayama regularly for 4 weeks; maintain a reflective journal documenting postures practiced, duration, and health benefits observed.	6	3	CO3	WK3, WK6	PO6, PO7, PO8
4	First Aid Scenario Simulation Report	Study and document appropriate responses to 5 first-aid emergency scenarios including CPR, choking, fractures, burns, and bleeding; prepare a structured emergency response guide.	6	4	CO4	WK2, WK5	PO6, PO9
5	Personal Fitness Assessment and Exercise Program Design	Measure individual fitness components (resting heart rate, flexibility, muscular endurance); evaluate results against norms and design a 6-week personalized exercise program using FITT principles.	6	1	CO1	WK1, WK3	PO1, PO2, PO9

TERM WORK ACTIVITIES (15 Hrs)							
Sl.No.	Activity	Description	Time	Module	CO	WK	PO
1	Physical Fitness Testing and Report	Conduct standard fitness tests (sit-and-reach, push-up test, 3-minute step test); record results, compare against age-based norms, and submit a written fitness report with recommendations.	5	1	CO1	WK2, WK4	PO4, PO9
2	Yoga Asana and Pranayama Demonstration	Demonstrate a sequence of 5 yogic asanas (one from each category: sitting, standing, lying) and one pranayama technique; explain the health benefits of each posture demonstrated.	5	3	CO3	WK3, WK6	PO6, PO9
3	First Aid and CPR Practical Demonstration	Demonstrate the primary survey (ABC), CPR on a training manikin, Heimlich maneuver, wound dressing for cuts and burns, and application of a sling; assessed by instructor using a standardized checklist.	5	4	CO4	WK2, WK5	PO6, PO9

RUBRICS FOR TERM WORK EVALUATION						
Sl. No.	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Subject Knowledge and Accuracy	Demonstrates thorough and accurate understanding of all concepts with no errors.	Shows good understanding with only minor errors.	Shows adequate understanding with some conceptual errors.	Shows limited understanding with several notable errors.	Little or no understanding of the subject evident.
2	Practical Skill Performance	Demonstrates all required practical skills correctly and with confidence.	Performs most practical skills correctly with minor lapses.	Performs skills adequately but with noticeable inconsistencies.	Struggles with most practical skills; requires repeated guidance.	Unable to perform practical skills correctly.
3	Record / Report Quality	Comprehensive, well-organized report with thorough data analysis and clear conclusions.	Clear, well-structured report with adequate detail and logical conclusions.	Satisfactory report with basic information but limited analysis.	Incomplete report with minimal information and poor structure.	Very poor or no report submitted.

4	Participation and Engagement	Consistently active and enthusiastic participation in all practical activities.	Regular participation with only occasional lapses in engagement.	Participates adequately when required; moderate engagement.	Rarely participates; frequently needs encouragement from instructor.	Does not participate in activities even when prompted.
5	Attendance and Punctuality	Attends all practical sessions on time with no absences.	Attends most sessions; rarely late with no unexcused absences.	Acceptable attendance with a few minor absences or instances of tardiness.	Poor attendance; frequently absent or consistently late.	Very poor attendance; misses most practical sessions.

ASSESSMENT PATTERN	
Assessment	**Weightage**
Attendance	10 %
Case Study/Micro project/Presentation	40 %
Activity evaluation	50 %
Total	100 Marks

Course Code	Course Name				Credits
J1ESL127	**ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP**				**1**
Regulation	2026	L: T:P:H:S	0:0:2:0:1	Notional Learning Hours/Semester	30
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	PL	Course delivery Mode		Practical	
Scheme of Evaluation		CIE: 100 Marks	ESE: NIL	Duration of ESE: NIL	
Pre-requisite	NIL				

COURSE OBJECTIVE	
1	To create awareness and familiarity with electrical wiring and safety measures to be taken.
2	To Identify various electronic components and to operate various measuring instruments
3	Learn to setup simple electronic circuits on breadboard and PCB

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Demonstrate the safety measures against electrical shocks	K3
2	Familiarise the components used in electric circuit like cables, switches, circuit breakers, batteries and earthing schemes	K3
3	Illustrate the connection diagram and identify the suitable accessories necessary for wiring simple electrical circuit	K3
4	Identify various electronic components	K3
5	Operate various measuring instruments	K3
6	Apply the design procedure of simple electronic circuits on breadboard and PCB	K3

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	2	-	3	-	3	-	3	-	3	-	-	3	-	-	3	3	-	-	-	-	-	-	-
2	3	-	3	-	-	3	-	-	-	3	-	-	-	2	-	-	-	-	-	-	-	-	-
3	2	-	3	2	-	3	-	-	-	3	-	-	-	3	-	-	-	-	-	-	-	-	-
4	2	-	3	-	-	3	-	-	2	3	-	-	-	2	-	-	-	-	-	-	-	-	-
5	2	-	3	-	-	3	-	2	-	-	-	2	3	3	-	-	-	-	-	-	-	-	-

6	2	-	-	3	-	3	-	2	-	-	-	3	-	3	-	-	-	-	-	2	-	-	-

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	Title	Topics	Hours
1	**Electrical Safety and Wiring**	Precautionary steps for electrical shocks, identification of cables, switches, fuses, MCB, ELCB, MCCB, wiring circuits (single lamp, two lamps, two-way switches, power distribution), transformer operation, voltage measurement using CRO	7
2	**Electrical Measurement, Battery and Earthing Systems**	Familiarisation of rheostats, measurement of potential across resistance elements, relative potential in DC circuits. Battery specifications (Lead acid, Li Ion, NiCd), types of earthing and ground enhancing materials	8
3	**Basic Electronics and Circuit Fundamentals**	Electronics Component Familiarisation: Identification, symbols, colour coding, packaging. Circuit Diagram and Tools: Drawing electronic circuits, interpreting datasheets, using tools Electronic Component Testing: Testing resistors, capacitors, diodes, transistors, JFET using multimeter	7
4	**PCB Design, Assembly, and Advanced Techniques**	PCB and Soldering Techniques: Types, design, fabrication, soldering, crimping. Circuit Assembly and Testing: Assembly on PCB/breadboard, use of power supply, rectifier, filters, ICs. Advanced Techniques: Surface Mount Technology, EDA tools like Ki Cad, Circuit	8

LIST OF EXPERIMENTS (30 Hours)

Instructions

- Minimum 12 Experiments are mandatory
- Students should maintain a record of the lab experiments.

Sl. No	Experiment	CO
	Electrical Workshop (Minimum of 7 Experiments to be done)	
1	A) Demonstrate the precautionary steps adopted in case of Electrical shocks. B) Identify different types of cables, wires, switches, fuses, fuse carriers, C) Identify MCB, ELCB and MCCB, familiarize the ratings.	CO1 CO2
2	Wiring a single lamp controlled by Single switch	CO3
3	Wiring a two lap controlled by two switches	CO3
4	Wiring of light/fan circuit using two-way switches. (Staircase wiring)	CO3
5	Wiring of a simple light circuit for light/ fan point (PVC conduit wiring) and a 6A plug socket with individual control.	CO3

6	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.	CO2 CO3
7	Familiarisation of step up and step-down transformers, (use low voltage transformers) Measurement and representation of voltage and waveform to scale in graph sheet with the help of CRO	CO3
8	A) Familiarisation of rheostats, B) Measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit.	CO3
9	A) Identify battery specifications using different types of batteries. (Lead acid, Li Ion, NiCd etc.) B) Familiarize different types of earthing (Pipe, Plate Earthing, and Mat Schemes) and ground enhancing materials (GEM).	CO2
Sl. No.	**Experiment**	**CO**
ELECTRONICS WORKSHOP (Minimum of 7 Experiments to be done)		
1	**Familiarization/Identification of electronic components with specification** (Functionality, type, size, colour coding, package, symbol and cost of -Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.)	CO4
2	**Drawing of electronic circuit diagrams using BIS/IEEE symbols and Interpret data sheets of discrete components and IC's**	CO4
3	**Familiarization/Application of testing instruments and commonly used tools**. - (Multimeter, Function generator, Power supply, CRO, DSO. Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station)	CO5
4	**Testing of electronic components using multimeter** - Resistor, Capacitor, Diode, Transistor and JFET.	CO5
5	**Familiarization of Printed circuit boards (PCB)** - Types, Single sided, Double sided, PTH, Processing methods. Design and fabrication of a single sided PCB for a simple circuit.	CO6
6	**Inter-connection methods and soldering practice**. Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions. Soldering practice in connectors and general-purpose PCB, Crimping	CO6
7	**Assembling electronic circuit/system on general purpose PCB, test and show the functioning** (Any two)- Fixed voltage power supply with transformer Rectifier diode Capacitor filter Zener/IC regulator Square wave generation using IC 555 timer in IC base.	CO6
8	**Assembling electronic circuits using SMT (Surface Mount Technology) stations.**	CO6
9	**Introduction to EDA tool** (such as Ki Cad or XCircuit)	CO6

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
SL.	Name of Book	Name of Author/s	Publisher	Year
1.	Electrical Design Estimating and Costing	K B Raina and S K Bhattacharya	New Age International Publishers	2024
2	Basic Electrical Engineering	D P Kothari and I J Magrath	Tata McGraw Hill 4	2019
3	Basic Electronics and Linear Circuits	NN Bhargava, D C Kulshreshtha and S C Gupta	Mc Graw Hill	2017
REFERENCE				
SL.NO	Name of Book	Name of Author/s	Publisher	Year
1	Electrical Systems Design	M K Giridharan	I K International Publishing House Pvt. Ltd	2022
VIDEO LINKS				
1	https://www.youtube.com/watch?v=kGDQkbNsC9w			
2	https://www.youtube.com/shorts/Epc50HsiM84			
3	https://www.youtube.com/watch?v=xDLAO8ajndk			
4	https://www.youtube.com/watch?v=cJkevV7l22k			
5	https://www.youtube.com/watch?v=OKfzXLrvOmw&list=PLBBGwIiUvNPCVfQCxGk9halPCPSKoof-u&index=9			
6	https://nptel.ac.in/courses/122106025, https://youtu.be/w8Dq8blTmSA, Lecture Series on Basic Electronics by Proof T.S.Natarajan, Department of physics, IIT Madras			
7	Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software https://onlinecourses.nptel.ac.in/noc25_ee163/preview, https://www.youtube.com/watch?v=HOpaW2Ungcc&list=PLp6ek2hDcoNAUpqc3DUj4U5hcipc2idZ5&index=11			
8	PCB Substrate and layers https://www.youtube.com/watch?v=itiOpVqSi0A&list=PLp6ek2hDcoNAUpqc3DUj4U5hcipc2idZ5&index=32			
9	Oscilloscope https://youtu.be/0FVzYLEdSA8			
SIMULATION TOOLS				
1	Falstad Circuit Simulator: https://www.falstad.com/circuit/			
2	Tinker cad Circuits: https://www.tinkercad.com/circuits			
3	Ki Cad's SPICE: https://www.kicad.org/discover/spice/			

RUBRICS FOR CONTINUOUS INTERNAL ASSESSMENT							
SL. NO	**evaluation criteria**	**weightage**	**Excellent (100%)**	**Good (80%)**	**Satisfactory (60%)**	**Needs improvement (40%)**	**Poor (10%)**
1	Preparation & Pre-lab Work	20%	Fully prepared, all tasks completed, clear concepts	Minor gaps, overall understands	Partially completed, some confusion	Minimal effort, weak comprehension	No prep, unable to explain
2	Lab Reports and Record Keeping	20%	Professional, clear, well-structured, referenced	Mostly clear, minor errors	Average, lacks clarity	Poor, incomplete	Not submitted
4	Attendance	15%	Professional, clear, well-structured, referenced	Mostly clear, minor errors	Average, lacks clarity	Poor, incomplete	Not submitted
5	Viva	15%	Demonstrates full mastery	Good responses	Can answer basic questions	Struggles with responses	Cannot answer
6	Internal Lab Examination	30%	Marks Scored by the student can be proportionally added to the Assessment based on the weightage.				
RUBRICS FOR END SEMESTER EXAMINATION							
Sl.NO	Criteria	Weightage	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Poor (1)
1	Experimental Preparation/Procedure	20%	Clear plan, correct setup, uses resources wisely	Mostly clear, few oversights	Basic preparation	Disorganized, unprepared	No attempt
2	Circuit Diagram/Execution	30%	Independently solves, correct methodology	Minor help, approach mostly right	Needs guidance, some mistakes	High dependency, errors	Unable to attempt
3	Output /Result	20%	Results fully correct, well interpreted	Results mostly correct	Partial correctness	Mostly incorrect	No output
4	Viva Voce	20%	All results correctly interpreted, strong insights	Good understanding	Basic interpretation	Minimal/incorrect	No inference
5	Record Submission	10%	Outstanding understanding, all	Good responses, minor errors	Satisfactory, basic answers	Poor knowledge, incomplete	Does not submit

			questions answered				

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**100%**
Lab Evaluation	50 %
Learning Activity (Self Learning)	10%
Attendance	10 %
Internal Examination	30 %
Course Project	NA
End Semester Examination	**-**
Total	**100**

Course Code	Course Name				Credits
J1BST221	**VECTOR CALCULUS, PARTIAL DERIVATIVES AND TRANSFORMS**				**3**
Regulation	2026	L: T:P:H:S	3:0:0: 0:4.5	Notional Learning Hours/Semester	90
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	TC	Course delivery Mode			Theory
Scheme of Evaluation		CIE: 40 Marks	ESE: 60 Marks	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	Basic Knowledge of Integration and Differentiation				

COURSE OBJECTIVE	
1	To introduce the calculus of functions of several variables, partial derivatives and the theory of Laplace transforms
2	To develop analytical skills for evaluating gradients, directional derivatives, divergence, curl and line integrals of vector fields
3	To apply vector integral theorems and Laplace-transform techniques to engineering problems involving flux, work and differential equations.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
CO1	Apply partial differentiation, the chain rule and implicit differentiation to analyse functions of several variables and locate their maxima and minima	K3
CO2	Apply Laplace transforms, shifting theorems and the convolution theorem to solve linear differential equations	K3
CO3	Compute the gradient, directional derivative, divergence, curl and line integrals of scalar and vector fields	K3
CO4	Apply Green's, divergence and Stokes' theorems to evaluate line, surface and flux integrals in engineering problems	K3

