FACULTY OF ENGINEERING & TECHNOLOGY
2025 Scheme

SCHEME OF TEACHING & EVALUATION
B.Tech. – I & II SEMESTER

VISION

- To develop an ethical and a competent global workforce with an inquisitive mind.

MISSION

- To equip the students with professional skills, ethical values and competency.
- To offer state of the art programs by collaborating with industry, academia and society.
- To undertake collaborative & inter disciplinary research for overall development.
- To develop leaders and entrepreneurs for the real and sustainable world

VALUES

EQUITY
The University will ensure the education imparted will be fair and impartial.

EMPATHY
The University will imbibe a culture to understand and share the feelings of another.

EXCELLENCE
The University in its true spirit will deliver quality education and chase perfection.

EXPEDITIOUS
The University will carry out the day-to-day work with speed and efficiency and adapt quickly to the changes.

ETHICS
The University will govern and instill stakeholders with moral principles.

Program Outcomes

PO1: **Engineering Knowledge:** Apply principles of mathematics, natural sciences, computing, engineering fundamentals, and specialized engineering knowledge to develop solutions for complex engineering problems.

PO2: **Problem Analysis:** Identify, formulate, and analyse complex engineering problems by reviewing research literature and drawing well-founded conclusions, while considering sustainable development.

PO3: **Design/Development of Solutions:** Design innovative solutions for complex engineering problems and develop systems, components, or processes that address identified needs, considering public health and safety, whole-life cost, net-zero carbon goals, culture, society, and environmental impact.

PO4: **Conduct Investigations of Complex Problems:** Utilize research-based knowledge to investigate complex engineering problems, incorporating experiment design, modelling, data analysis, and interpretation to derive valid conclusions.

PO5: **Engineering Tool Usage:** Develop, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, while recognizing their limitations in solving complex engineering problems.

PO6: The Engineer and the World: Assess and evaluate societal and environmental factors when addressing complex engineering problems, considering their impact on sustainability in relation to the economy, health, safety, legal frameworks, culture, and the environment.

PO7: **Ethics**: Uphold ethical principles, demonstrate commitment to professional integrity, respect human values, and promote diversity and inclusion while adhering to national and international laws.

PO8: **Individual and Team Collaboration:** Work effectively both independently and as a member or leader in diverse, multidisciplinary teams.

PO9: **Communication:** Communicate clearly and inclusively within the engineering community and society, demonstrating the ability to write effective reports, develop design documentation, and deliver impactful presentations while considering cultural, language, and learning differences.

PO10: **Project Management and Finance:** Apply engineering management principles and economic decision-making to one's work, effectively managing projects and contributing as both a team member and leader in multidisciplinary environments.

PO11: **Life-Long Learning:** Acknowledge the importance of continuous learning and cultivate the skills necessary for:
i) Independent and sustained self-improvement,
ii) Adaptability to evolving and emerging technologies, and
iii) Critical thinking in the broader landscape of technological advancements

PHYSICS CYCLE

I - Semester

SN	Course	CourseCode	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination					Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Learning	Duration in hours	CIE Marks		SEE Marks	Total Marks	
					L	T	P	SL		Theory	Practical			
1	ASC	25MAT110	Engineering Mathematics – I	MAT	3	0	2	3	03	50	25	50	125	4
2	ASC	25PHY120	Engineering Physics	PHY	3	0	2	3	03	50	25	50	125	4
3	ESC	25PSC130	Problem Solving through C	CSE	3	0	2	3	03	50	25	50	125	4
4	ESC	25ELN140	Basic Electronics Engineering	ECE	3	0	2	3	03	50	25	50	125	4
5	HS	25HWS150	Health, Wellness, and Safety Education.	H & S	1	0	0	1	01	50	0	50	100	1
6	HS	25ENG160	Foundational English	H & S	2	0	0	2	02	50	0	50	100	2
7	AEC	25CLS180	Computing and Life Skills	H & S	1	0	0	1	01	50	0	50	100	1
8	SEC	25SAL190	Sensors and Actuators Lab	ECE	0	0	2	2	02	0	100	0	100	1
Total Marks										350	200	350	900	21

SL-Self Learning and Skill Development Activities, TD/PSB- Teaching Department / Paper Setting Board, ASC-Applied Science Course, ESC- Engineering Science Courses. MC mandatory Courses.

CIE–Continuous Internal Evaluation, SEE- Semester End Examination, IC – Integrated Course (Theory Course Integrated with Practical Course).

CHEMISTRY CYCLE

I - Semester

SN	Course	CourseCode	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination					Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Learning	Duration in hours	CIE Marks		SEE Marks	Total Marks	
					L	T	P	SL		Theory	Practical			
1	ASC	25MAT110	Engineering Mathematics-I	MAT	3	0	2	3	03	50	25	50	125	4
2	ASC	25CHE120	Engineering Chemistry	CHE	3	0	2	3	03	50	25	50	125	4
3	ESC	25PSC130	Problem Solving through C	CSE	3	0	2	3	03	50	25	50	125	4
4	ESC	25ELE140	Basic Electrical Engineering	EEE	3	0	2	3	03	50	25	50	125	4
5	HS	25ENG160	Foundational English	H & S	2	0	0	2	02	50	0	50	100	2
6	HS	25ICO170	Indian Constitution	H & S	1	0	0	1	01	50	0	50	100	1
7	HS	25KVK170 25KAK170	Vyavaharika / Adalitha Kannada	H & S	1	0	0	1	01	100	0	-	100	1
8	AEC	25CAI280	Foundation of Cyber Security and AI.	Any DEPT	1	0	0	1	01	50	0	50	100	1
Total Marks										450	100	350	900	21

Student's Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfil the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. at the beginning of the 1st semester.

PHYSICS CYCLE

II - Semester

SN	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination					Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Learning	Duration in hours	CIE Marks		SEE Marks	Total Marks	
					L	T	P	SL		Theory	Practical			
1	ASC	25MAT210	Engineering Mathematics – II	MAT	3	0	2	3	03	50	25	50	125	4
2	ASC	25PHY220	Engineering Physics	PHY	3	0	2	3	03	50	25	50	125	4
3	ESC	25PYT230	Essentials of Python for Problem Solving	CSE	3	0	2	3	03	50	25	50	125	4
4	ESC	25ELN240	Basic Electronics Engineering	ECE	3	0	2	3	03	50	25	50	125	4
5	HS	25HWS250	Health, Wellness, and Safety Education.	H & S	1	0	1	1	01	50	0	50	100	1
6	HS	25PWS260	Professional Writing Skills in English	H & S	2	0	0	2	02	50	0	50	100	2
7	AEC	25CLS280	Computing and Life Skills	H & S	1	0	0	1	01	50	0	50	100	1
8	SEC	25SAL290	Sensors and Actuators Lab	ECE	0	0	2	2	02	0	100	0	100	1
Total Marks										350	200	350	900	21

Credit Definition:

1-hour Lecture (L) per week=1Credit.

2-hours Practical / Drawing (P) per week=1Credit.

ONE credit course requires students to engage in a minimum of 30 hours of learning activities. Of these, 50% should be allocated to lecture hours and the remaining 50% to self-learning, teamwork, and skill development activities

CHEMISTRY CYCLE

II - Semester

SN	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination					Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Learning	Duration in hours	CIE Marks		SEE Marks	Total Marks	
					L	T	P	SL		Theory	Practical			
1	ASC	25MAT210	Engineering Mathematics-II	MAT	3	0	2	3	03	50	25	50	125	4
2	ASC	25CHE220	Engineering Chemistry	CHE	3	0	2	3	03	50	25	50	125	4
3	ESC	25PYT230	Essentials of Python for Problem Solving	CSE	3	0	2	3	03	50	25	50	125	4
4	ESC	25ELE240	Basic Electrical Engineering	EEE	3	0	2	3	03	50	25	50	125	4
5	HS	25PWS260	Professional Writing Skill in English	H & S	2	0	0	2	02	50	0	50	100	2
6	HS	25ICO270	Indian Constitution	H & S	1	0	0	1	01	50	0	50	100	1
7	HS	25KVK270 25KAK270	Vyavaharika/Adalitha Kannada	H & S	1	0	0	1	01	100	0	-	100	1
8	AEC	25CAI280	Foundation of Cyber Security and AI.	Any DEPT	1	0	0	1	01	50	0	50	100	1
Total Marks										450	100	350	900	21

Internal (CIE) & External Evaluation (SEE) Scheme

For an integrated (IPCC) course with an L-T-P-SL marks distribution, the total marks are 125. These are distributed as follows: 50 marks for Internal Assessment, 25 marks for Practical (Internal), and 50 marks for the External Examination (SEE). **Two Internal Assessment (IA) tests will be conducted during the mid-semester and at the end of the semester**. Each test will carry 25 marks, and the average of the two tests will be considered. The remaining 25 marks under Internal Assessment will be allocated based on additional evaluations. **A minimum of THREE assessments must be chosen from the options provided.**

Exam	**External (SEE)**	**CIE Theory (50)**				**CIE Practical (25)**				**Total**
Assessments		IA TEST (Two tests are scheduled to be conducted) Average of Two tests.	AAT1 ***	AAT2	AAT3	Regularity*	Conduction & Record*	Viva-Voce*	Lab Exam**	
Max Marks	50	25	15	5	5	5	5	5	10	125
Minimum Marks	17.5 (18) (35%)	20 (40%)				12.5(13) (50%)				50

NOTE:

Student required to score minimum of 20 marks in CIE theory and 12.5(13) marks in CIE practical to be eligible to write the SEE.
* Regularity, conduction & record need to be evaluated for every experiment.
** One or two Lab exams need to be conducted.
*** For IPPC Courses AAT1 always refers to Project-Based Learning (PBL). Involving Student Presentation on the following.

i. **Motivation of the Project**
ii. **Objective of the Project**
iii. **Outcome of the Project**

ASSESSMENT TOOLS:

1) Assignments (Individual and/or Group)
2) Seminars
3) Oral/Online Quizzes
4) Group Discussions
5) Case Studies/Case Lets
6) Practical orientation on Design Thinking, Creativity & Innovation
7) Participatory & Industry-integrated Learning
8) Practical Activities
9) Class Presentations
10) Analysis of Industry/Technical/Business Reports
11) Reports on Guest Lectures / Webinars / Industrial Visits
12) Industrial / Social / Rural projects
13) Participation in Seminars
14) Project-Based Learning
15) Problem Solving Exercises
16) Simulation Tasks
17) Technical Presentation

PHYSICS CYCLE

ENGINEERING MATHEMATICS - I

Course Code	**25MAT110**	CIE Marks (Theory)	**50**
		CIE Marks (Practical)	**25**
Teaching Hours/Week (L:T:P:SL)	**3:0:2:3**	SEE Marks	**50**
Total Hours of Pedagogy (L:T:P:SL)	**120 (45:0:30:45)**	Total Marks	**125**
Credits	**04**	Exam Hours	**03**

Pre-requisites:

1. Operations on Matrices.
2. Basic Statistical Operations and Probability.
3. Basics of Differentiation and Integration.

