



Muthoot
Institute of Technology & Science
Autonomous
RELENTLESS PASSION FOR EXCELLENCE



B. TECH

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

CURRICULUM & SYLLABUS SEMESTER 1
2025 REGULATION

B.Tech

ARTIFICIAL INTELLIGENCE

AND DATA SCIENCE

2025 REGULATION

CURRICULUM & SYLLABUS

CONTENTS

COURSE CODE	COURSE NAME	PAGE NO.
	Curriculum	3
B250904/MA100A	Mathematics for Information Science-1	4
B250904/CH910B	Chemistry for Information Science	9
B250906/CN100C	Engineering Graphics and Computer Aided Drawing	15
B250906/CN100D	Introduction to Electrical & Electronics Engineering	19
B250905/CN110E	Algorithmic Thinking with Python	24
B250908/PE910K	Health and Wellness	29
B250906/CN130U	Basic Electrical and Electronics Engineering Workshop	33

SEMESTER 1

CURRICULUM

SLOT	COURSE CATEGORY	COURSE CODE	COURSE NAME	L	T	J	P	S	C
A	BS	B250904/MA100A	Mathematics for Information Science-1	3	1	0	0	2	3
B	BS	B250904/CH910B	Chemistry for Information Science	3	0	0	2	3	4
C	ES	B250906/CN100C	Engineering Graphics and Computer Aided Drawing	1	2	0	0	3	3
D	ES	B250906/CN100D	Introduction to Electrical & Electronics Engineering	4	0	0	0	4	4
E	ES	B250905/CN110E	Algorithmic Thinking with Python	2	1	0	2	3	4
K	HM	B250908/PE910K	Health and Wellness	1	0	0	1	0	1
U	ES	B250906/CN130U	Basic Electrical and Electronics Engineering Workshop	0	0	0	2	0	1
I	Skill Enhancement Course: Digital 101 (30Hours, NASSCOM) or equivalent								1
<i>(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work, C- Credit)</i>									

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

Course Code	Course Name	Course Category
B250904/MA100A	MATHEMATICS FOR INFORMATION SCIENCE-1	BS
Pre-requisite		
The basic knowledge of single variable calculus.		

COURSE OBJECTIVES	
1	To develop an understanding of differential calculus for analysing the slope, tangents, normal, and curvature of single-variable functions, and to interpret their geometric and physical significance.
2	To introduce the concepts of multivariable calculus and their applications in determining directional derivatives, gradients, and extremum points of multivariable functions.
3	To equip the students with optimization techniques for solving constrained and unconstrained problems using analytical methods such as Lagrange multipliers, and iterative methods such as the method of steepest descent.

COMPETENCY STATEMENT (CC)	
CC1	Demonstrate the ability to apply limits, continuity, and differentiation to single-variable and multivariable functions which includes higher-order, partial and directional derivatives, and use these concepts to find extrema.
CC2	Demonstrate the ability to apply methods of Lagrange multipliers, Steepest descent and graphical method in solving different types of constrained and unconstrained optimization 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	Apply the concepts of calculus to find tangent, normal, and concavity of single variable functions.	CC1	A		Rs
CO2	Apply the concepts of partial derivatives in finding directional derivatives, local extrema, and absolute extrema of multivariable functions.	CC1	A		Rs
CO3	Solve optimization problems using the method of Lagrange multipliers, graphical method, and method of steepest descent.	CC2	A		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				
<i>Correlation [3 – High, 2 –Medium, 1 – Low]</i>														

TEACHING AND ASSESSMENT SCHEME									
Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
L	T	J	P	S			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	Single Variable Calculus	Limits of function values, continuity at a point, continuous functions, rates of change: derivative at a point, derivative as a function, second and higher order derivatives, instantaneous rates of change, chain rule, implicit differentiation, tangents and normal lines, linearization, extreme values of functions on closed intervals, the Mean Value Theorem (without proof), concavity: the second derivative test for concavity. (Text 1 - Relevant topics from sections 2.2, 2.5, 3.1, 3.2, 3.3, 3.4, 3.6, 3.7, 3.9, 4.1, 4.2 4.4)	10
2	Partial derivatives - 1	Functions of several variables: domains and ranges, level curves of two variables, limits for functions of two variables, continuity for functions of two variables, partial derivatives of a function of more than two variables, partial derivatives and continuity, second order partial derivatives, the mixed derivative theorem, the chain rule: functions of two variables. (Text 1 - Relevant topics from sections 14.1, 14.2, 14.3, 14.4)	10
3	Partial derivatives - 2	The chain rule: functions of three variables, directional derivatives in the plane, interpretation of the directional derivative, gradient, properties of the directional derivative, the linearization of a function of two variables, local extreme values for functions of two variables: relative extrema, first derivative theorem for local extreme values, critical point, saddle point, second derivative test for local extreme values, absolute maxima and minima on closed bounded regions. (Text 1 - Relevant topics from sections 14.4, 14.5, 14.6, 14.7)	12
4	Optimization Techniques	Constrained maxima and minima, the method of Lagrange multipliers with one constraint, the method of Lagrange multipliers with two constraints, method of steepest descent (only two variables), LPP-formation, solution of LPP using graphical methods. (Text 2 - Relevant topics from section 14.8, sections 22.1, 22.2, 22.3)	10