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	3	2	2		-	-	-	-	3	3	-	2	2	-	-	-	-	-	2	-	-	-
2	2	3	3	2		-	-	-	-	3	3	-	3	2	-	-	-	-	-	2	-	-	-
3	2	3	2	3		-	-	-	-	3	3	-	3	2	-	-	-	-	-	2	-	-	-
4	2	3	3	3		-	-	-	-	3	3	-	3	2	-	-	-	-	-	2	-	-	-

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	**Title**	**Topics**	**Hours**
1	**Partial Derivatives**	Limits and continuity, Partial derivatives, Partial derivatives of functions with two variables, Partial derivatives viewed as rate of change and slopes, Partial derivatives of functions with more than two variables, Higher order partial derivatives, Local Linear approximations, Chain rule, Implicit differentiation, Maxima and minima of functions of two variables - relative maxima and minima **(Text 2: Relevant topics from sections 13.2, 13.3, 13.4, 13.5, 13.8)**	11
2	**Laplace Transforms**	Laplace Transform and its inverse, linearity, Laplace transform of basic functions, first shifting theorem, Laplace transform of derivatives, solution of differential equations using Laplace transform, Unit step function, Second shifting theorems. Dirac delta function and its Laplace transform, Convolution theorem (without proof) and its application for finding inverse Laplace transform of products of functions. **(Text 1: Relevant topics from sections 6.1, 6.2, 6.3, 6.4, 6.5)**	11
3	**Vector Calculus**	Vector valued function of single variable - derivative of vector valued function, Concept of scalar and vector fields, Gradient and its properties, Directional derivative, Divergent and curl, Line integrals of vector fields, Work done as line integral, Conservative vector field, independence of path, Potential function (results without proof **(Text 2: Relevant topics from section 12.1, 12.2, 13.6, 15.1, 15.2, 15.3)**	12
4	**Vector Integral Theorems**	Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals, finding areas using Green's theorem, Surface integrals over surfaces of the form $z = g(x, y)$, Flux integrals over surfaces of the form $z = g(x, y)$, Sources and sinks in incompressible field. Divergence theorem (without proof), Using Divergence theorem to find flux, Stokes' Theorem (without Proof) **(Text 2: Relevant topics from section 15.4, 15.5, 15.6, 15.7,15.8)**	11

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
Sl. No.	Name of Book	Name of Author/s	Publisher	Year
1	Advanced Engineering Mathematics	Erwin Krey zig	John Wiley & Sons	10th edition, 2016
2	Calculus	H. Anton, I. Biven, Davis	Wiley 12th edition	2024

REFERENCE				
SL No.	Name of Book	Name of Author/s	Publisher	Year
1	Thomas' Calculus	Maurice D. Weir, Joel Hass, Christopher	Przemyslaw Bogacki Pearson 15th edition.	2023
2	Higher Engineering Mathematics B. V. Ramana McGraw-Hill Education 39th edition, 2023	B. V. Ramana	McGraw-Hill Education 39th edition	2023
3	Bird's Higher Engineering Mathematics John Bird Taylor & Francis 9th edition, 2021	John Bird	Taylor & Francis 9th edition	2021
VIDEO LINKS				
1	https://nptel.ac.in/courses/111107108			
2	https://archive.nptel.ac.in/courses/111106139			
3	https://nptel.ac.in/courses/111107108			
4	https://nptel.ac.in/courses/111107108			
VIRTUAL LAB/SIMULATION TOOLS				
1	PYTHON			
2	MATLAB			

COURSE CONTENTS AND LECTURE SCHEDULE				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
Partial Derivatives (11 Hrs)	Part 1	Partial Derivatives	Concept of limit and continuity of functions of two variables, partial derivatives	2
	Part 2	Differentials	Differentials, Local Linear approximations	2
	Part 3	Chain Rule	Chain rule for partial Derivatives, Total derivative	4
	Part 4	Maxima and minima	Relative maxima and minima, Absolute maxima and minima on closed and bounded set.	3

Laplace Transforms (12 Hrs)	Part 1	Laplace Transform, inverse Transform	Finding Laplace Transform and inverse Transform, Linearity, First shifting theorem	3
	Part 2	Solution of Differential equations	Solution of Differential equations, Initial value problems by Laplace Transform method.	3
	Part 3	Unit step function and Dirac Delta function	Unit step function --- Second shifting theorem, Dirac Delta function	3
	Part 4	Convolution method	Finding Inverse Laplace Transform using Convolution method.	3
Vector Calculus (11 hours)	Part 1	Vector valued function of single variable.	Vector valued function of single variable - derivative of vector valued function, Concept of scalar and vector fields	2
	Part 2	Gradient, Divergent and curl	Gradient and its properties, Directional derivative, Divergent and curl	3
	Part 3	Line Integrals	Line integrals of vector fields, Work done as line integral,	3
	Part 4	Conservative vector field,	Conservative vector field, independence of path, Potential function (results without proof)	3
Vector Integral Theorems (11 hours)	Part 1	Green's theorem	Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals, finding areas using Greens theorem.	3
	Part 2	Surface integrals	Surface integrals over surfaces of the form $z = g(x, y)$	3
	Part 3	Divergence theorem	Divergence theorem (without proof), Using Divergence theorem to find flux, Sources and sinks in incompressible field.	3
	Part 4	Stokes theorem	Verification of Stokes theorem, using Stokes theorem to evaluate line integrals.	2

SELF LEARNING ACTIVITIES (30 Hrs)							
Sl. No	Activity	Description	Time	Module	CO	WK	PO
1	**Multivariable Optimisation Study**	Solve a graded set of maxima/minima problems for functions of two variables; verify critical points numerically in Python.	7 hrs	1	1	WK1 WK2 WK3	PO1, PO2, PO4 PO11
2	**Laplace Transform Worksheet**	Use Laplace transforms to solve a set of linear ODEs, including problems involving the unit step and Dirac delta functions; verify with Python.	8 hrs	2	2	WK2 WK3	PO1, PO2, PO4
3	**Vector Field Visualisation**	Use GeoGebra 3D / Python to visualise gradient, divergence and curl of sample fields; identify conservative fields and potential functions.	7 hrs	3	3	WK2 WK3 WK4	PO1, PO2, PO4
4	**Integral Theorems Problem Set**	Solve problems applying Green's, divergence and Stokes' theorems; verify the equality of the two sides for sample regions.	8 hrs	4	4	WK1 WK2 WK3 WK4	PO1, PO2 ,PO4

TERM WORK ACTIVITIES (15 Hrs)							
Sl No.	Activity	Description	Time	Module	CO	WK	PO
1	Partial Derivatives Problem.	Submit a computational report by solving 5 problems on partial derivatives, the chain rule and optimisation of two-variable functions.	5	1	CO1	WK2 WK3 WK4	PO1, PO2, PO4
2	**Laplace Transform Problem.**	Submit a computational report by solving 5 problems on Laplace transforms, shifting theorems and convolution applied to differential equations.	5	2	CO2	WK2 WK3 WK4	PO1, PO2, PO4
3	**Vector Calculus Computational Report**	Submit a computational report with two vector-field problems (gradient/divergence/curl, line integral) and one application of an integral theorem.	5	3,4	CO3 CO4	WK1 WK2 WK3	PO1, PO2, PO4

RUBRICS FOR TERM WORK EVALUATION						
Sl. No	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Understanding of Concept	Clear, in-depth, demonstrates originality	Good clarity, minor gaps	Adequate but lacks depth	Partial understanding	Very limited understanding
2	Implementation & Coding	Correct, optimized, well-documented	Correct but not optimized	Basic implementation with errors	Incomplete with major errors	No attempt
3	Analysis & Interpretation	Strong analysis with metrics & insights	Good analysis, limited metrics	Basic interpretation	Minimal interpretation	No analysis
4	Report & Presentation	Well-structured, professional, references included	Clear, minor issues in organization	Average, lacks polish	Poorly structured	Not submitted
5	Teamwork & Engagement	Highly collaborative and proactive	Good participation	Moderate effort	Low effort	Absent

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**40%**
Learning Activity (Self Learning, Term Work, Assignments, Module Test, Tutorials)	40 %
Attendance	10 %
Internal Examination	50 %
Course Project	NA
End Semester Examination	**60%**
Total	100 %

TABLE OF SPECIFICATIONS FOR QUESTION PAPER DESIGN									
Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	**U**	**A**	**An**	**E**	**C**	
1	Partial Derivatives	11		3	12				15
2	Laplace Transforms	12		3	12				15
3	Vector Calculus	11		3	12				15
4	Vector Integral Theorems	11		3	12				15
This shall be treated as a general guideline for students and teachers for distribution of marks.									

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN					
No: of Sections in the Question paper		2			
Part	**No. of Questions/Module**	**Total No. of Questions**	**Max. marks/ Question**	**Part Summary**	**Total Marks**
A	2 (No choice)	8	3	8 x 3	24
B	2 (Including Choice)	8	9	4 x 9	36
TOTAL MARKS					**60**

Course Code	Course Name				Credits
J1BSP212	**CHEMISTRY FOR ENGINEERS**				**4**
Regulation	2026	L: T:P:H:S	3:0:2: 0:5.5	Notional Learning Hours/Semester	120
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	TP	Course delivery Mode		Theory + Practical	
Scheme of Evaluation		CIE: 60 Marks	ESE:40 Marks	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	Basic Electrochemistry, Introduction to Organic Chemistry, Redox Reactions, Polymers				

COURSE OBJECTIVE	
1	To impart the fundamental principles of electrochemistry, corrosion and energy-conversion systems used in modern electrical and electronic devices.
2	To familiarise students with engineering materials - nanomaterials, conducting polymers and organic electronic materials - and their role in contemporary electronics
3	To develop the ability to apply spectroscopic and analytical techniques to characterise materials and to address environmental chemistry challenges (water, waste, climate).

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Apply electrochemical principles to analyze electrochemical cells, energy storage and conversion devices, and corrosion protection techniques for engineering applications.	K3
2	Apply the principles of nanomaterials, advanced polymers, and functional electronic materials to select appropriate materials for emerging engineering applications.	K3
3	Apply spectroscopic and analytical techniques (UV-Vis, IR, XRD, SEM) to characterise materials.	K3
4	Apply water quality assessment, treatment, and sewage management principles to address engineering problems for societal well-being.	K3
5	Apply environmental-chemistry principles to evaluate waste-treatment processes and to discuss climate-change indicators and Sustainable Development Goals.	K3

COURSE ARTICULATION MATRIX																								
CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes														
	WK									PO											PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	2	3	2	2	2	-	-	-	3	2	2	2	2	2	-	-	2	-	1			
2	3	2	3	2	-	2	-	-	-	3	2	2	2	2	-	-	-	2	-	1			
3	3	2	3	2	-	3	-	2	-	3	2	2	3	3	-	-	-	2	-	1			
4	3	2	3	2	3	2	2	-	2	3	2	2	2	2	3	-	2	2	-	2			
5	2	2	2	-	3	-	3	3	2	2	-	-	-	-	-	3	1	-	-	-			
Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"																								

SYLLABUS			
Module	Title	Topics	Hours
1	**Electrochemistry and Corrosion Science**	**Electrochemical Cell** - Electrode potential - Electrochemical series – Applications - Nernst equation for single electrode and cell (Numerical problems). **Reference Electrodes** - SHE, Calomel electrode - Glass electrode (construction only). **Energy conversion devices** - Li-ion battery - Fuel cell - Phosphoric acid fuel cell and Polymer electrolyte membrane fuel cell (PEMFC) - Solar cells - Photovoltaic cell (silicon based) - Photoelectrochemical cell - DSSC (Dye sensitised solar cell). **Corrosion** - Electrochemical corrosion mechanism - Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and Impressed current cathodic protection - Electroplating of copper - Electroless plating of copper.	10
2	**Materials for Electronic Applications**	**Nano Materials** - Classification based on Dimension & Materials - Synthesis - Sol gel and Chemical Reduction - Applications of nanomaterials - Carbon Nanotubes - Fullerenes - Graphene - Carbon Quantum Dots - Structure, properties & application. **Polymers** - Fire Retardant Polymers - Halogenated & Non-halogenated polymers - Conducting polymers - Classification - Polyaniline & Polypyrene - synthesis, properties and applications. **Organic electronic materials and devices** - Construction, working and applications of Organic Light Emitting Diode (OLED) & Quantum Dot LED (QLED) - Materials used in Quantum computing Technology - Super capacitors - Spintronics.	8
3	**Molecular Spectroscopy and Analytical Techniques**	**Spectroscopy** - Types of spectra- Molecular energy levels - Beer Lambert's law - Numerical problems **Electronic Spectroscopy** - Principle, Types of electronic transitions - Role of conjugation in absorption maxima - Instrumentation - Applications **Vibrational Spectroscopy** - Principle - Number of vibrational modes - Vibrational modes of CO_2 and H_2O - Applications **X-ray Diffraction (XRD)** - Principle and applications in determining crystal structure and phase identification. **Scanning Electron Microscope (SEM)** - Principle, instrumentation and Applications.	9

4	**Environmental Chemistry**	**Water characteristics** - Hardness - Types of hardness - Temporary and Permanent - Disadvantages of hard water - Degree of hardness (Numericals) **Water softening methods** - Ion exchange process - Principle, procedure and advantages - Reverse osmosis - Principle, process and advantages. **Water disinfection methods** - Chlorination - Break point chlorination - Ozone and UV irradiation. Dissolved oxygen (DO) - BOD and COD - Definition & Significance. **Waste Management** - Sewage water treatment - Primary, Secondary and Tertiary - Flow diagram - Trickling filter and UASB process. E Waste - Methods of disposal - Recycle, recovery and reuse. **Chemistry of climate change** - Greenhouse Gases- Ozone Depletion - Sustainable Development - An introduction to Sustainable Development Goals.	9

LIST OF EXPERIMENTS (24 hours)