Course objectives:

To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following:

1. *Matrix theory for solving system of linear equations and compute eigen values and eigen vectors.*
2. *Apply the variance in problems to test the consistency of two data set.*
3. *Apply addition and multiplication theorems of probability for solving problems arising from different disciplines of engineering.*
4. *Apply partial derivatives to find maxima and minima of functions of several variables.*
5. *Apply numerical techniques to solve system of linear equations.*

Module-1

	Page No.	From: 134-160				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24
Topic	**Linear Algebra** Rank of a matrix, Consistency of system of equations, Eigen values and Eigen vectors of matrix, Rayleigh's power method to find largest eigenvalue, Diagonalization of a matrix.					
Practical	• Rank of Matrix • Testing for consistency. • Eigen Values and Eigen Vectors.					
Team work and self - learning	**Assignment**	1. To find the rank of a matrix using row reduced Echelon form. 2. To Determine the consistency of a system of linear equations using matrix methods and discuss the conditions for consistency. 3. Compute the eigenvalues and eigenvectors of a matrix. 4. Use Rayleigh's power method to find the largest eigenvalue of a given matrix. 5. Perform the diagonalization of a matrix and verify the correctness of the diagonalization process.				

	Seminar	➢ The Math Behind the Machine: Linear Algebra in AI Models ➢ Matrix Operations in Machine Learning. ➢ Linear Algebra in 3D Computer Graphic
	Self-learning	• Method of Cramer's rule to solve system of equations. • Properties of Eigen Values. • Conjugate of a matrix. Hermitian matrix.
	Applications:	❖ **Machine Learning & AI:** Linear algebra is fundamental in algorithms like Principal Component Analysis (PCA), neural networks, and support vector machines. ❖ **Computer Graphics:** Used for transformations (scaling, rotation, translation) in 3D graphics and image processing.
Text Books and References	Dr. K.S. Chandrashekar	**Engineering Mathematics – 1, Ed. 2023 (pg. No 134-160)**

Module-2

	Page No.	From: **830-845**				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24
Topic:	**Statistics:** Collection And Classification of data, frequency distributions, Measures of central tendency, measures of dispersion, skewness and kurtosis.					
Practical	1. Methods to find Mean, Mode and Median. 2. Methods to find Methods to find Mean, Mode and Median. 3. Methods to find Variation and Standard Deviation. 4. Methods to find Quartile.					
Team work and self-learning	**Assignment**	1. Collect and classify data from a given sample, and construct frequency distributions for both discrete and continuous data. 2. Calculate the measures of central tendency (mean, median, mode) for a given dataset and interpret the results. 3. Compute the measures of dispersion (variance, standard deviation, range) for a dataset and analyse the spread of the data. 4. Determine the skewness and kurtosis of a given dataset and explain their implications on the shape of the distribution. 5. Construct and analyse frequency distributions using histograms and cumulative frequency curves.				
	Seminar	1. The Math Behind the Machine: Clustering,				

		Regression, and Statistical Thinking in AI. 2. Statistical Intelligence: The Backbone of Modern Machine Learning. 3. Mining the Future: Business Intelligence through Big Data Analytics.
	Self-learning	• Different methods of collection of data and their advantages and disadvantages. • Pictorial representation of Data. Example: Bar Graphs, Pie Charts, etc.
	Applications	❖ **Machine Learning:** Many AI algorithms, such as regression and clustering, are based on statistical concepts. ❖ **Big Data Analytics:** Companies analyze large datasets to make data-driven decisions. ❖ **Recommendation Systems:** Platforms like Netflix and Amazon use statistics to suggest content based on user behavior
Text Books and References	**B. S. Grewal**	**Higher Engineering Mathematics Khanna publishers, 44th Ed.,2024 (Pg No. 830-845)**

Module-3

	Page No.	From: **857-871**				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24
Topic:	**Probability:** Probability definition, Addition and Multiplication theorems of probability, Conditional Probability: Bayes theorem.					
Practical	1. Basic Probability Simulation. 2. Addition Theorem of Probability. 3. Multiplication Theorem of Probability.					
Team work and self-learning	**Assignment**	1. Define probability and explain the basic properties of probability with suitable examples. 2. Solve problems using the addition and multiplication theorems of probability for both independent and dependent events. 3. Calculate conditional probabilities and illustrate with real-world examples. 4. Apply Bayes' theorem to solve problems related to conditional probability and decision-making.				
	Seminar	1. Precision through Probability: The Role of Statistics in Quality Control and				

		Manufacturing. 2. Reliability Engineering: Predicting and Preventing System Failures Using Probability Models. 3. Probabilistic Models in Action: Ensuring Product Reliability in Modern Industries.
	Self-learning	• Probability using Set Notations. • Axioms of Probability using set notations.
	Applications	❖ Quality Control & Reliability Engineering ❖ Factories use probability to estimate the likelihood of defective products in a batch. ❖ The Six Sigma method applies probability to minimize defects in manufacturing. ❖ Reliability engineering predicts the probability of system failure over time (e.g., failure rates of car engines).
Text Books and References	**B. S. Grewal**	**Higher Engineering Mathematics Khanna publishers, 44th Ed.,2024 (Pg No. 857-871)**

Module-4

	Page No.	From: **41-86**				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24

Topic:	**Series Expansion and Multivariable Calculus** Taylor Series, Maclaurin's series, Partial differentiation, total derivatives, differentiation of composite functions. Jacobian. Maxima and minima for a function of two variables. Errors and Approximations.
Practical	• Program to expand functions using Maclaurin's series. • Program to finding Jacobeans.
Team work and self-learning	**Assignment** 1. Solving the Problems on Taylor series and Maclaurin series expansions. 2. Solving the problems involving partial derivatives, including higher-order partial derivatives. 3. Evaluate total derivatives of composite functions using the chain rule. 4. Apply Jacobian to convert one co-ordinate system into another co-ordinate system. 5. Apply the maxima and minima to find the functions of two variables.
	Seminar 1. Power Series and Precision: A Deep Dive into Taylor and Maclaurin Expansions. 2. Visualizing Change: Using Jacobians, Derivatives, and Series for Function Analysis.

		3. The Role of the Jacobian Matrix in Robotics and Computer Vision Applications.
	Self-learning	• Homogeneous Function: Euler's Theorem and related problems. • Maxima and Minima using Lagrange's method of undetermined multipliers.
	Applications	Taylor Series in Engineering & Control Systems ❖ Approximations in Physics & Engineering: Many real-world functions (e.g., exponential growth, sinusoids) are approximated using Taylor series. ❖ Control Systems: Used in linearizing nonlinear systems, such as robotic movement control and aircraft autopilot design.
Text Books and References	**Dr. K. S Chandrashekar**	**Engineering Mathematics – 1, Ed. 2023 (pg. No 41-86)**

Module-5

	Page No.	From: **294-300** **147-156**				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24

Topic:	**Numerical Analysis** Newton Raphson Method, Regula Falsi Method, Secant Method, Solutions of System of Linear Equations By Gauss Elimination, Gauss Jordan and Gauss Seidel Method.
Practical	• Program for finding root of equation using Newton Raphson method. • Program for finding root of equation using Regular Falsi method. • Program to solve system of equations by using Gauss Elimination Method. • Program to solve system of equations by using Gauss Jordan Method. • Program to solve system of equations by using Gauss Seidel Method.
Team work and self-learning	**Assignment** 1. Solve nonlinear equations using the Newton-Raphson method. 2. Find the required root of given equation by applying the Regula Falsi method. 3. Apply the Secant method to find approximate roots of nonlinear equations. 4. Solve a system of linear equations using the Gauss Elimination method with. 5. Demonstrate the Gauss-Jordan method for solving linear systems.

		6. Apply the Gauss-Seidel iterative method for solving systems of linear equations and test the solution by writing the program.
	Seminar	1. Root-Finding Techniques in Engineering: Applications of Newton-Raphson and Regula Falsi Methods. 2. Efficient Linear System Solving in Data Science: Applications of Gauss Elimination and Gauss-Jordan Methods. 3. Applications of Numerical Methods in Robotics
	Self-learning	• Iteration methods to solve Algebraic and Trans dental Equations. • Horner's Method to solve cubic polynomials. • Bisection Method to solve algebraic trans dental equations.
	Applications	Solving Linear Equations in Engineering ❖ Used in finite element analysis (FEA) for designing bridges, buildings, and aircraft structures. ❖ Matrix inversion
Text Books and References	**Dr. K. S Chandrashekar**	**Engineering Mathematics – 1, Ed. 2023 (pg.No 294-300) & (pg.No 147-156)**

Course Outcomes: *Student will be able to*
CO-1*: Apply matrix theory for solving system of linear equations and compute eigen values and eigen vectors.*
CO-2*: Apply the variance in problems to test the consistency of two data set.*
CO-3*: Apply addition and multiplication theorems of probability for solving problems arising from different disciplines of engineering.*
CO-4: *Apply partial derivatives to find maxima and minima of functions of several variables.*
CO-5: *Apply numerical techniques to solve system of linear equations.*

Text Books and References:

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

2.Dr. K. S. C: Engineering Mathematics, Sudha Publications

E-References

https://youtu.be/1XlT3Y2oyAU?si=PZT-vWg5pnZESQr9

https://youtu.be/LMSyiAJm99g?si=pBw6ys5WhWUVq7k2

https://www.youtube.com/watch?v=Y6sx1u5cDmo&list=PLEHGYFbPuuMGfyIXGx8V-Xhi0HRSjT8Ak

https://www.youtube.com/results?search_query=Series+Expansion+and+Multivariable+Calculus+introduction

ENGINEERING PHYSICS

Course Code	**25PHY120/220**	CIE Theory	**50**
		CIE Practical	**25**
Teaching Hours/Week (L:T:P:SL)	**3:0:2:3**	SEE Marks	**50**
Total Hours of Pedagogy (L:T:P:SL)	**120 (45:0:30:45)**	Total Marks	**125**
Credits	**04**	Exam Hours	**03**

Pre-requisites:
Basics of physics concepts studied in 11th and 12th classes.

