Muthoot Institute of Technology & Science
Autonomous
RELENTLESS PASSION FOR EXCELLENCE

B. Tech

in

Electronics Engineering (VLSI Design & Technology)

2026 REGULATION

CURRICULUM & SYLLABUS

Muthoot Institute of Technology & Science
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CONTENTS

SEMESTER 1

CURRICULUM

SLOT	COURSE CATEGORY	COURSE CODE	COURSE NAME	L	T	J	P	S	C
A	BST	B250802/MA100A	Mathematics for Electrical Science-1	3	1	0	0	2	3
B	BSE	B250009/EV110B	Fundamentals of Semiconductors	3	0	0	2	3	4
C	EST	B250906/CN100C	Engineering Graphics and Computer Aided Drawing	2	0	0	2	2	3
D	EST	B250906/CN100D	Introduction to Electrical and Electronics Engineering	4	0	0	0	4	4
E	ESE	B250905/CN110E	Programming in Python	2	1	0	2	3	4
K	HMT	B250908/CN900K	Life Skills and Professional Communication	1	1	0	0	0	1
U	ESL	B250906/CN930U	Basic Electrical and Electronics Engineering Workshop	0	0	0	2	0	1
I	SEC	Skill Enhancement Course: NASSCOM or equivalent							1
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work, C- Credit)									

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COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**3-1-0-0-2**	**Version**	**25/0**	**Credits**	**3**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	**Course Name**	**Course Category**
B250802/MA100A	**MATHEMATICS FOR ELECTRICAL SCIENCE-1**	**BST**
Pre-requisite		
The basic knowledge in matrices and calculus.		

COURSE OBJECTIVES	
1	To equip students with the knowledge and skills to analyze and solve linear systems of equations using matrix methods, understand the concepts of linear independence and matrix rank, and apply eigenvalue and eigenvector techniques for matrix diagonalization in mathematical and engineering applications.
2	To equip students with analytical techniques for solving ordinary differential equations (ODEs), including both homogeneous and non-homogeneous equations using methods like undetermined coefficients and variation of parameters.
3	To explain the concept of Laplace Transform and its use in solving differential equations arise in engineering problems.
4	To develop the ability to represent functions as series using Taylor and Fourier methods, and to apply these expansions for analyzing and solving problems in science and engineering.

COMPETENCY STATEMENT (CC)	
CC1	**Demonstrate the ability to** apply the concepts of linear algebra, differential equations, Laplace Transforms and series expansions to construct mathematical models and obtain effective solutions to practical problems.

COURSE OUTCOMES (CO)

Course Outcomes (CO): At the end of this course, learners will be able to:

CO	**CO Statement**	**CC Mapping**	**Cognitive (C)**	**Psychomotor (P)**	**Affective (A)**
CO1	**Solve** linear systems of equations by applying the properties of matrices and vectors.	CC 1	A		Rs
CO2	**Solve** linear differential equations with constant coefficients by using various methods.	CC 1	U		Rs
CO3	**Apply** Laplace transform to find the solution of Initial value problem.	CC 1	A		Rs
CO4	**Determine** series expansion of the given functions using Taylor and Fourier series.	CC 1	U		Rs

Cognitive (Revised blooms Level): *- **R**: Remember; **U**: Understand; **A**: Apply; **An**: Analyse; **E**: Evaluate; **C**: Create*
Psychomotor Domain (Dave's): *- **I**-Imitation, **M**-Manipulation, **P**-Precision, **Ar**-Articulation, **N**-Naturalisation*
***Affective (Krathwohl)**: - **Re**-Receiving, **Rs**-Responding, **V**-Valuing, **O**-Organization, **Ch**-Characterization*

CO	**Program Outcomes (PO) & Program Specific Outcomes (PSO) Correlation Matrix**													
	PO											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	2	2									1			
2	2	2									1			
3	2	2									1			
4	2	2									1			
Correlation [3 – High, 2 -Medium, 1 – Low]														

TEACHING AND ASSESSMENT SCHEME									
Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
							Theory		
L	T	J	P	S	C		CIA	ESE	Total
3	1	0	0	2	3	90	40	60	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Linear Algebra	Linear systems of equations, Row echelon form and rank of a matrix, Solution by Gauss elimination, Eigenvalues and Eigenvectors of matrices, Diagonalization of matrices. **(Text 1- Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4)**	10
2	Ordinary Differential Equation	Homogeneous linear ODEs of second order, non-homogeneous linear ODEs of second order (with constant coefficients) – General solution by the method of undetermined coefficients, Solution of Non - homogeneous second order linear ODE (with constant coefficients)- by the method of variation of parameters. Solution of Homogeneous linear ODEs of higher order with constant coefficients, Solution of Non Homogeneous linear ODEs of higher order with constant coefficients by the method of undetermined coefficients(particular solutions for the functions $ke^x, kx^n, k\cos\omega x, k\sin\omega x$ and their linear combinations). **(Text 1: Relevant topics from sections 2.1, 2.2, 2.7, 2.10, 3.1, 3.2, 3.3)**	10
3	Laplace Transform	Laplace transform, Inverse Laplace transform, Linearity property, First shifting theorem, Transform of derivatives, solution of initial value problems by Laplace transform (Second order linear ODE with constant coefficients with initial conditions at t=0 only), Unit step function, Second shifting theorem, Dirac delta function and its transform (Initial value problems involving unit step function and Dirac delta function are excluded) , Convolution theorem (without proof) and its application to finding Laplace transform of products of functions. **((Text 1: Relevant topics from sections 6.1, 6.2, 6.3, 6.4, 6.5)**	10
4	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 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 10.8)**	10

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Symmetric matrix, Skew-symmetric matrix, Orthogonal Matrix, Properties of eigenvalues of Symmetric matrix, Skew-symmetric matrix, Orthogonal Matrix **(1 hour)** Practice problems on solving systems of linear equations using Gauss elimination **(2 hours)**, finding eigenvalues and eigenvectors **(2 hours)**, diagonalization **(2 hour)** **Team Work -** Apply Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) in a simple electrical circuit to form a system of linear equations in matrix form. Then solve the system of equations using Gauss Elimination method and using python. **(2 hours).**	9

2	Solving non-homogeneous ODE using direct integration method **(1 hour**), Solving non-homogeneous ODE using variable separable method **(1 hour)**. Practice problems on solving non-homogeneous ODE with constant coefficients by the method of undetermined coefficients **(3 hours)**, variation of parameters **(2 hours)**. **Team Work -** Develop a mathematical model for a mass-spring-damper system subjected to an external time-dependent force, and perform its dynamic analysis using Python-based simulation **(2 hours).**	9
3	Practice problems on Solving initial value problem using Laplace transform **(3 hours)**, unit step function, second shifting theorem (**2 hours)** Finding inverse Laplace transform using convolution theorem **(2 hours)** **Team work** -Identify and explain a real-world engineering problem that can be modeled using a linear differential equation with constant coefficient, and solve it using Laplace Transform methods and using python **(2 hours)**.	9
4	Practice problems on Fourier series expansion of functions **(2 hours)**, Half range sine series expansion of functions **(2 hours)** and Half range cosine series expansion of functions **(2 hours)**. **Team work-** Develop Fourier series expansions of real-world signals like square wave and triangular wave also plot the Fourier approximation using python **(2 hours)**.	8

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons 10th edition, 2016
2	Calculus	H Anton, I Biven, S Davis	12th edition, Wiley, 2024

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

Web Resource	
1	https://nptel.ac.in/courses/111101115
2	Ordinary and Partial Differential Equations and Applications - Course
3	Mod-01 Lec-01 General Introduction
4	https://youtube.com/playlist?list=PLyqSpQzTE6M8gnapvdLN92hs_4F75OSuH&si=hWcuSXdZilZs5ZCs

DETAILED SYLLABUS (Self-learning if any to be marked)

Module	Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	Linear systems of equations	L	CO1	U			1
	Row echelon form and rank of a matrix	L	CO1	U			2
	Tutorial Problems	T	CO1	U			1
	Solution by Gauss elimination	L	CO1	A			2

	Tutorial Problems	T	CO1	A		Rs	1
	Eigenvalues and Eigenvectors of matrices	L	CO1	A			3
	Tutorial Problems	T	CO1	A		Rs	1
	Symmetric matrix, Skew-symmetric matrix, Orthogonal Matrix	S	CO1	U			1
	Properties of eigenvalues of Symmetric matrix, Skew-symmetric matrix, Orthogonal Matrix	S	CO1	U			1
	Diagonalization of matrices	L	CO1	A			2
	Tutorial Problems	T	CO1	A		Rs	1
2	Solving non-homogeneous ODE using direct integration method	S	CO2	U			1
	Solving non-homogeneous ODE using variable separable method	S	CO2	U			1
	Solution of Homogeneous linear ODEs of second order with constant coefficients	L	CO2	U			2
	Tutorial Problems	T	CO2	U		Rs	1
	Existence and uniqueness of solutions (without proof), Linear dependence and independence of solutions using Wronskian	L	CO2	U			1
	Non-homogeneous linear ODEs of second order (with constant coefficients) – General solution by the method of undetermined coefficients	L	CO2	U			2
	Tutorial Problems	T	CO2	U		Rs	1
	Solution of non - homogeneous second order linear ODE (with constant coefficients)- by the method of variation of parameters.	L	CO2	U			2
	Tutorial Problems	T	CO2	U		Rs	1
	Solution of Homogeneous linear ODEs of higher order with constant coefficients.	L	CO2	U			1
	Solution of non- homogeneous linear ODEs of higher order with constant coefficients by the method of undetermined coefficients	L	CO2	U			2
	Tutorial Problems	T	CO2	U		Rs	1
3	Laplace Transform and its inverse	L	CO3	U			2
	Linearity. First shifting theorem(s-shifting)	L	CO3	U			1
	Tutorial Problems	T	CO3	U		Rs	1
	Transform of Derivatives	L	CO3	U			1
	Solution of differential equation using Laplace transform	L	CO3	A			2
	Tutorial Problems	T	CO3	A		Rs	1
	Unit step function, Second shifting theorem	L	CO3	U			2
	Dira delta function and its transform	L	CO3	U			1
	Tutorial Problems	T	CO3	U		Rs	1
	Convolution theorem in finding inverse Laplace transform of products of functions	L	CO3	U			1
	Tutorial Problems	T	CO3	U		Rs	1
4	Taylor series representation	L	CO4	U			1
	Maclaurin series representation	L	CO4	U			1
	Tutorial Problems	T	CO4	U		Rs	1
	Fourier series, Euler formulas, Convergence of Fourier series (Dirichlet's conditions)	L	CO4	U			1
	Fourier series of 2π periodic functions	L	CO4	U			2
	Tutorial Problems	T	CO4	U		Rs	1
	Fourier series of 2l periodic functions	L	CO4	U			2
	Tutorial Problems	T	CO4	U		Rs	1
	Half range sine series expansion	L	CO4	U			1
	Half range cosine series expansion	L	CO4	U			2
	Tutorial Problems	T	CO4	U		Rs	1