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Relations, functions, types of functions, limits of functions, continuity at a point, continuous functions (2 hours) . Practice problems on continuity of functions, derivatives (2 hours) , Practice problems on rate of change, tangents & normal (2 hours) , Practice problems on maxima & minima of functions, concavity (2 hours) . Team Work - Formulate and solve real-life problem situations by identifying the appropriate mathematical function, determining its critical points, and applying suitable techniques to find the local or absolute extrema of the function (1 hour) .	9
2	Practice problems on Limits & continuity for functions of two variables (3 hours) , Practice problems on partial derivatives of first & higher order derivatives (3 hours) , Practice problems on chain rule for two variables (3 hours) .	9
3	Practice problems on chain rule for three variables (2 hours) , Practice problems on directional derivatives & gradient (3 hours) , Practice problems on linearization of a function & extreme values of a function (3 hours) . Team Work - Analyse real-life problem situations by modelling them using multivariable functions, determine the critical points and apply suitable optimization techniques to identify local and global extrema of the functions (1 hour) .	9
4	Basics of Linear programming problems, concept of global and local optimum (2 hours)	9

	Practice problems on Lagrange Multipliers with one constraint & two constraints (2 hours), Practice problems on Method of Steepest Descent (2 hours), Practice problems on formulation of LPP & finding the solution by graphical method (2 hours). Team Work - Formulate & apply the graphical method to solve the real-life linear programming problems by representing the constraints as feasible regions and identifying the optimal solution to maximize or minimize the objective function (1 hour).	
--	---	--

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Thomas' Calculus	Maurice D. Weir, Joel Hass, Christopher Heil, Przemyslaw, Bogacki	Pearson, 15th edition
2	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons, 10th edition

Reference			
Sl. No.	Title of Book	Author	Publication
1	Calculus	Howard Anton, Irl Bivens, Stephens Davis	Wiley, 10th edition, 2012
2	Optimization: Algorithms and Applications	Rajesh Kumar Arora	CRC Press, 1st edition 2015
3	Multivariable Calculus	Ron Larson, Bruce Edwards	Brooks/Cole, Cengage Learning, 10th edition, 2014
4	Calculus & Its Applications	Goldstein, Schneider, Lay, Asmar	Pearson, 14th edition, 2018
5	Bird's Higher Engineering Mathematics	John Bird	Taylor & Francis, 9th edition, 2021
6	Higher Engineering Mathematics	B.V Ramana	McGraw-Hill Education, 39th edition, 2023

Web Resource	
1	https://nptel.ac.in/courses/109104124
2	https://nptel.ac.in/courses/111103764
3	https://nptel.ac.in/courses/111104125
4	https://youtu.be/Hi81OgB38OI?feature=shared

DETAILED SYLLABUS (Self-learning if any to be marked)							
Module	Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	Introduction to the subject and syllabus	L	CO1	U			1
	Relations, functions, types of functions, limits of functions, continuity at a point, continuous functions.	S	CO1	U			
	Limits of Function Values, Continuity at a point, Continuous Functions.	L	CO1	U			1
	Rates of Change: Derivative at a Point Derivative as a Function, Second and Higher-Order Derivatives, Instantaneous Rates of Change	L	CO1	U			1
	Tutorial	T	CO1	U		Rs	1
	Chain Rule, Implicit Differentiation	L	CO1	U			2
	Linearization	L	CO1	U			1
	Tutorial	T	CO1	U		Rs	1
	Extreme Values of Functions on Closed Intervals.	L	CO1	A			2
	The Mean Value Theorem (without proof).	L	CO1	U			1
	Tangents and Normal Lines, Concavity: The Second Derivative Test for Concavity.	L	CO1	A			1
Tutorial	T	CO1	U		Rs	1	
2	Functions of Several Variables: Domains and Ranges	L	CO2	U			1
	Level curves of functions two variables	L	CO2	U			1