Course Objectives (CO):

- To establish a foundation in quantum mechanics and to understand the electronic properties and of semiconductors.
- To study the dielectric behavior of solids and to explore the phenomenon of superconductivity along with its applications.
- To understand the principles of laser as well as optical fibres, along with their applications in communication technology.
- To understand the fundamental principles of electromagnetism, Maxwell's equations also to explore the principles of quantum computing significance of physics in artificial Intelligence (AI) and the Internet of Things (IoT).
- To perform the experiments in engineering physics and to understand their underlying basic principles.

Module-1

	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24

Quantum Mechanics and Semiconductors		**Quantum Mechanics:** de-Broglie Hypothesis and Matter Waves, de-Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity (Qualitative), Heisenberg's uncertainty principle and its application (Non-existence of electron inside the nucleus-Non-Relativistic), Time independent Schrodinger wave equation, Wave Function, Physical significance of a wave function, Normalization of wave function, Eigen Values and Eigen functions, Particle inside one-dimensional infinite potential well. Numerical problems: de-Broglie Hypothesis, Heisenberg's uncertainty principle, One-dimensional infinite potential well. **Semiconductors:** Classification of materials based on band theory of solids, Fermi level in intrinsic semiconductors (Derivation), Concentration of electrons in conduction band & holes concentration in valance band (only mention the expression), Electrical conductivity of a semiconductor (derivation), **Numerical problems:** Fermi energy, Conductivity of semiconductors,
Practical		1. Planck's Constant using LEDs. 2. Fermi Energy of Copper 3. Transistor Characteristics 4. Photo-Diode Characteristics 5. Solar cell characteristics 6. Energy Gap of the given Semiconductor
Team work and self -learning	Video Tutorials	Watch introductory videos or animation on de-Broglie waves Note key takeaways
	Assignment on physics derivations	Derive the uncertainty relation. Study application: Non-existence of electrons in the nucleus. Solve few numerical examples. Derive the equation of Time-independent

		Schrodinger equation. Practice normalization examples, Discuss physical meaning with visual graphs. Concept of eigen values/functions in quantum systems. Solving Schrodinger equation for infinite well, derive wave functions and energy levels, visualize standing wave solutions, Solve simple problems.

Reference Books

Quantum Mechanics	A textbook of Engineering physics by M N Avadhanulu,11e, S Chand, ISBN-978-93-528-3399-3	Page no- 663-730
	Solid state physics by S O Pillai, 10th edition, New Age publications.	Page no- 158-165 & 197-231
Semiconductors	A textbook of Engineering physics by M N Avadhanulu,11e, S Chand, ISBN-978-93-528-3399-3	Page no- 970-1017
	Solid state physics by S O Pillai, 10th edition, New Age publications.	Page no- 232-2 & 521-605

Module-2

	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24

Dielectric Properties of Solids, and Superconductors		**Dielectric properties of solids:** Polar and non-polar dielectrics, Dielectric constant, Relation between polarization and dielectric constant (Derivation), Types of Polarization, internal fields in solid (Derivation), Clausius- Mossotti equation (Derivation), Application of dielectrics. Numerical problems: Dielectric constant, Polarization, Clausius - Mossotti equation. **Superconductors:** Temperature dependence of resistivity, Effects of Magnetic fields, Meissner's Effect, Types of Superconductors, BCS theory (Qualitative), High-Temperature superconductivity, Applications: SQUID and MAGLEV. Numerical problems: Critical field. Relative permeability
Practical		1. Charging and Discharging of a Capacitor 2. Series and Parallel LCR Circuits
	Assignment-1	**Dielectric Properties of Solids:** Introduction to Dielectrics. Study definitions and examples. Derive relation between polarization and dielectric constant. Practice simple numerical problems. Study each type polarization with diagrams and examples and create a comparative summary table. Understand Internal fields, Derivation of Clausius-Mossotti Equation Practice 2–3 numerical problems. Applications of Dielectrics in Capacitors, Insulation, Optical devices.
	Assignment-2 and short videos or demos	**Superconductors:** Introduction, temperature and magnetic field dependence of resistivity, interpretation of their graphs. Contrast with normal conductors, Meissner effect, visualize exclusion of magnetic field, understand critical magnetic field concept. Distinguish type I & type II, High-Tc superconductors. BCS Theory (Qualitative), Cooper pairs, energy gap. Applications of superconductors, SQUID, MAGLEV. Watch

		short videos or demos, Learn working principles and real-world significance.
Reference Books		
Dielectric Properties of Solids	A textbook of Engineering physics by M N Avadhanulu,11e, S Chand, ISBN-978-93-528-3399-3	Page no- 1071-1113
	Solid state physics by S O Pillai, 10th edition, New Age publications.	Page no- 623-691
Superconductors	A textbook of Engineering physics by M N Avadhanulu,11e, S Chand, ISBN-978-93-528-3399-3	Page no- 1151-1175
	Solid state physics by S O Pillai, 10th edition, New Age publications.	Page no- 356-424

Module-3

	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24
	Lasers: Induced absorption, spontaneous emission & stimulated emissions, Expression for energy density equation in terms of Einstein's coefficients, Requisites of a Laser system, Conditions for Lasing action (Qualitative). Principle, Construction and working of Semiconductor laser, Applications of Lasers (He-Ne, CO_2, Nd-YAG, Semiconductor Laser) Numerical problems: Power of laser, Population inversion. **Optical Fibers:** Structure of optical fibers, Propagation mechanism, Acceptance angle and Acceptance cone, Numerical aperture (Derivation), Fractional index change, Modes of propagation, Number of modes and V-parameter, Types of optical fibers. Attenuation and expression for attenuation coefficient (Derivation), Applications: Point-to-point communication. **Numerical problems:** Numerical aperture, Number of modes, Attenuation.					
Practical	Numerical Aperture of an optical fiber using laser					
	Assignment-1	Understand the energy transitions and their characteristics, use diagrams to visualize the processes. Watch short videos or animations for clarity. Einstein's Coefficients and Energy Derive the energy density of radiation. Applications of He-Ne, CO_2, Nd:YAG, and Semiconductor Lasers, List common applications by type, solve few related numerical problems.				
	Assignment-2	Understanding working of optical fibers through ray diagrams. Learn the modes of propagation and V-Parameter. Study single-mode vs multi-mode behavior, Practice numerical problems on number of modes. Derive attenuation coefficient expression. Practice attenuation-related numerical problems, Applications in point-to-point communication.				
Reference Books						
Photonics	A textbook of Engineering physics by M N Avadhanulu,11e, S Chand, ISBN-978-93-528-3399-3	Page no- 1191-1229				
	Solid state physics by S O Pillai, 10th edition, New Age publications.	Page no- 705-727				

Optical Fibres	A textbook of Engineering physics by M N Avadhanulu,11e, S Chand, ISBN-978-93-528-3399-3,	Page no- 1258-1301
	Solid state physics by S O Pillai, 10th edition, New Age publications.	Page no- 727-740

Module-4

	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24

Electromagnetism and Electromagnetic waves	Gradient: electric potential & field, Divergence: Gauss law in electrostatics, Curl: Ampère's Law, Gauss divergence theorem, deriving Maxwell's equations in integral form. Stokes' theorem**,** Faraday's Laws of induction, Ampere's law. Maxwell's equations: (in integral form) Gauss's Law in Electric Field, Gauss's Law for Magnetism, Faraday's Law of Induction, Ampere-Maxwell Law. Electromagnetic Waves: Wave equation in terms of electric field using Maxwell's equations. Plane electromagnetic waves in vacuum along with the equations for E, B and c in terms of μ_0 and ε_0, E and B. Transverse nature of electromagnetic waves.
Practical	Magnetic Field at any point along the axis of a circular coil.

	Assignment-1	Study definitions and visualize each operation using field line diagrams. Understand how each operator connects to physical laws. Convert surface integrals to volume integrals. Convert line integrals to surface integrals. Write the physical meaning and applications of each law. Derive Maxwell's equations in integral form using these theorems. Visualize flux and circulation using vector field animations.
	Assignment-2	Derive wave equation for E using Maxwell's equations to find wave speed. Transverse nature of EM waves, Direction of propagation (E ⊥ B ⊥ direction). Use simulation tools to visualize E and B oscillating perpendicularly and propagation of electromagnetic waves. Draw field diagrams for wave propagation. Derive relation between E, B, and c.