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design)								
Module	Module Title	Distribution of Marks (RBL)						Total Marks
		R	U	A	An	E	C	
1	Linear Algebra	√	√	√				15
2	Ordinary Differential Equation	√	√					15
3	Laplace Transforms	√	√	√				15
4	Fourier Series	√	√					15
This ToS shall be treated as a general guideline for students and teachers for distribution of marks								

ASSESSMENT PATTERN	
Assessment	**Marks**
Continuous Internal Assessment	**40**
1. Internal Examination	**20**
2. Learning Activity	**15**
3. Regularity	**5**
4. Course Project	
End Semester Examination	**60**
Total	**100**

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(AN AUTONOMOUS COLLEGE AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANATHAPURAM)

FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	B250802/ MA100A		
Course Name:	MATHEMATICS FOR ELECTRICAL SCIENCE-1		
Max. Marks	**60**	**Duration:**	2 hours 30 minutes
Common to EC & EE			

PART A

(Answer all questions. Each question carries 3 marks)

No.	*Question*	*CO*	*Marks*
1	Determine the row echelon form of the matrix $\begin{bmatrix}1 & 2 & 3\\2 & 4 & 6\\1 & 1 & 1\end{bmatrix}$ and hence evaluate its rank.	CO 1	(3)
2	If 2 is an eigen value of the matrix $\begin{bmatrix}3 & -1 & 1\\-1 & 5 & -1\\1 & -1 & 3\end{bmatrix}$, without using its characteristic equation find the other eigen values and also find the eigen values of A^3, A^T, A^{-1} and $6A$.	CO 1	(3)
3	Obtain the general solution of the ordinary differential equation $y'' - 5y' + 6y = 0$.	CO 2	(3)
4	Form an ordinary differential equation from the given basis: $x,\ xlnx$.	CO 2	(3)
5	Determine the inverse Laplace transform of the function $\frac{s+1}{s^2+2s+5}$	CO 3	(3)
6	Find the Laplace transform of the function $f(t) = t^2e^{3t}$.	CO 3	(3)
7	Construct the half-range cosine series for $f(x) = e^x$ in (0,1).	CO 4	(3)
8	Obtain the Fourier series representation of $f(x) = x^2 - 2$ for $-2 < x < 2$.	CO 4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

No.		*Question*	*CO*	*Marks*
		MODULE I		
9	a)	Find the values of λ and μ so that the given system of equations $x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ has i) No solution. ii) Infinite solutions. iii) Unique solution.	CO 1	(5)
	b)	Determine the eigenvalues and corresponding eigenvectors of the matrix A = $\begin{bmatrix}-2 & 2 & -3\\2 & 1 & -6\\-1 & -2 & 0\end{bmatrix}$.	CO 1	(4)
		OR		
10	a)	Diagonalize the matrix $A = \begin{bmatrix}-1 & 2 & -2\\2 & 4 & 1\\2 & 1 & 4\end{bmatrix}$.	CO 1	(5)
	b)	Test for consistency and solve the following system of equations using Gauss elimination method $2x + 3y - z = 3, x - y + 2z = 2,\ 3x + 2y + z = 5.$	CO 1	(4)
		MODULE II		

11	a)	The current $i(t)$ in an electrical circuit satisfies $i'' - 3i' + 2i = e^{2t}$. Find the complete solution for $i(t)$ using the method of undetermined coefficients.	CO 2	(5)
	b)	Find the general solution of $y'' + 4y = 8x^2$.	CO 2	(4)
		OR		
12	a)	Obtain the general solution of the ordinary differential equation $(3D^2 + 27I)y = 3cosx + \cos 3x$.	CO 2	(5)
	b)	Use variation of parameters to obtain the solution of the linear ordinary differential equation $y'' - 2y' + y = e^x lnx$.	CO 2	(4)
		MODULE III		
13	a)	Using Laplace transform, solve the differential equation $y'' + 5y' + 6y = e^{-t}, y(0) = 0, y'(0) = 1$.	CO 3	(5)
	b)	Find the inverse Laplace transform of the function $\frac{s^2+2}{s(s^2+9)}$.	CO 3	(4)
		OR		
14	a)	Using the convolution theorem, determine the inverse Laplace transform of the function $\frac{\omega}{s^2(s^2-\omega^2)}$.	CO 3	(5)
	b)	Express in terms of unit step function and hence find the Laplace transform of $f(t) = \begin{cases} t-1 \,; 1 < t < 2 \\ 3-t \,; 2 < t < 3 \end{cases}$.	CO 3	(4)
		MODULE IV		
15	a)	Find the Fourier series expansion of the periodic function $f(x) = \begin{cases} x \,; 0 < x < 1 \\ 1-x \,; 1 < x < 2 \end{cases}$.	CO 4	(5)
	b)	The periodic function $f(x) = \|x\|$, defined on (–π, π) is used to model a triangular waveform. Determine the Fourier coefficients a_n and b_n.	CO 4	(4)
		OR		
16	a)	The periodic square wave signal is defined by $f(x) = \begin{cases} -\pi \,; -\pi < x < 0 \\ x \,; 0 < x < \pi \end{cases}$ with period 2π. Find the Fourier series expansion of $f(x)$.	CO 4	(5)
	b)	Construct the half-range sine series for $f(x) = \sin(\frac{\pi x}{l})$ in $(0, l)$.	CO 4	(4)

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COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**3-0-0-2-3**	**VERSION**	**25/0**	**CREDITS**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250009/EV110B	**Fundamentals of Semiconductors**	**PCB - Core – Project Based Learning**
PRE-REQUISITE		
NIL		

PREAMBLE
This course introduces the fundamentals of quantum theory, semiconductor physics, and energy band concepts required to understand electronic materials and devices. It covers optoelectronic devices, optical fiber communication, and laser principles with their applications. The course also provides exposure to modern semiconductor technologies such as MOSFET, FinFET, and MEMS for current electronic systems.

RATIONALE
Understanding semiconductor device physics is essential for VLSI, embedded systems, fabrication technology, and nanoelectronics. The course bridges theory and application through modelling, simulation, and parameter analysis.

CO	CO Statement	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	**Apply** semiconductor fundamentals and carrier concentration concepts using basic simulation tools.	A	M	Rs
CO2	**Describe** semiconductor and advanced electronic materials used in modern devices.	A	M	Rs
CO3	**Describe** semiconductor devices, scaling technologies, and MEMS applications.	A	M	Rs
CO4	**Describe** principles of optical fibers, optoelectronic devices, and lasers used in semiconductor applications.	A	M	V

Cognitive (Revised blooms Level): - R: Remember; U: Understand; A: Apply; An: Analyse; E: Evaluate; C: Create , Psychomotor Domain (Dave's): - I-Imitation, M-Manipulation, P-Precision, Ar-Articulation, N-Naturalisation
Affective (Krathwohl): - Re-Receiving, Rs-Responding, V-Valuing, O-Organization, Ch-Characterization

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	**T**	**J**	**P**	**S**	**120**	**C**	**CIA**	**ESE**	**Total**	**CIA**	**ESE**	**Total**	
3	0	0	2	3		4	25	60	85	10	5	15	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)			
Module	**Title**	**Major Topics**	**Hrs**

1	Semiconductor Fundamentals	Quantum theory and atomic structure:Bohr atomic model, Quantized energy levels, Wave–particle duality, De Broglie hypothesis, Heisenberg uncertainty principle, Concept of energy quantization;Energy band theory: Conductors, Semiconductors, and insulators, Intrinsic and extrinsic semiconductors: n-type and p-type semiconductor materials, Carrier concentration, Concepts of Fermi level, Crystal structure of silicon.	12
2	Semiconductor Materials	Introduction to semiconductor materials : Elemental and compound semiconductors, Silicon, Polysilicon,SiO_2 - Properties and applications; Wide bandgap semiconductor materials : SiC, GaN; Compound semiconductor materials : GaAs, InP, AlGaAs ; Advanced Electronic Materials : graphene, CNTs, flexible polymers.	13
3	Semiconductor Device Technology	Semiconductor Technology Evolution : Moore's law, Technology scaling concepts, Evolution of electronic chips from micro-scale to nano-scale technologies. Modern Semiconductor Devices: MOSFET, Introduction to FinFET technology. MEMS Technology : Concepts of MEMS.	11
4	Semiconductor Optical Devices	Optical properties of semiconductor materials: propagation of light through optical fibers, types of optical fibers, numerical aperture, Light-sensitive devices: LDR, photodiode, phototransistor, and LED. Lasers : Principles of lasers, Ruby lasers.	12

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	**Title of Book**	**Author**	**Publication**
1.	Semiconductor Physics and Devices	Donald A. Neamen	4/e, McGraw-Hill, 2021
2.	Physics of Semiconductor Devices	S.M. Sze, Kwok K. Ng	4/e, Wiley, 2021
3.			

Reference			
Sl. No.	**Title of Book**	**Author**	**Publication**
1.	Principles of Semiconductor Devices	Sima Dimitrijev	2/e, Oxford University Press, 2011
2.	Electronic Devices and Circuits	J.B. Gupta	6/e, Katson Publishers (India), 2016
3.	Electronic Devices	Thomas L. Floyd	9/e, Pearson, 2021
4.	Fundamentals of Semiconductor Devices	M.K. Achuthan & K.N. Bhatt	2/e, McGraw-Hill, 2017
5.	Introduction to Semiconductor Materials and Devices	M.S. Tyagi	John Wiley & Sons, 2004
6.	Fundamentals of Semiconductor Devices	B.L. Anderson & R.L. Anderson	2/e, McGraw-Hill, 2017

Web Resource	
1.	**https://nptel.ac.in/courses/117106031 NPTEL_SSD_1**
2.	**https://nptel.ac.in/courses/117105084 NPTEL_SSD_2**
3.	**https://engineering.purdue.edu/~ece606**

DETAILED SYLLABUS

Module	**Title**	**Topic**	**Mode of Delivery**	**CO**	**Learning Domain**			**Hrs**
					C	**P**	**A**	
1		Introduction to atomic structure	L	1	U	M	Rs	1

	Quantum Theory and Atomic Structure	Niels Bohr atomic model						
		Quantized energy levels, Electron transitions and photon emission/absorption, Wave–particle duality	L		U	M	Rs	1
		Basic quantum concepts: de Broglie wavelength, Heisenberg uncertainty principle (introductory level), Concept of energy quantization	L		U	M	Rs	2
	Energy Band Theory and Semiconductor Basics	Formation of energy bands in solids, Valence band and conduction band, Forbidden energy gap,Energy band diagrams	L		U	M	V	3
		Classification of materials: • Conductors • Semiconductors • Insulators Concept of electrical conductivity based on band structure	L		U	M	V	2
	Semiconductor Materials and Carrier Fundamentals	Intrinsic semiconductors	L		U	M	V	1
		Extrinsic semiconductors n-type semiconductors p-type semiconductors	L		U	M	V	2
		Majority and minority carriers	L		U	M	V	1
		Doping process and impurity atoms	L		U	M	V	1
		Carrier concentration basics	L		U	M	V	2
		Introduction to Fermi level in intrinsic and extrinsic semiconductors	L		U	M	V	2
	Crystal Structure and Semiconductor Materials	Crystal structure of Silicon Covalent bonding in semiconductors	L		U	M	V	5
		Lattice structure and unit cell basics						
	Simulation	MATLAB simulation of carrier concentration in intrinsic and extrinsic semiconductors	P		U	M	V	4
2	**Elemental and compound semiconductors**	Introduction to elemental and compound semiconductors: Gallium Arsenide (GaAs), Indium Phosphide (InP), Silicon Carbide (SiC)	L	2	U	M	Rs	2
		Comparison of elemental and compound semiconductors, Applications.	L					
		Properties of silicon	L,S					