	Limits for functions of two variables	L	CO2	U			1
	Tutorial	T	CO2	U		Rs	1
	Continuity for functions of two variables	L	CO2	U			1
	Partial derivatives of functions of more than two variables	L	CO2	U			2
	Tutorial	T	CO2	U		Rs	1
	Partial derivatives and continuity	L	CO2	U			1
	Second - order partial derivatives	L	CO2	U			1
	The mixed derivative theorem, The Chain Rule: Functions of two variables	L	CO2	U			2
	Tutorial	T	CO2	U		Rs	1
3	The Chain Rule: Functions of three Variables	L	CO2	U		Rs	1
	Directional Derivatives in the Plane, Interpretation of the Directional Derivative	L	CO2	A			2
	Gradient	L	CO2	U			1
	Tutorial	T	CO2	U		Rs	1
	Properties of the Directional Derivative	L	CO2	U			1
	The Linearization of a Function of Two Variables.	L	CO2	U			1
	Local Extreme Values for Functions of Two Variables: Relative extrema	L	CO	A			2
	Tutorial	T	CO2	U		Rs	1
	First derivative theorem for local extreme values	L	CO2	A			1
	Critical point, saddle point	L	CO2	U			1
	Second Derivative Test for Local Extreme Values, Absolute Maxima and Minima on Closed Bounded Regions	L	CO2	A			2
Tutorial	T	CO2	U		Rs	1	
4	Basics of Linear programming problem, concepts of Global and local optimum	S	CO3				
	Constrained Maxima and Minima	L	CO3	U			1
	The Method of Lagrange Multipliers with one constraint	L	CO3	A			2
	Tutorial	T	CO3	U		Rs	1
	The Method of Lagrange Multipliers with two constraints	L	CO3	A			2
	Method of Steepest Descent (only two variables)	L	CO3	A			2
	Tutorial	T	CO3	U		Rs	1
	LPP - formation	L	CO3	U			1
	Solution of LPP using graphical method	L	CO3	A			2
Tutorial	T	CO3	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	Single Variable Calculus	√	√	√				15
2	Partial Derivatives - 1	√	√					15
3	Partial Derivatives - 2	√	√	√				15
4	Optimization Techniques	√	√	√				15

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

ASSESSMENT PATTERN

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

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

Course Code	Course Name	Course Category
B250904/CH910B	CHEMISTRY FOR INFORMATION SCIENCE	BS
Pre-requisite		
Concepts of chemistry introduced at the plus two levels especially Electrochemistry, Polymers, Structure of Molecules, Environmental Pollution and Volumetric Analysis.		

COURSE OBJECTIVES	
1	To equip students with a thorough understanding of electrochemical principles and their applications in energy storage and corrosion science, enabling them to address challenges in areas such as battery development, corrosion prevention, and pH measurement.
2	To explore the synthesis, properties, and applications of nanomaterials, conducting polymers and advanced devices which are relevant in the field of electronics, quantum computing, and energy technology.
3	To understand the principles and applications of spectroscopic and microscopic techniques for material characterization and analysis at the atomic and molecular levels.
4	To develop an understanding of water chemistry, pollution control, e-waste management, and the role of chemistry in achieving sustainable development goals.

COMPETENCY	
CC1	Demonstrate the ability to apply fundamental principles of electrochemistry, materials science, and spectroscopy to design and develop materials and systems for various technological applications, including energy storage, corrosion protection, and advanced materials characterization.
CC2	Demonstrate the ability to apply the principles of water chemistry and waste management to analyse water quality parameters, and implement sustainable strategies for waste reduction and resource recovery.

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 the basic concept of electrochemistry and corrosion to explore the applications in engineering fields.	CC1	A	M	V
CO2	Apply the principles of nanomaterials, conducting polymers and organic electronic devices to solve engineering problems.	CC1	A	M	V
CO3	Utilize the principles and applications of spectroscopic and microscopic techniques for the analysis and characterization of materials.	CC1	A	M	V
CO4	Select various water treatment and waste management methods to solve different environmental issues in a sustainable way.	CC2	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					

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

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme						
L	T	J	P	S			Theory			Practical			Total
					C	CIA	ESE	Total	CIA	ESE	Total		
3	0	0	2	3	4	120	25	60	85	10	5	15	100
<i>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</i>													

