A CMI INSTITUTION

CHRIST COLLEGE OF ENGINEERING (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

CURRICULUM AND SYLLABUS

2025 REGULATION

(SEMESTER 3)

Approved by BoS meeting held on: 18th June 2026

Approved by Academic Council meeting held on: 23rd June 2026

BoS Chairperson	Director of Academics	Principal
Dr. Meenakshy K	Dr. Manoj George	Dr. Solomon P A

CHAIRPERSON
Board of Studies
B.Tech Electrical & Electronics Engineering
Christ College of Engineering
(Autonomous)
Irinjalakuda, Kerala

CHRIST COLLEGE OF ENGINEERING AUTONOMOUS IRINJALAKUDA

CHRIST COLLEGE OF ENGINEERING (AUTONOMOUS), IRINJALAKUDA

Run by

Christ Educational and Charitable Trust

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

B.TECH 2025 REGULATION

Semester-3 Syllabus

THIRD SEMESTER: Electrical and Electronics Engineering														
Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs./Week
						L	T	P	R		CAE	ESE		
THEORY														
1	A	G25CDT321	BS	GC	Complex Analysis, Partial Differential Equations and Transforms	2	1	0	0	3.5	40	60	3	3
2	B	E25ADR302	PC-PBL	PC	Analog and Digital Electronics	2	1	0	1	4.5	60	40	4	4
3	C	E25CNT303	PC	PC	Circuits and Networks	2	1	0	0	3.5	40	60	3	3
4	D	A25AIT304	ES	GC	Introduction to Artificial Intelligence and Data Science	3	1	0	0	5	40	60	4	4
5	E	A25ECT305	HM	CC	Engineering Economics	2	0	0	0	3	40	60	2	2
6	F	A25AET306	HM	CC	Strategic Communication and Documentation in Engineering Practice	2	0	0	0	3	50	-	2	2
7	G	G25EST307	HM	CC	Environmental Science	1	0	0	0	1.5	40	60	1	1
PRACTICALS														
8	H	E25ADP308	PC	PC	Analog and Digital Electronics Lab	0	0	3	0	1.5	50	50	2	3
9	I	A25EDR339	SE	CC	Engineering Design and Innovation Studio (EDIS-I)	0	0	0	2	2	50	-	1	2
10	J	E25CMP310	PC	PC	Circuits and Measurements Lab	0	0	3	0	1.5	50	50	2	3
ACTIVITY POINT PROGRAMME														
11		A25APP311	MC	CC	Activity Point Programme					0			-	
VALUE ADDED COURSES														
12	M	-	VA	CC	Minor course	3	1	0	0	5	40	60	4	4
Total										**29/ 34***			**24/ 28***	**27/ 31***

* Project-Based Learning (PBL) Courses Integrated in Semesters 3 to 6

Semester-3

Complex Analysis Partial Differential Equations and Transforms.

Course Code	G25CDT321	**CAE Marks**	**40**
Hours per week	2: 1 : 0 : 0	**ESE Marks**	**60**
Credits	**3**	**Exam Hours**	**2 hrs 30 min**
Prerequisites (if any)	**None**	**Course Type**	**Theory**

SYLLABUS

Module	Syllabus Description	Contact Hours
1	Complex Function: Complex Function, Limit, Continuity, Derivative, Analytic functions, Cauchy-Riemann Equations (without proof), Laplace's Equations, Harmonic functions, Finding harmonic conjugate, Conformal mapping, Mappings of $w= z^2$, $w=e^z$, $w= \frac{1}{z}$, $w=sinz$.	10
2	Complex Integration: Complex Integration: Line integrals in the complex plane (Definition & Basic properties), First evaluation method, Second evaluation method, Cauchy's integral theorem (without proof) on simply connected domain, Independence of path, Cauchy integral theorem on multiply connected domain (without proof), Cauchy Integral formula (without proof).	10
3	Partial Differential Equations: Partial differential equations, Formation of partial differential equations –elimination of arbitrary constants-elimination of arbitrary functions, Solutions of a partial differential Equations, Solution of equations by method of separation of variables. One dimensional wave equation- vibrations of a stretched string, derivation, solution of the wave equation using method of separation of variables, D'Alembert's solution of the wave equation, One dimensional heat equation, derivation, solution of the heat equation.	10
4	Fourier Transform: Fourier Integral, From Fourier series to Fourier Integral, Fourier Cosine and Sine integrals, Fourier Cosine and Sine Transform, Linearity, Transforms of Derivatives, Fourier Transform and its inverse, Linearity, Transforms of Derivative.	10