		Applications of silicon in electronic devices	L		U	M	Rs	2
		Introduction to polysilicon, Applications of polysilicon in semiconductor technology	L					2
		Properties of SiO_2, Applications of SiO_2 in semiconductor fabrication and insulation	L					2
	Wide Bandgap Semiconductor Materials	Basic properties of SiC, Applications of SiC in power electronics	L		U	M	V	2
		Basic properties of GaN, Applications of GaN in high-frequency and high-power devices	L,S					
	Compound Semiconductor Materials	Compound semiconductor materials: GaAs, InP, AlGaAs.	L,S		U	M	V	2
	Advanced Electronic Materials	Graphene : Basic structure and properties, Applications in electronics	L,S		U	M	Rs	1
		Carbon Nanotubes (CNTs) : Introduction and properties, Applications in nanoelectronics	L		U	M	Rs	2
		Flexible Polymer Materials : Introduction to flexible polymers , Applications in flexible electronics and sensors	L		U	M	Rs	2
	Activity	➢ Case study on Si, SiC, and GaN applications in electronics ➢ Study on graphene, CNTs, or flexible polymers ➢ Comparative study of wide bandgap and conventional semiconductor materials						
3	**Evolution of Semiconductor Technology**	Moore's Law	L	3	U	M	Rs	1
		Technology scaling concepts, Constant field and constant voltage scaling.	L,S		U	M	V	1
		Evolution from micro-scale to nano-scale technologies, Challenges in nano-scale device fabrication	L,S		U	M	Rs	2
	Modern Semiconductor Devices	MOSFET: structure, working, and types.	L		U	M	V	2
		Short channel effects in MOSFET	L		U	M	V	1
		Introduction to FinFET technology, FinFET structure and operation, Advantages of FinFET over MOSFET	L		U	M	Rs	3
	MEMS Technology	Introduction to MEMS (Micro-Electro-Mechanical Systems)	L,S		U	M	Rs	1
		Basic concept of micro-sensors and micro-actuators	L,S		U	M	Rs	2
		MEMS components (cantilevers, beams, microstructures)	L		U	M	Rs	2
		Applications of MEMS in sensors and consumer electronics.	L,S		U	M	Rs	1

	Simulation	➢ MOSFET characteristic simulation using MATLAB or online simulators	P		U	M	V	4
	Activity	Applications of MEMS	S		U	M	V	4
4	**Optical Properties of Semiconductor Materials**	Introduction to optical properties of semiconductors	L	4	U	M	Rs	1
		Propagation of light through optical fibers	L		U	M	Rs	3
		Types of optical fibers, Numerical aperture and its significance						
	Optoelectronic Devices	LDR (Light Dependent Resistor), Photodiode, Phototransistor : Principle of photoconductivity, Construction and working, Applications	L		U	M	V	4
		LED and its applications	L		U	M	V	2
	Lasers	Principles of Laser	L		U	M	Rs	4
		Absorption, spontaneous emission, and stimulated emission						
		Population inversion concept						
		Optical resonator (mirrors) and amplification of light						
		Properties of laser						
		Ruby Laser :Construction ,Working ,Characteristics ,Applications						
	Simulation	Simulation of LDR, LED, and photodiode characteristics by varying light intensity/voltage and plotting their response curves using tools like Proteus or MATLAB.	P		U	M	V	4
	Activity	Test LDR, LED, and photodiode to demonstrate real-time light sensing, switching, and signal response based on varying light intensity.	S					4

COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**4-0-0-0-2**	**Version**	**25/0**	**Credits**	**3**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	Course Name	Course Category
B250906/CN100C	**ENGINEERING GRAPHICS AND COMPUTER AIDED DRAWING**	**EST**
Pre-requisite		
NIL		

COURSE OBJECTIVES	
1	To equip students with the ability to visualize, represent, and interpret engineering designs using technical drawings.
2	To learn the features of CAD software

COMPETENCY STATEMENT (CC)	
CC1	Demonstrate the ability to interpret, construct, and communicate technical drawings by applying standard conventions and projection techniques, enabling effective visualization and representation of engineering components for design, analysis, and manufacturing applications.
CC2	Develop the ability to use CAD software for 2D drawings.

COURSE OUTCOMES (CO)

Course Outcomes (CO): At the end of this course, learners will be able to:

CO	CO Statement	CC Mapping	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	Draw the orthographic projection of points and lines located in different quadrants	CC1	A		
CO2	Generate multi-view orthographic projections of engineering objects by visualizing them in different positions	CC1	A		
CO3	Plot sectional views of engineering solids	CC1	A		
CO4	Develop surfaces of engineering objects	CC1			
CO5	Prepare pictorial drawings using the principles of isometric projection	CC1	A		
CO6	Sketch simple 2Ddrawings using CAD tools	CC2	U		Rs

Cognitive (Revised blooms Level): *- **R**: Remember; **U**: Understand; **A**: Apply; **An**: Analyse; **E**: Evaluate; **C**: Create*
Psychomotor Domain (Dave's): *- **I**-Imitation, **M**-Manipulation, **P**-Precision, **Ar**-Articulation, **N**-Naturalisation*
***Affective (Krathwohl)**: - **Re**-Receiving, **Rs**-Responding, **V**-Valuing, **O**-Organization, **Ch**-Characterization*

CO	Program Outcomes (PO) & Program Specific Outcomes (PSO) Correlation Matrix													
	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	**3**										**1**		1	
2	**3**										**1**		1	
3	**3**										**1**		1	
4	**3**										**1**		1	
5	**3**										**1**		1	
6	**3**				**2**						**1**	1	1	

Correlation [3 – High, 2 -Medium, 1 – Low]

TEACHING AND ASSESSMENT SCHEME									
Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
							Theory		
L	T	J	P	S	C		CIA	ESE	Total
4	0	0	0	2	3	90	40	60	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Orthographic projection of points and lines	Introduction: Relevance of technical drawing in the engineering field. Types of lines, Dimensioning, BIS code of practice for technical drawing. (No questions for the end semester examination) Orthographic Projection of points in different quadrants, Projection of straight lines inclined to one plane, and inclined to both planes. Trace of a line. Inclination of lines with reference planes. True length and true inclinations of line inclined to both the reference planes.	12
2	Orthographic projection of solids	Orthographic Projection of Simple solids such as Triangular, Rectangular, Square, Pentagonal and Hexagonal Prisms and Pyramids, Cube, Cone and Cylinder. Projection of solids in simple position including profile view. Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes.	12
3	Sections of solids and Development of surfaces	Sections of Solids: Sections of Prisms, Pyramids, Cube, Cone and Cylinder with axis in vertical position and cut by different section planes. True shape of the sections. (Exclude true shape given problems). Development of Surfaces: Development of surfaces of the solids and solids cut by different section planes. (Exclude problems with through holes)	16
4	Isometric projection	Isometric Projection: Isometric scale- Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Sphere, Hemisphere and their combinations.	10
5	Computer Aided Drawing (CAD)	Computer Aided Drawing (CAD): Introduction, Role of CAD in design and development of new products, Advantages of CAD. Creating two-dimensional drawing with dimensions using suitable software. (CAD, only internal evaluation)	10

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Application problems from projection of lines	6
2	Application problems from development of surfaces	6
3	Understand the basics of AutoCAD: https://www.autodesk.in/campaigns/autocad-tutorials	6
4	https://knowledge.autodesk.com/support/autocad/getting-started?sort=score	6
5	https://all3dp.com/autocad-tutorial-beginners/	6

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Engineering Graphics	Varghese, P. I.	V I P Publishers
2	Engineering Graphics	Benjamin, J.	Pentex Publishers
3	Engineering Graphics	John, K. C.	Prentice Hall India Publishers

4	Engineering Drawing	Bhatt, N., D.	Charotar Publishing House Pvt Ltd.
5	Engineering Graphics	Anilkumar, K. N.	Adhyuth Narayan Publishers

Reference			
Sl. No.	Title of Book	Author	Publication
1	Engineering Graphics with AutoCAD,	Kulkarni, D. M., Rastogi, A. P. and Sarkar, A. K.,	Prentice Hall India Publishers
2	Engineering Drawing & Graphics	Venugopal, K.	New Age International Publishers
3	Engineering Drawing	Parthasarathy, N. S., and Murali, V.	Oxford University Press

Web Resource	
1	NPTEL Course – Engineering Drawing (Web) - https://archive.nptel.ac.in/courses/112/102/112102304/
2	A R STUDY DESK – Engineering Graphics - Introduction Videos
3	Online learning App A R STUDY DESK – Engineering Graphics: Your Animated Notebook (EGYAN)

DETAILED SYLLABUS *(Self-learning if any to be marked)*

Module	Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	Introduction: Relevance of technical drawing in the engineering field. Types of lines, Dimensioning, BIS code of practice for technical drawing.	CL	CO1	A			1
	Orthographic projection of points	CL	CO1	A			1
	Projection of straight lines inclined to one plane	CL	CO1	A			1
	Projection of straight lines inclined to both planes	CL	CO1	A			4
	Trace of a line.	CL	CO1	A			1
	Inclination of lines with reference planes.	CL	CO1	A			1
	True length and true inclinations of line inclined to both the reference planes.	CL	CO1	A			3
	Orthographic projection of lines (Additional numerical problems – Self learning)	SL	CO1	A			6
2	Orthographic projection of solids- Introduction	CL	CO2	A			1
	Orthographic Projection of Simple solids such as Triangular, Rectangular, Square, Pentagonal and Hexagonal Prisms and Pyramids, Cube, Cone and Cylinder	CL	CO2	A			2
	Projection of solids in simple position including profile view.	CL	CO2	A			2
	Projection of solids with axis inclined to one of the reference planes	CL	CO2	A			2
	Projection of solids with axis inclined to both reference planes	CL	CO2	A			5
3	Sections of Solids- Introduction	CL	CO3	A			1
	Sections of Prisms, Pyramids, Cube, True shape	CL	CO3	A			3
	Section of Cone and Cylinder with axis in vertical position, True shape	CL	CO3	A			4
	Development of Surfaces- Introduction	CL	CO4	A			1
	Development of surfaces of the solids and solids cut by different section planes	CL	CO4	A			1
	Development of surfaces (additional problems) – self learning	SL	CO4	A			6
4	Isometric projection- Introduction	CL	CO5	A			1
	Isometric scale- Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Sphere, Hemisphere	CL	CO5	A			4

	Projections of combination of solids	CL	CO5	A			5
5	Computer Aided Drawing (CAD)- Introduction	CL	CO6	A			1
	Creating two-dimensional drawing with dimensions using suitable software	CL	CO6	A		Re	5
	CAD - self learning- Questions in 2D drawing	SL	CO6	A		Re	18

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design)

Module	Module Title	Distribution of Marks (RBL)						Total Marks
		R	U	A	An	E	C	
1	Orthographic projections of points and lines			√				15
2	Orthographic projections of solids			√				15
3	Sections of solids and development of surfaces			√				15
4	Isometric projection			√				15