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Electrochemistry and Corrosion	Electrochemical Cell-Electrode potential- Nernst equation - Reference electrodes –Electrochemical series - Glass Electrode & pH Measurement- Conductivity and its measurement. Li-ion battery & H ₂ -O ₂ fuel cell. Corrosion –Electrochemical corrosion - Galvanic series - Corrosion control methods – Electroplating of copper - Electroless plating of copper.	9
2	Materials for Electronic Applications	Nanomaterials - Classification -Synthesis -Carbon Nanotubes, Fullerenes, Graphene & Carbon Quantum Dots – Polymers - Fire Retardant Polymers- Conducting Polymers- Polyaniline & Polypyrrole-Organic electronic materials and devices-Organic Light Emitting Diode (OLED) & Dye-Sensitized Solar Cells (DSSC). Materials used in Quantum computing Technology, Super capacitors, Spintronics.	9
3	Molecular Spectroscopy and Analytical Techniques	Spectroscopy- Types of spectra- Molecular energy levels – Beer Lambert’s law – Electronic spectroscopy- Instrumentation – Applications. Vibrational spectroscopy – Number of vibrational modes – Vibrational modes of CO ₂ and H ₂ O – Applications. Thermal Analysis: Dielectric Thermal Analysis (DETA) of Polymers-Electron Microscopic Techniques: SEM.	9
4	Environmental Chemistry	Water characteristics - Hardness -Degree of hardness (Numericals)- Water softening methods – Water disinfection methods – Dissolved oxygen (DO), BOD and COD. Waste Management: Sewage water treatment- E Waste-Methods of disposal. Chemistry of climate change- Greenhouse Gases- Ozone Depletion- Sustainable Development- Sustainable Development Goals.	9

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Cells and Batteries– Primary and Secondary cells- Construction, working and applications of Lead acid battery, Nickel cadmium battery and Nickel metal hybrid battery.	12
2	Polymers- Classification-Types of Polymerisation-Copolymers. Sensors- Physical, chemical and bio sensors- introduction and applications.	12
3	Structure of Atom, Molecular Orbital Theory and Shape of Molecules. Application of spectroscopy in daily life.	12
4	Pre- lab work.	16

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Engineering Chemistry	B. L. Tembe, Kamaluddin, M. S. Krishnan	NPTEL Web-book
2	Physical Chemistry	P. W. Atkins	Oxford University Press
3	Instrumental Methods of Analysis	H. H. Willard, L. L. Merritt	CBS Publishers
4	Engineering Chemistry	Jain & Jain	Dhanpath Rai Publishing Company

Reference			
Sl. No.	Title of Book	Author	Publication
1	Fundamentals of Molecular Spectroscopy	C. N. Banwell	McGraw-Hill
2	Principles of Physical Chemistry	B. R. Puri, L. R. Sharma, M. S. Pathania	Vishal Publishing Co
3	Introduction to Spectroscopy	Donald L. Pavia	Cengage Learning India Pvt. Ltd
4	Polymer Chemistry: An Introduction	Raymond B. Seymour, Charles E. Carraher	Marcel Dekker Inc
5	The Chemistry of Nanomaterials: Synthesis, Properties and Applications	Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham	Wiley-VCH Verlag GmbH & Co.
6	Organic Electronics Materials and Devices	Shuichiro Ogawa	Springer Tokyo
7	Principles and Applications of Thermal Analysis	Gabbot, P	Oxford: Blackwell Publishing

Web Resource	
1	https://onlinecourses.nptel.ac.in/noc25_mm35/preview
2	https://onlinecourses.nptel.ac.in/noc25_ch51/preview

DETAILED SYLLABUS (Self-learning if any to be marked)							
Module	Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	Electrochemical Cell Electrochemical Cell and Electrode potential	L	CO1	U		Rs	1
	Nernst equation for single electrode and cell (Numerical problems)	L, P	CO1	A	M	V	1
	Nernst Equation-Numerical Problems	L	CO1	A		Rs	1
	Electrochemical series and applications	L, P	CO1	A	M	V	1
	Reference electrodes – SHE & Calomel electrode – Construction and Working	L	CO1	U		Rs	1
	Glass Electrode & pH Measurement Conductivity-Measurement using Digital conductivity meter.	L, P	CO1	A	M	V	1
	Li-ion battery & H ₂ -O ₂ fuel cell (acid electrolyte only) construction and working.	L	CO1	U		Rs	1
	Corrosion Electrochemical corrosion mechanism (acidic & alkaline medium)	L	CO1	U		Rs	1
	Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and impressed current cathodic protection. Electroplating of copper – Electroless plating of copper.	L	CO1	U		Rs	1
Construction, working and applications of Lead acid battery, Nickel cadmium battery and Nickel metal hybrid battery.	S	CO1	U		Rs		