COURSE OUTCOMES

CO No.	Description	Blooms KL
CO1	Explain the fundamental concepts of complex functions, limits, continuity, differentiability, analytic functions, and the Cauchy–Riemann equations.	2
CO2	Apply techniques of complex integration, including line integrals and Cauchy's integral formula, to evaluate integrals of complex-valued functions.	3
CO3	Solve partial differential equations arising in physical problems using appropriate methods, including separation of variables and D'Alembert's method.	3
CO4	Compute Fourier integrals, Fourier sine and cosine transforms, and Fourier transforms of functions and their derivatives.	3
CO5	Analyze complex mappings, harmonic functions, partial differential equation models, and Fourier transform techniques to interpret and solve mathematical and physical problems.	4

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1							
CO2	3	3	2	1							
CO3	3	3	2	1							
CO4	3	3	2	1							
CO5	3	3	3	2	1						

Course Assessment Method (CAE: 40 Marks, ESE: 60 Marks)

Continuous Assessment and Evaluation Marks (CAE):

Assignment(Activity based)	Internal Examination-I(Written)	Internal Examination-II(Written)	Internal Examination-III(Written)	Total
15	30	30	30	40
	A total of 90 marks will be scaled to 25			

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

Part A	Part B	Total
2 questions from each module. Total of 8 questions, each carrying 3 marks (8 x 3 = 24 Marks)	Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. (4 x 9 = 36 Marks)	60

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10th edition, 2016
2	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	44th Edition, 2018

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Complex Analysis	Dennis G. Zill, Patrick D. Shanahan	Jones & Bartlett	3rd edition, 2015
2	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education	39th edition, 2023
3	Fast Fourier Transform - Algorithms and Applications	K.R. Rao, Do Nyeon Kim, Jae Jeong Hwang	Springer	1st edition, 2011
4	Advanced Engineering Mathematics	Peter V. O'Neil	Cengage	7th Edition, 2012

Semester-3
ANALOG AND DIGITAL ELECTRONICS

Course Code	E25ADR302	**CIE Marks**	60
Teaching Hours/Week (L:T:P: R)	2: 1 : 0 : 1	**ESE Marks**	40
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

1. At the end of the course the student will be able to design analog electronic systems using BJT, FET, OP-Amp and 555 timer IC.

2. Design different types of combinational and sequential logic circuits and implement digital circuits using Hardware Descriptive Language.

Syllabus

Module No.	Syllabus Description	Contact Hours
1	**BJT Biasing Circuits:** Concept of stabilization, Problems on Fixed, Collector to base and Voltage divider bias. **(4 hours)** **Power Amplifiers:** Conversion efficiency, Class A, Class B, Class AB, Class C amplifiers. **(2 hours)** **Feedback Circuits:** Positive and negative feedback. **(1 hour)** **Field Effect Transistors:** Construction, working and characteristics of JFET and MOSFET (Enhancement type). **(2 hours)** **Oscillators:** Phase Shift Oscillator (Expression of frequency of oscillation)–Wien Bridge Oscillator – LC Oscillator circuits – Crystal Oscillator. **(3 hours)**	12

2	**Introduction to Operational Amplifiers Op-Amp Circuits:** Inverting Amplifiers & Non-inverting Amplifiers – Summing & Difference Amplifiers - Differentiator & Integrator circuits, Instrumentation amplifier. **(4 hours)** **Comparators:** Voltage level detectors and Schmitt trigger. **(3 hours)** **Wave form generation using Op-Amps:** Square and Triangular waveform generator **(1 hour)** **Timer555 IC:** Internal diagram of 555 IC– Astable and Monostable multi-vibrators using 555 IC. **(2 hours)**	**10**