Reference Books

Electromagnetism	A textbook of Engineering physics by M N Avadhanulu,11e, S Chand, ISBN-978-93-528-3399-3	Page no- 170-183
Electromagnetic Waves		Page no-184-199

Module-5

	Number of hours of engagement	L	T	P	SL	Total
		9	0	6	9	24

Quantum Computing, Physics in AI and IOT	**Quantum Computing**: Qubits, superposition, entanglement. Significance of quantum computing (Cryptography, optimization), Quantum Gates & Circuits: Pauli-X, Hadamard, CNOT gates. Simple quantum algorithms (Deutsch's algorithm). Applications: Quantum cryptography. **Sensors & IOT:** Physics of Data Acquisition, MEMS accelerometers (Newton's laws in IoT devices). Temperature/light sensors (thermistors, photodiodes). Weather prediction using physics informed machine learning. Low-power electronics (quantum tunnelling in flash memory).	
	Assignment-1	Learn how qubits differ from classical bits? Watch simulations of superposition and entanglement. Learn the matrix representation of Pauli-X, H, and CNOT gates, simulate basic circuits using free tools like IBM Quantum Composer or Quirk. Study how the BB84 protocol ensures secure communication. Watch a visual walkthrough of Deutsch's algorithm.
	Assignment-2	Study how MEMS sensors measure motion and how Newton's laws are applied? Temperature & Light Sensors. Thermistors and photodiodes, Weather Prediction, using machine learning in IoT. IoT Energy Challenges & Sustainable Solutions: Low-Power Electronics: Quantum tunneling in flash memory, understand how quantum tunneling helps in reducing energy use in memory devices?

Reference Books

Quantum Computing & Physics in AI	Quantum computation and Quantum information, Nielsen and Chuang, 10th edition, Cambridge university, ISBN- 978-1-107-61919-7.	Page no- 13-22 32-34, 71-184, 571-593
Physics in AI and IOT	IOT fundamentals- Networking Technologies, Protocols, and use cases for the internet of things, Hanes, Salgueiro, ISBN- 978-93-868-7374.	Page no- 76-84

***Course Outcomes*:**

After completion of the course, students shall be able to

CO-1: Understand the fundamental principles of Quantum Mechanics, semiconductors and applications**.**

CO-2: Understand the concepts of dielectrics materials, superconductors, and applications.

CO-3: Understand the principles of LASER, Optical fibers, and their relevant applications.

CO-4: Acquire the fundamental knowledge & working principles of electromagnetism, electromagnetic waves, quantum computing, physics in AI and IOT.

CO-5: Perform the engineering physics experiments and realize their underlying basic principles.

PROBLEM SOLVING THROUGH C

Course Code	**25PSC130/230**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P:SL)	**3:0:2:3**	**SEE Marks**	**50**
		CIE Practical	**25**
Total Hours of Pedagogy (L:T:P:SL)	**120 (45:0:30:45)**	**Total Marks**	**125**
Credits	**04**	**Exam Hours**	**03**

Pre-requisites:

- Basic knowledge of Computers
- Problem solving skills

Course objectives:

This course will enable students to:

1. *Interpret the basic syntax, structure, and features of the C programming language.*
2. *Apply decision-making and looping constructs to develop logical solutions.*
3. *Analyse problems and implement solutions using arrays and string operations.*
4. *Create modular programs using user-defined functions for code reusability.*
5. *Apply and evaluate pointers, structures, and unions for efficient program design.*

Module-1

	Page No. /Chapters	Chapters: **2,3,4,5**				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24
Topic	**Introduction to Computers**: Basics of Computer Systems, Hardware and Software Components, Types of Programming Languages, Problem solving Tools: Definition and Characteristics of Algorithms, Writing Algorithms for Simple Problems, Definition and Purpose of Flowchart, Symbols Used in Flowcharts, Pseudocode. **Overview of C**: Importance of C, Sample Programs 1,2,3, Basic Structure of C programming, Programming Style, executing a C programming. **Constants, Variables, and Data Types**: Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of variables, assigning values to Variables, Defining Symbolic Constants, Declaring variable as Constant. **Operators and Expressions**: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Operators, Type conversions in Expressions, Operators Precedence and Associativity. **Managing Input and Output Operations**: Introduction, Reading and Writing a Character, Formatted Input and Output.					

Activities	1. **Analyzing C Program Structure:** Break down a simple C program to identify its components: headers, main function, variable declarations, and statements. 2. **Data Types and Variables:** Exercises on declaring variables of different data types. 3. **Operators and Expressions:** Practice problems involving arithmetic, relational, logical, and bitwise operators. 4. **Input and Output Operations:** Reading and writing characters using getchar() and putchar().					
Practical	1. Program to find area and circumference of a circle. 2. Program to demonstrate functions of math.h library. 3. Program to calculate simple and compound interest. 4. Write a C program to read three integers from the user and evaluate the following arithmetic expression (a + b) * c - (a % c). 5. Write a C program to read a character from the user and check whether it is an uppercase letter, lowercase letter, digit, or special character.					
Teamwork and self-learning	Assignment	1. Write and explain the basic structure of a C program. 2. Explain the types of C tokens with examples. 3. Write a program to demonstrate all arithmetic operators. 4. Explain type conversion with an example. 5. Write a program to take input and display output using scanf() and printf()				
	Seminar	1. C-tokens 2. Role of variables and constants in program execution.				
	Self-reading	1. Keywords and identifiers in C. https://www.geeksforgeeks.org/difference-between-keyword-and-identifier/ 2. Operator precedence and associativity. http://geeksforgeeks.org/operator-precedence-and-associativity-in-c/				
Module-2						
	Page No. /Chapters	Chapters: **6,7**				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24
Topic	**Decision Making and Branching**: Introduction, Decision making with if statement, If-Else Statement, Nested If-Else statements, Else-if ladder, Switch Statement, ?: Operator, Goto statement. **Decision Making and Looping:** Introduction, While Statement, Do-While Statement, For Statement.					
Activities	1. **Conditional Statements:** Debugging exercises to identify logical errors in conditional constructs. 2. **Looping Constructs:** Exercises on nested loops and loop control statements like break and continue.					

	3. **Problem-Solving Sessions:** Real-world scenarios requiring decision-making and looping, such as menu-driven programs.					
Practical	1. Program to check if a number is prime or not. 2. Program to find the roots of a quadratic expression given discriminant as d>0(real roots), d<0(imaginary roots) and d=0(equal roots). 3. Program to check if a number is a palindrome or not. 4. Program to find factorial of given input number n and display the result. 5. Program to compute **x** to the power n using **while** loop.					
Teamwork and self-learning	Assignment	1. Write a program using if-else to find the largest of three numbers. 2. Differentiate between while, do...while, and for loops with syntax. 3. Write a program to implement a calculator using switch statement. 4. Explain the use of goto with an example. 5. Write a program to print Fibonacci series using loops.				
	Seminar	1. Branching mechanisms in C – if, switch, goto. 2. Comparison of different looping constructs.				
	Self-reading	1. Nested loops and their applications. https://www.geeksforgeeks.org/dynamic-array-in-c/ 2. Break and continue statements. https://www.geeksforgeeks.org/storage-for-strings-in-c/				
Module-3						
	Page No. /Chapters	Chapters: **8,9**				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	**0**	**6**	**9**	**24**
Topic	**Arrays:** Introduction, One Dimensional Arrays, Declaration and Initialization of One-dimensional Arrays, Two-Dimensional Arrays, Initialization of two-dimensional arrays, Dynamic arrays. **Character Arrays and Strings**: Introduction, Declaring and Initializing a String variables, Reading strings from terminal, Writing strings to Screen, String handling functions, Table of strings.					
Activities	1. **One-Dimensional Arrays:** Exercises on array declaration, initialization, and traversal. 2. **Two-Dimensional Arrays:** Exercises on Matrix operations like addition, subtraction, and multiplication. 3. **String Handling:** Writing custom functions for string manipulation.					
Practical	1. Program to find the maximum and minimum element in an array. 2. Program to find product of two **mxn** matrices. 3. Program to demonstrate string handling functions. 4. Program to write a function that accepts a string and counts the number of vowels, consonants, digits, and special characters. 5. Write a program that will compute the length of a given character string.					

Teamwork and self-learning	Assignment	1. Write a program to find the largest and smallest element in an array. 2. Explain the difference between one-dimensional and two-dimensional arrays. 3. Write a program to perform matrix addition. 4. Write a program to check if a string is a palindrome. 5. Explain any five string handling functions with examples.
	Seminar	1. Real-world applications of arrays in C. 2. Multi-dimensional arrays.
	Self-reading	1. Dynamic arrays in C. https://www.geeksforgeeks.org/dynamic-array-in-c/ 2. Memory representation of strings. https://www.geeksforgeeks.org/storage-for-strings-in-c/

Module-4

	Page No. /Chapters	Chapters: **10**				
	Number of hours of engagement	L	T	P	SL	Total
		9	**0**	**6**	**9**	**24**
Topic	**User Defined Functions:** Introduction, Need for User defined functions, A Multi-Function program, Elements of user defined functions, Definition of functions, return values and their types, Function Calls, Function Declaration, Category of functions, Recursion, passing arrays to a function, Passing strings to a function.					
Activities	1. **Function Basics:** Understanding function prototypes and scope of variables. 2. **Parameter Passing:** Passing arrays and strings to functions. 3. **Recursion:** Implementing recursive functions for problems like factorial, Fibonacci series, and GCD.					
Practical	1. Program to write a function to return the GCD (Greatest Common Divisor) of two numbers. 2. Program to find factorial of a number using recursion. 3. Program to swap two numbers using call by value and call by reference. 4. Program to search a key passing as a parameter to a function using sequential search.					
Teamwork and self-learning	Assignment	1. Write a program using functions to calculate factorial of a number. 2. Explain different categories of functions with examples. 3. Explain recursion with a program to generate Fibonacci series. 4. Write a program to pass an array to a function. 5. Difference between function declaration and definition.				
	Seminar	1. Recursion vs Iteration. 2. Importance of modular programming.				
	Self-reading	1. Function call stack. https://www.geeksforgeeks.org/function-call-stack-in-c/ 2. Practice on recursive programming example.				