Instructions

- Minimum 10 Experiments

Sl. No.	Experiment	CO
1	Estimation of iron in iron ore	1
2	Estimation of copper in brass	1
3	Determination of cell constant and conductance of solutions	1
4	Calibration of pH meter and determination of pH of a solution	1
5	Synthesis of polymer Urea-formaldehyde resin	2
6	Synthesis of polymer Phenol-formaldehyde resin	2
7	Synthesis of polymer Poly aniline.	2
8	Analysis of IR spectra	3
9	Identification of drugs using TLC	3
10	Determination of molar absorptivity of a compound (KMnO4 or any water-soluble food colorant)	3
11	Determination of saponification value of a given vegetable oil	3,5
12	Determination of calorific value using Bomb calorimeter	3,5
13	Estimation of chlorine in water (Mohr's method)	4,5
14	Estimation of total hardness of water-EDTA method	4,5
15	Estimation of dissolved oxygen by Winkler's method	4,5

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION

TEXTBOOKS

SL. No	Name of Book	Name of Author/s	Publisher	Year
1	Engineering Chemistry	B. L. Tembe, Kamaluddin, M. S. Krishnan	NPTEL Web-book	2018
2	Physical Chemistry	P. W. Atkins	Oxford University Press	International Edition- 2018
3	Instrumental Methods of Analysis	H. H. Willard, L. L. Merritt	CBS Publishers	7th Edition-2005
4	Engineering Chemistry	Jain & Jain	Dhanpath Rai Publishing Company	17th Edition - 2015

REFERENCE

SL. No	Name of Book	Name of Author/s	Publisher	Year
1	Fundamentals of Molecular Spectroscopy	C. N. Banwell	McGraw-Hill	4th edn., 1995
2	Principles of Physical Chemistry	B. R. Puri, L. R. Sharma, M. S. Pathania	Vishal Publishing Co	47th Edition, 2017
3	Introduction to Spectroscopy	Donald L. Pavia	Cengage Learning India Pvt. Ltd	2015
4	Polymer Chemistry: An Introduction	Raymond B. Seymour, Charles E. Carraher	Marcel Dekker Inc	4th Revised Edition, 1996
5	The Chemistry of Nanomaterials: Synthesis, Properties and Applications	Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham	Wiley-VCH Verlag GmbH & Co. KGaA	2014
6	Organic Electronics Materials and Devices	Organic Electronics Materials and Devices	Shuichiro Ogawa	2024

VIDEO LINKS (NPTEL, SWAYAM…)

1	https://onlinecourses.nptel.ac.in/noc20_mm04/preview
2	https://onlinecourses.nptel.ac.in/noc21_mm38/preview
3	https://onlinecourses.nptel.ac.in/noc20_cy08/preview
4	https://onlinecourses.nptel.ac.in/noc19_ce32/preview

VIRTUAL LAB/SIMULATION TOOLS

1	https://ccnsb06-iiith.vlabs.ac.in/exp/infra-red-spectroscopy/simulation.html?authuser=0
2	https://mas-iiith.vlabs.ac.in/exp/uv-visible-spectroscopy/simulation.html

COURSE CONTENTS AND LECTURE SCHEDULE				
Module	Part	Part Name	Topics Covered	Hours
1.Electrochemistry and Corrosion Science	Part 1	**Electrochemical Cells and Electrode Potentials**	Electrochemical Cell - Electrode potential - Electrochemical series – Applications - Nernst equation for single electrode and cell (Numerical problems)	3
	Part 2	**Reference Electrodes**	SHE, Calomel electrode - Glass electrode (construction only)	2
	Part 3	**Energy Conversion Devices**	Li-ion battery - Fuel cell - Phosphoric acid fuel cell and Polymer electrolyte membrane fuel cell (PEMFC) - Solar cells - Photovoltaic cell (silicon based) - Photoelectrochemical cell - DSSC (Dye sensitised solar cell).	3
	Part 4	**Corrosion and Corrosion Control Methods**	Electrochemical corrosion mechanism - Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and impressed current cathodic protection - Electroplating of copper - Electroless plating of copper.	2
2.Materials for Electronic Applications	Part 1	**Classification and Synthesis of Nanomaterials**	Classification of nanomaterials based on Dimension & Materials - Synthesis - Sol gel and Chemical Reduction - Applications of nanomaterials.	2
	Part 2	**Carbon-Based Nanomaterials and Applications**	Carbon Nanotubes - Fullerenes - Graphene - Carbon Quantum Dots - Structure, properties & application.	2
	Part 3	**Functional Polymers**	Polymers - Fire Retardant Polymers - Halogenated & Non-halogenated polymers - Conducting polymers - Classification - Polyaniline & Polypyrrole - synthesis, properties and applications.	2
	Part 4	**Electronic Materials and Devices**	Organic electronic materials and devices - Construction, working and applications of Organic Light Emitting Diode (OLED) & Quantum Dot LED (QLED) - Materials used in Quantum computing Technology - Super capacitors - Spintronics.	2
3.Molecular Spectroscopy and Analytical Techniques	Part 1	**Fundamentals of Spectroscopy and Molecular energy levels**	Spectroscopy - Types of spectra - Molecular energy levels – Beer Lambert's law – Numerical problems	2
	Part 2	**Molecular Electronic Spectroscopy**	Electronic Spectroscopy – Principle, Types of electronic transitions – Role of conjugation in absorption maxima – Instrumentation - Applications.	3
	Part 3	**Vibrational Spectroscopy**	Vibrational Spectroscopy – Principle - Number of vibrational modes - Vibrational modes of CO_2 and H_2O – Applications.	2
	Part 4	**Characterization Techniques**	X-ray Diffraction (XRD) – Principle and applications in determining crystal structure and phase identification. SEM - Principle, instrumentation, and Applications.	2

4.Environmental Chemistry	Part 1	**Water Characteristics and Hardness**	Water characteristics - Hardness - Types of hardness- Temporary and Permanent. Disadvantages of hard water -Degree of hardness (Numericals).	2
	Part 2	**Water Softening Methods**	Ion exchange process - principle, procedure and advantages. Reverse osmosis – principle, process and advantages.	2
	Part 3	**Water Disinfection and Wastewater Treatment**	Water disinfection methods Chlorination - Break point chlorination Ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- Definition & Significance. Waste Management - Sewage water treatment- Primary, Secondary and Tertiary - Flow diagram -Trickling filter and UASB process.	3
	Part 4	**E - Waste Management and Climate Chemistry**	E Waste - Methods of disposal – Recycle, recovery and reuse - Chemistry of climate change- Greenhouse Gases - Ozone Depletion - Sustainable Development - An introduction to Sustainable Development Goals.	2

SELF LEARNING ACTIVITIES (30 Hrs)

Sl. No	Activity	Description	Time	Module	CO	WK	PO
1	**Battery / Fuel-Cell Case Study**	Pick a real-world battery (e.g., Li-ion in an EV) or Fuel cell application; Write a structured 2-page report on operating principle, performance, and sustainability concerns.	6 Hrs	1	CO1	WK1 WK3 WK5 WK7	PO1 PO6 PO PO11
2	**Nanomaterials Survey**	Survey a recent journal/review article on graphene OR conducting polymers; produce a note on synthesis, properties, and electronic-engineering applications.	6 Hrs	2	CO2	WK1 WK3 WK8	PO1 PO2 PO9 PO11
3	**Spectra Interpretation Practice**	Take labelled IR and UV-Vis spectra from a public database; identify functional groups / transitions; submit annotated worksheets.	6 Hrs	3	CO3	WK1 WK2 WK3	PO1 PO4 PO5
4	**Water Treatment and Hardness**	Watch NPTEL video on water softening and hardness measurement. Prepare a short write-up on ion-exchange and RO methods	6 Hrs	4	CO4	WK1 WK3 WK5 WK7	PO1 PO6 PO8 PO11
5	**Climate Change Awareness Activity**	Make a 1-page infographic showing greenhouse gases and their impact on climate change.	6 Hrs	4	CO5	WK1 WK2 WK3 WK5 WK7 WK8 WK9	PO1 PO7 PO8 PO11

TERM WORK ACTIVITIES (30 Hrs)							
Sl. No	**Activity**	**Description**	**Time**	**Module**	**CO**	**WK**	**PO**
1	Case Study on corrosion	Study corrosion failures in engineering structures (bridges, pipelines, ships, automobiles, or offshore structures) and recommend suitable corrosion prevention methods.	8 Hrs	1	CO1	WK1 WK2 WK3	PO1 PO2 PO5
2	Concept-Based Quiz on Material Characterization Techniques	Students will prepare and conduct a 20–25 question concept-based quiz covering spectroscopy, XRD, SEM and nano materials	8 Hrs	2, 3	CO2, CO3	WK1 WK2 WK3	PO1 PO2 PO4 PO5 PO9
3	Environment / Sustainability Presentation	Prepare a short group presentation or poster on Climate change / Sustainable Development Goals (SDGs). Emphasize chemistry's role in sustainability.	8 Hrs	4	CO5	WK1 WK2 WK3 WK5 WK7 WK8 WK9	PO1 PO7 PO8 PO11
4	Mini Project: Water and Wastewater Analysis	Estimate hardness, chloride, or DO values of given water samples (or simulated data). Create a comparative table of methods (EDTA, Mohr, Winkler).	6 Hrs	4	CO4	WK1 , WK4 , WK7	PO1 PO7

RUBRICS FOR TERM WORK EVALUATION						
Sl. No	Evaluation Criteria	Excellent (5)	Good (4)	Satisfactory(3)	Needs Improvement (2)	Poor (1)
1	Understanding of Concept	Clear, in-depth, demonstrates originality	Good clarity, minor gaps	Adequate but lacks depth	Partial understanding	Very limited understanding
2	Implementation & Coding	Correct, optimized, well-documented	Correct but not optimized	Basic implementation with errors	Incomplete with major errors	No attempt
3	Analysis & Interpretation	Strong analysis with metrics & insights	Good analysis, limited metrics	Basic interpretation	Minimal interpretation	No analysis
4	Report & Presentation	Well-structured, professional, references included	Clear, minor issues in organization	Average, lacks polish	Poorly structured	Not submitted
5	Teamwork & Engagement	Highly collaborative and proactive	Good participation	Moderate effort	Low effort	Absent

LAB EVALUATION RUBRICS							
Sl. No	**Criteria**	**Weigh tage**	**Excellent (5)**	**Good (4)**	**Satisfactor y (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Preparation & Pre-Lab Work	30%	Comes fully prepared with pre-lab work completed; demonstrates clear understanding of objectives and procedure.	Minor gaps in pre-lab preparatio n; understan ds most objectives and procedure s.	Partial pre-lab work done; limited understandi ng of objectives.	Minimal preparation; weak understanding of experiment.	No preparation ; unable to explain objectives/ procedure.
2	Experimental Skills & Performance	40%	Performs experiment independently with precision, follows correct procedure	Performs experime nt with minor guidance; procedure mostly correct.	Needs frequent guidance; some procedural errors.	Struggles with procedure; requires constant help.	Unable to perform experiment correctly even with help
3	Analysis, Interpretation and Documentation	30%	Analyze, Interpret and Document results correctly	Minor interpretat ion issues.	Some errors in analysis; interpretati on superficial.	Major errors in calculations; misinterprets results. Errors in Documentatio n	No meaningful analysis/int erpretation.

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**60%**
Lab Evaluation	30 %
Learning Activity (Self Learning, Term Work, Assignments,)	20%
Attendance	10 %
Internal Examination	40 %
Course Project	NA
End Semester Examination	**40%**
Total	100

TABLE OF SPECIFICATIONS FOR ESE QUESTION PAPER DESIGN										
Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	U	A	An	E	C	
1	Electrochemistry and Corrosion Science	10	3	5	2				10
2	Materials for Electronic Applications	8	3	5	2				10
3	Molecular Spectroscopy and Analytical Techniques	9		7	3				10
4	Environmental Chemistry	9		7	3				10
Total		36	6	24	10				40
This shall be treated as a general guideline for students and teachers for distribution of marks.									

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN					
No: of Sections in the Question paper			2		
Part	No. of Questions/ Module	Total No. of Questions	Max. marks/ Question	Part Summary	Total Marks
A	1 (No choice)	8	2	8x2	16
B	2 (Including Choice)	8	6	4 x 6	24
TOTAL MARKS					**40**

Course Code	Course Name				Credits
J1EST203	**FOUNDATIONS OF COMPUTING**				**3**
Regulation	2026	L: T:P:H:S	3:0:0:0:4.5	Notional Learning Hours/Semester	90
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	TC	Course delivery Mode			Theory
Scheme of Evaluation		CIE: 40 Marks	ESE: 60 Marks	Duration of ESE: 2 Hr 30 Min.	

Pre-requisite	Nil

COURSE OBJECTIVE

1	**Introduce** fundamental computer hardware components and their working.
2	**Understand** data representation and CPU architecture
3	**Explain** operating systems and networking fundamentals.