2	Nanomaterials Classification based on Dimension & Materials	L	CO2	U		Rs	1
	Synthesis – Sol gel & Chemical Reduction - Applications of nanomaterials	L	CO2	U		Rs	1
	Carbon Nanotubes, Fullerenes- structure, properties & application.	L	CO2	U		Rs	1
	Graphene & Carbon Quantum Dots – structure, properties & application.	L	CO2	U		Rs	1
	Polymers Fire Retardant Polymers- Halogenated & Non-halogenated polymers (Examples only) Conducting Polymers- Classification	L	CO2	U		Rs	1
	Polyaniline- synthesis, properties and applications. Polypyrrole-synthesis, properties and applications	L, P	CO2	A	M	V	1
	Organic electronic materials and devices Construction, working and applications of Organic Light Emitting Diode (OLED)	L	CO2	U		Rs	1
	Construction, working and applications of Dye-Sensitized Solar Cells (DSSC)	L	CO2	U		Rs	1
	Materials used in Quantum computing Technology. Super capacitors, Spintronics	L	CO2	U		Rs	1
	Polymers- Classification-Types of Polymerisation-Copolymers. Sensors- Physical, chemical and bio sensors- introduction and applications	S	CO2	U		Rs	
3	Spectroscopy Types of spectra and Molecular Energy Levels	L	CO3	U		Rs	1
	Beer Lambert's law – Numerical problems	L, P	CO3	A	M	V	1
	Beer-Lambert's law-Numerical Problems	L	CO3	A		Rs	1
	Electronic Spectroscopy – Principle, Types of electronic transitions	L	CO3	U		Rs	1
	Role of conjugation in absorption maxima. Instrumentation-Applications	L, P	CO3	A	M	V	1
	Vibrational spectroscopy – Principle Number of vibrational modes	L	CO3	U		Rs	1
	Vibrational modes of CO ₂ and H ₂ O – Applications	L, P	CO3	A	M	V	1
	Thermal Analysis Dielectric Thermal Analysis (DETA) of Polymers-Working and Application.	L	CO3	U		Rs	1
	Electron Microscopic Techniques SEM - Principle, instrumentation and Applications.	L	CO3	U		Rs	1
	Structure of Atom, Molecular Orbital Theory and Shape of Molecules. Application of spectroscopy in daily life	S	CO3	U		Rs	
4	Water Characteristics Hardness - Types of hardness- Temporary and Permanent	L	CO4	U		Rs	1
	Disadvantages of hard water. Degree of hardness	L, P	CO4	A	M	V	1
	Degree of hardness (Numerical)	L	CO4	A		Rs	1
	Water softening methods-Ion exchange process-Principle, procedure and advantages. Reverse osmosis – principle, process and advantages	L	CO4	U		Rs	1
	Water disinfection methods – chlorination-Break point chlorination, ozone and UV irradiation.	L	CO4	U		Rs	1
	Dissolved oxygen (DO), BOD and COD- Definition & Significance.	L, P	CO4	A	M	V	1
	Waste Management Sewage water treatment- Primary, Secondary and Tertiary - Flow diagram - Trickling filter and UASB process.	L	CO4	U		Rs	1
	E Waste, Methods of disposal – recycle, recovery and reuse.	L	CO4	U		Rs	1

Chemistry of climate change- Greenhouse Gases- Ozone Depletion. Sustainable Development- an introduction to Sustainable Development Goals.	L	CO4	U		Rs	1
Estimation of Hardness – EDTA Method and Estimation of Dissolved Oxygen- Winkler’s method Health impacts of E-waste	S	CO4	U		Rs	