<table>
<tr><td></td><td></td><td colspan="5">https://www.wscubetech.com/resources/c-programming/recursion</td></tr>
<tr><td colspan="7">Module-5</td></tr>
<tr><td rowspan="3"></td><td>Page No. /Chapters</td><td colspan="5">Chapters: 11,12</td></tr>
<tr><td rowspan="2">Number of hours of engagement</td><td>L</td><td>T</td><td>P</td><td>SL</td><td>Total</td></tr>
<tr><td>9</td><td>0</td><td>6</td><td>9</td><td>24</td></tr>
<tr><td>Topic</td><td colspan="6">Structures and Unions: Defining a structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Operations on Individual Members, Arrays of Structures, Arrays within Structures, Structures within Structures, Structures and Functions, Unions
Pointers: Introduction, Understanding Pointers, Accessing the Address of a Variable, Declaring Pointer Variables, Initialization of Pointer Variables, Accessing a Variable through its Pointer, Pointer Expressions, Pointers and Arrays, Pointers and Character Strings, Array of Pointers, Functions that Return Multiple Values, Pointers as Function Arguments, Functions Returning Pointers, Pointers to Functions, Pointers and Structures.</td></tr>
<tr><td>Activities</td><td colspan="6">1. Structures and Unions: Comparing structures and unions through practical examples.
2. Pointers with Arrays and Functions: Passing pointers to functions, Dynamic memory allocation using malloc(),calloc(), realloc() and free().
3. Pointers: Data structure applications like implementation of Stack, Queue and linked list.</td></tr>
<tr><td>Practical</td><td colspan="6">1. Program to store N student details using structure.
2. Program to pass a structure to a function using a pointer and modify its data.
3. Program to demonstrate Array of Pointers.
4. Program to demonstrate the utilization of unions.
5. Programs to demonstrate Stack, Queue and linked list using pointers.</td></tr>
<tr><td rowspan="3">Team work and self-learning</td><td>Assignment</td><td colspan="5">1. Write a program using structure to store and display student data.
2. Explain the concept of pointers with an example.
3. Differentiate between structures and unions.
4. Write a program to demonstrate passing structure to a function.
5. Write a program to demonstrate pointer to array.</td></tr>
<tr><td>Seminar</td><td colspan="5">1. Pointers in memory management.
2. Structure within structure and applications.</td></tr>
<tr><td>Self-reading</td><td colspan="5">1. Pointer to function and Pointers as return types. https://www.tutorialspoint.com/cprogramming/c_passing_pointers_to_functions.htm
2. Pointer arithmetic. https://www.tutorialspoint.com/cprogramming/c_return_pointer_from_functions.htm</td></tr>
</table>

		3. Introduction to data structures. https://www.geeksforgeeks.org/introduction-to-data-structures/

Course Outcomes:

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

***CO-1**: Explain the fundamentals of C programming syntax, keywords, data types, and operators.*

***CO-2:** Develop programs using conditional statements and iterative control structures.*

***CO-3:** Implement and manipulate arrays and strings to solve computational problems.*

***CO-4:** Design modular programs using user-defined functions to improve code organization.*

***CO-5:** Use pointers, structures, and unions effectively for advanced data handling.*

Text Books:

1. Programming in ANSI C, E Balaguruswamy, 8th Edition**.** McGraw Hill education publication.

Reference Books:

1. R.G Dromey, "How to solve it by Computer", PHI publications
2. Yashavant Kanetkar, "Let Us C",15th Edition,bpb Publication.
3. Reema Thareja, "Computer fundamentals and Programming in C", Second edition 2017, Oxford University Press.
4. Reema Thareja, "Data structure using C", 3rd edition 2012, Oxford University Press.

E-References:

1. https://onlinecourses.nptel.ac.in/noc22_cs45/preview
2. https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp&search_language=English

BASIC ELECTRONICS ENGINEERING

Course Code	**25ELN140/240**	CIE Theory	**50**
		CIE Practical	**25**
Teaching Hours/Week (L: T:P:SL)	**3:0:2:3**	SEE Marks	**50**
Total Hours of Pedagogy (L: T:P:SL)	**120 (45:0:30:45)**	Total Marks	**125**
Credits	**04**	Exam Hours	**03**

Pre-requisites: Basics of Semiconductor Physics and Mathematics, Logical reasoning skills, Role of R, L and C components in electronic circuits.

Course objectives:

1. To understand and differentiate the function of active and passive electronic components and analyse their significance in the design and performance of rectifiers and voltage regulators used in power supply systems.

2. To design and implement amplifiers and oscillators by applying theoretical and practical knowledge of semiconductor devices such as BJTs and operational amplifiers.

3.To develop and simulate digital logic circuits, employing fundamental principles of combinational and sequential logic for solving real-world digital system applications.

4.To explore the architecture and functionality of embedded systems, and analyse the integration of sensors and actuators in modern embedded applications.

5. To comprehend and apply key principles of analog and digital communication systems, including frequency spectrum, modulation techniques, and radio wave propagation, in the context of current communication technologies.

Module-1

	Page No.	From: 90-94,118-126 Text Book-1				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24
Semiconductor Diodes. Power Supplies– Block diagram	Introduction, PN Junction diode, Characteristics and Parameters, Half-wave rectifier, Full-wave rectifiers, Zener Diode - Junction Breakdown, Circuit Symbol and Characteristics (Limited Analysis and only circuit level working principle with application perspective). Rectifiers, Filters, Voltage regulators, Output resistance and voltage regulation (only conceptual approach without design) https://youtu.be/Fwj_d3uO5g8?si=VIrvtMtwLJcAuygm https://www.youtube.com/watch?v=6OMEF5MkU7k					
Activity	Quick Recap & Concept Check, Interactive Circuit Analysis: Diode Characteristics and Wrap-Up Quiz / Discussion.					
Practical	**1. V-I Characteristics of a PN Junction Diode** 2. Half-Wave and Full-Wave Rectifier Circuits 3. Zener Diode as a Voltage Regulator					
Team work and self -learning	Interactive Simulations	Use platforms like Falstad Circuit Simulator, **Tinkercad** Circuits, or Multisim Live to build and simulate: PN junction diode under forward/reverse bias Half-wave and full-wave rectifiers Zener diode in voltage regulation setup				
	Video Tutorials	**YouTube Channels:** All About Electronics, Neso Academy, Electronics Hub				
	Micro-Learning Tasks	Write a comparison chart: Half-wave vs Full-wave Rectifier Zener Diode vs Ordinary Diode				

<table>
<tr><td></td><td>Team Work</td><td colspan="5">Design of a DC Power Supply Using Full-Wave Rectifier with Zener Regulation</td></tr>
<tr><td colspan="7">Module-2</td></tr>
<tr><td rowspan="3"></td><td>Page No.</td><td colspan="5">From: 140-144,180-182,166-174 Text Book-1</td></tr>
<tr><td rowspan="2">Number of hours of engagement</td><td>L</td><td>T</td><td>P</td><td>SL</td><td>Total</td></tr>
<tr><td>9</td><td>0</td><td>6</td><td>9</td><td>24</td></tr>
<tr><td>Amplifiers, Operational amplifiers & Oscillators.</td><td colspan="6">Types of amplifiers, Parameters of amplifiers, Phase shift, Negative feedback, multi-stage amplifiers (only concepts with application perspective).
Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor.
Positive feedback, Conditions for oscillations, Ladder network oscillator, Wein bridge oscillator.
https://www.youtube.com/watch?v=U3ZXyy5PCuY
https://www.youtube.com/watch?v=kiiA6WTCQn0&list=PLwjK_iyK4LLDBB1E9MFbxGCEnmMMOAXOH
https://www.youtube.com/watch?v=XVS8Puf4tiw</td></tr>
<tr><td>Activities</td><td colspan="6">Warm-up Discussion: Amplifiers in Everyday Life, Op-Amps: From Ideal to Practical Use, Oscillators & Positive Feedback and Concept Quiz / Application Match-Up</td></tr>
<tr><td>Practical</td><td colspan="6">1. Inverting and Non-Inverting Amplifiers using Op-Amp
2. Op-Amp Based adder and subtractor
3. Wien Bridge Oscillator using Op-Amp</td></tr>
<tr><td rowspan="3">Team work and self-learningP1-4</td><td>Simulation Practice</td><td colspan="5">Using Tinkercad, Falstad, or Multisim
Simulate:
Inverting & Non-Inverting amplifiers
Integrator and differentiator circuits
Wien Bridge oscillator and observe sine wave output</td></tr>
<tr><td>YouTube Learning Playlist</td><td colspan="5">Op-amp explained with animation
Wien bridge oscillator working
Practical amplifier design for beginners</td></tr>
<tr><td>Team-Based Project Ideas</td><td colspan="5">Multi-Function Op-Amp Trainer Kit:
Design and build a compact circuit board that can demonstrate different op-amp configurations: inverting, non-inverting, voltage follower, summer, and subtractor.</td></tr>
<tr><td colspan="7">Module-3</td></tr>
<tr><td rowspan="3"></td><td>Page No.</td><td colspan="5">Text 2: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7</td></tr>
<tr><td rowspan="2">Number of hours of engagement</td><td>L</td><td>T</td><td>P</td><td>SL</td><td>Total</td></tr>
<tr><td>9</td><td>0</td><td>6</td><td>9</td><td>24</td></tr>
<tr><td>Boolean Algebra and Logic Circuits. Combinational Logic & Sequential Logic.</td><td colspan="6">Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates
Introduction, Design procedure, Adders- Half adder, Full adder (Text 2:4.1,4.2, 4.3)
Introduction, RS, JK, D and T Flip-flops, Shift registers, Counters (only concepts with application perspective).</td></tr>
</table>