3	**Number Systems and Codes:** Conversions - Signed representation of binary numbers. **(2 hours)** **Logic gates:** Logic gates functions- Boolean laws and theorems. Internal diagram of TTL NAND gate and CMOS NOR gate. **(3 hours)** **K-map representation:** SOP and POS Simplification **(3 hours)** **DAC:** Weighted resistor type, R-2R Ladder type. **(1 hour)** **ADC:** Flash type, Successive approximation type. **(1 hour)** **State Machines:** Mealy and Moore models, sequence detectors. **(2 hours)**	**12**
4	**Combinational circuits:** Adders and Subtractors, Encoders, Decoders, Multiplexers and Demultiplexers. **(3 hours)** **Sequential circuits:** Introduction to Flip-flops– SR, JK, D and T flip-flops. **(2 hours)** Counters-Up/Down counters, synchronous and asynchronous counters, Ring counter and Johnson Counter. **(4 hours)** **Introduction to Verilog:** Implementation of AND gate, OR gate, half adder and full adder. **(1 hour)**	**10**

Course Assessment Method (CAE: 40 Marks, ESE: 60 Marks)

Continuous Assessment and Evaluation Marks (CAE):

Assignment (Activity based)	Project	Internal Examination-I (Written)	Internal Examination-II (Written)	Internal Examination-III (Written)	Total
15	20	30	30	30	
		A total of 90 marks will be scaled to 25			60

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

Part A	Part B	Total
· 2 questions from each module. · Total of 8 questions, each carrying 3 marks (8 x 2 = 16 Marks)	· Each question carries 9 marks. · Two questions will be given from each module, out of which 1 question should be answered. · Each question can have a maximum of 3 sub divisions. (3 x 8 = 24 Marks)	40

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Design BJT and FET amplifier circuits and oscillators.	**K3**
CO2	Design and develop various OPAMP application circuits and delay circuits using 555 timer.	**K3**
CO3	Formulate digital functions using Boolean algebra and describe the operation of various ADC and DAC circuits.	**K4**
CO4	Design combinational and sequential logic circuits and implement digital circuits using Verilog HDL.	**K3**
CO5	Implement an electronic hardware circuit for the solution of a real time Problem.	**K6**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2									
CO2	3	2									
CO3	3	2									
CO4	3	2									
CO5	3	3			3						

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Introductory Electronic Devices and Circuits	Robert T Paynter	Pearson Education	
2	Electronic devices and Circuit Theory	Boylestad R. L. and L. Nashelsky	Pearson Education	
3	Digital Fundamentals	Floyd T.L	Pearson Education	11/e, 2017
4	Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog	M. Morris Mano, Michael D. Ciletti	Pearson Education	6/e, 2018

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Fundamentals of Analog Circuits	Floyd T.L.	Pearson Education	
2	Op-Amps and Linear Integrated Circuits	Gayakward R. A.	PHI Learning Pvt. Ltd.	
3	Fundamental of Digital Circuits	A Anand Kumar	Prentice Hall	4/e, 2023
4	Fundamentals of Digital Logic with Verilog Design	Stephen Brown	McGraw Hill Education	2/e 2018

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/108/105/108105158/
2	https://archive.nptel.ac.in/courses/108/102/108102112/
3	https://nptel.ac.in/courses/108106084
4	https://archive.nptel.ac.in/courses/108/105/108105132/
5	https://archive.nptel.ac.in/courses/18/106/108106177/

PBL Course Elements

L: Lecture (3 Hrs.)	**R: Project (1 Hr.), 2 Faculty Members**		
	Tutorial	**Practical**	**Presentation**
Lecture delivery	Project identification	Simulation/ Laboratory Work/ Workshops	Presentation (Progress and Final Presentations)
Group discussion	Project Analysis	Data Collection	Evaluation
Question answer Sessions/ Brainstorming Sessions	Analytical thinking and self-learning	Testing	Project Milestone Reviews, Feedback, Project reformation (If required)
Guest Speakers (Industry Experts)	Case Study/ Field Survey Report	Prototyping	Poster Presentation/ Video Presentation: Students present their results in a 2 to 5 minutes video

Assessment and Evaluation for Project Activity

Sl. No	Evaluation for	Allotted Marks
1	Project Planning and Proposal	2
3	Involvement in the project work and Team Work	4
4	Execution and Implementation	8
5	Final Presentations	3
6	Project Quality, Innovation and Creativity	3
Total		**20**

Semester-3

Circuits and Networks

Course Code	E25CNT303	**CIA Marks**	40
Teaching Hours/Week (L: T:P: R)	2: 1 : 0 : 0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hours 30 Minutes
Prerequisites (if any)	G25EET105	**Course Type**	Theory