PRACTICAL SYLLABUS						
Topic	Objective	CO	Learning Domain			Hrs
			C	P	A	
Calibration of pH meter and determination of pH of a solution.	To calibrate a digital pH meter using standard buffer solutions and to accurately determine the pH of the given unknown solutions.	CO1	A	M	V	2
Determination of cell constant and conductance of solutions.	To determine the cell constant of a conductivity cell using a standard KCl solution and to measure the conductance of given solutions using a digital conductivity meter.	CO1	A	M	V	2
Verification of Nernst equation for electrochemical cell.	To verify the Nernst equation by measuring the electrode potential of a given electrochemical cell at different ion concentrations and comparing the experimental values with theoretical values.	CO1	A	M	V	2
Estimation of iron in iron ore.	To estimate the percentage of iron present in a given iron ore sample using a redox titration method with potassium permanganate as the titrant.	CO1	A	M	V	2
Synthesis of polymers (a)Urea- formaldehyde resin (b)Phenol-formaldehyde resin.	To synthesise the polymers such as urea-formaldehyde resin and phenol-formaldehyde resin and hence to note their yield.	CO2	A	M	V	2
Determination of wavelength of absorption maximum and colorimetric estimation of Fe ³⁺ in solution.	To determine the wavelength of maximum absorption of Fe ³⁺ using a colorimeter and to estimate the concentration of Fe ³⁺ in a given solution based on Beer-Lambert’s law.	CO3	A	M	V	2
Determination of molar absorptivity of a compound (KMnO ₄ or any water-soluble food colorant).	To determine the molar absorptivity (ε) of a coloured compound such as potassium permanganate by measuring absorbance at its λ _{max} and applying Beer-Lambert’s law.	CO3	A	M	V	2
Analysis of IR spectra.	To analyse the IR spectrum of given compounds based on characteristic absorption bands and to characterize the unknown compounds	CO3	A	M	V	2
Estimation of dissolved oxygen by Winkler’s method.	To estimate the amount of dissolved oxygen (DO) present in a water sample using Winkler’s iodometric method, which is essential for assessing water quality and aquatic life sustainability.	CO4	A	M	V	2
Estimation of total hardness of water- EDTA method.	To determine the total hardness of a given water sample by complexometric titration using Ethylene diamine tetra acetic acid (EDTA) as the titrant and Eriochrome Black T as the indicator.	CO4	A	M	V	2

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design)								
Module	Module Title	Distribution of Marks (RBL)						Total Marks
		R	U	A	An	E	C	
1	Electrochemistry and Corrosion Science	√	√	√				15
2	Materials for Electronic Applications	√	√	√				15
3	Molecular Spectroscopy and Analytical Techniques	√	√	√				15
4	Environmental Chemistry	√	√	√				15
<i>This ToS shall be treated as a general guideline for students and teachers for distribution of marks.</i>								

ASSESSMENT PATTERN	
Assessment	Marks
Continuous Internal Assessment	40
1. Internal Examination	20
2. Continuous Lab Evaluation	10
3. Learning Activity	
4. Attendance	5
5. Course Project	
6. Internal Examination (Lab)	5
End Semester Examination	60
Total	100

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

Course Code	Course Name	Course Category
B250906/CN100C	ENGINEERING GRAPHICS AND COMPUTER AIDED DRAWING	ES
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 2D drawings 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		
<i>Correlation [3 – High, 2 –Medium, 1 – Low]</i>															

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

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

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

Course Code	Course Name	Course Category
B250906/CN100D	INTRODUCTION TO ELECTRICAL & ELECTRONICS ENGINEERING	ES
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						
<i>Correlation [3 – High, 2 –Medium, 1 – Low]</i>														

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	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	Frenzel L 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
	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					1
	Average and RMS values and form factor of waveforms - Numerical Problems	L, T, S	CO3	A		V	2
	Phasor representation of sinusoidal quantities. Trigonometric, Rectangular, Polar and complex forms.	L					1
	Analysis of simple AC circuits: Purely resistive circuit	L					1
	Analysis of simple AC circuits: Purely inductive & capacitive	L, T, S	CO3	A		V	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	
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
<i>This ToS shall be treated as a general guideline for students and teachers for distribution of marks</i>							

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

COURSE DESCRIPTION							
Regulation	2025	L-T-J-P-S	2-1-0-2-3	Version	25/0	Credits	4
<i>(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)</i>							

Course Code	Course Name	Course Category
B250905/CN110E	ALGORITHMIC THINKING WITH PYTHON	ES
Pre-requisite		
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	
CC1	Apply the basic engineering concepts to solve near to real-life engineering problems
CC2	Demonstrates proficiency in programming languages, frameworks, and development tools

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	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, 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					

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		
2	3	3	3		2		2		2	2	3	2		
3	3	3	3		2		2		2	2	3	2		
4	3	3	3		2		2		2	2	3	2		
<i>Correlation [3 – High, 2 -Medium, 1 – Low]</i>														

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme						
L	T	J	P	S			Theory			Practical			Total
					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 Preparation	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).	11

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/h5pppsychology/chapter/problem-solving/
2	https://onlinecourses.nptel.ac.in/noc21_cs32/preview

DETAILED SYLLABUS (Self-learning if any to be marked)							
Module	Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	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	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	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