	https://www.youtube.com/watch?v=1xY_zA5L5QQ&list=PLpcxIhM1pan2m1Cx0usq9QMCKEiM7M3WP https://www.youtube.com/watch?v=AaN72s5WfOM&list=PLuYnCh-Sh1XdvuSGjQRi2jgUH9_CiVR8J					
Tutorial	Number System Conversion & Complements, Boolean Expression Simplification and Flip-Flops and Applications.					
Practical	1. Verification of Logic Gates and Boolean Expressions 2. Implementation of Half Adder and Full Adder Circuits 3. Study of Flip-Flops (RS, JK, D, T) using ICs					
Team work and self-learning	Assignment	**Practice Conversions & Number Systems** Practice converting between binary, octal, decimal, and hexadecimal using worksheets or online quizzes (e.g., on verification. **Boolean Algebra Simplification** Use online tools like **Boolean Algebra Calculator**, **Digital Electronics Simulator** (CircuitVerse),				
	Video Learning & Micro Activities	Watch animated explainers for: Half & Full Adders RS, JK, D, T Flip-Flops Counters and shift registers Practice drawing logic circuit diagrams for given Boolean expressions.				
	Team Work	1.Digital Lock System using Logic Gates and Flip-Flops 2. Binary Calculator (Adder/Subtractor) Using Logic Gates				
Module-4						
	Page No.	From: 209-225 Text Book 1				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24
Embedded Systems & Sensors and Interfacing	Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC. Arduino Controller. Simple interface experiments using embedded C. https://www.youtube.com/watch?v=aYfBTXXhK70&t=426s https://www.youtube.com/watch?v=dcNk0urQsQM https://www.youtube.com/watch?v=BLrHTHUjPuw					
Tutorial	**Microprocessor vs Microcontroller | RISC vs CISC**, Embedded System Elements and Classification and Arduino Programming – Interface & Embedded C.					
Practical	1. LED Blinking and Pattern Generation using Arduino 2. Interface a Push Button with Arduino (Digital Input) 3. Interfacing a Temperature Sensor (e.g., LM35) with Arduino					
Team work and self-learning	Read and Understand Core Concepts	Embedded Systems vs General Computing Systems: What makes embedded systems different: Specialized for specific tasks, constrained by resources (memory, processing power, etc.), and integrated into larger systems. General computing systems: General-purpose machines, like PCs, designed to run a wide variety of applications. Core Elements of an Embedded System:				

		Hardware: Microcontroller, sensors, actuators, etc. Software: Embedded C programming, firmware, operating systems (optional). Interfaces: Communication protocols (I2C, SPI, UART, etc.)
	Online Tutorials & Interactive Platforms	**Arduino Basics**: Get hands-on with **Arduino IDE**, and practice writing Embedded C for basic projects. Tutorials like **"Getting Started with Arduino"** and **"Arduino Projects"** on **Instructables** or **Arduino's official site**.
	Simulations	Use **Tinkercad Circuits** to simulate Arduino projects (ideal for beginners). Experiment with basic circuits, like LED blinkers, simple sensors, or digital inputs/outputs.

Module-5

	Page No.	From: 18.1 -18.7 Text Book 3				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		9	0	6	9	24
Analog Communication Schemes & Digital Modulation Schemes	**Analog Communication Schemes:** Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM, FM. Advantages of digital communication over analog communication, ASK, FSK, PSK, Radio signal transmission Multiple access techniques. (Text 3) https://www.youtube.com/watch?v=mHvV_Tv8HDQ https://www.youtube.com/watch?v=qGwUOvErR8Q					
Tutorial	Analog and Digital Communication – Concepts and Applications, Discuss the **block diagram of a modern communication system,** Types of Communication & Modulation and Digital Communication Concepts.					
Practical	1. Frequency Shift Keying (FSK) using Digital ICs Demo. 2. Study of Multiplexing using Analog Switch or MUX IC Demo. 3. Amplitude Modulation and Demodulation Demo.					
Team work and self-learning	Self-Learning	**Conceptual Understanding of Communication Systems** **Modern Communication System Scheme:** Understand the basic structure: Information source → Transducer → Transmitter → Channel → Receiver → Destination. Study **Information source** (e.g., speech, video, or digital data) and **input transducers** (e.g., microphone, camera). Explore **Channel or Medium** (wired vs. wireless, hardwired vs. softwired) and its role in signal transmission. **Modulation** **Amplitude Modulation (AM):** Study how the amplitude of the carrier wave is varied to encode the information signal. Example: AM radio transmission.				

	Team Work	**Design and Simulation of AM and FM Modulation and Demodulation:** Design AM and FM systems for transmitting a simple audio signal. Simulate the modulation and demodulation processes using MATLAB or Python

Course Outcomes:

CO-1: *Analyze the role of active and passive electronic components in the development of rectifiers and voltage regulators as a part of power supply design.*

CO-2: *Apply the acquired knowledge to construct amplifiers and oscillators using semiconductor devices.*

CO-3: *Apply the fundamental knowledge of digital logic to realize the applications of combinational and sequential circuits.*

CO-4: *Interpret the characteristics and technological advances of embedded systems associated with sensors and actuators.*

CO-5: Relate the analog and digital communication engineering concepts, spanning from frequency spectrum, basic modulation concepts and radio wave propagation to the applications of contemporary communication systems.

Text Books and References:

1. Electronic Circuits, Fundamentals & Applications By Mike Tooley 4th Edition & 2015
2. Digital Logic & Computer Design by M. Morris Mano PHI Learning 2008 Ed.
3. Basic Electronics by D P Kothari, I J Nagrath McGraw Hill Education (India), Private Limited 2nd Edition, 2018.

HEALTH, WELLNESS, AND SAFETY EDUCATION

Course Code	**25HWS150/250**	CIE Marks	**50**
Teaching Hours/Week (L:T:P:SL)	**1:0:0:1**	SEE Marks	**50**
Total Hours of Pedagogy (L:T:P:SL)	**30 (15:0:0:15)**	Total Marks	**100**
Credits	**01**	Exam Hours	**01**

Course Objectives:

COB-1: *To provide students with fundamental knowledge of health, wellness, and fitness, enabling them to adopt a balanced lifestyle through proper nutrition, physical activity, and mental well-being strategies.*

COB-2: *To equip students with knowledge and strategies to manage stress, maintain mental and emotional well-being, prevent lifestyle diseases, and understand the importance of public health policies and emergency response.*

COB-3: *To create awareness about road safety principles, traffic regulations, and the role of engineers in designing safe road infrastructure while promoting responsible driving habits.*

COB-4: *To educate students on the common causes of road accidents, the importance of first aid and emergency care, and the role of technology in accident prevention.*

COB-5: *To create awareness about the effects of drug abuse on health, society, and workplace safety while educating students on prevention strategies, rehabilitation programs, and legal frameworks.*

Module-1

Page No.	From:				
Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
	3	0	0	3	6

Introduction to Health & Wellness, Nutrition & Diet and Physical Fitness & Exercise		**Definition and dimensions of health** (physical, mental, emotional, social, spiritual). Concept of wellness, personal Hygine and its importance in life. Relationship between health and engineering profession. **Basics of nutrition** – Macronutrients and Micronutrients. Balanced diet and its significance. Diet planning for a healthy lifestyle. Common nutritional deficiencies and their prevention. **Importance of physical activity and exercise**. Types of exercise (Aerobic, Anaerobic, Strength Training, Yoga). Basics of cardiovascular fitness and muscular strength. Role of Yoga and Meditation in well-being. Walk Minimum 5000 Steps and show the record.
Team work and self -learning	Self -learning	**Explore WHO resources** to understand health dimensions and wellness through official reports and infographics. **Watch educational videos** on YouTube about nutrition, balanced diets, and exercise types from trusted health channels. **Use fitness apps** to track diet, physical activity, and learn yoga or meditation techniques for practical engagement. **Read articles and blogs** from reputable sources like Mayo Clinic or Harvard Health to stay informed about wellness and prevention of deficiencies. **Reflect on personal habits** and create a simple health journal to plan diet, track workouts, and observe mental and emotional well-being.

Module-2						
	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		3	0	0	3	6
Stress Management, Mental Health, Lifestyle Diseases, Preventive Measures and Health Policies & First Aid.	**Introduction to stress and its impact on health**. Techniques to manage stress (Time Management, Relaxation Techniques). Importance of mental health and emotional well-being. Sleep hygiene and its role in health. **Introduction to lifestyle diseases** (Obesity, Diabetes, Hypertension, Heart Disease). Role of lifestyle modifications in prevention. Importance of preventive healthcare.					
Team work and self-learning	Self-learning	**Learn about stress** and its effects on the body and mind through short articles or educational videos from health organizations. **Practice stress management** techniques like time management, deep breathing, and guided relaxation using free mobile apps or online resources. **Explore mental health awareness** through podcasts, TED Talks, or reading stories that highlight emotional well-being and resilience. **Understand the importance of sleep** by researching sleep hygiene habits and tracking your own sleep patterns for improvement. **Study lifestyle diseases** and how simple habits like regular exercise, healthy eating, and routine check-ups can help in prevention and long-term health.				

Module-3						
	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		3	0	0	3	6
Introduction to Road Safety, Traffic Rules and Regulations	**Importance of road safety in daily life**. Road accidents: Causes, consequences, and statistics. Role of engineers in designing safe road infrastructure. Awareness campaigns and global road safety initiatives. **Basic traffic rules and signs.** Motor Vehicle Act and penalties for violations. Role of government bodies in traffic management (RTO, Police, NHAI). Safe driving habits and importance of defensive driving.					

Team work and self-learning	Self-learning	Understand the importance of road safety by exploring real-life case studies and accident statistics to see its impact on daily life. Learn basic traffic rules and signs using digital quizzes or road safety apps to reinforce recognition and understanding. Explore the role of engineers in creating safer roads through documentaries or articles on infrastructure design and innovation. Study the Motor Vehicle Act and related penalties through official government websites or summarized guides. Watch road safety campaigns and practice safe driving habits like defensive driving through simulations and driving tutorials.