COURSE OBJECTIVES

1. Carryout steady state DC and AC Circuit analysis using various theorems
2. Carryout transient response analysis of DC circuits with DC and AC excitations
3. Carryout three phase unbalanced power system analysis
4. Represent electrical network as Two-Port networks
5. Design resonance circuits with lower and higher cutoff frequencies
6. Carryout analysis on coupled circuits

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Power in 3-phase circuits with unbalance in load** – steady state analysis of 3-wire unbalanced delta connected circuit - steady state analysis of 3-phase 4-wire and 3-wire (using Millman's theorem only) unbalanced star connected circuit –neutral shift. **(7 Hours)** **Resonance -** series resonance– resonant frequency – variations of impedance and current with frequency – bandwidth – quality factor – parallel resonance (series RL in parallel with C –calculation of resonant frequency) – Parallel Resonance (Series RL with C in Parallel) **(5 Hours)** Activity: MATLAB/Simulink Simulation on unbalanced three phase circuits and series resonance with practical applications. Activity for Fast Learners: Analysis of three phase power system with source unbalancing and both source and load unbalancing in MATLAB/Simulink.	12
2	Supermesh and Supernode analysis, Superposition Theorem, Source Transformation (steady state analysis of AC and DC Circuits with independent sources alone) **(5 Hours)** Thevenin Theorem, Norton Theorem, Maximum Power Transfer Theorem (steady state analysis of AC and DC Circuits and independent and dependent sources) **(5 Hours)** Reciprocity Theorem (DC Circuits only) **(2 Hours)** Activity: MATLAB/Simulink Simulation on Verification of Superposition Theorem and Maximum Power Transfer Theorem with practical applications	12
3	**Two port networks** – Z, Y, h, T parameters – conditions for symmetry and reciprocity – relationship between parameters – interconnection of two port networks – series, parallel and cascade **(5 Hours)** **Coupled circuit** – dot convention – fixing of dots – coefficient of coupling - conductively coupled equivalent circuit - sinusoidal steady state analysis of coupled circuits, concept of wireless power transfer. **(4 Hours)**	9

	Activity: Get Certified in MATLAB/Simulink Onramp Course in Circuit Simulation	
4	Transient response of simple series and parallel RL and RC circuits with DC excitation and initial conditions – natural response and forced response – time constant - transformed circuits in s-domain - solution using Laplace transforms – solution using mesh analysis and nodal analysis **(5 Hours)** Transient response of series RLC circuit with DC excitation and initial conditions – damping –overdamped, underdamped, critically damped and undamped - solution using Laplace transforms **(4 Hours)** Transient response of simple series and parallel RL and RC circuits with sinusoidal excitation and zero initial conditions – solution using Laplace transforms **(3 Hours)** Activity: Get Certified in MATLAB/Simulink Onramp Course in Solving Ordinary Differential Equations with MATLAB	**12**

Lecture Plan		
Module No. (Total Lecture Hours)	Topics	Lecture Hours
1 (12 Hours)	Unbalanced Three Phase Systems: Steady state analysis of 3-wire unbalanced delta connected circuit	2
	Steady state analysis of 3-phase 4-wire unbalanced star connected circuit	2
	Steady state analysis of 3-phase 3-wire (using Millman's theorem only) unbalanced star connected circuit and neutral shift	2
	Numerical problems on three phase systems	1
	Resonance: Series resonance– resonant frequency	1
	Variations of impedance and current with frequency	1
	Bandwidth – quality factor	1
	Parallel resonance (series RL in parallel with C –calculation of resonant frequency)	1
	Numerical Problems on resonance	1
2 (12 Hours)	Supermesh Analysis	1
	Supernode Analysis	1
	Superposition Theorem	2
	Source Transformation	1
	Thevenin Theorem	2
	Norton Theorem	1
	Maximum Power Transfer Theorem	2
	Reciprocity Theorem	2
3 (9 Hours)	Two Port Networks: Z, Y, h, T parameters	2
	Conditions for symmetry and reciprocity	1
	Relationship between parameters	1
	Interconnection of two port networks – series, parallel and cascade	1
	Coupled Circuits: dot convention, fixing of dots	1
	Coefficient of coupling	1
	Conductively coupled equivalent circuit	1
	Sinusoidal steady state analysis of coupled circuits and concept of wireless power transfer	1