COURSE OUTCOMES

	Upon successful completion of this course, students will be able to:	Blooms Level
1	Identify hardware components and their working	K2
2	Explain data representation and CPU architecture	K2
3	Describe operating systems and networking concepts	K2
4	Analyse system-level operations	K3

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	-	3	3	3	-	-	-	2	-	3	3	3	3	-	-	-	-	-	-	3	1	3	-
2	-	3	3	3	-	-	-	2	-	3	3	3	3	-	-	-	-	-	-	3	1	3	-
3	-	3	3	3	-	-	-	2	-	3	3	3	3	-	-	-	-	-	-	3	1	3	-
4	-	3	3	3	-	3	3	2	3	3	3	3	3	-	-	-	-	-	-	3	1	3	-

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	**Title**	**Topics**	**Hours**
1	**Computer Hardware and System Components**	Computer Hardware – CPU, Memory – ***Memory Hierarchy***: Registers, Cache, RAM, Virtual Memory; Motherboard; **Computer Peripherals** – Input Devices, Output Devices, **Storage Devices** (HDDs, SSDs, Optical Drives); I/O Communication & Device Management, Interface Cards, Buses; Firmware, Boot Process, **BIOS/UEFI**, Interrupts, Device Drivers (Basics)	11
2	**Data Representation and CPU Architecture**	Data Representation – **Binary representation of data and numbers**, Number Systems (Binary, Octal, Hexadecimal), Integer Representation (Signed/Unsigned); **Data Storage Units** (Bits, Bytes, KB, MB, GB), ASCII & Unicode; CPU Architecture & Instruction Set – ALU, Registers, Control Unit, Instruction Format, **Basics of** Assembly Language; Fetch–Decode–Execute Cycle, **Instruction Execution**, Pipelining (Intro)	11
3	**System Software and Computer Networks**	System Software – Operating Systems (Functions & Types), Process & Memory Management (Basics); **Basic Commands in** Linux / Windows, Shell Scripting (Bash – Basics); Computer Networks – LAN, MAN, WAN, Client-Server & Peer-to-Peer, Network Topologies; Internet Concepts – IP Addressing, DHCP, NAT, DNS, VPN, Routers & Switches, Network Security (Desktop & Perimeter), Firewalls (Basics), WWW & Web Servers	12
4	**Web Fundamentals and Client-Server Technologies**	Web Fundamentals – HTML (Structure, Tags, Forms); CSS(Styling, Layouts);JavaScript (Basics, Events, Validation); Client-Server Architecture, HTTP/HTTPS Basics, **Introduction to** Responsive Design, Web Hosting Basics	11

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Invitation to Computer Science	G. Michael Schneider, Judith Gersting	Cengage	2/e, 2020
2	The Architecture of Computer Hardware, Systems Software, & Networking: An Information Technology Approach	Irv Englander	Wiley	5/e, 2014
3	HTML, CSS, and JavaScript All in One, Sams Teach Yourself	Julie C. Meloni, Jennifer Kyrnin	Pearson	1/e, 2020

REFERENCE				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	The Elements of Computing Systems, Second Edition: Building a Modern Computer from First Principles	Noam Nisan and Shimon Schocken	The MIT Press	2/e, 2021
2	Peter Norton's Introduction to Computers	Peter Norton	McGraw Hill	6/e, 2010
3	Web Design with HTML, CSS, JavaScript and JQuery	Jon Duckett	Wiley	1/e, 2014
VIDEO LINKS				
1	https://onlinecourses.nptel.ac.in/noc24_cs43/preview – NPTEL: Programming in C			
2	https://onlinecourses.nptel.ac.in/noc22_cs37/preview – *NPTEL: Problem Solving Through C*			
3	https://www.youtube.com/playlist?list=PLBlnK6fEyqRgMCpWVuFwshJHfVhE-Sv6a – *Gate Smashers: C Programming Complete Course*			
VIRTUAL LAB/SIMULATION TOOLS				
1	Tinker cad Circuits Proteus			
2	Cisco Packet Tracer, Wireshark			
3	Visual Studio Code, Replit			

COURSE CONTENTS AND LECTURE SCHEDULE				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
1. Computer Hardware and System Components (15 Hrs)	Part 1	Introduction to Computer Hardware	Overview of computer system, basic components, CPU fundamentals, types of computers	3
	Part 2	Memory Systems	Memory hierarchy – Registers, Cache, RAM, Virtual Memory, memory types and characteristics	3
	Part 3	Peripherals and Storage Devices	Input devices, output devices, storage devices (HDDs, SSDs, optical drives), interface cards	2
	Part 4	System Operations and Booting	I/O communication, device management, buses, firmware, BIOS/UEFI, boot process, interrupts, device drivers (basics)	3
2. Data Representation and CPU Architecture (15 Hrs)	Part 1	Number Systems and Data Representation	Binary, octal, hexadecimal systems, conversions, integer representation (signed/unsigned)	3
	Part 2	Data Encoding and Storage	Data storage units (bits, bytes, KB, MB, GB), ASCII, Unicode representation	2
	Part 3	CPU Architecture	ALU, registers, control unit, instruction format, basics of assembly language	3
	Part 4	Instruction Execution	Fetch–Decode–Execute cycle, instruction execution, pipelining (introduction)	3

3. System Software and Computer Networks (15 Hrs)	Part 1	Operating Systems	Functions and types of OS, process management, memory management (basics)	3
	Part 2	Command Line and Scripting	Basic commands in Linux/Windows, shell scripting (bash basics)	3
	Part 3	Computer Networks	LAN, MAN, WAN, client-server and peer-to-peer networks, network topologies	3
	Part 4	Internet and Security	IP addressing, DHCP, NAT, DNS, VPN, routers & switches, network security, firewalls, WWW, web servers	3
4. Web Fundamentals and Client-Server Technologies (15 Hrs)	Part 1	HTML Fundamentals	Structure of HTML, tags, forms, basic page design	3
	Part 2	CSS and Styling	CSS syntax, styling, layouts, basic design principles	2
	Part 3	JavaScript Basics	Variables, events, form validation, basic scripting	3
	Part 4	Web Architecture	Client-server model, HTTP/HTTPS basics, responsive design, web hosting basics	3

SELF LEARNING ACTIVITIES (30 Hrs)

Sl. No	Activity	Description	Time	Module	CO	WK	PO
1	Video-based Learning	Watch NPTEL/SWAYAM lectures on computer hardware, memory systems, and CPU architecture. Summarize key concepts and examples.	6	1	CO1	WK2	PO1, PO2
2	Practice Log	Practice number system conversions, data representation, and CPU cycle problems. Document steps and errors.	6	1,2	CO1, CO2	WK2	PO2, PO3
3	Mini-Tutorial Creation	Prepare a short tutorial on memory hierarchy, CPU architecture, or instruction cycle with diagrams.	6	2	CO2	WK3	PO3, PO5
4	Networking Study Exercise	Analyze network configurations (LAN, WAN, topologies) and document observations.	6	3	CO3	WK3	PO4, PO6
5	Case Study	Study a real-world system (e.g., web server or OS environment) and explain hardware–software interaction.	6	4	CO4	WK5	PO1, PO2

TERM WORK ACTIVITIES (15 Hrs)							
Sl. No.	Activity	Description	Time	Module	CO	WK	PO
1	Hardware Components Analysis.	Analyse and document computer hardware components (CPU, memory, peripherals). Prepare a report explaining their functions and interactions.	4	1	CO1	WK1	PO1, PO2, PO5
2	Data Representation and CPU Architecture Application.	Perform data representation exercises including number system conversions, encoding (ASCII/Unicode), and CPU instruction cycle analysis.	4	2	CO2	WK2	PO1, PO2,
3	System Design and Web-Based Mini Project.	Design a mini-project such as a basic webpage or system architecture diagram demonstrating client-server interaction and networking concepts. Submit report and presentation.	7	3,4	CO3, CO4	WK3	PO1, PO2, PO4, PO6, PO11

RUBRICS FOR TERM WORK EVALUATION						
Sl. No.	Evaluation Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Poor (1)
1	Completeness	All tasks, reports, and activities are fully completed with additional insights or enhancements.	All tasks completed with minor gaps.	Most tasks completed with limited depth.	Some tasks incomplete or missing.	Very little work completed.
2	Technical Accuracy	Concepts are clearly explained with accurate understanding of hardware, data representation, and networking.	Mostly correct with minor conceptual errors.	Some conceptual or logical issues present.	Frequent errors or misunderstandings.	Incorrect or no understanding demonstrated.
3	Documentation & Presentation	Report is neat, well-structured, properly formatted with diagrams and clear explanations.	Well-structured with minor formatting issues.	Understandable but lacks clarity or proper structure.	Poorly formatted or incomplete documentation.	No proper documentation submitted.

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**40%**
Learning Activity (Self Learning, Term Work, Assignments, Module Test, Tutorials)	40 %
Attendance	10 %
Internal Examination	50 %
Course Project	NA
End Semester Examination	**60%**
Total	100 %

TABLE OF SPECIFICATIONS FOR QUESTION PAPER DESIGN

Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	**U**	**A**	**An**	**E**	**C**	
1	Computer Hardware and System Components	15	3	12					15
2	Data Representation and CPU Architecture	15	-	3	12				15
3	System Software and Computer Networks	15		3	12				15
4	Web Fundamentals and Client-Server Technologies	15		3	12				15

This shall be treated as a general guideline for students and teachers for distribution of marks.

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN

No: of Sections in the Question paper		2			
Part	**No. of Questions/Module**	**Total No. of Questions**	**Max. marks/ Question**	**Part Summary**	**Total Marks**
A	2 (No choice)	8	3	8 x 3	24
B	2 (Including Choice)	8	9	4 x 9	36
TOTAL MARKS					**60**

Course Code	Course Name				Credits
J1ESP204	**FUNDAMENTALS OF C PROGRAMMING**				**4**
Regulation	2026	L: T:P:H:S	3:0:2:0:5.5	Notional Learning Hours/Semester	120
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	TP	Course delivery Mode		Theory + Practical	
Scheme of Evaluation		CIE: 60 Marks	ESE: 40 Marks	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	Nil				

COURSE OBJECTIVE	
1	To enable learners to develop versatile C programs for solving computational problems encountered in engineering and everyday applications.
2	To equip learners with the skills to design and implement efficient C programs using appropriate language constructs for real-world problem solving..
3	To develop logical thinking and problem-solving abilities through structured and modular programming concepts using C

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Explain and apply the fundamental concepts of C programming, including data types, operators, expressions, control statements, and program structure to solve computational problems.	K2
2	Develop programs using arrays, strings, and related algorithms such as searching, sorting, and matrix operations for data processing tasks	K3
3	Design modular and reusable programs using functions, macros, structures, unions, and storage classes to implement structured solutions	K3
4	Implement efficient C programs using pointers, dynamic memory allocation, and file handling to manage and manipulate data effectively	K3

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	3	3	-	-	-	-	2	-	3	3	3	3	-	-	-	-	-	-	3	-	-	-
2	-	3	3	2	-	-	-	2	-	3	3	3	3	-	-	-	-	-	-	3	-	-	-
3	-	-	3	3	2	-	-	2	-	3	3	3	3	-	-	-	-	-	-	3	-	-	-
4	-	-	3	3	-	2	-	2	-	3	3	3	3	-	-	-	-	-	-	3	-	-	-

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	**Title**	**Topics**	**Hours**
1	**Introduction to C programming**	Algorithm and Flowchart. **C Fundamentals,** Character set, Tokens, Constants, Identifiers, Keywords, Basic Data Types, Variables, Operators and their precedence (arithmetic, relational, logical, bitwise), Expressions, Statements, Input and Output statements (`scanf()`, `printf()`), Structure of a C program, Simple programs (sum, average, area, etc.), Decision-making statements (`if`, `if-else`, nested `if`, `switch`), Looping constructs (`while`, `do-while`, `for`), Jump statements (`break`, `continue`), Nested loops, Sample programs (factorial, prime numbers, etc.)	9
2	**Arrays and Strings**	Single-dimensional arrays (definition, initialization, accessing elements), Two-dimensional arrays (definition, initialization, matrix operations), Programs for searching (sequential search) and sorting (bubble sort), Strings (declaration, input/output), String library functions (`strlen`, `strcpy`, `strcmp`, `strcat`), Programs for string processing (matching, reversal, palindrome, etc.),	9
3	**Functions and Structures**	Function definition, Function call, Function prototype, Parameter passing, Recursion, Passing arrays to functions, Macros (defining and using), Command-line arguments, Structures (defining, accessing members), Array of structures, Passing structures to functions, Unions, Storage classes (automatic, static, external, register)	9
4	**Pointers and Files**	Pointers (declaration, operations, passing to functions), Accessing array elements and strings using pointers, Pointer to pointer, Dynamic memory allocation (`malloc()`, `calloc()`, `free()`, `realloc()`), File handling (types of files, opening/closing), Reading and writing files (`fopen`, `fclose`, `fprintf`, `fscanf`, `fread`, `fwrite`), File processing functions (`fseek()`, `ftell()`, `rewind()`)	9

LIST OF EXPERIMENTS (24 Hours)		
Instructions • Lab experiments must be implemented in C. • Minimum 14 Experiments are mandatory. • Suitable Data/ Datasets can be used whenever required. • Students should maintain a record of the lab experiments.		
Sl. No.	**Experiment**	**CO**
1	Write a program to find the Sum of two numbers	
2	Write a program to find the Area of a Triangle	
3	Write a program to find the given number is Odd or Even	
4	Write a program to find the Sum of the digits of a number	
5	Write a program to find the Fibonacci Sequence Generation Using a While Loop	
6	Write a program to check whether the given number is an Armstrong number	
7	Write a program to check the given number is palindrome or not	
8	Write a program to find the Factorial of a number	
9	Write a program to find the Sum of three numbers using functions	
10	Write a program to find the Area of a triangle using functions	
11	Write a program to implement Calculator using function	
12	Write a program for Even number sieving from an array .	
13	Write a program for Matrix addition	
14	Write a program to find the Transpose of a matrix	
15	Write a program for Matrix multiplication	
16	Write a program for Bubble Sort	
17	Write a program for Sequential search using functions	
18	Write a program to Find the largest number in an array using function	
19	Write a program for String Concatenation	
20	Write a program for String Palindrome	
21	Write a program for Substring search and deletion	
22	Write a program for Dynamic memory allocation -create nodes for a class and store details of students.	
23	Write a program for Factorial of a number using recursion	
24	Write a program for File manipulation -file creation, deletion, fseek()	
25	Write a program for Copying a file	
26	Write a program for Removing blank spaces in a file	

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
Sl. No	Name of Book	Name of Author/s	Publisher	Year
1.	Programming in ANSI C	E. Balagurusamy, Mcgraw Hill	Mc Graw Hill 9/e	2024
2	Programming with C	Schaum Series, Gottfried B.S.,Tata McGraw Hill	Mc Graw Hill 4/e,	2018