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

ASSESSMENT PATTERN

Assessment	Marks
Continuous Internal Assessment	**40**
1. Internal Examination	**20**
2. Learning Activity	**15**
3. Regularity	**5**
4. Course Project	**-**
End Semester Examination	**60**
Total	**100**

Muthoot Institute of Technology & Science
Autonomous
RELENTLESS PASSION FOR EXCELLENCE

(AN AUTONOMOUS COLLEGE AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANATHAPURAM)

FIRST SEMESTER B. TECH DEGREE REGULAR EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	B250906/CN100C		
Course Name:	Engineering Graphics and Computer Aided Drawing		
Max. Marks	**60**	**Duration**:	**2 hours 30 minutes**
Common to EEE, ECE, CSE, AI, AD, CY			

Instructions: Retain all Construction lines. Show necessary dimensions. Answer any ONE question from each module. Each question carries 15 marks

No.	***Question***	***CO***	***Marks***
	MODULE 1		
1	A line AB has its end A 20mm above HP and 25mm in front of VP. The other end B is 45mm above HP and 55mm in front of VP. The distance between the end projectors is 60mm. Draw its projections. Also find the true length and true inclinations of the line with HP and VP.	CO1	(15)
2	The top view of a line PQ is 60mm long measures 50mm, while the length of its front view is 40mm. Its end P is in the VP and is 10mm below the HP. Draw the projections of the line and find its inclination with HP and VP.	CO1	(15)
	MODULE 2		
3	Draw the projections of a pentagonal prism of 30mm base side and 60mm height which is resting on its base edge on the ground such that its axis is inclined at 45^0 to HP and the resting base edge at 30^0 to VP.	CO2	(15)
4	A square pyramid, base 30mm side and axis 60mm long has a triangular face on the ground and the vertical plane containing the axis makes an angle of 45^0 with the VP. Draw its projections.	CO2	(15)
	MODULE 3		
5	A square prism of base side 30mm and height 75mm rests on the HP on one of its ends with two of its rectangular faces equally inclined to the VP. It is cut by a plane perpendicular to the VP and inclined at 60^0 to the HP meeting the axis at 15mm from the top. Draw the elevation, sectional plan and true shape of the section. What are the maximum width W and length L of the section?	CO3	(15)
6	A vertical cone of 35mm diameter and axis 50mm is cut by a section plane which makes 45^0 to HP and bisects the axis of the cone. Draw the development of the lateral surface of the truncated cone.	CO4	(15)
	MODULE 4		
7	A square pyramid of side 30mm and axis length 50mm is resting centrally on the top of a cube of side 50mm. Draw the isometric view of the solids.	CO5	(15)
8	A cylinder 50mm base diameter and 70mm high is resting on its base on the HP. It is surmounted centrally by a sphere of 30mm diameter. Draw the isometric projection of the solids.	CO5	(15)

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RELENTLESS PASSION FOR EXCELLENCE

COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**4-0-0-0-4**	**Version**	**25/0**	**Credits**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	Course Name	Course Category
B250906/CN100D	**INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING**	**EST**
Pre-requisite		
The basic knowledge of single variable calculus.		

COURSE OBJECTIVES	
1	Analyse simple DC electric circuits by applying circuit laws
2	Describe the basic concepts of magnetic circuits and electromagnetic Induction
3	Apply electrical concepts to solve single-phase and three-phase circuits
4	To provide fundamental knowledge of electronic devices and circuits.
5	To introduce communication systems, instrumentation, and IoT concepts.
6	To create awareness of applications of electronics in real-life domains.

COMPETENCY STATEMENT (CC)	
CC1	Analyse and troubleshoot complex electrical circuits using fundamental principles
CC2	Apply principles of solid-state physics in electronic system design
CC3	Design and analyse communication systems with modulation and demodulation

COURSE OUTCOMES (CO)

Course Outcomes (CO): At the end of this course, learners will be able to:

CO	CO Statement	CC Mapping	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	Apply circuit laws to solve simple DC circuits in steady state	CC1	A		V
CO2	Explain the basics of magnetic circuits and concept of electromagnetic induction	CC1	U		Rs
CO3	Calculate the parameters of alternating voltage and current waveforms	CC1	A		V
CO4	Apply the fundamental laws of electrical engineering to solve single phase and three phase AC circuits in steady state	CC1	A		V
CO5	Describe the working principles and V–I characteristics of semiconductor devices and apply them in basic electronic circuits.	CC2	U	I	Rs
CO6	Discuss the concepts of communication systems, electronic instrumentation, and IoT with applications in various real-life domains.	CC3	U	I	Rs

Cognitive (Revised blooms Level): *- **R**: Remember; **U**: Understand; **A**: Apply; **An**: Analyse; **E**: Evaluate; **C**: Create*
Psychomotor Domain (Dave's): *- **I**-Imitation, **M**-Manipulation, **P**-Precision, **Ar**-Articulation, **N**-Naturalisation*
***Affective (Krathwohl)**: - **Re**-Receiving, **Rs**-Responding, **V**-Valuing, **O**-Organization, **Ch**-Characterization*

CO	Program Outcomes (PO)& Program Specific Outcomes (PSO) Correlation Matrix													
	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3			2		3							
2	2													
3	3	3			2		3							
4	3	3			2		3							
5	3	2												
6	2	2				1	1		1					

Correlation [3 – High, 2 -Medium, 1 – Low]

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
							Theory		
L	**T**	**J**	**P**	**S**	**C**		**CIA**	**ESE**	**Total**
4	0	0	0	4	4	120	40	60	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

CO	Program Outcomes (PO)& Program Specific Outcomes (PSO) Correlation Matrix													
	PO										PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	3			2		3							
2	2													
3	3	3			2		3							
4	3	3			2		3							
5	3	2												
6	2	2				1	1		1					

Correlation [3 – High, 2 -Medium, 1 – Low]

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
							Theory		
L	**T**	**J**	**P**	**S**	**C**		**CIA**	**ESE**	**Total**
4	0	0	0	4	4	120	40	60	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)

Module	Title	Major Topics	Hrs
1	Analysis of Circuits	Equivalent resistance, mesh analysis, Node analysis	10
1, 2	Concepts of Magnetic circuits and Electromagnetic Induction	Basic terminologies in magnetic circuits, Series and Parallel magnetic circuits	6
2	Analysis of AC Circuits	AC Fundamentals, Analysis of single-phase circuits, Analysis of balanced three phase circuits	14
3	Introduction to Electronics devices & circuits	Passive & active components, Diodes, voltage regulator, power supply, BJT, FET	16
4	Introduction to telecommunication & Instrumentation	Wired communication, AM, FM, Wireless communication, Instrumentation	14

SELF-LEARNING / TEAM WORK

Sl. No	Self-learning / Team Work Description	Hrs
1	Equivalent resistance of a circuit (star delta conversion): additional problems	7
2	Mesh analysis: additional problems	7
3	Node analysis: additional problems	7
4	Parameters of AC waveforms: additional problems	8
5	Analysis of single phase RLC circuits: additional problems	8
6	Analysis of 3 phase RLC circuits: additional problems	8
7	Collect datasheets or product manuals of at least 3 basic electronic components (diode, transistor, MOSFET) and summarize their key parameters.	3
8	Trace the evolution of communication systems through simple block diagrams and real-world examples.	2
9	Small group case study on IoT applications – smart home OR healthcare OR agriculture.	10

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Basic Electrical Engineering	D P Kothari and I J Nagrath	McGraw Hill 4/e 2019
2	Schaum's Outline of Basic Electrical Engineering	J.J.Cathey and Syed A Nasar	Tata McGraw Hill 3/e 2010
3	Basic Electrical and Electronics Engineering	Bhattacharya S K	Pearson
4	Basic Electrical and Electronics Engineering	D. P. Kothari and I. J. Nagrath	McGraw Hill 2/e 2020
5	Electronics Devices & Circuit Theory	R. LBoylstead, L.Nashelsky	Pearson 11/e, 2015
6	Electronics Communication Systems	Kennedy & Davis	McGraw Hill, 6/e, 2017

Reference			
Sl. No.	Title of Book	Author	Publication
1	Electrical Engineering Fundamentals	Del Toro V	Pearson Education 2/e 2019
2	Engineering Circuit Analysis	Hayt W H, Kemmerly J E, and Durbin S M	Tata McGraw-Hill
3	Electrical and Electronic Technology	Hughes	Pearson Education
4	Basic Electrical Engineering	D C Kulshreshtha	Tata McGraw Hill 2/e 2019
5	Electronics Fundamentals: Circuits, Devices & Applications	Thomas Floyd, David Buchla	Pearson, 8/e
6	Electronics: A system approach	Neil Storey	Pearson 6/e, 2017
7	Electronic Communication	Dennis Roddy &John Coolen	Pearson, 4/e, 2008
8	Principles of Electronics Communication Systems	FrenzelL.E	McGraw Hill, 4/e, 2016

Web Resource	
1	https://www.coursera.org/learn/linear-circuits-dcanalysis (Module 1)
2	https://www.coursera.org/lecture/linear-circuits-ac-analysis/1-4-circuit-analysis-with-ac-impedances-gArJ6 (Module 1)
3	https://www.coursera.org/lecture/linear-circuits-ac-analysis/1-2-phasors-rEHhq(Module 2)
4	https://nptel.ac.in/courses/117106108
5	https://ocw.mit.edu/courses/ec-s06-practical-electronics-fall-2004/
6	https://nptel.ac.in/courses/108101091
7	https://nptel.ac.in/courses/117105143

DETAILED SYLLABUS *(Self-learning if any to be marked)*							
Module	Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	Introduction to Electrical Engineering, Basic Terminology, including voltage, current, power, resistance, emf,	CD	CO1	A			1
	Resistances in series and parallel, Current and Voltage Division Rules	L					1
	Capacitors & Inductors: V-I relations and energy stored. Ohm's law	L					1
	star-delta conversion (resistive networks only) - problems.	L				Rs	1
	Numerical problems	T, S	CO1	A		V	2
	Mesh current method – matrix representation - Solution of network equations.	L, T, S					1