4 (12 Hours)	Transient response of simple series and parallel RL and RC circuits with DC excitation and initial conditions	2
	Natural response and forced response – time constant	1
	Transformed circuits in s-domain - solution using Laplace transforms	1
	Solution using mesh analysis and nodal analysis	1
	Transient response of series RLC circuit with DC excitation and initial conditions	2
	Damping –overdamped, underdamped, critically damped and undamped	1
	Solution using Laplace transforms	1
	Transient response of simple series and parallel RL and RC circuits with sinusoidal excitation and zero initial conditions	2
	Solution using Laplace transforms	1

COURSE OUTCOMES

Course Outcome		Bloom's Level	WK Addressed	SDG
CO1	Analyze Three Phase Unbalanced AC Circuits under Steady State in Star & Delta Configuration for efficient energy transportation and Design Series & Parallel RLC Circuits under Resonance.	2,3,4	WK3, WK4, WK6	SDG 7: Affordable & Clean Energy
CO2	Solve Electric Circuits with DC and AC Excitation under Steady State by using Circuit Analysis Methods for efficient energy transportation.	1,2,3	WK3, WK4, WK6	
CO3	Model Two Port Networks in Z, Y, h & T Parameters and Solve the Coupled Circuits by using Laplace Transformation for efficient energy transportation.	2,3,4,5,6	WK3, WK4, WK6	
CO4	Evaluate First and Second Order Electric Circuits with DC and AC Excitations by using Laplace Transformation for efficient energy transportation.	2,3,4,5	WK3, WK4, WK6	
CO5	Develop and Analyze the Model of Electric Circuits in MATLAB/ Simulink for efficient energy transportation.	3,4,5,6	WK3, WK4, WK6	

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2									
CO2	3	2									
CO3	3	2									
CO4	3	2									
CO5	3	3			3						

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Course Assessment Method (CAE: 40 Marks, ESE: 60 Marks)

Continuous Assessment and Evaluation Marks (CAE):

Assignment	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Internal Examination- 3 (Written)	Total
15	30	30	30	40
	A total of 90 marks will be scaled to 25			

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
2 Questions from each module. Total of 8 Questions, each carrying 3 marks (8x3 =24marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 9 marks (4x9 = 36 marks)	60

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Network Analysis	Van Valkenburg	Pearson	3rd 2019
2	Network Analysis and Synthesis	Ravish R Singh	McGraw Hill Education	2nd 2019
3	Electric Circuits & Networks	Suresh Kumar	Pearson	1st 2008
4	Circuits and Networks, Analysis and Synthesis	A Sudhakar, Shyammohan S Palli	McGraw Hill Education	5th 2017
Reference Books				
1	Engineering Circuit Analysis	Hayt and Kemmerly	McGraw Hill Education	8th 2013
2	Circuit Theory Analysis and Synthesis	Chakrabarti	Dhanpat Rai & Co	7th 2018
3	Theory and Problems in Electric circuits	Joseph A. Edminister and Mahmood Nahvi	McGraw Hill	5th 2010.

Video Links (NPTEL, SWAYAM…)	
Sl.No.	**Link ID**
1	MATLAB/Simulink Onramp Course in Solving Ordinary Differential Equations with MATLAB https://matlabacademy.mathworks.com/details/solving-ordinary-differential-equations-with-matlab/odes
2	MATLAB/Simulink Onramp Course in Circuit Simulation with MATLAB https://matlabacademy.mathworks.com/details/circuit-simulation-onramp/circuits
3	NPTEL Course in Basic Electrical Circuits offered by Prof. Gajendranath Chowdary, IIT Madras https://nptel.ac.in/courses/117106108
4	NPTEL Course in A Basic Course on Electric and Magnetic Circuits offered by Prof. Ashok Kumar Pradhan, IIT Kharagpur https://nptel.ac.in/courses/108105479

SEMESTER S3

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Course Code	A25AIT304	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	Linear Algebra and Python	Course Type	Theory

Course Objectives:

1. Demonstrate an in-depth understanding of advanced linear algebra, machine learning algorithms, and statistical analysis methodologies within the context of engineering applications and computational frameworks.