REFERENCE				
Sl. No	Name of Book	Name of Author/s	Publisher	Year
1	Computer fundamentals and Programming in C	Anita Goel and Ajay Mittal, Pearson	Pearson	
2	Problem Solving and Program Design in C	Byron S Gottfried	Mc Graw Hill	4/e, 2018
3	C Programming Language	Brian W. Kernighan and Dennis M. Ritchie, Pearson,	Pearson 2/e,	2015
VIDEO LINKS				
1	https://onlinecourses.nptel.ac.in/noc24_cs43/preview – NPTEL: Programming in C			
2	https://onlinecourses.nptel.ac.in/noc22_cs37/preview – *NPTEL: Problem Solving Through C*			
3	https://www.youtube.com/playlist?list=PLBlnK6fEyqRgMCpWVuFwshJHfVhE-Sv6a – *Gate Smashers: C Programming Complete Course*			
SIMULATION TOOLS				
1	OnlineGDB/Replit(C Compiler and Debugger)			
2	Code::Blocks / Dev C++			
3	Visual Studio Code (with C/C++ extensions)			

COURSE CONTENTS AND LECTURE SCHEDULE				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
1. Introduction to C programming (9 Hrs)	Part 1	Basics of C Programming	Algorithm and Flowchart, C Fundamentals, Character set, Tokens, Constants, Identifiers, Keywords, Basic Data Types, Variables	2
	Part 2	Operators and Expressions	Operators and their precedence (arithmetic, relational, logical, bitwise), Expressions, Statements, Input and Output statements (`scanf()`, `printf()`), Structure of a C program	2
	Part 3	Decision Making and Looping	Decision-making statements (`if`, `if-else`, nested `if`, `switch`), Looping constructs (`while`, `do-while`, `for`), Jump statements (`break`, `continue`)	3
	Part 4	Nested Loops and Sample Programs	Nested loops, Sample programs (sum, average, area, factorial, prime numbers, etc.)	2

2. Arrays and Strings (9 Hrs)	Part 1	Single-Dimensional Arrays	Single-dimensional arrays (definition, initialization, accessing elements)	2
	Part 2	Two-Dimensional Arrays	Two-dimensional arrays (definition, initialization, matrix operations)	2
	Part 3	Searching and Sorting	Programs for searching (sequential search) and sorting (bubble sort)	2
	Part 4	String Operations	Strings (declaration, input/output), String library functions (`strlen`, `strcpy`, `strcmp`, `strcat`), String processing programs (matching, reversal, palindrome, etc.)	3
3. Functions and Structures (9 Hrs)	Part 1	Functions Basics	Function definition, Function call, Function prototype, Parameter passing	2
	Part 2	Advanced Function Concepts	Recursion, Passing arrays to functions, Macros (defining and using), Command-line arguments	2
	Part 3	Structures and Arrays	Structures (defining, accessing members), Array of structures	2
	Part 4	Unions and Storage Classes	Passing structures to functions, Unions, Storage classes (automatic, static, external, register)	3
4. Pointers and Files (9 Hrs)	Part 1	Pointer Fundamentals	Pointers (declaration, operations, passing to functions), Accessing array elements and strings using pointers	2
	Part 2	Pointer Applications	Pointer to pointer, Dynamic memory allocation (`malloc()`, `calloc()`, `free()`, `realloc()`)	2
	Part 3	File Handling Basics	File handling (types of files, opening/closing), Reading and writing files (`fopen`, `fclose`, `fprintf`, `fscanf`, `fread`, `fwrite`)	3
	Part 4	Advanced File Processing	File processing functions (`fseek()`, `ftell()`, `rewind()`)	2

SELF LEARNING ACTIVITIES (30 Hrs)							
Sl.No.	**Activity**	**Description**	**Time**	**Module**	**CO**	**WK**	**PO**
1	Video-based Learning	Watch NPTEL lectures on C fundamentals, data types, and control structures. Summarize key takeaways and examples in a short report.	6	1	CO1	WK1	PO1, PO2
2	Code Practice Log	Practice small C programs (loops, conditionals, arrays) using an online compiler. Document the challenges and corrections.	6	1,2	CO1, CO2	WK2	PO2, PO3

3	Mini-Tutorial Creation	Prepare a short tutorial on a C programming concept (functions, recursion, or structures) with code examples for peer learning.	6	3	,CO3	WK3, WK4	PO3, PO5
4	Build File-Based Applications	Create programs that store and retrieve data from files	6	4	CO4	WK8 WK9	PO9 PO11
5	Case Study	Analyze real-world C applications (e.g., embedded systems, system utilities) and explain how modular programming principles are applied.	6	3	CO3	WK5	PO1, PO2

TERM WORK ACTIVITIES (30 Hrs)							
Sl.No.	**Activity**	**Description**	**Time**	**Module**	**CO**	**WK**	**PO**
1	Control Structures Implementation	Develop C programs using if, switch, loops, and nested control structures. Evaluate output correctness and efficiency.	10	1	CO1	WK1	PO1, PO2, PO5
2	Arrays and Strings Application	Implement searching, sorting, and string manipulation programs. Compare time complexity and efficiency.	10	2	CO2	WK2	PO1, PO2, PO3 PO4, PO5
3	Student Record Management System	Build a data-storage system using structures, dynamic memory, and file operations.	5	All modules	All CO's	WK2, WK3, WK6, WK7, WK8	PO1, PO2, PO3 PO4, PO5, PO6

RUBRICS FOR TERM WORK EVALUATION						
Sl.No.	Evaluation Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Poor (1)
1	Understanding of Concept	Clear, in-depth, demonstrates originality	Good clarity, minor gaps	Adequate but lacks depth	Partial understanding	Very limited understanding
2	Implementation & Coding	Correct, optimized, well-documented	Correct but not optimized	Basic implementation with errors	Incomplete with major errors	No attempt
3	Analysis & Interpretation	Strong analysis with metrics & insights	Good analysis, limited metric	Basic interpretation	Minimal interpretation	No analysis

4	Report & Presentation	Well-structured, professional, references included	Clear, minor issues in organization	Average, lacks polish	Poorly structured	Not submitted
5	Teamwork & Engagement	Highly collaborative and proactive	Good participation	Moderate effort	Low effort	Absent

LAB EVALUATION RUBRICS							
Sl.No.	**Criteria**	**Weigh tage**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Preparation & Pre-Lab Work	30%	Comes fully prepared with pre-lab work completed; demonstrates clear understanding of objectives and procedure.	Minor gaps in pre-lab preparation ; understands most objectives and procedures.	Partial pre-lab work done; limited understandin g of objectives.	Minimal preparation; weak understanding of experiment.	No preparation ; unable to explain objectives/ procedure.
2	Experiment al Skills & Performanc e	40%	Performs experiment independently with precision, follows correct procedure	Performs experiment with minor guidance; procedure mostly correct.	Needs frequent guidance; some procedural errors.	Struggles with procedure; requires constant help.	Unable to perform experiment correctly even with help
3	Analysis, Interpretati on and Documenta tion	30%	Analyze, Interpret and Document results correctly	Minor interpretati on issues.	Some errors in analysis; interpretation superficial.	Major errors in calculations; misinterprets results. Errors in Documentatio n	No meaningful analysis/int erpretation.

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**60%**
Lab Evaluation	30 %
Learning Activity (Self Learning, Term Work, Assignments,)	20%
Attendance	10 %
Internal Examination	40 %
Course Project	NA
End Semester Examination	**40%**
Total	100

ABLE OF SPECIFICATIONS FOR ESE QUESTION PAPER DESIGN										
Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	U	A	An	E	C	
1	Image Segmentation and Recognition	8	3	7					10
2	Morphological Image Processing	12		4	6				10
3	Data Compression techniques	8		4	6				10
4	Image, Audio, and Video Compression	8		4	6				10
This shall be treated as a general guideline for students and teachers for distribution of marks.									

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN					
No: of Sections in the Question paper			2		
Part	No. of Questions/ Module	Total No. of Questions	Max. marks/ Question	Part Summary	Total Marks
A	1 (No choice)	4	3	4x 3	12
B	2 (Including Choice)	8	7	4 x 7	28
TOTAL MARKS					**40**

Course Code	Course Name				Credits
J1EST205	**ENGINEERING ENTREPRENEURSHIP AND IPR**				**2**
Regulation	2026	L: T:P:H:S	2:0:0: 0:3	Notional Learning Hours/Semester	60
(L: Lecture, T: Tutorial, P: Practical, H: Project: S: Self Learning and Term work (SL&TW))					
Course Type	TC	Course delivery Mode			Theory
Scheme of Evaluation		CIE: 40 Marks	ESE: 60 Marks	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	Nil				

COURSE OBJECTIVE	
1	Introduce the concepts of innovation, creativity, and entrepreneurship in the context of engineering applications, helping students understand how ideas evolve into viable ventures.
2	Develop the ability to identify real-world engineering problems and apply structured frameworks such as design thinking, problem-solution canvas, and Lean Canvas to create potential business ideas.
3	Equip students with the skills to prepare a simplified business plan, covering aspects such as market analysis, customer validation, financial feasibility, and prototype development.
4	Provide a fundamental understanding of Intellectual Property Rights (IPR) and their application in protecting and commercializing engineering innovations within the start-up ecosystem.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		**Blooms Level**
1	Describe the principles of innovation, ideation, and entrepreneurship, and relate them to the process of developing engineering-based start-ups.	**K2**
2	Identify real-world problems and apply structured approaches such as design thinking and Lean Canvas to generate feasible business ideas.	**K3**
3	Develop a simplified business plan integrating customer validation, market strategy, and prototype planning.	**K4**
4	Apply the concepts and legal procedures of Intellectual Property Rights (IPR) to safeguard and commercialize innovative engineering solutions.	**K3**
5	Demonstrate teamwork, entrepreneurial communication, and creativity through SLA and term evaluation activities such as pitch decks and prototype concepts.	**K4**

COURSE ARTICULATION MATRIX																							
CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	2	2	–	–	–	–	–	3	3	2	2	1	–	–	–	–	1	–	3	2	–
2	2	3	3	2	2	–	–	–	–	3	3	3	2	2	1	–	–	2	–	–	3	3	2
3	2	3	3	2	2	–	–	–	–	3	3	3	2	3	1	–	2	2	2	–	3	3	3
4	2	3	3	2	3	–	–	–	–	3	3	3	3	3	2	1	2	2	2	1	2	3	2
5	3	3	2	2	3	2	–	–	2	2	2	3	3	3	2	3	3	3	3	2	2	2	3
Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"																							

SYLLABUS			
Module	Title	Topics	Hours
1	Ideation, Innovation & Entrepreneurial Foundation	Introduction to ideation and innovation – concepts, need and importance; design thinking process; types and stages of entrepreneurship; characteristics of successful entrepreneurs; startup ecosystem in India – Startup India, MSME, incubation centers; fundamentals of Intellectual Property Rights (IPR) – patents, trademarks, copyrights, and designs; significance of IPR in engineering and technology ventures.	7
2	Problem Identification and Business Model Design	Problem and solution canvas; identification of real-world problems; customer discovery and need assessment; market segmentation and validation; Lean Canvas and value proposition design; competitor analysis and differentiation strategy; legal and ethical considerations in entrepreneurship.	7
3	Business Plan and Prototype Planning	Elements of a business plan – market analysis, product/service description, operational plan, marketing and financial strategy; Minimum Viable Product (MVP) concept; prototype requirement analysis and development approach; project scheduling and resource planning; risk management and documentation; pitch deck preparation and presentation skills.	8
4	IPR for Innovation and Commercialization	Overview of intellectual property laws; patent filing procedures (Indian and international); patentability criteria and prior art search; copyright and industrial design rights; trademark registration and trade secrets; technology transfer and licensing; commercialization strategies; case studies of Indian startups utilizing IPR; emerging IPR issues in digital and AI-based innovations.	8

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION

TEXTBOOKS

SL NO	Name of Book	Name of Author/s	Publisher	Year
1.	Innovation and Entrepreneurship for Engineers	Bharat Bhushan & Seema Bhushan	CRC Press	2016
2	Business Model Generation	Alexander Osterwalder & Yves Pigneur	Wiley	2010
3	The Startup Owner's Manual	Steve Blank & Bob Dorf	Wiley	2020
4	Indian Patent Law	P. Narayanan	Eastern Book Company	2020

REFERENCE

SL NO	Name of Book	Name of Author/s	Publisher	Year
1	Intellectual Property Rights: In the Digital Age	Prabuddha Ganguli	Tata McGraw Hill	2021
2	Start with Why	Simon Sinek	Penguin	2011
3	The Innovator's DNA	Clayton M. Christensen & Jeffrey H. Dyer	Harvard Business Review Press	2019
4	The Startup India Manifesto: A Guide to the Indian Startup Ecosystem	Rashmi Bansal & Deepinder Goyal	Westland Publications	2020

VIDEO LINKS

1	Entrepreneurship - https://nptel.ac.in/courses/110106141
2	Intellectual Property - https://onlinecourses.nptel.ac.in/noc22_hs59
3	Business Fundamentals for Entrepreneurs - https://onlinecourses.nptel.ac.in/noc25_mg13
4	Innovation, Business Models and Entrepreneurship - https://nptel.ac.in/courses/110107094

VIRTUAL LAB/SIMULATION TOOLS

1	**I2E (Idea to Execution) Startup Simulation Tool** - Interactive business simulation used in management and entrepreneurship education. Allows students to experience business model design, pricing, funding, and growth strategies in a virtual environment.
2	**IP India** – Patent Search and Filing Portal (Government of India) - Official Indian Patent Office platform for prior art search, patent filing, and IP management. Enables students to explore patent databases, file provisional applications, and understand the IPR process workflow.
3	**BMC Simulator (Business Model Canvas Simulation Tool)** -Digital tool to practice Business Model Canvas creation, mapping customer segments, value propositions, and revenue streams. Enables collaborative innovation exercises for project-based learning.