	Numerical problems	T					1
	Node voltage methods-matrix representation-solution of network equations by matrix methods - numerical problems.	L, T, S					1
	Numerical problems	T					2
	Basic Terminology: MMF, field strength, flux density, reluctance - comparison between electric and magnetic circuits	L	CO2	U		Rs	1
	Series and parallel magnetic circuits with composite materials	L					1
2	Faraday's laws, Lenz's law, statically induced and dynamically induced emfs, problems	L	CO2	U		Rs	1
	Self-inductance and mutual inductance, coefficient of coupling	L					1
	Generation of alternating voltages-Representation of sinusoidal waveforms: frequency, period	L	CO3	A		V	1
	Average and RMS values and form factor of waveforms - Numerical Problems	L, T, S					2
	Phasor representation of sinusoidal quantities. Trigonometric, Rectangular, Polar and complex forms.	L					1
	Analysis of simple AC circuits: Purely resistive circuit	L	CO3	A		V	1
	Analysis of simple AC circuits: Purely inductive & capacitive	L, T, S					2
	circuits; Inductive and capacitive reactance, concept of impedance.						
	Average Power, Power factor						
	Analysis of RL, RC and RLC series Circuits-active, reactive and apparent power.						2
	Numerical Problems	T					2
	Generation of three phase voltages, advantages of three phase systems, star and delta connections	L	CO4	U		Rs	1
	Relation between line and phase voltages, line and phase currents - Numerical problems.	L, T, S					1
	Numerical Problems	T					2
3	Passive & Active components	L, T	CO5	U	I	Rs	1
	Rectifiers: Full-wave & Bridge - Ripple factor (with & without capacitor filter)						2
	Zener voltage regulator, Line & load regulation	L, T, S	CO5	U	I	Rs	2
	Block diagram of regulated DC power supply						1
	BJT Construction & working, V-I characteristics of BJT	L, T	CO5	U	I	Rs	2
	CE configuration: Input-output characteristics						1
	Comparison of CE, CB & CC configurations	L	CO5	U	I	Rs	1
	Concept of biasing & load line, Transistor as a switch (circuit & working)	L, T	CO5	U	I	Rs	2
	Transistor as an amplifier, RC coupled amplifier: Circuit diagram & frequency response	L, T	CO5	U	I	Rs	2
	Basics of FETs (MOSFET) - Construction & working of N & P channel MOSFET (Drain & Transfer characteristics)	L, S	CO5	U	I	Rs	2
4	General block diagram of a communication system	L, T	CO6	U	I	Rs	1
	Need for modulation, Concept of AM & angle modulation (no derivation)						2
	Basic concept of wired communication, Wired channels: twisted pair, coaxial cable, fiber optic cable	L	CO6	U	I	Rs	2

	Introduction to wireless communication, Block diagram of GSM, Comparison of 3G, 4G, 5G & 6G technologies	L, S	CO6	U	I	Rs	2
	Block diagram of electronic instrumentation system, Digital Multimeter,	L	CO6	U	I	Rs	2
	Function generator, Introduction to CRO & Lissajous patterns						2
	IoT based smart homes, IoT in healthcare, IoT in agriculture (case study only)	L, S	CO6	U	I	V	3

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design)

Module	Module Title	Distribution of Marks (RBL)						Total Marks
		R	U	A	An	E	C	
1	Analysis of DC Circuits	√	√	√				15
2	Analysis of AC Circuits	√	√	√				15
3	Introduction to Electronics devices & circuits		√	√				15
4	Introduction to telecommunication & Instrumentation		√	√				15

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

ASSESSMENT PATTERN	
Assessment	**Marks**
Continuous Internal Assessment	**40**
1. Internal Examination	**20**
2. Learning Activity	**15**
3. Regularity	**5**
4. Course Project	**-**
End Semester Examination	**60**
Total	**100**

(AN AUTONOMOUS COLLEGE AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANATHAPURAM)

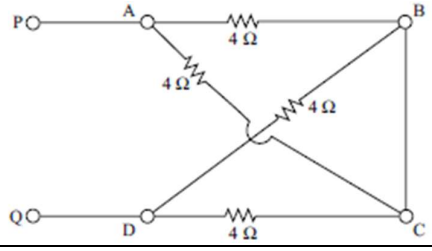
FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	B250906/CN100D		
Course Name:	INTRODUCTION TO ELECTRICAL & ELECTRONICS ENGINEERING		
Max. Marks	**60**	**Duration**:	**2 hours 30 minutes**
Specify if the question paper is common to different programmes			
Use of Data Book / IS codes, etc to be specified by the question paper setter			
• ***Students should write answers to Questions of Part 1 between the pages 1 and 15 and answers to Questions of Part 2 between pages 16 and 30 of the answer booklet. No additional answer books /sheets will be provided.*** • ***No separate minimum marks are required to pass.***			

PART 1- ELECTRICAL ENGINEERING (30 MARKS)

PART 1 - A

MODULE 1 & 2

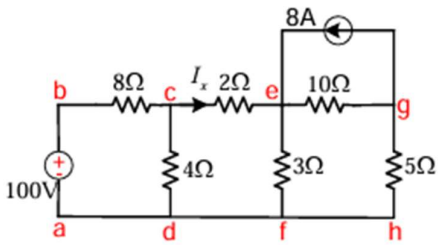
(Answer all questions. Each question carries 3 marks)

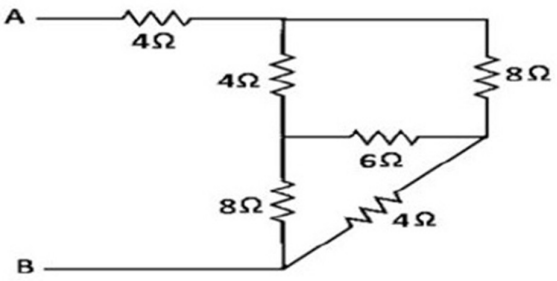
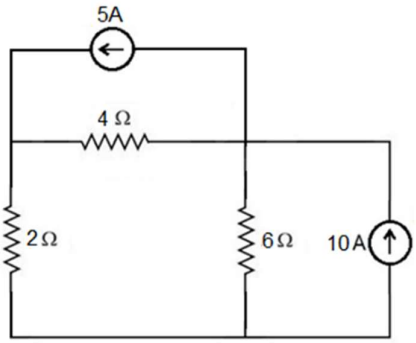
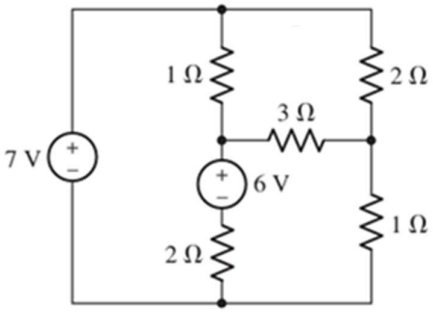
No.	***Question***	***CO***	***Marks***
1	Calculate the resistance between the terminals P and Q of the network shown. 	CO1	(3)
2	Differentiate between electric resistance and magnetic reluctance.	CO2	(3)
3	Electromotive force (emf) can be generated in two ways – statically induced and dynamically induced. Compare these two types of induced emf with respect to principle, condition of flux, and applications.	CO2	(3)
4	A solenoid coil with an inductance of 0.5 H is used in a smart lighting control system, which operates on a 230 V, 50 Hz AC supply. Derive the expressions for the instantaneous voltage and current through the coil.	CO3	(3)

PART 1 - B

MODULE 1 & 2

(Answer any one full question from each module, each question carries 9 marks)

No.		***Question***	***CO***	***Marks***
		MODULE I		
5	a	In the circuit shown determine the current I_x. 	CO1	(5)

	b	Apply star-delta transformation to determine the equivalent resistance R_{AB}. 	CO1	(4)
		OR		
6	a	Apply Nodal analysis to solve the node voltages in the circuit shown. 	CO1	(4)
	b	Apply mesh analysis to determine the three mesh currents in the circuit shown below. 	CO1	(5)
		MODULE II		
7	a	A technician is testing a device that uses a capacitor to limit current flow. When connected directly to a 230 V AC source, the device draws 1 A current. To protect sensitive components, the current needs to be reduced to 0.5 A by adding a resistor in series. i) Determine the frequency of the applied voltage. ii) Calculate the resistance required to be connected in series with the capacitor to limit the current to 0.5 A, assuming frequency remains unchanged. iii) Compute the phase angle between supply voltage and current after inserting the resistor, and state whether current leads or lags the voltage.	CO4	(4)

	b	An industrial motor is connected to a 3-phase, 400V supply through a delta-connected impedance network. Each phase of the network has an impedance of 8+j6 Ω. i) Calculate the line current drawn by the motor system. ii) Determine the power factor of the system. iii) Compute the total power consumed.	CO4	(5)
OR				
8	a	An R–L–C series circuit is used as part of an AC filtering system. By adjusting the inductance, the current peaks at 0.5 A while operating at 230 V, 50 Hz supply. At this point, a voltage of 350 V is recorded across the capacitor. i) Calculate the resistance of the circuit. ii) Determine the capacitance of the capacitor. iii) Find the inductance of the inductor when the circuit is in resonance.	CO4	(4)
	b	An industrial motor acting as a balanced three phase load consists of three coils each having resistance of 4Ω and inductance 0.02H. It is connected to a 415V, 50Hz, 3-phase ac supply. Determine the phase voltage, phase current, power factor and active power when the load is connected in star.	CO4	(5)

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(***Use of Data Book / IS codes, etc to be specified by the question paper setter***

- ***Students should write answers to Questions of Part 1 between the pages 1 and 15 and answers to Questions of Part 2 between pages 16 and 30 of the answer booklet. No additional answer books /sheets will be provided.***
- ***No separate minimum marks are required to pass.***

PART 2 - ELECTRONICS ENGINEERING (30 MARKS)

PART 2 - A

MODULE 3 & 4

(Answer all questions. Each question carries 3 marks)

No.	***Question***	***CO***	***Marks***
1	The colour bands Violet, Blue, Brown, and Gold are observed on a resistor. Analyse whether this resistor is suitable for a circuit that specifies the resistance must remain between 730 Ω and 780 Ω. Support your conclusion with appropriate calculations.	CO5	(3)
2	Calculate emitter current IE in a BJT if the value of β is 50 and IB =20μA	CO5	(3)
3	Discuss the role of IoT in transforming traditional agricultural practices.	CO6	(3)
4	Discuss how the information signal affects the carrier in AM and FM, and critically compare their advantages and limitations.	CO6	(3)

PART 2 – B				
MODULE 3 & 4				
(Answer any one full question from each module, each question carries 9 marks)				
No.		***Question***	***CO***	***Marks***
MODULE III				
5		You are designing a power supply circuit for a portable radio that requires a steady DC voltage. The circuit includes a rectifier to convert the AC mains supply to DC before the voltage is regulated.		
	a)	Identify and sketch the type of rectifier used in the circuit.	CO5	(3)
	b)	Describe the working principle of the above rectifier in the power supply circuit.	CO5	(3)
	c)	Sketch the waveforms of the input AC voltage, the rectified output voltage, and the regulated output voltage supplied to the radio.	CO5	(3)
OR				
6		An electronics trainee is testing a MOSFET using a multimeter. When the voltage measured between the gate and source is 0 V, the device does not conduct between drain and source. However, on applying a positive gate to source voltage, current begins to flow from drain to source.		
	a)	Identify the type and illustrate the construction of MOSFET.	CO5	(3)
	b)	Justify the trainee's observations regarding the operation of this MOSFET when tested under different gate to source voltages.	CO5	(4)
	c)	Interpret the drain characteristics of this MOSFET with the help of a neat sketch, identifying the different regions of operation.	CO5	(2)
MODULE IV				
7		A broadcast engineer is planning to transmit an audio signal of frequency range 300 Hz – 3.4 kHz directly over a long distance to multiple locations. After setting up the transmission, he notices that at the receiver end, the signal is highly attenuated and gets distorted with noise, making the speech almost unintelligible.		
	a)	Identify the reason for the poor reception of the directly transmitted audio signal and suggest a suitable method to overcome this issue.	CO6	(4)
	b)	Describe any two techniques that enable effective transmission of signals over long distances, and illustrate your explanation with neat sketches.	CO6	(5)
OR				
8		You are assigned to troubleshoot an electrical circuit in a lab where a resistor, capacitor, and a battery are connected. The circuit is not functioning as expected, and you suspect faulty components.		
	a)	Recommend a suitable instrumentation system that can be used to perform the necessary measurements in this scenario, and draw its block diagram.	CO6	(4)
	b)	How does the suggested instrument function in measuring battery current and resistance.	CO6	(5)