Module-4

	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		3	0	0	3	6
Road Accidents and Emergency Response	**Common causes of road accidents** (Human error, Mechanical failure, Environmental factors). First aid and emergency care for accident victims. Role of technology in accident prevention (CCTV, GPS, Smart Traffic Signals). Case studies on major road accidents and lessons learned.					
Team work and self-learning	Self-learning	**Study the common causes of road accidents** such as human error, vehicle issues, and weather through safety reports and educational videos. **Learn basic first aid** and emergency response techniques using online courses or tutorials focused on accident scenarios. **Explore how technology helps prevent accidents** with resources on smart traffic systems, GPS tracking, and surveillance tools. **Analyze case studies** of major road accidents to understand what went wrong and what safety measures were implemented afterward. **Practice emergency preparedness** by simulating accident response steps and knowing key helpline				

Module-5

	Page No.	From:				
	Number of hours of engagement	L	T	P	SL	Total
		3	0	0	3	6
Drug Abuse, Its Impact, Prevention and Rehabilitation	**Types of drugs and their effects on health**. Psychological, physical, and social consequences of drug abuse. Influence of drugs on driving and workplace safety. Myths and facts about drug addiction. Strategies to prevent substance abuse. Role of family, educational institutions, and society in drug prevention. Rehabilitation programs and support for affected individuals. Government laws and policies against drug abuse (NDPS Act). **(Workshop on Traffic, drugs and betting issues)**					
Team work and self-learning	Self-Learning	Learn about different types of drugs and their harmful effects on the body and mind through verified health portals and videos. Understand the consequences of drug abuse—psychological, physical, and social—by reading real-life stories or interviews. Explore how drugs impair driving and work safety using awareness campaigns and expert talks.				

		Debunk myths about addiction by comparing facts from scientific sources and government health websites. Study prevention strategies and the role of families, schools, and laws like the NDPS Act in fighting substance abuse, including rehab and support systems.

Course Outcomes:

CO-1: *Students will be able to understand and apply the principles of health and wellness in daily life, make informed nutritional choices, engage in regular physical activity, and manage stress effectively for overall well-being.*

CO-2: *Students will be able to apply stress management techniques, adopt a healthy lifestyle to prevent diseases, understand public health policies, and respond effectively to medical emergencies with basic first aid knowledge.*

CO-3: *To create awareness about road safety principles, traffic regulations, and the role of engineers in designing safe road infrastructure while promoting responsible driving habits.*

CO-4: *To educate students on the common causes of road accidents, the importance of first aid and emergency care, and the role of technology in accident prevention.*

CO-5: *Students will be able to understand the impact of drug abuse, identify preventive measures, promote a drug-free lifestyle, and gain knowledge of rehabilitation support and legal policies like the NDPS Act.*

Textbooks:

Primary Textbooks:

Health and Wellness – Charles B. Corbin & Gregory J. Welk
Fitness & Wellness – Werner W.K. Hoeger & Sharon A. Hoeger
The Essentials of Health and Wellness– James L. Summitt
Road Safety and Traffic Management – R.K. Sharma
Drug Abuse and Prevention: A Practical Guide – S.K. Chaturvedi

FOUNDATIONAL ENGLISH

Course Code	**25ENG160/260**	CIE Marks	**50**
Teaching Hours/Week (L:T:P:SL)	**30:0:0:30**	SEE Marks	**50**
Total Hours of Pedagogy	**60**	Total Marks	**100**
Credits	**02**	Exam Hours	**02**

Course Objective:

By the end of the course, students will be able to:

COB-1: *Understand the foundational rules and structure of English grammar.*
COB-2: *Apply grammatical concepts to construct clear and effective sentences.*
COB-3: *Identify and correct grammatical errors in written and spoken English.*
COB-4: *Develop grammar skills relevant to academic and technical communication.*
COB-5: *Build confidence in using standard English in professional scenarios.*

Module-1

	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		6	0	0	6	12
Topic	Noun, Pronoun, Adjective, Verb, Adverb, Prepositions, Conjunctions, Interjections. Sentence types: Declarative, Interrogative, Imperative, Exclamatory. Subject-Verb Agreement.					
Practical	Sentence building exercises. Identifying parts of speech in paragraphs. Group storytelling using target grammar. Pair work: Transforming sentences by changing parts of speech.					
Team work and self-learning	Assignment	**Grammar app practice:** (e.g., Grammarly, British Council) Worksheet exercises with answer keys. Online quizzes and flashcard apps. Writing a paragraph using all 8 parts of speech.				
	Seminar	**"The Power of Word Choice: Exploring the Impact of Parts of Speech"** Demonstrate how different parts of speech can influence the strength and tone of a message.				
	Self-reading	**Online Grammar Portal (Grammarly Blog)** Topics like "Understanding Sentence Fragments and Run-Ons" or "Parts of Speech Overview" are excellent for independent learning.				

<table>
<tr><td></td><td></td><td colspan="5"></td></tr>
<tr><td colspan="7">Module-2</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Number of hours of engagement</td><td>L</td><td>T</td><td>P</td><td>SL</td><td>Total</td></tr>
<tr><td>6</td><td>0</td><td>0</td><td>6</td><td>12</td></tr>
<tr><td>Topic</td><td colspan="6">Tenses: Present, Past, Future, Perfect, and Continuous Tenses.
Tense consistency in writing and speech.
Usage of auxiliary verbs.</td></tr>
<tr><td>Practical</td><td colspan="6">Identify and correct the tense inconsistency in the given paragraph.
Rewrite a dialogue maintaining tense consistency throughout.</td></tr>
<tr><td rowspan="3">Team work and self-learning</td><td>Assignment</td><td colspan="5">Understand the correct usage of present, past, and future tenses.
Distinguish between simple, perfect, and continuous forms.
Apply tense consistency in writing and speech.
Use auxiliary verbs accurately in various tense constructions.</td></tr>
<tr><td>Seminar</td><td colspan="5">Common tense inconsistencies in student writing and how to avoid them.
Tense consistency in academic vs. creative writing.</td></tr>
<tr><td>Self-reading</td><td colspan="5">Read an editorial or blog post and note how tense is maintained throughout.
Study examples of correct and incorrect tense usage and analyse why they work or don’t.</td></tr>
<tr><td colspan="7">Module-3</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Number of hours of engagement</td><td>L</td><td>T</td><td>P</td><td>SL</td><td>Total</td></tr>
<tr><td>6</td><td>0</td><td>0</td><td>6</td><td>12</td></tr>
<tr><td>Topic</td><td colspan="6">Simple, Compound, and Complex Sentences.
Question formation (WH-questions, yes/no).
Active and Passive Voice.
Direct and Indirect Speech.</td></tr>
<tr><td>Practical</td><td colspan="6">Question-answer interviews.
Group sentence formation games.
Active-to-passive rewriting tasks.
Script reading and transformation.</td></tr>
<tr><td>Team work and self-learning</td><td>Assignment</td><td colspan="5">Identify and label 10 sentences as simple, compound, or complex. Rewrite each in another form (e.g., change a simple sentence to complex).
Combine the following simple sentences to form compound and complex ones without changing the meaning.
Write a 150-word paragraph using at least 2 of each type: simple, compound, and complex sentences</td></tr>
</table>

	Seminar	How does sentence structure affect clarity and style in writing? Why is variety in sentence types important in academic or creative writing? What are the common mistakes students make when constructing compound or complex sentences?
	Self-reading	Recording and transcribing own speech. Sentence puzzle worksheets. Peer correction via online platforms (forums). Grammar YouTube tutorials with exercises.

Module-4

		L	T	P	SL	Total
	Number of hours of engagement	6	0	0	6	12

Topic	Adjective and Adverb: Degrees and positioning. Relative Clauses (who, which, that, etc.). Conjunctions: Coordinating, Subordinating, Correlative. Prepositions and Prepositional Phrases.	
Practical	Descriptive paragraph writing. Linking ideas in group discussions. Clause connection challenge (sentence chaining). Real-life simulation: Giving directions, instructions.	
Team work and self-learning	Assignment	Identify all adjectives and adverbs in the given passage. Classify them by degree (positive, comparative, superlative) and explain their positioning. Rewrite the sentences using the correct degrees of comparison (e.g., "good → better → best") and proper positioning of modifiers. Write 10 original sentences using a mix of adjectives and adverbs in different degrees and positions. Highlight each modifier used.
	Seminar	How does the positioning of adjectives and adverbs affect sentence meaning and clarity? What is the difference between "who," "which," and "that" in relative clauses? What challenges do learners face in mastering prepositions in English?
	Self-reading	Reading and annotating texts (focus on connectors). Word ladder activities with modifiers. Self-quizzing using apps or books. Blog commenting using correct connectors.

Module-5						
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		6	0	0	6	12
Topic	Articles (a, an, the). Common grammar mistakes (subject-verb, pronouns, punctuation). Idiomatic expressions and phrasal verbs. Capitalization Rules.					
Practical	Grammar correction races (in teams). Writing and peer editing formal letters. Presenting prepared speeches. Grammar scavenger hunt (error spotting).					
Team work and self-learning	Assignment	Fill in the blanks in the following sentences using **a, an,** or **the**. Explain your choices. Identify and correct article errors in the given paragraph. Write a short descriptive paragraph (100 words) about a place or object using at least 5 correct uses of articles.				
	Seminar	Why is article usage challenging for learners from non-article languages? When is it appropriate to omit articles in English writing? What are the most common grammar errors in student writing and how can they be avoided?				
	Self-reading	Editing sample essays or emails. Creating a grammar log of mistakes and corrections. Practicing with English writing forums. Watching English interviews and analyzing usage.				

Course Outcomes (COs):

On successful completion of this course, students will be able to:

CO-1: *Analyze and apply correct grammatical structures in writing and speech.*

CO-2: *Demonstrate appropriate use of tenses, voice, and sentence types.*

CO-3: *Construct grammatically accurate and coherent academic and technical documents.*

CO-4: *Identify common errors and effectively revise written communication.*

CO-5: *knowledge to improve performance in interviews, emails, and presentations.*

Text Books

1.Raymond Murthy- English Grammar in Use

2.Wren &Martin-High School English and Grammar and Composition

References:

3. Purdue Online Writing Lab (OWL)-https://owl.purdue.edu

4. Cambridge Dictionary Grammar Guide-https://dictionary.cambridge.org

COMPUTING AND LIFE SKILLS

Course Code	**25CLS 180/280**	CIE Marks	**50**
Teaching Hours/Week (L:T:P:SL)	**1:0:0:1**	SEE Marks	**50**
Total Hours of Pedagogy (L:T:P:SL)	**30 (15:0:0:15)**	Total Marks	**100**
Credits	**01**	Exam Hours	**01**

The course will enable the students,
COB1: To equip students with essential computing skills required for engineering applications.
COB2: To develop digital literacy skills for effective document creation, data analysis, presentations, and professional communication.
COB3: To provide foundational knowledge of banking, digital transactions, financial planning, and taxation for effective personal finance management.
COB4: To enhance communication, time management, teamwork, career readiness, and entrepreneurial skills for professional success.
COB5: To enhance students' ability to adapt to technological advancements and workplace dynamics.