COURSE CONTENTS AND LECTURE SCHEDULE				
Module	Part	Part Name	Topics Covered	Hours
1.Foundations of Innovation and Entrepreneurship (7 hours)	Part 1	**Introduction to Entrepreneurship**	Definition, scope, and significance of entrepreneurship; evolution of entrepreneurship in engineering; characteristics and competencies of successful entrepreneurs.	2
	Part 2	**Innovation and Creativity**	Concept and importance of innovation; types of innovation (incremental, disruptive, process, and product); creativity techniques; fostering innovation among engineers.	2
	Part 3	**Design Thinking and Ideation**	Stages of design thinking—empathize, define, ideate, prototype, test; idea generation and selection methods; creative problem-solving.	2
	Part 4	**Startup Ecosystem in India**	Overview of Startup India, MSME, and Make in India initiatives; incubation centers, accelerators, and funding opportunities; role of government and private sectors in promoting startups.	1
2.Opportunity Identification and Business Modelling (7 hours)	Part 1	**Problem Identification and Validation**	Identifying engineering and societal problems; converting challenges into opportunities; defining and validating problem-solution fit through user feedback and field studies.	2
	Part 2	**Market Research and Customer Profiling**	Conducting market research; market segmentation, targeting, and positioning; customer persona creation; data collection and validation using survey tools.	2
	Part 3	**Business Model Canvas (BMC)**	Key components of BMC – customer segments, value propositions, key partners, resources, channels, and revenue streams; comparison with Lean Canvas approach.	2
	Part 4	**Competitor and Industry Analysis**	Understanding competitors and industry trends; SWOT analysis, Porter's five forces; developing differentiation and positioning strategies.	1
3. Business Planning and Prototype Development (8 hours)	Part 1	**Business Plan Preparation**	Framework and importance of a business plan; structure – executive summary, business objectives, marketing, operational, and financial plans.	2
	Part 2	**Prototype Planning and Development**	Concept of Minimum Viable Product (MVP); prototype design stages; tools and techniques for rapid prototyping; iterative testing and validation.	2
	Part 3	**Financial and Resource Planning**	Cost estimation, budgeting, and resource allocation; funding sources – bootstrapping, venture capital, crowdfunding; preparing financial projections.	2
	Part 4	**Risk Management and Pitching**	Risk identification and mitigation; crafting effective pitch decks; investor communication and presentation skills; storytelling in entrepreneurial pitches.	2

4. Intellectual Property Rights (IPR) and Commercialization (8 hours)	Part 1	**Introduction to IPR**	Overview and importance of Intellectual Property Rights; types – patents, copyrights, trademarks, industrial designs; role of IPR in promoting innovation and entrepreneurship.	2
	Part 2	**Patent Filing and Legal Aspects**	Patent system in India; criteria for patentability; process of patent filing; patent databases and prior art search; legal procedures and documentation.	2
	Part 3	**Technology Transfer and IP Commercialization**	IP ownership and licensing; technology transfer and commercialization models; IP valuation; protecting intellectual assets in startups.	2
	Part 4	**Case Studies and Emerging Trends**	Case studies of Indian IP-based startups; IPR in AI and digital technology; global IP policies, open-source innovation, and future challenges.	2

SELF LEARNING ACTIVITIES (30 Hrs)

Sl. No	Activity	Description	Time	Module	CO	WK	PO
1	**Lean Canvas Development for a Startup Idea**	Students will identify a real-world engineering or social problem and develop a Lean Canvas model covering value proposition, customer segments, channels, and revenue streams. A brief presentation of the idea and validation findings will be submitted as a report.	8 hrs	2	CO2, CO3	WK3, WK4	PO3, PO4, PO5
2	**Mini Patent Search and IPR Case Study**	Students will perform a prior art search using the Indian Patent Office database or Google Patents for an innovative concept. They will summarize findings and discuss the relevance of IPR to their identified product or startup idea.	7 hrs	4	CO4, CO5	WK1, WK5, WK9	PO6, PO7, PO11

RUBRICS FOR SELF LEARNING ACTIVITIES EVALUATION

Sl.No	Evaluation Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Poor (1)
1	**Understanding of Concept / Application**	Demonstrates deep understanding of entrepreneurial and IPR concepts with clear real-world linkage.	Shows good understanding and applies concepts with minor gaps.	Demonstrates basic understanding but lacks clear practical connection.	Limited understanding; weak linkage between theory and application.	No conceptual understanding demonstrated.

2	**Quality of Analysis and Innovation**	Highly innovative idea or approach with thorough analysis and original insights.	Good innovative approach; analysis is logical and relevant.	Moderate creativity and analysis; lacks depth.	Minimal innovation or analytical reasoning.	No innovation or critical thinking evident.
3	**Use of Tools / Frameworks**	Effectively uses relevant tools (e.g., Lean Canvas, patent search database) with accurate and complete data.	Appropriate use of tools with minor errors or omissions.	Partial use of tools; limited accuracy.	Incomplete or incorrect application of tools/frameworks.	No use of relevant tools or methods.
4	**Documentation and Presentation**	Clear, professional documentation and presentation with visuals and well-structured content.	Good structure; minor errors in formatting or clarity.	Adequate presentation; lacks strong organization or clarity.	Poor structure; weak visual or written presentation.	Unorganized or incomplete submission.
5	**Engagement and Effort**	Demonstrates exceptional initiative, teamwork, and consistent engagement throughout SLA.	Shows good effort and engagement with minor lapses.	Moderate effort; limited team participation.	Minimal participation or incomplete effort.	No effort or engagement demonstrated.

RUBRICS FOR TERM WORK EVALUATION						
Sl.No.	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	**Quality of Business Plan / Report**	Business plan is comprehensive, logically structured, and clearly communicates objectives, strategy, and feasibility.	Plan is well-structured with minor gaps in detail or analysis.	Plan covers main points but lacks depth and clarity in certain areas.	Limited scope or incomplete sections; poor analysis.	Lacks structure, detail, or coherence.
2	**Innovation and Practical Feasibility**	Demonstrates a highly innovative idea that is technically and commercially feasible.	Innovative and relevant, but minor gaps in practicality.	Moderate innovation; feasibility is partially addressed.	Weak innovation or limited feasibility assessment.	No innovative or feasible aspect identified.

3	**Prototype / Pitch Deck Design**	Prototype or pitch deck is visually clear, well-organized, and effectively communicates technical and business value.	Clear and informative presentation with minor design flaws.	Adequate presentation but lacks strong clarity or structure.	Poorly organized pitch; unclear concept communication.	Incomplete or missing prototype/ presentation.
4	**Team Collaboration and Role Distribution**	Excellent teamwork with clear roles, mutual coordination, and equal participation throughout the activity.	Good teamwork; minor role imbalance.	Fair participation with some coordination issues.	Weak collaboration or unequal workload distribution.	No evidence of teamwork or coordination.
5	**Communication and Presentation Skills**	Outstanding verbal and visual communication; confident, engaging, and professional delivery.	Clear and confident presentation with minor issues.	Adequate communication; needs improvement in clarity or flow.	Unclear delivery; lacks confidence and organization.	Poor communication; unstructured and unengaging

TERM WORK ACTIVITIES (15 Hrs)							
Sl. No.	**Activity**	**Description**	**Time**	**Module**	**CO**	**WK**	**PO**
1	**Preparation of a Comprehensive Business Plan**	Students will prepare a concise business plan for an innovative engineering startup idea. The plan should include executive summary, product/service description, market analysis, operations plan, and financial overview.	8 hrs	3	CO3, CO5	WK2, WK3, WK4	PO3, PO4, PO5
2	**Prototype Concept / Pitch Deck Presentation**	Teams will design a prototype concept or MVP (conceptual model) and present it through a structured pitch deck. Evaluation based on innovation, feasibility, presentation quality, and teamwork.	6 hrs	3,4	CO3, CO4, CO5	WK3, WK6, WK9	PO6, PO8, PO10

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**40%**
Learning Activity (Self Learning, Term Work, Assignments, Module Test, Tutorials)	40 %
Attendance	10 %
Internal Examination	50 %
Course Project	NA
End Semester Examination	**60%**
Total	100 %

TABLE OF SPECIFICATIONS FOR QUESTION PAPER DESIGN

Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	**U**	**A**	**An**	**E**	**C**	
1	Foundations of Innovation and Entrepreneurship	7	5	10					15
2	Opportunity Identification and Business Modelling	7	5	5	5				15
3	Business Planning and Prototype Development	8	2	4	4	5			15
4	Intellectual Property Rights (IPR) and Commercialization	8	5	5	5				15

This shall be treated as a general guideline for students and teachers for distribution of marks.

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN

No: of Sections in the Question paper		2			
Part	**No. of Questions/Module**	**Total No. of Questions**	**Max. marks/ Question**	**Part Summary**	**Total Marks**
A	2 (No choice)	8	3	8 x 3	24
B	2 (Including Choice)	8	9	4 x 9	36
TOTAL MARKS					**60**

Course Code	Course Name				Credits
J1HMP126	**LIFE SKILLS AND PROFESSIONAL COMMUNICATION**				**1**
Regulation	2026	L: T:P:H:S	1:0:1:0:2	Notional Learning Hours/Semester	30
(L: Lecture, T: Tutorial, P: Practical, H: Project: S: Self Learning and Term work (SL&TW))					
Course Type	TP	Course delivery Mode			
Scheme of Evaluation		CIE: 100 Marks	ESE: 0 Marks	Total Marks:100	
Pre-requisite	Nil				

COURSE OBJECTIVE	
1	To foster self-awareness and personal growth, enhance communication and interpersonal connection skills, promote effective participation in groups and teams, develop critical thinking, problem-solving, and decision-making skills, and cultivate the ability to exercise emotional intelligence.
2	To equip students with the necessary skills to listen, read, write & speak, to comprehend and successfully convey any idea, technical or otherwise.
3	To equip students to build their profile in line with the professional requirements and standards.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Develop the ability to know & understand oneself, show confidence in one's potential & capabilities, set goals and develop plans to accomplish tasks	K5
2	Develop the ability to communicate and connect with others, participate in groups/teams, empathise, respect diversity, be responsible and understand the need to exercise emotional intelligence	K5
3	Develop thinking skills, problem-solving and decision-making skills	K5
4	Develop listening, reading, writing & speaking skills, ability to comprehend & successfully convey any idea, and ability to analyse, interpret & effectively summarize textual, audio & visual content	K6
5	Develop the ability to create effective presentations through audio-visual mediums with the use of technology tools and initiate effective use of social media platforms & tech forums for content delivery and discussions	K6
6	Initiate profile-building exercises in line with the professional requirements, and start networking with professionals/academicians	K6

COURSE ARTICULATION MATRIX																								
CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes														
	WK									PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	3		3		3												1		3			
2		3	3	3		3								1		3		3		3			
3	3		3		3	3		3			1	1		1				1		1			
4				3	3		3	3	3					1				1		2			
5														2				1		2			
6														1				1					
Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"																								

SYLLABUS

Table 1. Activities: 76 Marks

Module	Activity	Class room (L) / Self Study (SS)	Week of completion	Group / Individual (G/I)	Marks	Skills	CO
1.1	Group formation and self-introduction among the group members	L	1	G	-	• Connecting with group members • Time management - Gantt Chart	
1.2	Familiarizing the activities and preparation of the time plan for the activities	L	1	G	-		
1.3	Preparation of Gantt chart based on the time plan	SS	1	G	2		
2.1	Take an online personality development test, self-reflect and report	SS	1	I	2	• Self-awareness Writing	CO1

2.2	Role-storming exercise 1: Students assume 2 different roles given below and write about their ● Strengths, ● Areas for improvement, ● Concerns, ● Areas in which he/she hesitates to take advice, ● Goals/Expectations, from the point of view of the following assumed roles ● their parent/guardian/mentor ● their friend/sibling/cousin	L	1	I	2	●Goal setting - Identification of skills and setting goal ●Self-awareness ●Discussion in groups ●Group work- Compiling of ideas ●Mind mapping	CO1
2.3	Role-storming exercise 2: Students assume the role of their teacher and write about the ●Skills required as a B.Tech graduate ●Attitudes, habits, approaches required and activities to be practised during their B.Tech years, in order to achieve the set goals	SS	1	I	2		CO1
2.4	Discuss the skills identified through rolestorming exercise by each one within their own group and improvise the list of skills	L	1	G	2		CO1
2.5	Prepare a mind map based on the role- storming exercise and exhibit/present it in class	SS	2	G	2		CO1
3	Prepare a presentation on instances of empathy they have observed in their own life or in other's life	L	2 to 4	I	2	Empathy	CO2

4.1	Each student connects and networks with a minimum of 3 professionals from industry/public sector organizations/other agencies/NGOs /academia (at least 1 through LinkedIn)	SS	3	I	2	●Workplace awareness ●Listening ●Communication-interacting with people ●Networking through various media including LinkedIn ●Discussion in groups ●Report preparation Creativity Goal setting - Preparation of action plan	
4.2	Interact with them to understand their workplace details including ● workplace skills required ● their work experience ● activities they have done to enhance their employability during their B.Tech years ● suggestions on the different activities to be done during B.Tech years	SS	3	I	4		CO2
4.3	Discuss the different workplace details & work readiness activities assimilated by each through the interactions within their group and compile the inputs collected by the individuals Prepare the Minutes of the discussions	SS	3	G	2		CO2
4.4	Report preparation based on the discussions	SS	4	G	3		CO4

4.5	Perform a role-play based on the workplace dynamics assimilated through interactions and group discussions	L	5	G	4		CO3
4.6	Identify their own goal and prepare an action plan for their undergraduate journey to achieve the goal	SS	5	I	2		CO1
5.1	Select a real-life problem that requires a technical solution and list the study materials needed	L	6	G	2		CO3
5.2	Listen to TED talks & video lectures from renowned Universities related to the problem and prepare a one-page summary (Each group member should select a different resource)	SS	6	I	2		CO4
5.3	Use any online tech forum to gather ideas for solving the problem chosen	SS	6	G	2		CO5
5.4	Arrive at a possible solution using six thinking that exercise	L	7	G	3		CO3
5.5	Prepare a report based on the problem-solving experience	SS	7	G	2		CO4
6.1	LinkedIn profile creation	SS	1	I	2	Profile-building	CO6
6.2	Resume preparation	SS	8	I	2		CO6
6.3	Self-introduction video	SS	8	I	3		CO6