2. Integrate theoretical foundations with practical problem-solving by analyzing complex engineering data, extracting significant insights, and employing appropriate mathematical and computational techniques for artificial intelligence and data science applications.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Basics of AI and Machine Learning** – applications in engineering – types of Machine Learning systems, Components of an ML system and challenges in ML. **Principles of supervised learning** – regression analysis (linear regression) Evaluation metrics. Introduction to classification – logistic regression model. **Unsupervised model example**- K-means clustering. **Artificial Neural Network**- Perceptron- Universal Approximation Theorem (statement only)- Multi-Layer Perceptron- Introduction to Deep Neural Network.	13
2	Role of linear algebra in Data representation and analysis. **Matrix decomposition** – Spectral Decomposition, Singular Value Decomposition (SVD) and its applications. **Dimensionality reduction technique** - Principal Component Analysis (PCA) and its application (No numerical problems).	10

3	**Applied Probability**: Basics of probability- Conditional probability- Bayes theorem and its applications. Random variables and analysis. **Statistics:** Statistical measures of central tendency and statistical summaries- Correlation analysis and Covariance	12
4	**Basics of Data Science**: Benefits of data science-use of statistics and Machine Learning in Data Science- data science process - applications of Machine Learning in Data Science. Introduction to Big Data and its applications. Application of PowerBI Demonstration of ML applications in data science using Python (Regression, Data analysis).	10

Course Assessment Method (CAE: 40 Marks, ESE: 60 Marks)

Continuous Assessment and Evaluation Marks (CAE):

Assignment	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Internal Examination- 3 (Written)	Total
15	30	30	30	40
	A total of 90 marks will be scaled to 25			

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
2 Questions from each module. Total of 8 Questions, each carrying 3 marks (8x3 =24marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 9 marks (4x9 = 36 marks)	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the basics of AI and machine learning and apply techniques to develop solutions for simple engineering problems.	K2/K3
CO2	Apply advanced mathematical methods such as matrix decomposition to analyze and solve engineering problems, contributing to scientific and sustainable development.	K3
CO3	Analyze and interpret data using statistical tools to extract actionable insights and aid in decision-making in engineering	K3
CO4	Understand the basics of data science and integrate with machine learning techniques to create feasible engineering solutions that address modern industry needs.	K3
CO5	Demonstrate the ability to visualize and interpret datasets using machine learning and data science concepts to facilitate innovation in engineering practices	K3/K4

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2						2
CO2	3	2		2							
CO3	3	2		2							
CO4	3	3	2	3	3						2
CO5		2			3						2

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Introduction to Linear Algebra	Gilbert Strang	Wellesley-Cambridge Press	6th edition, 2023
2	Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow	Aurélien Géron	O'Reilly Media, Inc.	2nd edition, 2022
3	Mathematics for machine learning	Deisenroth, Marc Peter, A. Aldo Faisal, and Cheng Soon Ong	Cambridge University Press	1st edition. 2020
4	Fundamentals of mathematical statistics	Gupta, S. C., and V. K. Kapoor	Sultan Chand & Sons	9th edition, 2020
5	Introducing data science: big data, machine learning, and more, using Python tools	Cielen, Davy, and Arno Meysman	Simon and Schuster	1st edition, 2016

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Data science: concepts and practice	Kotu, Vijay, and Bala Deshpande	Morgan Kaufmann	2nd edition, 2018
2	Probability and Statistics for Data Science	Carlos Fernandez-Granda	Center for Data Science in NYU	1st edition, 2017
3	Foundations of Data Science	Avrim Blum, John Hopcroft, and Ravi Kannan	Cambridge University Press	1st edition, 2020
4	Statistics For Data Science	James D. Miller	Packet Publishing	1st edition, 2019
5	Probability and Statistics - The Science of Uncertainty	Michael J. Evans and Jeffrey S. Rosenthal	University of Toronto	1st edition, 2009

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/106/106/106106198/
2	https://archive.nptel.ac.in/courses/106/106/106106198/ https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/resources/lecture-29-singular- value-decomposition/
3	https://ocw.mit.edu/courses/18-650-statistics-for-applications-fall-2016/resources/lecture-19- video/
4	https://archive.nptel.ac.in/courses/106/106/106106198/