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COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**2-1-0-2-3**	**Version**	**1**	**Credits**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							
Course Code	**Course Name**						**Course Category**
B250903/CN110E	**PROGRAMMING IN PYTHON**						**ES**
Pre-requisite if any							
NIL							

COURSE OBJECTIVES	
1	To provide students with a thorough understanding of algorithmic thinking and its practical applications in solving real-world problems.
2	To explore various algorithmic paradigms, including brute force, divide-and-conquer, dynamic programming, and heuristics, in addressing and solving complex problems

COMPETENCY STATEMENT (CC)	
CC1	Apply the basic engineering concepts to solve near to real-life engineering problems
CC2	Demonstrates proficiency in the Python programming language

CO	Program Outcomes & Program Specific Outcomes Correlation Matrix													
	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	3		2		2		2	2	3			
2	3	3	3		2		2		2	2	3			
3	3	3	3		2		2		2	2	3			
4	3	3	3		2		2		2	2	3			

Correlation [3 – High, 2 -Medium, 1 – Low]

COURSE OUTCOMES (CO)

Course Outcomes (CO): At the end of this course, learners will be able to:

CO	CO Statement	CC Mapping	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	Interpret problem-solving strategies by using computing as a model for addressing near real-world problems.	1	U	M	Rs
CO2	Develop clear and accurate models, such as algorithms, pseudocode, and flowcharts, to represent the problem by articulating it before attempting to solve it.	1	A	M	Rs
CO3	Apply the essential python programming skills, to translate the algorithmic model into executable program.	2	A	M	Rs
CO4	Identify systematic approaches and problem-solving strategies for computational problems.	1	A	M	Rs

Cognitive (Revised blooms Level): *- **R**: Remember; **U**: Understand; **A**: Apply; **An**: Analyse; **E**: Evaluate; **C**: Create*

Psychomotor Domain (Dave's): *- **I**-Imitation, **M**-Manipulation, **P**-Precision, **Ar**-Articulation, **N**-Naturalisation*

***Affective (Krathwohl)**: - **Re**-Receiving, **Rs**-Responding, **V**-Valuing, **O**-Organization, **Ch**-Characterization*

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	C		CIA	ESE	Total	CIA	ESE	Total	
2	1	0	2	2	4	120	25	60	85	15	0	15	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)

Module	Title	Major Topics	Hrs
1	Foundations of Problem-Solving and Python Basics	Problem-Solving Strategies, The Problem-Solving Process, Essentials of Python Programming	7
2	Algorithm Design with Pseudocode and Flowcharts	Pseudocode, Flowcharts	9
3	Modular Problem-Solving with Python: Control Structures to Recursion	Selection and Iteration, Decomposition and Modularization, Recursion	10
4	Fundamental Computational Approaches to Problem-Solving	Divide-and-Conquer Approach, Dynamic Programming Approach, Greedy Algorithm Approach	10

SELF-LEARNING / TEAM WORK

Sl. No	Self-learning / Team Work Description	Hrs
1	Pre-Lab Practical Learning	19
2	Case study: Pick simple problems (e.g., finding prime numbers) document steps: understanding, model, algorithm, coding, testing.	12
3	Group activity: Each team takes a real-world scenario (e.g., ATM withdrawal process, online shopping checkout) and develops pseudocode with sequencing, selection, and repetition.	12
4	Compare recursive vs iterative solutions for factorial & Fibonacci. Trace recursion using call-stack diagrams.	10
5	Study simple brute-force problems: padlock, password guessing. Write small brute-force code (e.g., linear search).	10

SUGGESTED LEARNING RESOURCES

Text Book

Sl. No.	Title of Book	Author	Publication

1	Problem solving & programming concepts	Maureen Sprankle, Jim Hubbard	Pearson
2	How to Solve It: A New Aspect of Mathematical Method	George Pólya	Princeton University Press

Reference			
Sl. No.	Title of Book	Author	Publication
1	Creative Problem Solving: An Introduction	Donald Treffinger., Scott Isaksen, Brian Stead-Doval	Prufrock Press
2	Psychology (Sec. Problem Solving.)	Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M	H5P Edition
3	Computational Thinking: A Primer for Programmers and Data Scientists	G Venkatesh Madhavan Mukund	Mylspot Education Services Pvt Ltd
4	Computer Arithmetic Algorithms	Koren, Israel	AK Peters/CRC Press

Web Resource	
1	https://opentextbc.ca/h5ppsychology/chapter/problem-solving/
2	https://onlinecourses.nptel.ac.in/noc21_cs32/preview

DETAILED SYLLABUS *(Self-learning if any to be marked)*								
Module	Title	Major Topic & Sub Topic	Mode of Delivery	CO	Learning Domain			Hrs
					C	P	A	
1	Foundations of Problem-Solving and Python Basics	**Problem-solving strategies** – definition, importance, trial & error, heuristics, means-ends analysis, backtracking (working backward)	L	CO1	U	M	Rs	2
		The problem-solving process – computer as a model of computation, understanding the problem, formulating a model, developing an algorithm, writing the program, testing & evaluating the solution	L	CO1	U	M	Rs	3
		Essentials of Python programming – variables, numeric and string data types, math module, Python Standard Library, I/O (print, input), operators & precedence	L	CO1	U	M	Rs	2
		Case study: Pick simple problems (e.g., prime numbers) and document steps (understanding, model, algorithm, coding, testing)	S	CO1	U	M	Rs	12

2	Algorithm Design with Pseudocode and Flowcharts	**Pseudocode Representation** – meaning & definition, reasons for using pseudocode, constructs of pseudocode (sequencing, selection – if-else, case structure; repetition – for, while, repeat-until loops)	L	CO2	A	M	Rs	3
		Sample problems using pseudocode – evaluate expression (d=a+b*c), simple interest, larger of two numbers, smallest of three numbers, grade computation (KTU scale), numbers 1–50 in descending order, sum of n numbers (all loop types), factorial, largest of n numbers (more may be added)	L, T	CO2	A	M	Rs	3
		Flowcharts – symbols: start/end, arithmetic operation, I/O, decision, module call, loop (hexagon), flow-lines, connectors (on-page & off-page)	L	CO2	A	M	Rs	2
		Flowcharts for sample problems – construct diagrams for problems listed earlier (expression evaluation, interest, factorial, largest number, etc.); use of tools like RAPTOR suggested	T	CO2	A	M	Rs	1
		Self-learning – Group activity: Each team takes a real-world scenario (e.g., ATM withdrawal process, online shopping checkout) and develops pseudocode with sequencing, selection, and repetition	S	CO2	A	M	Rs	12
3	Modular Problem-Solving with Python: Control Structures to Recursion	**Selection and iteration using Python** – if-else, elif, for loop, range, while loop	L	CO3	A	M	Rs	2
		Sequence data types in Python – list, tuple, set, strings, dictionary	L	CO3	A	M	Rs	2
		Creating and using arrays in Python (using NumPy library)	L	CO3	A	M	Rs	1
		Decomposition and modularization – problem decomposition as a strategy for solving complex problems, modularization, motivation for modularization	L	CO3	A	M	Rs	2
		Functions in Python – defining & using functions, functions with multiple return values. The idea should be demonstrated using Merge Sort and the problem of returning the top three integers from a list of n ≥ 3 integers (examples). (Not limited to these exercises; more can be worked out if time permits).	L	CO3	A	M	Rs	1
		Recursion – definition, reasons for using recursion, the call stack, recursion and the stack, avoiding circularity in recursion	T	CO3	A	M	Rs	1

		Sample recursive problems – finding nth Fibonacci number, GCD of two integers, factorial of a positive integer, adding two positive integers, sum of digits of a positive number (Not limited to these exercises; more can be worked out if time permits).	L, T	CO3	A	M	Rs	1
		Self-learning: Compare recursive vs iterative solutions for factorial & Fibonacci; trace recursion using call-stack diagrams	S	CO3	A	M	Rs	10
4	Fundamental Computational Approaches to Problem-Solving	**Brute-force Approach** – Introductory diagrammatic/algorithmic explanation (analysis not required). Example: Padlock, Password guessing	L	CO4	A	M	Rs	2
		Divide-and-Conquer Approach– Introductory diagrammatic/ algorithmic explanation (analysis not required). Example: The Merge Sort Algorithm. Advantages of Divide and Conquer Approach. Disadvantages of Divide and Conquer Approach	L	CO4	A	M	Rs	2
		Dynamic Programming Approach – introductory diagrammatic/algorithmic explanation (analysis not required). Example: Fibonacci series. Recursion vs Dynamic Programming	L	CO4	A	M	Rs	2
		Greedy Algorithm Approach – Introductory diagrammatic /algorithmic explanation (analysis not required). Example: Given an array of positive integers each indicating the completion time for a task, find the maximum number of tasks that can be completed in the limited amount of time you have. Motivations for the Greedy Approach. Characteristics of the Greedy Algorithm. Greedy Algorithms vs Dynamic Programming	L	CO4	A	M	Rs	2
		Randomized Approach – Introductory diagrammatic/ algorithmic explanation (analysis not required). Example: Coupon Collector Problem – A company selling jeans gives a coupon for each pair of jeans. There are n different coupons. Collecting n different coupons gives you a free pair. How many jeans do you expect to buy before getting a free one?	L	CO4	A	M	Rs	2
		Self-learning – Study simple brute-force problems: padlock, password guessing. Write small	S	CO4	A	M	Rs	11

		brute-force code (e.g., linear search).						

PRACTICAL SYLLABUS						
Module	Objective	CO	Learning Domain			Hrs
			C	P	A	
1	To practice basic syntax, input/output, and simple execution in Python	3	A	M	Rs	1
1	To understand and apply different primitive data types in Python	3	A	M	Rs	1
1	To practice arithmetic operators and precedence in Python	3	A	M	Rs	1
1	To familiarize string operations and indexing	3	A	M	Rs	1
1	To understand built-in libraries and formatting	3	U	M	Rs	1
1	To apply data structures and library usage	3	A	M	Rs	1
3	To apply selection control structure	3	A	M	Rs	1
1	To apply formulas and I/O	3	A	M	Rs	1
3	To practice nested iteration and control flow	3	A	P	Rs	1
3	To apply iteration and conditions with efficiency	3	A	P	Rs	1
3	To apply recursion for mathematical problems	3	A	P	Rs	1
3	To practice recursion basics	3	A	P	Rs	1
3	To strengthen recursive algorithm design	3	A	P	Rs	1
3	To apply recursion for number theory problems	3	A	P	Rs	1
3	To apply modularization and conditionals	3	A	Ar	V	1
3	To understand modular programming and reuse	3	A	Ar	V	1
3	To apply modularization by selective import of functions	3	A	Ar	V	2
3	To apply string validation logic	4	A	P	Rs	2

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design)								
Module	Module Title	Revised Blooms Level Mapping						Total Marks
		R	U	A	An	E	C	
1	Foundations of Problem-Solving and Python Basics	-	√	-	-	-	-	15
2	Algorithm Design with Pseudocode and Flowcharts	-	√	√	-	-	-	15
3	Modular Problem-Solving with Python: Control Structures to Recursion	-	√	√	-	-	-	15
4	Fundamental Computational Approaches to Problem-Solving	-	√	√	-	-	-	15
This ToS shall be treated as a general guideline for students and teachers for distribution of marks.								