Module-1

	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		3	0	0	3	6
Fundamentals of Computing	Basics of Computer Hardware and Software. Operating Systems (Windows/Linux). Overview Introduction to Cloud Computing and Storage. Basics of Programming Logic (Flowcharts, Algorithms, Pseudocode). Introduction to Typing skills with **Type Racer**.					
Team work and self - learning	Self - learning	Identify and differentiate between basic computer hardware and software components Understand the role and types of operating systems Get a basic introduction to cloud computing and storage services Learn the fundamentals of programming logic using flowcharts, algorithms, and pseudocode				

Module-2

	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		3	0	0	3	6
Productivity and Digital Tools	Word Processing (MS Word/Google Docs). Spreadsheet Applications (MS Excel/Google Sheets). Presentation Software (MS PowerPoint/Google Slides). Email Etiquette and Professional					

	Communication.	
Team work and self-learning	Word Processing (MS Word / Google Docs)	Features of a word processor Basic formatting: headings, bold, italics, bullet points, line spacing Page setup, inserting images, tables, and hyperlinks **Watch** *Video tutorial:* "Beginner's Guide to Google Docs or MS Word" **Practice Task** Create a one-page resume or assignment cover page Include: heading, name, paragraph text, bulleted list, image/logo, and footer
	Spreadsheets & Presentation Tools	Spreadsheet basics: cells, rows, columns, formulas (SUM, AVERAGE). Simple charts and sorting data **Practice Task** Create a student marks table Calculate total and average marks Insert a bar or pie chart of the marks Part B: **Presentation Tools (30 mins)** **Read** Creating effective slides: titles, bullet points, visuals, transitions Do's and Don'ts of presenting
	Email Etiquette & Professional Communication	Read: Structure of a professional email Do's and Don'ts of email writing Importance of subject lines, greetings, clarity, tone, and signature Watch : *Video:* "How to Write a Professional Email" Practice Task: Draft an email to a professor requesting an extension for an assignment Subject line Greeting Body with reason and polite tone Closing and signature. **Spring Board Certification**.

Module-3						
	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		3	0	0	3	6
Basics of Banking and Personal Finance.	Introduction to Banking, Digital Banking and Transactions, Basics of Financial Planning, Budgeting, Income, Expenses, and Savings. Importance of Emergency Funds. Introduction to Tax Basics (GST, Income Tax Overview). Cyber frauds and its Prevention.					
Team work and self-learning	Self-learning	Understand how **banking systems** work and what digital banking involves Learn the essentials of **budgeting, saving**, and **financial planning** Recognize the **importance of emergency funds** in personal finance Gain a basic understanding of **tax systems** like **GST** and **Income Tax.** **Spring Board Certification**.				
Module-4						
	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		3	0	0	3	6
Life Skills and Professional Development	Effective Communication Skills (Verbal & Written). Time Management and Goal Setting. Critical Thinking and Decision-Making. Teamwork, Collaboration, and Leadership.					
Team work and self-learning	Self-learning	Understand the key components of **verbal and written communication** Learn strategies for **managing time** and **setting meaningful goals** Develop basic **critical thinking and decision-making** abilities Explore the values of **teamwork, collaboration, and leadership.** **Infosys Spring Board Certification course on Time management is Mandatory.**				
Module-5						
	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		3	0	0	3	6
Career	Resume Writing and Interview Skills. Corporate Culture and Workplace					

Readiness and Workplace Etiquette	Behavior. Networking and Personal Branding. Entrepreneurship and Innovation in Engineering. **Create and personalize a LinkedIn profile to enhance professional exposure.**	
Team work and self-learning	Self-Learning	Learn to craft a **professional resume** tailored to specific roles Prepare for **interviews** with confidence and clarity Understand **workplace behaviour** and corporate professionalism Explore **networking**, **personal branding**, and **entrepreneurship mindset** Recognize the value of **innovation in engineering careers.**
CO1: Demonstrate proficiency in basic computing and digital tools used in engineering. *CO2: Apply logical thinking and problem-solving techniques to real-world engineering challenges.* *CO3: Students will manage banking, digital payments, budgeting, savings, and basic taxation effectively.* *CO4: Students will enhance communication, time management, critical thinking, and leadership skills for effective teamwork and decision-making.* *CO5: Develop career-oriented skills such as resume writing, interview preparation, and workplace etiquette.*		
Text Books: Fundamentals of Computers– E. Balagurusamy Computing Essentials – Timothy J. O'Leary & Linda I. O'Leary Soft Skills: Enhancing Employability – M. S. Rao **Fundamentals of Financial Management** – Prasanna Chandra		
Reference Books: Digital Literacy for Dummies – Faithe Wempen **Financial Literacy by SEBI:** www.sebi.gov.in		

SENSORS AND ACTUATORS LAB

Course Code	**25SAL190/290**	CIE Marks	**100**
Teaching Hours/Week (L:T:P:SL)	**0:0:2:2**	SEE Marks	**0**
Total Hours of Pedagogy (L:T:P:SL)	**30 (0:0:30:0)**	Total Marks	**100**
Credits	**01**	Exam Hours	**01**

The course will enable the students,
COB1: To Understand Fundamentals of Sensor Technology
COB2: To Develop Proficiency in Arduino Programming
COB3: To Design and Implement Sensor-Based Systems
COB4: To Analyze and Interpret Sensor Data
COB5: Encourage Problem-Solving with Real-World Applications

Module-1

Basics of Sensors/Controllers and Actuators	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		0	0	6	0	6

Understanding Different Types of Sensors, Their Characteristics, and Demonstrations.
Understanding Different Types of Actuators and Their Demonstration.
Understanding Different Types of Microcontrollers and Their Applications.
Understanding Arduino Architecture and Its Programming.
Understanding the Arduino IDE and Its Built-in Functions.
Basic Programming using Arduino.
https://www.youtube.com/watch?v=BtLwoNJ6klE
https://www.youtube.com/watch?v=Wa8CjGsOFzY
https://www.youtube.com/watch?v=WvFmYy75Ju0
https://www.youtube.com/watch?v=tVrC2HqEfDc

Module-2

Basic Experiments and sense and control	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		0	0	6	0	6

Arduino API and its built-in functions
Button-Controlled LED: Control multiple LEDs using multiple buttons.
Temperature Display: Display temperature readings from a sensor (e.g., DHT11 or LM35) on an LCD screen turn on Fan when temperature above set value.
Automated Plant Watering: Use a moisture sensor and a pump to automatically water a plant based on soil moisture.

DHT11/DHT22: Measure temperature and humidity and turn on Dryer if humidity above the set value
BMP180/BME280: Barometric pressure, temperature, and humidity sensor.
BME680: Environmental sensor with gas, temperature, humidity, and pressure. Control alarm if gas detected.
https://www.youtube.com/watch?v=pPexpWW6Hq8&list=PL4B0LEKY-jrT_fjOGkX_NZ52ZHZf8s9S-

Module-3

Advanced Experiments and sense and control	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		0	0	6	0	6

MQ-2: Gas sensor, detects methane and smoke. When smoke/gas is detected turn on water pump/fan.
BH1750: Ambient light sensor. Turn on /OFF Street light based on ambient light.
TDS Sensor: Measures Total Dissolved Solids in water.
Rain Sensor: Detects rainfall. When rain detected send message.
Detect metal or non-metal object presence turn on Buzzer if metal detected.

https://www.youtube.com/watch?v=WL3mNmtGvhs

https://www.youtube.com/watch?v=JQXAAe1c3pk

https://www.youtube.com/watch?v=-CXHtn1bhIg

https://www.youtube.com/watch?v=jBIiH-VU768

Module-4

Actuators	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		0	0	6	0	6

Types of actuators.

Control speed and direction of DC motor using H-bridge

Relay-based Actuation: Switch high-power devices using relay and microcontroller

Piezoelectric Buzzer or Actuator: Generate sound or vibration.

Heater Control using Relay/MOSFET: Control heating element using sensor feedback.

Smart Lighting System using LDR and Relay

https://www.youtube.com/watch?v=3kM_iBUaDVI

https://www.youtube.com/watch?v=YNVfPrFtTno

Module-5

	Page No.	From:				
	Number of hours of engagement	**L**	**T**	**P**	**SL**	**Total**
		0	0	6	0	6
Flow based Development	**Node-RED** is a flow-based development tool for wiring together hardware devices. Create dash Board for temperature and Pressure. Send mail if temperature is above set value. https://www.youtube.com/watch?v=3AR432bguOY https://www.youtube.com/watch?v=ryEFNy1E_LU&list=PLogiUurtMYtQMeN9qhBmYJJHxI9gOcwBT					

Course Objectives:
CO1: Understand Fundamentals of Sensor Technology
CO2: Develop Proficiency in Arduino Programming
CO3: Design and Implement Sensor-Based Systems
CO4: Analyze and Interpret Sensor Data
CO5: Encourage Problem-Solving with Real-World Applications

Text Books:

1) Fundamentals of Sensors and Instrumentation Engineering (Paperback, Dr.Bikas Mondal, Sanghamitra Layek, Susmita Das, Santana Das.)

2) https://www.uio.no/studier/emner/matnat/ifi/IN1060/v21/arduino/arduino-projects-book.pdf

Reference Books:

https://www.arduino.cc/en/software/

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