7	Prepare a presentation on instances of demonstration of emotional intelligence	SS	9	I	2	Emotional intelligence	CO2
8	Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)	SS	10	G	3	Diversity	CO2, CO5
9	Take online Interview skills development sessions like robotic interviews; self-reflect and report	SS	10	I	2	Interview skills	CO6
10	Take an online listening test, self-reflect and report	SS	11	I	2	Listening skills	CO6
11.1	Activities to improve English vocabulary of students	L	8	I/G	4	• English vocabulary • English language skills • Writing • Presentation • Group work Self-reflection	CO4
11.2	Activities to help students	L	9	I/G	2		CO4
11.3	identify errors in English language usage Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words	L	10	I/G	2		CO4
11.4	Write a self-reflection report on the improvement in English language communication through this course	SS	12	I	2		CO4
11.5	Presentation by groups on the experience of using online collaboration tools in various group activities and time management experience as per the Gantt chart prepared	L	11 to 12	G	2		CO4, CO5

12.1	Each group prepares video content for podcasts on innovative technological interventions/research work tried out in Kerala context by academicians/professionals/Govt. agencies/research institutions/private agencies/NGOs/other agencies	SS	12	G	4	• Audio-visual presentations creations with the use of technology tools • Effective use of social media platforms Profile building	CO2, CO4, CO5
12.2	Upload the video content to podcasting platforms or YouTube	SS	12	G	1		CO5
12.3	Add the link of the podcast in their LinkedIn profile	SS	12	G	1		CO5

Table 2.
Lab hour Activities (P): 24 Marks

Sl No	Activity	Marks	Skill	CO
1	Hands-on sessions on day-to-day engineering skills and a self-reflection report on the experience gained: 1. Drilling practice using electric hand drilling machines. 2. Cutting of MS rod and flat using electric hand cutters. 3. 4. Filing, finishing and smoothening using electrically operated hand grinders. 5. MS rod cutting using Hack saw by holding the work in bench wise. 6. Study and handling different types of measuring instruments. 7. Welding of MS, SS work pieces. 8. Pipe bending practice (PVC and GI). 9. Water tap fitting. 10. Water tap rubber seal changing practice.	**24**	Basic practical engineering skills	**3**

	11. Union and valves connection practice in pipes. 12. Foot valve fitting practice. 13. Water pump seal and bearing changing practice			
2	Language Lab sessions	-	Language Skills	**4**

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
Sl.No.	Name of Book	Name of Author/s	Publisher	Year
1	Life Skills & Personality Development	Maithry Shinde et.al.	Cambridge University Press	2022
2	Emotional Intelligence: Why it can matter more than IQ	Daniel Goleman	Bloomsbury, Publishing PLC	2020
3	Think Faster, Talk Smarter: How to speak successfully when you are put on the spot	Matt Abrahams	Macmillan Business	2023
REFERENCE				
Sl.No.	Name of Book	Name of Author/s	Publisher	Year
1	English Grammar in Use	Raymond Murphy	Cambridge University Press	2023
2	Life Skills for Engineers	Ramesh S., Vishnu R.G.	Ridhima Publications	2016
3	Effective Technical Communication	Ashraf Rizvi	McGraw Hill Education	2017
VIDEO LINKS				
1	https://www.youtube.com/watch?v=qUUwojhmZOU&t=1s			
2	https://www.youtube.com/watch?v=TjE4IoSyT9U&t=1s			
3	https://www.youtube.com/watch?v=K9b3Z_v8lQI			
VIRTUAL LAB/SIMULATION TOOLS				
1	https://flipgridapp.com/			
2	https://www.canva.com/online-whiteboard/			
3	https://trello.com/			
4	https://www.todoist.com/			

COURSE CONTENTS AND LECTURE SCHEDULE (20 HOURS)				
Module	**Part**	**Part Name**	**Topics Covered**	**Hours**
1.Introduction	**Part 1**	Group creation	Group formation and self-introduction among the group members	1
	Part 2	Activity planning	Familiarizing the activities and preparation of the time plan for the activities	1
	Part 3	Gantt chart	Preparation of Gantt chart based on the time plan	1
2. Skills and Self-awareness	**Part 1**	Role-storming exercise-1	Students assume 2 different roles given below and write about their • Strengths, • Areas for improvement, • Concerns, • Areas in which he/she hesitates to take advice, • Goals/Expectations, from the point of view of the following assumed roles • their parent/guardian/mentor their friend/sibling/cousin **<u>Skills to be developed:</u>** • Goal setting - Identification of skills and setting goal • Self-awareness • Discussion in groups Group work- Compiling of ideas Mind mapping	3
	Part 2	Share and refine skills	Discuss the skills identified through role storming exercise by each one within their own group and improvise the list of skills	1
3. Empathy	**Part 1**	Presentation on empathy	Prepare a presentation on instances of empathy they have observed in their own life or in other's life	2
4. Contextual problem	**Part 1**	Real-life problems	Select a real-life problem that requires a technical solution and list the study materials needed	1
	Part 2	Six thinking hat	Arrive at a possible solution using six thinking hat exercise	1

5. English Language	**Part 1**	English vocabulary	Activities to improve English vocabulary of students	2
	Part 2	Errors in English language	Activities to help students identify errors in English language usage	2
	Part 3	English spelling, pronunciation, and confusing word	Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words	3
	Part 4	online collaboration tools	Presentation by groups on the experience of using online collaboration tools in various group activities and time management experience as per the Gantt chart prepared	2

SELF LEARNING ACTIVITIES (10 Hrs)

Sl.No.	Activity	Description	Time	Module	CO	WK	PO
1	Gantt chart preparation	Preparation of Gantt chart based on the time plan	1	1	CO1	1	1
2	Self-awareness Writing	Take an online personality development test, self-reflect and report	1	2	CO1	1	2
3	Role-storming exercise	Students assume the role of their teacher and write about the ● Skills required as a B.Tech graduate ● Attitudes, habits, approaches required and activities to be practised during their B.Tech years, in order to achieve the set goals	1	2	CO1	1	1
4	Goal setting - Preparation	Identify their own goal and prepare an action plan for their undergraduate journey to achieve the goal	1	4	CO1	2	2
5	online - international talks	Listen to TED talks & video lectures from renowned Universities related to the problem and prepare a one-page summary (Each group member should select a different resource)	1	5	CO4	4	3
6	Portfolio Personal creation	LinkedIn and Resume profile creation	1	6	CO6	6	5
7	emotional intelligence	Prepare a presentation on instances of demonstration of emotional intelligence	1	7	CO2	2	5
8	diversity aspects	Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)	1	8	CO2, CO5	7	5

9	Interview skills	Take online Interview skills development sessions like robotic interviews; self-reflect and report	1	9	CO6	6	5
10	listening test	Take an online listening test, self-reflect and report	1	10	CO6	8	7

RUBRICS FOR TERM WORK EVALUATION						
Sl.No.	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Completeness	All tasks done with extra depth, innovative additions	All tasks completed, few minor gaps	Most tasks done, limited depth	Some tasks missing or incomplete	Very little completed
2	Technical Accuracy	Algorithms and implementations are correct and efficient	Mostly correct, minor issues	Some conceptual errors	Major conceptual gaps	Incorrect or no implementation
3	Documentation & Presentation	Well-structured, clear, professional	Structured but with small lapses	Understandable but lacks clarity	Poorly structured	No documentation

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**100%**
Lab Evaluation	24%
Learning Activity (Self Learning, Term Work, Assignments,)	76%
Attendance	0 %
Internal Examination	NA
Course Project	NA
End Semester Examination	**0%**
Total	**100**

Course Code	Course Name				Credits
J1ECT207	**LOGIC CIRCUIT DESIGN**				**3**
Regulation	2026	L: T:P:H:S	2:1:0:0:3.5	Notional Learning Hours/ Semester	90
(L: Lecture, T: Tutorial, P: Practical, H: Project, S: Self Learning and Term work (SL&TW))					
Course Type	PE	Course delivery Mode			Theory
Scheme of Evaluation	**CIE: 40 Marks**	**ESE: 60 Marks**	**Duration of ESE: 2 Hr 30 Min.**		
Pre-requisite	**Nil**				

COURSE OBJECTIVE	
1	Understand digital logic fundamentals including logic gates and Boolean expressions used in digital systems.
2	Design and analyze combinational and sequential digital circuits for performing various logical and arithmetic operations.
3	Verify digital circuit designs using Hardware Description Languages (HDL) such as Verilog

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		**Blooms Level**
1	Apply the knowledge of digital representation of information and Boolean algebra to deduce optimal digital circuits.	K2
2	Apply the principles of Boolean algebra to design combinational and sequential logic	K3
3	Apply hardware description language (HDL) to design digital circuits.	K3
4	Analyze and differentiate the performance characteristics of various logic families	K3

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	3	3	-	-	-	3	-	3	-	_	_	-	-	-	_	_	-	_	2	-	-
2	3	3	3	3	-	-	-	3	-	3	2	2	_	-	-	-	_	_	-	_	2	-	-
3	3	3	3	3	3	2	-	3	-	3	2	2	_	_	-	-	_	_	-	_	2	-	-
4	3	3	3	-	-	-	-	3	-	3	-2	_	-	-	-	-	_	_	-	_	2	-	-

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	**Title**	**Topics**	**Hours**
1	**Introduction to digital circuits**	Arithmetic of Binary number systems, Signed and unsigned numbers, BCD, Error detecting codes-Gray code, Parity, Error correcting code– 7 bit hamming code, Sum of product and product of sum - simplification, canonical forms- min term and max term, Simplification of Boolean expressions - Karnaugh map (upto 4 variables), Implementation of Boolean expressions using universal gates.	11
2	**Combinational logic circuits**	Half adder and Full adder, Half and full subtractors, BCD adder, Ripple carry and carry look ahead adders, Decoders, Encoders, Code converters, Comparators, Parity generator, Multiplexers, De-multiplexers, Implementation of Boolean algebra using MUX.	12
3	**Sequential Circuits**	SR Latch, Flip flops - SR, JK, Master-Slave JK, D and T Flip flops. Conversion of Flip flops, Excitation table and characteristic equation. Shift registers-SIPO, SISO, PISO, PIPO and Universal shift registers. Ring and Johnsons counters. Design of Asynchronous, Synchronous and Mod N counters	11
4	**Logic Families and Introduction to HDL**	Electrical characteristics of logic gates (Noise margin, Fanin, Fan-out, Propagation delay, Transition time, Power -delay product) - Overview of Logic Families: TTL, ECL, CMOS, Comparison of TTL, ECL, and CMOS characteristics. Circuit description and working of TTL – inverter and NAND Introduction to Verilog HDL – Basic language elements, Basic implementation of logic gates and combinational circuits.	11

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
Sl.No.	Name of Book	Name of Author/s	Publisher	Year
1	Digital Fundamentals	Thomas L. Floyd	Pearson Education	2017
2	Fundamentals of Digital Logic with Verilog Design	Stephen Brown	McGraw Hill Education	2004
REFERENCE				
Sl.No.	Name of Book	Name of Author/s	Publisher	Year
1	Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog	M Morris Mano, Michael D. Ciletti	Pearson India	2018
2	Fundamentals of Digital Circuits	A. Ananthakumar	PHI	2016

3	Introduction to Logic Circuits & Logic Design with Verilog	Brock J. LaMeres	Springer	2019
4	Digital Design Verilog HDL and Fundamentals	Joseph Cavanagh	CRC Press	2008
5	Digital Circuits and Systems	D.V. Hall	Tata McGraw Hill	1989

VIDEO LINKS	
1	https://nptel.ac.in/courses/108105113
2	https://onlinecourses.nptel.ac.in/noc20_ee32/preview
3	https://nptel.ac.in/courses/117106114
4	https://www.youtube.com/watch?v=XBcHnz08ZW8&t=20s
5	https://www.youtube.com/watch?v=CeD2L6KbtVM&list=PL803563859BF7ED8C
VIRTUAL LAB/SIMULATION TOOLS	
1	Xilinx Vivado / Quartus Prime
2	ModelSim
3	Logisim
4	Tinkercad Circuits
5	Python with MyHDL / Verilog simulator

COURSE CONTENTS AND LECTURE SCHEDULE

Module	Part	Part Name	Topics Covered	Hours
1. Introduction to digital circuits (11 Hrs)	Part 1	Binary Arithmetic	Arithmetic of Binary number systems, Signed and unsigned numbers, BCD, Error detecting codes-Gray code, Parity, Error correcting code– 7 bit hamming code	4
	Part 2	Boolean Algebra	Sum of product and product of sum - simplification, canonical forms- min term and max term	2
	Part 3	Simplification Techniques	Simplification of Boolean expressions Karnaugh map (upto 4 variables)	3
	Part 4	Logic Gate Implementation	Implementation of Boolean expressions using universal gates.	2
2.Combinational logic circuits (12 Hrs)	Part 1	Arithmetic Circuits	Half adder and Full adder, Half subtractor and Full subtractor,	3
	Part 2	Advanced Arithmetic Circuit	BCD adder, Ripple carry and carry look ahead adders	3
	Part 3	Data Conversion and Comparison Circuits	Encoders, Decoders,Code converters, 1 & 2- bit comparators, Parity generator,	3
	Part 4	Data Routing Circuits and Implementation	Multiplexers, De-multiplexers, Implementation of Boolean algebra using MUX.	3

3.Sequential circuits (11 Hrs)	Part 1	Introduction to Sequential Logic and Latches	SR Latch, Flip flops - SR, JK, Master-Slave JK, D and T Flip flops.	3
	Part 2	Flip-Flop Analysis and Conversion	Conversion of Flip flops, Excitation table and characteristic equation.	3
	Part 3	Shift Registers	Shift registers-SIPO, SISO, PISO, PIPO and Universal shift registers.	3
	Part 4	Counters and Sequential Circuit Design	Ring and Johnsons counters. Design of Asynchronous, Synchronous and Mod N counters	2
4. Logic Families and Introduction to HDL (11 Hrs)	Part 1	Electrical Characteristics of Logic Families	Electrical characteristics of logic gates (Noise margin, Fanin, Fan-out, Propagation delay, Transition time, Power -delay product)	3
	Part 2	Logic Families and their Characteristics	Overview of Logic Families: TTL, ECL, CMOS, Comparison of TTL, ECL, and CMOS characteristics	2
	Part 3	Circuit Description and Working of TTL Gates	Circuit description and working of TTL – inverter and NAND	3
	Part 4	Introduction to Verilog HDL	Introduction to Verilog HDL – Basic language elements, Basic implementation of logic gates and Combinational circuits.	3