ASSESSMENT PATTERN	
Assessment	**Mark**
Continuous Internal Assessment	40
1. Internal Examination	20
2. Continuous Lab Evaluation	5
3. Learning Activity	
4. Regularity	5
5. Course Project	
6. Lab Examination	10
End Semester Examination	60
Total	**100**

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			Total Pages: 2
Register No.:	.....	Name:	.....

FIRST SEMESTER B. TECH DEGREE EXAMINATION, MONTH & YEAR (2025 SCHEME)			
Course Code:	**B250903/CN110E**		
Course Name:	**PROGRAMMING IN PYTHON**		
Max. Marks	**60**	**Duration**:	**2 hours 30 minutes**
CE, ME, EEE			

PART A

(Answer all questions. Each question carries 3 marks)

No.	***Question***	***CO***	***Marks***
1	With the help of a suitable example, explain the membership operator in Python.	CO 1	(3)
2	List the operator precedence rules supported in Python.	CO 1	(3)
3	Draw a flowchart to find and display the factorial of a given number.	CO 2	(3)
4	Develop the algorithm, flowchart, and pseudocode to find the sum of 'n' numbers entered by the user.	CO 2	(3)
5	Compare and contrast pre-test and post-test looping constructs in Python with examples.	CO 3	(3)
6	Write a Python program to read two matrices and display its sum.	CO 3	(3)
7	Compare and contrast the greedy approach and dynamic programming approach.	CO 4	(3)
8	Write an algorithm to calculate the nth Fibonacci number using the dynamic programming approach.	CO 4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

No.		***Question***	***CO***	***Marks***
MODULE I				
9	a)	Develop a program that finds all prime numbers up to a given integer n. Elaborate the steps involved in computer-based problem solving process to solve this problem.	CO 1	(6)
	b)	Let A =127, B = 63 Predict the output of the expressions: A & B, A | B and A >> 3.	CO 1	(3)
OR				
10	a)	A delivery driver in a new city does not know all the streets but chooses routes based on experience, such as avoiding busy roads and taking familiar turns. Which problem-solving strategy is the driver using? Discuss how this strategy helps in making quick decisions and where it might lead to errors.	CO 1	(6)
	b)	You are given the area of a circle. Write a Python program using the math module to calculate the radius of the circle.	CO 1	(3)
MODULE II				
11	a)	Develop the algorithm, flowchart, and pseudocode to find the reverse of a number and to check if it is palindrome or not.	CO 2	(6)
	b)	Illustrate how a switch-case statement can be represented in pseudocode.	CO 2	(3)
OR				
12	a)	You visit a shop to buy a new mobile. During the festive season, the shop offers a 10% discount on all mobiles. Additionally, customers can exchange their old mobiles for a flat price of ₹1000. Draw a flowchart to input the original price of the mobile and print its selling price. Note that all customers may not have an old mobile for exchange. Also prepare algorithm and pseudocode for the given problem.	CO 2	(6)
	b)	Illustrate how a loop or repetition can be represented in a flowchart.	CO 2	(3)
MODULE III				

13	a)	Create a telephone directory using a dictionary, where the name of the individual is the key and the telephone number is the value. Write a Python program that allows the user to perform the following operations: 1. Add a contact – add a new name and phone number. 2. Update a contact – modify the phone number of an existing contact. 3. Delete a contact – remove an existing contact. 4. Search for a contact – retrieve the phone number by name. 5. Display all contacts. 6. Exit the program. Use a menu-driven approach.	CO 3	(6)
	b)	Write a program that accepts the lengths of three sides of a triangle as inputs. The program should output whether or not the triangle is a right-angled triangle (recall the Pythagorean theorem). Implement the solution using functions.	CO 3	(3)
		OR		
14	a)	A person deposits a fixed amount every year into a retirement account that earns compound interest. Given the initial deposit, annual contribution, interest rate, and number of years, write a recursive program to calculate the total savings at retirement. Do not use loops or built-in financial functions.	CO 3	(5)
	b)	Sarah is a data analyst working for a marketing agency. She is given a list of customer ages from a recent survey conducted by her company. The list contains a mix of integers representing ages and some strings due to data entry errors. Sarah needs to clean the data by removing erroneous entries (non-integer values) and then analyze the data to find: 1. The youngest and oldest customers. 2. The average age of the customers. 3. The most common age in the list.	CO 3	(4)
		MODULE IV		
15	a)	With the help of a neat diagram, demonstrate the merge sort algorithm to sort the following set of numbers: [20, 30, 10, 7, 23, 17, 100, 2].	CO 4	(5)
	b)	You are organizing a security system for your office where each employee has a 4-digit PIN code for access. Due to a system malfunction, you forgot the correct PIN but know that it is a 4-digit number (0000–9999). Write an algorithm to determine the correct PIN using a brute-force approach. Explain the logic behind trying all possible combinations.	CO 4	(4)
		OR		
16	a)	A company selling coffee gives a sticker with every cup purchased. There are '*n*' different stickers in total. Collecting all '*n*' different stickers earns you a free cup of coffee. Using a randomized approach, design an algorithm to estimate how many cups of coffee you need to buy on average to collect all '*n*' stickers.	CO 4	(5)
	b)	You want to watch as many movies as possible at a film festival. Each movie has a start and end time, and you can only watch one at a time. Given an array of movies with their start and end times, write an algorithm to find the maximum number of movies you can watch in full.	CO 4	(4)

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COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**1-1-0-0-0**	**Version**	**25/0**	**Credits**	**1**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							
Course Code		**Course Name**				**Course Category**	
B250908/CN900K		**LIFE SKILLS AND PROFESSIONAL COMMUNICATION**				**HM**	
Pre-requisite							
NIL							

COURSE OBJECTIVES	
1	To foster self-awareness and personal growth, 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 enhance students' overall communication skills, enabling them to comprehend, interpret and express ideas clearly in diverse academic and professional settings.
3	To equip students to build their profile in line with the professional requirements and standards.

COMPETENCY STATEMENT (CC)	
CC1	Learners demonstrate essential life skills and professional communication skills, enabling them to adapt confidently to personal, academic, and professional challenges and contribute meaningfully to society.

COURSE OUTCOMES (CO)

Course Outcomes (CO): At the end of this course, learners will be able to:

CO	CO Statement	CC Mapping	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	Evaluate self-awareness to set effective goals and plans	CC 1	A		V
CO2	Evaluate the ability to focus on strengthening the fundamentals of emotional quotient	CC 1	A		V
CO3	Apply techniques to enhance Critical Thinking, Problem-solving and Decision-making skills	CC 1	A		V
CO4	Apply strategies to improve comprehension and communication skills	CC 1	A		Rs
CO5	Present ideas using modern technological platforms	CC 1	A		V
CO6	Establish a professional network using networking platforms	CC 1	An		O

***Cognitive (Revised blooms Level): - R**: Remember; **U**: Understand; **A**: Apply; **An**: Analyse; **E**: Evaluate; **C**: Create*
***Psychomotor Domain (Dave's): - I**-Imitation, **M**-Manipulation, **P**-Precision, **Ar**-Articulation, **N**-Naturalisation*
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CO	Program Outcomes (PO) & Program Specific Outcomes (PSO) Correlation Matrix													
	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1					2	2	2	2	3	1	1	1		
2							2	1	2		1	1		
3	1	2	1	2		2	1	3	2	2	1	1		
4						1		2	3	1	2	1		
5					1			2	3		2	1		
6						2		3	3		2	1		
Correlation [3 – High, 2 -Medium, 1 – Low]														

TEACHING AND ASSESSMENT SCHEME									
Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
							Theory		
L	T	J	P	S	C		CIA	ESE	Total
1	1	0	0	0	1	30	100	-	100
***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*									

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Personal Growth & Self-management	1. Group formation and self-introduction 2. Preparation of Gantt chart 3. Online personality development test 4. Role-storming exercise	5
2	Workplace & Interpersonal Skills	1. Presentation on instances of empathy 2. Networking with professionals to develop workplace skills 3. Role- Play 4. Report writing	7
3	Problem-Solving & Creative thinking	1. Identifying real-life problem that requires a technical solution 2. Six thinking hat exercises 3. Group Discussion 4. Video presentation on diversity aspects	9
4	English Language communication & Professional Development	1. Online Interview skills development session. 2. Listening test 3. Activities to improve English vocabulary of students 4. Video content for podcasts on technological interventions/research work tried out in Kerala context	9

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Take an online personality development test, self-reflect and report	1
2	Prepare a mind map based on the role-storming exercise	1
3	Students indulge in self-reflection and identify their own goal and prepare for their undergraduate journey	1

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Life Skills & Personality Development	Maithry Shinde et.al.	Cambridge University Press
2	Emotional Intelligence: Why it can matter more than IQ	Daniel Goleman	Bloomsbury Publishing PLC
3	Think Faster, Talk Smarter: How to speak successfully when you are put on the spot	Matt Abrahams	Macmillan Business
4	Deep Work: Rules for focused success in a distracted world	Cal Newport	PIATKUS
5	Effective Technical Communication	Ashraf Rizvi	McGraw Hill Education

Reference			
Sl. No.	Title of Book	Author	Publication
1	Life Skills for Engineers	Remesh S., Vishnu R.G	Ridhima Publication
2	Soft Skills & Employability Skills	Sabina Pillai andAgna Fernandez	Cambridge University Press
3	Guide to writing as an Engineer	David F. Beer and David McMurrey	John Willey. New York
4	LinkedIn Profile Optimization	Donna Serdula	

Web Resource	
1	www.mindtools.com
2	TED Talks on Life Skills
3	www.linkedin.com/learning

DETAILED SYLLABUS *(Self-learning if any to be marked)*

Sl. No	Activity	Mode of Delivery	Group/ Individual (G/I)	Mark	COs	Learning Domain			Hrs
						C	P	A	
1.1	Group formation and self-introduction among the group members	L	G			R		Re	2
1.2	Familiarizing the activities and preparation of the time plan for the activities	L	G			R		Re	
1.3	Preparation of Gantt chart based on the time plan	L, T	G	5	CO1	A		Re	
2.1	Take an online personality development test	L, T	I	2	CO1	U		V	3
2.2	Role-storming exercise 1:	L, T	I	2	CO1	U			