SEMESTER S3

ENGINEERING ECONOMICS

Course Code	**A25ECT305**	**CIE Marks**	**40**
Teaching Hours/Week (L: T:P: R)	**2:0:0:0**	**ESE Marks**	**60**
Credits	**2**	**Exam Hours**	**2 Hrs. 30 Min.**
Prerequisites (if any)	**None**	**Course Type**	**Theory**

Course Objectives:

This course introduces engineering students to economic principles and decision-making techniques required for evaluating engineering projects and business investments. It focuses on demand and supply analysis, cost concepts, financial management, project evaluation techniques, and economic decision-making under risk and uncertainty.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Introduction to Economics:** Meaning, Nature, and Scope of Economics, Microeconomics and Macroeconomics, Role of economics in engineering decision-making, Production Possibility Curve and Opportunity cost, Consumer behaviour theory and Consumer equilibrium (Cardinal Approach). Circular flow of economic activity (Four Models), Taxation and Goods and Services Tax (GST), Sustainable development principles in engineering economics, Triple Bottom Line (People, Planet, Profit).	6

2	**Fundamentals of Micro Economics*:*** Demand and Factors determining demand – Law of Demand – Demand curve- Price elasticity of demand- measurement of price elasticity and its applications (Numerical Problems), Demand forecasting methods, Linear Regression Method (Numerical Problems) – Supply: factors determining supply - Law of supply – Supply curve- Equilibrium price determination (Numerical Problems) - Changes in demand and supply and its effects on equilibrium price and quantity Production: Factors of Production, Production function - Law of variable proportion, Returns to scale, Applications of micro economic concepts in engineering and technology markets.	6

3	**Market structure and Cost:** Market: Perfect Competition - Monopoly - Monopolistic Competition (features and equilibrium of a firm) - Oligopoly – Features – Kinked demand model Cost: Short run cost curves – Fixed Cost, Variable Cost, Total costs, Average and Marginal cost (Numerical Problems), Revenue, Break-even analysis and Margin of safety (Numerical Problems), Private cost and Social cost – Sunk cost –Explicit and implicit cost. Learning curve concept, Cost control and cost reduction, Productivity measurement, Economic optimization in engineering operations	6
4	**Financial Management, Time Value of Money and Project Evaluation:** Financial Management: Financial Statements, Balance Sheet, Income Statement, Cash Flow Statement, Financial ratio analysis. Time Value of Money: Concept of interest, Simple and compound interest, Nominal and effective interest rates, Present worth and future worth analysis.	6

	Capital Budgeting Techniques: Payback Period Method, Accounting Rate of Return (ARR), Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index (PI) (Numerical Problems).	

Course Assessment Method (CAE: 40 Marks, ESE: 60 Marks)

Continuous Assessment and Evaluation Marks (CAE):

Assignment (Activity based)	Internal Examination-I (Written)	Internal Examination-II (Written)	Internal Examination-III (Written)	Total
15*	30	30	30	
	A total of 90 marks will be scaled to 25.			40

*One or more assignments should be given, and the total marks should be consolidated and converted to 15 as per revised evaluation guidelines.

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

Part A	Part B	Total
2 questions from each module. Total of 8 questions, each carrying 3 marks (8 x 3 = 24 Marks)	Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. (4 x 9 = 36 Marks)	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the fundamental economic concepts, consumer behaviour, taxation, and sustainable development principles relevant to engineering decision-making.	Understand (K2)
CO2	Apply demand, supply, elasticity, demand forecasting, and production theories to analyze economic problems in engineering and technology markets	Apply (K3)
CO3	Analyze market structures, cost concepts, break-even situations, productivity measures, and optimization techniques for engineering operations.	Analyze (K4)
CO4	Evaluate financial statements and apply time value of money concepts for investment and financial decision-making.	Evaluate (K5)
CO5	Assess engineering projects using project appraisal techniques, risk analysis methods, and sustainability principles to support managerial decision-making.	Evaluate (K5)

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	**2**	**1**	**-**	**-**	**-**	**3**	**2**	**-**	**-**	**1**	**1**
CO2	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**1**
CO3	**2**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**3**	**1**
CO4	**2**	**2**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**3**	**1**