SELF LEARNING ACTIVITIES (30 Hrs)							
Sl.No.	Activity	Description	Time	Module	CO	WK	PO
1	Video-based Learning	Watch NPTEL videos on digital logic fundamentals, summarize Boolean algebra and circuit simplification.	6	1	CO1	WK1, WK2, WK3, WK4	PO1, PO2, PO3, PO8, PO9, PO11
2	Research Paper Review	Review a recent IEEE paper on Flip- Flop Design for Low Power and High Performance Digital Systems	6	III	CO2	WK1, WK2, WK3, WK4	PO1, PO2, PO3, PO8, PO9, PO11
3	Combinational Circuit Design	Design and simulate arithmetic circuits using CAD tools	6	II	CO2	WK1, WK2, WK3, WK4	PO1, PO2, PO3, PO8, PO9, PO11
4	Coding Assignment	Implement a logic circuit in Verilog (e.g., 4-bit ALU) and document results.	6	IV	CO3	WK2, WK3, WK4, WK5, WK6, WK8	PO1, PO2, PO3, PO5, PO8, PO9, PO11

5	Case Study	Prepare a report of the Quine–McCluskey method as a systematic tabular approach for simplifying Boolean expressions in digital circuit design.	6	I	CO1	WK1, WK2, WK3, WK4	PO1, PO2, PO3, PO8, PO9, PO11

TERM WORK ACTIVITIES (15 Hrs)							
Sl.No	Activity	Description	Time	Module	CO	WK	PO
1	Digital Calculator Design	Team design of 4-bit ALU with basic arithmetic operations	5 Hrs	1	CO1	WK, WK, WK, WK4	PO1, PO2, PO3, PO8, PO9, PO11
2	Traffic Light Controller	Traffic light controller design and implementation	5 Hrs	2	CO2	WK, WK, WK, WK4	PO1, PO2, PO3, PO8, PO9, PO11
3	Sequential Circuit Design	Design, simulate, and document a 3-bit synchronous counter using flip-flops (JK/D) and verify its timing diagram.	3 Hrs	3	CO2, CO3	WK, WK, WK, WK, WK, WK, WK8	PO1, PO2, PO3, PO5 PO8, PO9, PO11
4	Logic Family Investigation	Collaborative research on emerging logic technologies	2 Hrs	4	CO4	WK, WK, WK, WK7	PO1, PO2, PO6, PO8, PO9, PO11

RUBRICS FOR TERM WORK EVALUATION						
Sl.No.	**Evaluation Criteria**	**Excellent (5)**	**Good (4)**	**Satisfactory (3)**	**Needs Improvement (2)**	**Poor (1)**
1	Understanding of Concept	Clear, in-depth, demonstrate s originality	Good clarity, minor gaps	Adequate but lacks depth	Partial understanding	Very limited understanding
2	Implementation on & Coding	Correct, optimized, well-documented	Correct but not optimized	Basic implementation with errors	Incomplete with major errors	No attempt
3	Analysis & Interpretation	Strong analysis with metrics & insights	Good analysis, limited metrics	Basic interpretation	Minimal interpretation	No analysis
4	Report & Presentation	Well-structured, professional, references included	Clear, minor issues in organization	Average, lacks polish	Poorly structured	Not submitted
5	Teamwork & Engagement	Highly collaborative and proactive	Good participation	Moderate effort	Low effort	Absent

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**40%**
Learning Activity (Self Learning, Term Work, Assignments, Module Test, Tutorials)	40 %
Attendance	10 %
Internal Examination	50 %
Course Project	NA
End Semester Examination	**60%**
Total	100 %

TABLE OF SPECIFICATIONS FOR QUESTION PAPER DESIGN

Module	Module Title	Teaching Hours	Distribution of Marks (Revised Bloom's Level)						Total Marks
			R	**U**	**A**	**An**	**E**	**C**	
1	Introduction to digital circuits & Boolean algebra	11	3	12					15
2	Combinational logic circuits	12	-	3	12				15
3	Sequential Circuits	11	3	12					15
4	Logic families and Introduction to HDL	12	3	12					15

This shall be treated as a general guideline for students and teachers for distribution of marks.

END SEMESTER EXAMINATION (ESE) QUESTION PAPER PATTERN

No: of Sections in the Question paper		2			
Part	**No. of Questions/Module**	**Total No. of Questions**	**Max. marks/ Question**	**Part Summary**	**Total Marks**
A	2 (No choice)	8	3	8 x 3	24
B	2 (Including Choice)	8	9	4 x 9	36
TOTAL MARKS					**60**

Course Code	Course Name				Credits
J1ESL248	**INFORMATION TECHNOLOGY WORKSHOP**				**1**
Regulation	2026	L: T:P:H:S	0:0:2: 0:1	Notional Learning Hours/Semester	30
(L: Lecture, T: Tutorial, P: Practical, H: Project: S: Self Learning and Term work (SL&TW))					
Course Type	PL	Course delivery Mode		Practical	
Scheme of Evaluation		CIE: 100 Marks	ESE: 0	Duration of ESE: 2 Hr 30 Min.	
Pre-requisite	Nil				

COURSE OBJECTIVE	
1	To develop a foundational understanding of computer systems, including hardware components, operating systems, and basic networking concepts..
2	To equip students with practical skills in Linux/Unix environments, including command-line operations, shell scripting, and system-level interactions.
3	To enable learners to design and develop basic web applications, using HTML, CSS, and JavaScript, along with version control tools for project management.

COURSE OUTCOMES		
Upon successful completion of this course, students will be able to:		Blooms Level
1	Experiment with fundamental computer hardware components and demonstrate their iteraction with system software.	K3
2	Apply Linux/Unix command-line operations and develop basic shell scripts for system-level tasks.	K3
3	Perform network configuration and troubleshooting using standard networking tools and commands	K3
4	Develop basic web pages and interactive elements using HTML, CSS, and JavaScript.	K3
5	Utilize development tools and version control systems (Git/Bitbucket) for managing and deploying simple projects.	K3

COURSE ARTICULATION MATRIX

CO	Knowledge Attitude Profile									Program Outcomes & Program Specific Outcomes													
	WK									PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	2	3	2			2				3	2										2		
2	2	3	2			2				3	2										2		
3	2	3	2			2				3	2	2									2		
4	2	3	2	2		2				3	3	2									2	2	
5	2	3	2	2		2				3	3	2									2	2	2

Correlation levels: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

SYLLABUS			
Module	Title	Topics	Hours
1	**Computer Hardware & Operating Systems**	Computer hardware components, peripherals, boot process, installation of Linux and Windows OS, basic Unix/Linux commands	6
2	**Networking Fundamentals & Configuration**	Networking hardware (RJ45, UTP, fibre, switch, router, WAP, modem), networking commands (ipconfig, ping, traceroute, ssh, ftp), network setup and configuration	6
3	**Network Analysis & System Tools**	Network traffic analysis using Wireshark/Packet Tracer, shell programming in Linux (bash), basic LaTeX usage	9
4	**Web Development & Version Control**	HTML, CSS, JavaScript, form validation, image slider, deploying web pages, development environments (VS Code, Sublime), Git/Bitbucket	9

LIST OF EXPERIMENTS (30 Hours)

Instructions

- Lab experiments must be implemented in corresponding programming languages
- Minimum 10 Experiments are mandatory
- Suitable Data/ Datasets can be used whenever required
- Students should maintain a record of the lab experiments.

Sl. No.	Experiment	CO
1	Practice Computer Hardware – Familiarization CPU Box, Motherboard, CPU & Chip-set, Interface cards, Card slots, Hard disk, Cables, SMPS, NIC, Various ports, etc. Computer Peripherals - I/O Devices. Storage devices, Interface cards – Buses – Firmware	CO1
2	Familiarization of Boot process	CO1
3	Familiarizing installation of Linux and Windows operating systems	CO1
4	Familiarizing basic Unix/Linux commands - ls, mkdir, cp, mv, grep, rmdir, chmod, useradd, passwd, history, dmesg, CPU info, uname, du, time, write, fdisk	CO2
5	Familiarizing networking hardware - RJ45, UTP, fibre, switch, NIC, router, Wireless Access Point (WAP), modem	CO3
6	Familiarizing basic networking commands - ipconfig, ping, traceroute, lookup, ssh, scp, telnet, ftp	CO3
7	View network traffic using Wireshark/Packet tracer	CO3
8	Familiarizing the steps how to configure and establishing a network connecting	CO3
9	Shell programming in Linux(bash)	CO2
10	Create a web page and deploy on a local web server.	CO4
11	Use JavaScript to validate forms.	CO4
12	Create an image slider using HTML, CSS, and JavaScript. Allow users to navigate between images using previous and next buttons.	CO4
13	Familiarisation of LaTeX - Basic only	CO5
14	Familiarisation of Development Environments - Visual studio code, Sublime Text, Atom	CO5
15	Introducing Repositories - Git / Bitbucket	CO5

INSTRUCTIONAL AND TECHNOLOGY SUPPORT INFORMATION				
TEXTBOOKS				
SL. No	Name of Book	Name of Author/s	Publisher	Year
1	Invitation to Computer Science	G. Michael Schneider, Judith Gersting	Cengage	2/e, 2020
2	LINUX for Developers: Jumpstart Your Linux Programming Skills	William Rothwell	Pearson	1/e, 2018
3	HTML, CSS, and JavaScript - All in One, Sams Teach Yourself	Julie C. Meloni, Jennifer Kyrnin	Pearson	1/e, 2018
REFERENCE				
SL. No	Name of Book	Name of Author/s	Publisher	Year
1	Operating System Concepts	Abraham Silberschatz, Peter B. Galvin, Greg Gagne	Wiley	2018
2	Computer Networking: A Top-Down Approach	James F. Kurose, Keith W. Ross	Pearson	2021
3	HTML and CSS: Design and Build Websites	Jon Duckett	Wiley	2011
VIDEO LINKS				
1	https://overthewire.org/wargames/bandit/			
2	https://www.w3schools.com/			
SIMULATION TOOLS				
1	Wireshark, Packet Tracer			

RUBRICS FOR TERM WORK EVALUATION							
Sl. No.	**Evaluation Criteria**	**Weightage**	**Excellent (100%)**	**Good (80%)**	**Satisfactory (60%)**	**Needs Improvement (40%)**	**Poor (10%)**
1	Understanding & Conceptual Clarity	40%	Demonstrates complete understanding of concepts; applies theory correctly; shows deep comprehension	Good understanding; minor conceptual gaps; mostly correct application	Basic understanding; some confusion; limited application	Weak understanding; major gaps; incorrect application	No understanding; unable to explain concepts
2	Experimental/Programming Skills	30%	Flawless execution; optimal approach; error-free; efficient solution; exceeds requirements	Good execution; minor errors; effective approach; meets requirements	Basic execution; several errors; simple approach; partially meets requirements	Poor execution; major errors; inefficient approach; barely meets requirements	Unable to execute; non-functional; does not meet requirements

3	Analysis, Interpretation, and Documentation.	30%	Professional quality; comprehensive; accurate results; well-structured; exceeds expectations	Good quality; mostly accurate; clear structure; meets expectations	Acceptable quality; some inaccuracies; basic structure; minimal expectations met	Poor quality; many inaccuracies; weak structure; below expectations	Unacceptable quality; incorrect; no proper structure

RUBRICS FOR CONTINUOS INTERNAL ASESSMENT							
Sl. No.	**Evaluation Criteria**	**Weigh tage**	**Excellent (100%)**	**Good (80%)**	**Satisfactory (60%)**	**Needs Improvement (40%)**	**Poor (10%)**
1	Preparation & Pre-lab Work	20%	Fully prepared, all tasks completed, clear concepts	Minor gaps, overall understands	Partially completed, some confusion	Minimal effort, weak comprehension	No prep, unable to explain
2	Experimental/ Programming Skills	20%	Executes with precision, independent work	Minor help needed, mostly accurate	Frequent help, some errors	Constant help, major errors	Unable to perform
3	Analysis & Interpretation	10%	In-depth analysis, insightful, correct inference	Good analysis, few gaps	Basic interpretation	Minimal interpretation, errors	No analysis
4	Attendance and Timeliness of record Submission	10%	Professional, clear, well-structured, referenced	Mostly clear, minor errors	Average, lacks clarity	Poor, incomplete	Not submitted
5	Viva	10%	Demonstrates full mastery	Good responses	Can answer basic questions	Struggles with responses	Cannot answer
6	Internal Lab Examination	30%	Marks Scored by the student can be proportionally added to the Assessment based on the weightage.				

RUBRICS FOR END SEMESTER EXAMINATION							
Sl. No.	Criteria	Weigh tage	Excellent (5)	Good (4)	Satisfactor y (3)	Needs Improvement (2)	Poor (1)
1	Experimental Preparation	20%	Clear plan, correct setup, uses resources wisely	Mostly clear, few oversights	Basic preparatio n	Disorganized, unprepared	No attempt
2	Problem Solving/Executi on	30%	Independently solves, correct methodology	Minor help, approach mostly right	Needs guidance, some mistakes	High dependency, errors	Unable to attempt
3	Output Quality	20%	Results fully correct, well interpreted	Results mostly correct	Partial correctnes s	Mostly incorrect	No output
4	Inference/Interpr etation (Viva Voce)	20%	All results correctly interpreted, strong insights	Good understand ing	Basic interpretat ion	Minimal/incor rect	No inferenc e
5	Record Submission	10%	Outstanding understanding, all questions answered	Good responses, minor errors	Satisfactor y, basic answers	Poor knowledge, incomplete	Does not submit

ASSESSMENT PATTERN	
Assessment	**Weightage**
Continuous Internal Assessment	**100%**
Lab Evaluation	50 %
Learning Activity (Self Learning)	10%
Attendance	10 %
Internal Examination	30 %
Course Project	NA
End Semester Examination	-
Total	**100**