	<p>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 $n \geq 3$ integers (examples). (Not limited to these exercises; more can be worked out if time permits).</p>	L	CO3	A	M	Rs	1
	<p>Recursion – definition, reasons for using recursion, the call stack, recursion and the stack, avoiding circularity in recursion</p>	T	CO3	A	M	Rs	1
	<p>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).</p>	L, T	CO3	A	M	Rs	1
	<p>Self-learning: Compare recursive vs iterative solutions for factorial & Fibonacci; trace recursion using call-stack diagrams</p>	S	CO3	A	M	Rs	10
4	<p>Brute-force Approach – Introductory diagrammatic/algorithmic explanation (analysis not required). Example: Padlock, Password guessing</p>	L	CO4	A	M	Rs	2
	<p>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</p>	L	CO4	A	M	Rs	2
	<p>Dynamic Programming Approach – introductory diagrammatic/algorithmic explanation (analysis not required). Example: Fibonacci series. Recursion vs Dynamic Programming</p>	L	CO4	A	M	Rs	2
	<p>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</p>	L	CO4	A	M	Rs	2
	<p>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?</p>	L	CO4	A	M	Rs	2
	<p>Self-learning – Study simple brute-force problems: padlock, password guessing. Write small brute-force code (e.g., linear search).</p>	S	CO4	A	M	Rs	11

PRACTICAL SYLLABUS						
Module	Objective	CO	Learning Domain			Hrs
			C	P	A	
1	To practice basic syntax, operators and user input handling	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	C	P	V	1
3	To understand modular programming and reuse	3	C	P	V	1
3	To apply string validation logic	3	A	P	Rs	1
4	To apply sorting, merging and algorithm design	3	A	P	V	1
4	To apply loops, decision making and simulate game strategy	3	A	P	V	2
4	To apply probability simulation, decision analysis and algorithmic reasoning	4	A	P	V	2

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design)								
Module	Module Title	Distribution of Marks (RBL)						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. Attendance	5
5. Course Project	
6. Lab Examination	10
End Semester Examination	60
Total	100

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

Course Code	Course Name	Course Category
B250908/PE910K	HEALTH AND WELLNESS	HM
Pre-requisite		
NIL		

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

COMPETENCY STATEMENT (CC)	
CC	Demonstrate a commitment to a healthy lifestyle through regular physical activity and avoidance of addictive substances to promote holistic wellness.

COURSE OUTCOME (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	Explain the importance of physical activity in maintaining human metabolic system.	CC1	U		Re
CO2	Practice life style management strategies to improve mental health and wellness.	CC1	U	M	Rs
CO3	Practice healthy life style through regular physical activities and abstaining from addictive substances.	CC1	U	M	Ch
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 & Program Specific Outcomes Correlation Matrix														
	PO											PSO			
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
1	2					1	1		1		1				
2	2					1	1		1		1				
3	2					1	1		1		1				

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	Total	
1	0	0	1	0	1	30	30	0	30	20	0	20	50
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	Physical Well-Being and Fitness	Human Body Systems. Quantifying Physical Activity Energy Expenditure. FITT principle	4
2	Mental Health Awareness & Balanced diet	Understanding Mental Health, Addiction and Related Issues, Resources for Mental Wellness.	2
3	Health and Wellness Through Lifestyle Management	Manage common hypokinetic diseases and disorders. Meaning, Aims and objectives of yoga. Understanding on substance abuse and addiction	4
4	First Aid Essentials	First aid and principles of First Aid.	2

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Team activities: Group presentations (Sample topics: Addiction / mental health awareness and suicide prevention, Nutrition concepts, Popular dietary trends, Nutritional needs at different life stages)	4

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Foundations of Nutrition	Bhavana Sabarwal	Commonwealth Publishers 1999
2	Anatomy and physiology in health and illness.	Ross and Wilson	Waugh, A., & Grant, A. 2022
3	The Mental Health Handbook A Cognitive Behavioural Approach	Trevor Powell	Routledge 2009

Reference			
Sl. No.	Title of Book	Author	Publication
1	Fit to be Well Essential Concept	Thygerson, A. L., Thygerson, S. M., & Thygerson, J. S.	Jones & Bartlett Learning 2018
2	Introduction to physical education, fitness, and sport	Siedentop, D., & Van der Mars, H.	Human kinetics. 2022
3	Substance Use Disorders. Manual for Physicians.	Lal, R., & Ambekar, A. (2005).	National Drug Dependence Treatment Centre, New Delhi 2005
4	The exercise health connection- how to reduce your risk of disease and other illnesses by making exercise your medicine.	Nieman, D. C., & White, J. A	Public Health 1998
5	ACSM's resource manual for guidelines for exercise testing and prescription.	Lippincott Williams & Wilkins.	American College of Sports Medicine. 2012
6	Exercise Physiology: energy, nutrition and human performance	Katch, F. I., Katch, V. L., & McArdle, W. D.	Lippincott Williams & Wilkins 2010
7	Positive Psychology for Improving Mental Health & Well-Being	Dr. Geetika Patnaik	Notion Press 2019