	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: i) parent/guardian/mentor ii) friend/sibling/cousin							Rs	
2.3	Role-storming exercise 2: Students assume the role of their teacher and write about ● Skills required as a B.Tech graduate ● Attitudes, habits, approaches required and activities to be practiced during their B.Tech years, in order to achieve the set goals	L, T	I	2	CO1	U		Rs	
2.4	Discuss the skills identified through role storming exercise by each one within their own group and improvise the list of skills	L, T	G	2	CO1	R		Re	
2.5	Exhibit/present the mind map prepared based on the role-storming exercise in the class	L, T	G	2	CO1	U		Re	
3	Prepare a presentation on instances of empathy the students have observed in their own life or in other's life	L, T	I	5	CO2	U		V	3
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)	L, T	I	2	CO2	U		Rs	
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 Prepare a documentation of this	L, T	I	4	CO2	U		Rs	4
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	L, T	G	2	CO2	U		Rs	

4.4	Report preparation based on the discussions	L, T	G	3	CO4	R			
4.5	Perform a role-play based on the workplace dynamics assimilated through interactions and group discussions	L, T	G	4	CO3	U		Rs	
4.6	Students prepare an action plan for their undergraduate journey	L, T	I	2	CO1	R		Rs	
5.1	Select a real-life problem that requires a technical solution and list the study materials needed	L, T	G	2	CO3	A		Rs	
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)	L, T	I	2	CO4	U			3
5.3	Use any online tech forum to gather ideas for solving the problem chosen	L, T	G	2	CO5	A		Rs	
5.4	Arrive at a possible solution using six thinking hat exercise	L, T	G	5	CO3	An		V	
5.5	Prepare a report based on the problem- solving experience	L, T	G	2	CO4	A			
6.1	LinkedIn profile creation	L, T	I	2	CO6	U			
6.2	Resume preparation	L, T	I	5	CO6	A			2
6.3	Self-introduction video	L, T	I	3	CO6	A		V	
7	Prepare a presentation on instances of demonstration of emotional intelligence	L, T	I	2	CO2	A		V	3
8	Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)	L, T	G	5	CO2CO5	A		V	3
9	Take online Interview skills development sessions like robotic interviews; self-reflect and report	L, T	I	2	CO6	U		V	1
10	Take an online listening test, self- reflect and report	L, T	I	2	CO6	U		Rs	1
11.1	Activities to improve English vocabulary of students	L, T	I/G	4	CO4	U		Re	
11.2	Activities to help students identify errors in English language usage	L, T	I/G	2	CO4	U		Re	
11.3	Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words	L, T	I/G	2	CO4	U		Re	4

11.4	Write a self-reflection report on the improvement in English language communication through this course	L, T	I	2	CO4	A		V	
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, T	G	5	CO4CO5	A		V	
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	L, T	G	10	CO2CO4CO5	A		V	1
12.2	Upload the video content to podcasting platforms or YouTube	T	G	2	CO5	U			
12.3	Add the link of the podcast in their LinkedIn profile	T	G	2	CO5	U			

ASSESSMENT PATTERN	
Assessment	**Marks**
Continuous Internal Assessment	**100**
Internal Examination	
Learning Activity	**100**
Regularity	
Course Project	
End Semester Examination	
Total	**100**

COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**0-0-0-2-0**	**Version**	**25/0**	**Credits**	**1**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	**Course Name**	**Course Category**
B250906/CN930U	**Basic Electrical and Electronics Engineering Workshop**	**ESL**
Pre-requisite		
NIL		

COURSE OBJECTIVES	
1	To enable students to gain hands-on exposure to fundamental tools, instruments, and practices in electrical engineering
2	To develop a practical understanding on how electrical engineering concepts are applied to Domestic wiring
3	To familiarize students with basic electronic components, instruments, and circuit symbols, and to enable them to interpret datasheets and specifications.
4	To develop the ability to test, assemble, and simulate simple electronic circuits using standard tools, PCB techniques, and EDA software.
5	To develop basic electronic skills with emphasis on safety, practical use, and real-life applications

COMPETENCY	
CC1	Apply skills in wring, circuit assembly, trouble shooting and testing to solve real life problems
CC2	Apply basic sciences to address industrial needs effectively.
CC3	Apply the principle of solid-state physics in electronic system design.
CC4	Apply Total Quality Management (TQM) principles for ensuring the quality of products and services.
CC5	Demonstrate effective individual and teamwork, communication, problem-solving, conflict resolution, and leadership skills.

COURSE OUTCOMES

Course Outcomes (CO): At the end of this course, learners will be able to:

CO	CO Statement	CC Mapping	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	**Demonstrate** safety measures against electric shocks.	CC1	U		Rs
CO2	**Identify** the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols	CC1 CC2	U	I	Rs
CO3	**Illustrate** the connection diagram using suitable accessories for wiring simple electrical circuits	CC1	A	M	V
CO4	Demonstrate the use of components and instruments to construct and test simple circuits	CC1 CC3	A	M	Rs
CO5	Perform PCB fabrication, soldering, and interconnections to build and test simple circuits.	CC4 CC5	A	P	V
CO6	Construct basic electronic circuits such as rectifiers and amplifiers, and verify their operation through simulation using EDA tools	CC1 CC3 CC5	An	Ar	V

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1	1					3					2			
2	2	1				2		1	1		2			
3	2	1	1			2	1	2	2		2			
4	3	2	1											
5	3	2	1		2				1	1				
6	3	2	2	1	3				1	1				
Correlation [3 – High, 2 -Medium, 1 – Low]														

TEACHING AND ASSESSMENT SCHEME									
Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
							Practical		
L	T	J	P	S	C		CIA	ESE	Total
0	0	0	2	0	1	30	50	50	100

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SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Basic wiring and safety measures	Demonstration of precautionary measures against electric shock	8
2	Identification and use of electric accessories	Demonstrate the use of components and instruments to construct and test simple circuits	8
3	Basic Circuit Wiring and Component Testing	Fundamentals of Circuit Wiring and Component Testing (covers familiarization of components, datasheets, instruments/tools, multimeter testing, and safety practices)	8
4	PCB Fabrication, Soldering, and Circuit Assembly	PCB Fabrication, Soldering, and Circuit Assembly (covers PCB study, fabrication, soldering/interconnection, circuit assembly & testing, and EDA tool introduction)	8

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Study of electrical components and safety measures	2
2	Study of different types of wiring	2
3	Study of distribution board with protective devices.	2
4	Watch tutorial videos on safe handling of multimeter, CRO, and function generator; summarize key safety points.	1
5	Practice drawing simple electronic circuit diagrams (power supply, 555 timer) using IEEE symbols.	1
6	Mini-project Assemble and test a fixed voltage power supply.	1

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Electrical Design Estimating and Costing	K B Raina, SK Bhattacharya	New Age International Publishers
2	Basic Electrical Engineering	D P Kothari, I J Nagrath	Tata McGraw Hill
3	Electronic Devices and Circuit Theory	R. L. Boylestad& L. Nashelsky	Pearson Ed
4	Electronic Devices: Conventional Current Version	Thomas L. Floyd	Pearson Ed

Reference			
Sl. No.	Title of Book	Author	Publication
1	Electrical Wiring Residential	Ray C. Mullin & Phil Simmons	Cengage Learning
2	Electrical Wiring, Estimating and Costing	S.L. Uppal & G.C. Garg	Khanna Publishers
3	Basic Electrical Engineering	V.K. Mehta & Rohit Mehta	S. Chand Publishing
4	Electronic Devices and Circuits	David A Bell	Oxford University Press
5	Electronic Circuit Analysis and Design	Donald A. Neamen	McGraw Hill

Web Resource	
1	www.allaboutcircuits.com
2	https://ocw.mit.edu/courses/ec-s06-practical-electronics-fall-2004/
3	https://nptel.ac.in/courses/122106025
4	https://be-iitkgp.vlabs.ac.in

PRACTICAL SYLLABUS

Topic	Objective	CO	Learning Domain			Hrs
			C	P	A	
a) Demonstrate the precautionary steps adopted in case of Electrical shocks.	Demonstrate essential safety procedures and first-aid steps to be followed in case of electric shock.	CO1	U	I	Rs	2
b) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB, familiarize the ratings.	Identify and understand the types, ratings, and applications of various electrical cables, protection devices, and switches.	CO2	U	I	Rs	
Wiring of a simple light circuit for light/ fan point (PVC conduit wiring) and a 6A plug socket with individual control.	PVC conduit wiring for light/fan point and 6A plug socket – Perform PVC conduit wiring for a light/fan point and a 6 A plug socket with individual control.	CO3	A	M	V	2
Wiring of light/fan circuit using two-way switches. (Staircase wiring)	Wire a light/fan circuit controlled from two different locations using two-way switches.	CO3	A	M	V	2
Wiring of fluorescent lamp and a power plug (16 A) socket with a control switch.	Connect and control a fluorescent lamp and a 16 A power plug socket using a control switch.	CO3	A	M	V	2
Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.	Assemble and wire a single-phase power distribution system with protective and metering devices.	CO3	A	M	V	2
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	Identify and understand the operation of step-up and step-down transformers using low-voltage models. Measure and plot voltage waveforms to scale on a graph sheet using a Cathode Ray Oscilloscope.	CO2	U		Rs	2
Familiarisation of rheostats, measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit.	Use a rheostat to measure potential across resistance elements and illustrate relative potential in a DC circuit.	CO2	U		Rs	

a) Identify battery specifications using different types of batteries. (Lead acid, Li Ion, NiCd etc.) b) Familiarize different types of earthing (Pipe, Plate Earthing, Mat Schemes) and ground enhancing materials (GEM).	Identify the specifications and characteristics of different types of batteries such as Lead-acid, Li-ion, and NiCd.	CO2	U		Rs	2
Familiarization of Electronic Components	To identify active, passive, and electromechanical components along with connectors, fuses, switches, relays, heat sinks, and displays, and to learn their specifications, circuit symbols, and approximate cost.	CO4	A	M	Rs	2
Drawing of Circuit Diagrams & Data Sheets	To draw electronic circuit diagrams using BIS/IEEE standard symbols and to interpret data sheets of commonly used discrete components and ICs.	CO4	A	P	V	2
Familiarization of Instruments & Tools	To operate basic electronic testing instruments such as Multimeter, Function Generator, DC Power Supply, CRO, and DSO, and to familiarize with commonly used tools including soldering iron, desoldering pump, and crimping tools.	CO5	A	M	Rs	2
Testing of Components using Multimeter	To test the electrical characteristics and functionality of basic electronic components such as resistors, capacitors, diodes, BJTs, and JFETs using appropriate testing methods.	CO5	A	P	V	2
PCB Study and Fabrication	To study different types of printed circuit boards (single-sided, double-sided, and plated through hole) and to design and fabricate a simple single-sided PCB.	CO6	A	Ar	V	2
Soldering & Interconnection Practice	To study various interconnection methods such as breadboard, crimping, and soldering, and to practice soldering of connectors and assembling simple circuits on a PCB.	CO6	An	Ar	V	2
Assembly & Testing of Simple Circuit	To assemble and test an electronic circuit, for a fixed voltage power supply using transformer, rectifier diode, capacitor filter, and Zener/IC regulator and verify it's working.	CO6	An	Ar	V	2
Introduction to EDA tool	Simulation of basic electronic circuit using Multisim	CO6	An	P	V	2

ASSESSMENT PATTERN	
Assessment	**Marks**
Continuous Internal Assessment	**100**
1. Continuous Lab Evaluation	90
2. Internal Examination	-
3. Regularity	10
4. Course Project	-
End Semester Examination	**-**
Total	**100**