Web Resource	
1	https://www.nutrition.gov/#:~:text=Nutrition.gov%20is%20powered%20by,you%20make%20healthful%20eating%20choices
2	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2879108/
3	https://yoga.ayush.gov.in/
4	https://www.mindful.org/

DETAILED SYLLABUS (Self-learning if any to be marked)							
Module	Major Topic & Sub Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	Human Body Systems related to Physical activity and its functions: Respiratory System - Cardiovascular System. Musculoskeletal System and the Major Muscle groups of the Human Body	L	CO1	U		Re	1
	Quantifying Physical Activity Energy Expenditure and Metabolic equivalent of task (MET) Exercise Continuum: Light- intensity physical activity, Moderate - intensity physical activity, Vigorous - intensity physical activity.	L	CO1	U		Re	1
	Defining Physical Activity, Aerobic Physical Activity, Anaerobic Physical Activity, Exercise and Health-Related Physical Fitness. FITT principle to design an Exercise program	L	CO1	U		V	1
	Components of Health-related Physical Fitness: - Cardiorespiratory Fitness-Muscular strength - Muscular Endurance-Flexibility- Body composition.	L	CO1	U		Re	1
2	Concept of Health and Wellness: Health and wellness differentiation, Factors affecting health and wellness. Mental health and Factors affecting mental health Sports and Socialization: Sports and character building -Leadership through Physical Activity and Sports	L	CO2	U		V	2
	Diet and nutrition: Exploring Micro and Macronutrients: Concept of Balanced diet Carbohydrate & the Glycemic Index Animal & Plant -based Proteins and their Effects on Human Health Dietary Fats & their Effects on Human Health Essential Vitamins and Minerals	L	CO2	U		Rs	2
3	Life style management strategies to prevent / manage common hypokinetic diseases and disorders -Obesity Cardiovascular diseases - Diabetes -Osteoporosis - Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis, lordosis, flat-foot, Knock knee)	L	CO2	U		Re	1
	Meaning, Aims and objectives of yoga - Classification and importance of Yogic Asanas (Sitting, Standing, lying) Pranayama and Its Types - Active Lifestyle and Stress Management Through Yoga	L	CO2	U		O	1
	Understanding on substance abuse and addiction Psychoactive substances & its ill effects- Alcohol-Opioids- Cannabis -Sedative -Cocaine -Other stimulants, including caffeine -Hallucinogens - Tobacco -Volatile solvents.	L	CO3	U		V	2
4	First aid and principles of First Aid: Primary survey: ABC (Airway, Breathing, Circulation). Qualities of a Good First Aider First aid measures for: - Cuts and scrapes - Bruises- Sprains - Strains- Fractures - Burns - Nosebleeds.	L	CO3	U		Rs	1
	First Aid Procedures: Cardiopulmonary Resuscitation (CPR) - Heimlich Maneuver - Applying a sling Sports injuries: Classification (Soft Tissue Injuries -Abrasion, Contusion, Laceration, Incision, Sprain & Strain)	L	CO3	U		Rs	1

PRACTICAL SYLLABUS						
Topic	Objective	CO	Learning Domain			Hrs
			C	P	A	
Stretching exercises (V Sit Reach Test)	Improving Flexibility through Stretching Exercises	CO3		M		12
Strength exercises (Partial Curl Up, Push Up)	To assess and improve muscular strength.	CO3		M		
Endurance Exercises (Run & Walk)	To assess and improve cardiovascular endurance,	CO3		M		

ASSESSMENT PATTERN	
Assessment	Marks
Continuous Internal Assessment	100
1. Internal Examination	
2. Activity Evaluation	40
3. Learning Activity	40
4. Attendance	20
5. Course Project	
End Semester Examination	0
Total	100

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

Course Code	Course Name	Course Category
B250906/CN130U	Basic Electrical and Electronics Engineering Workshop	ES
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 wiring, 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.	CC54 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
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 & Program Specific Outcomes Correlation Matrix														
	PO											PSO			
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
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		
L	T	J	P	S			CIA	ESE	Total
0	0	0	2	0	1	30	50	0	50

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	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. b) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB, familiarize the ratings.	Demonstrate essential safety procedures and first-aid steps to be followed in case of electric shock. Identify and understand the types, ratings, and applications of various electrical cables, protection devices, and switches.	CO1 CO2	U U	I I	Rs Rs	2
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 Method	Marks
Continuous Internal Assessment	
1. Continuous Lab Evaluation	45
2. Internal Examination	-
3. Attendance	5
4. Course Project	-
End Semester Examination	
Total	
	100