CO5	**2**	**3**	**3**	**2**	**1**	**3**	**2**	**1**	**1**	**3**	**2**

1: Slight (Low),2: Moderate (Medium),3: Substantial (High),: No Correlation

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Engineering Economics	Leland Blank & Anthony Tarquin	McGraw-Hill Education	9th Edition, 2024
2	Fundamentals of Engineering Economics	Chan S. Park	Pearson Education	5th Edition, 2022
3	Principles of Economics	N. Gregory Mankiw	Cengage Learning	10th Edition. 2024
4	Engineering Economy	William G. Sullivan, Elin M. Wicks & C. Patrick Koelling	Pearson	17th Edition, 2023

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Engineering Economy and Economic Analysis	Ted G. Eschenbach	Oxford University Press	7th Edition, 2021
2	Financial Management: Theory and Practice	Eugene F. Brigham & Michael C. Ehrhardt	Cengage Learning	17th Edition, 2022
3	Project Management for Engineering, Business and Technology	John M. Nicholas & Herman Steyn	Routledge	6th Edition, 2023
4	Sustainable Engineering: Concepts, Design and Case Studies	David T. Allen & David R. Shonnard	Pearson	2nd Edition, 2021

SEMESTER 3

ANALOG & DIGITAL ELECTRONICS LAB

Course Code	**E25ADP308**	**CIE Marks**	50
Teaching Hours/Week (L: T:P: R)	0:0:3:0	**ESE Marks**	50
Credits	2	**Exam Hours**	3
Prerequisites (if any)		**Course Type**	Lab

Course Objectives:

1. Design of Transistor and Op amp Circuits
2. Design and implementation of digital circuits
3. Simulation and hardware implementation of the circuits

Expt. No.	Experiments
1	Clipping and clamping circuits using diodes.
2	RC coupled amplifier using BJT in CE configuration-Measurement of gain, BW and plotting of frequency response.
3	JFET amplifier-Measurement of gain, BW and plotting of frequency response.
4	Op-amps circuits – inverting and non-inverting amplifier, Scale changer, adder, integrator, and differentiator.
5	Op- Amp Oscillators – RC Phase shift and Wien Bridge Oscillator
6	Schmitt trigger using Op-amp
7	Waveform generation– Square, triangular and saw tooth waveform generation using OPAMPs.
8	Astable and Monostable circuit using 555IC
9	Introduction to PCB layout software.
10	Verification and Realization of De-Morgan's Theorem
11	Realization of SOP and POS function from K-map reduction
12	Realization of 2-bit comparator using gates
13	Combinational circuits using multiplexer ICs
14	Study of flipflops using gates
15	Study of flipflop ICs 7474 and 7476
16	Realization of Ripple up and down counters and modulo-N counter using flipflop ICs.
17	Design of synchronous up-down counter

18	VHDL implementation of full adder

*Carryout Minimum 12 Experiments

Course Assessment Method
(CIE: 50 Marks, ESE: 50 Marks)

Continuous Internal Evaluation Marks (CIE):

Preparation/Pre-Lab Work, Viva, and Timely Lab Reports (Continuous Assessment)	Internal Examination	Total
30	20	50

End Semester Examination Marks (ESE)

Procedure/ Preparatory work/ Design/ Algorithm	Conduct of experiment/ Execution/ Troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)	WKs	SDGs
CO1	Use the various electronic instruments and for conducting experiments.	**K1**	**WK1**	**12**
CO2	Design and develop various analog electronic circuits using diodes, transistors and ICs	**K4**	**WK1, WK2, WK3, WK6**	
CO3	Design and implement combinational and sequential digital circuits	**K4**	**WK1, WK2, WK3, WK6**	
CO4	Use various software for electronic circuit design.	**K4**	**WK1, WK2, WK3, WK6**	
CO5	Work in groups as member with professional ethics while conducting experiments and effectively communicate through orally and written reports.	**K2**	**WK9**	

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**
CO1	3										
CO2	2	3	3	3	3			3	3		
CO3	2	3	3	3	3			3	3		
CO4	2	3	3	3	3			3	3		
CO5	3	3	3	3	3			3	3		

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Introductory Electronic Devices and Circuits	Robert T Paynter	Pearson Education	
2	Electronic devices and Circuit Theory	Boylestad R. L. and L. Nashelsky	Pearson Education	
3	Electronic Circuits : Analysis and Design	Donald A Neaman	McGraw Hill Companies	

SEMESTER 3

CIRCUITS & MEASUREMENTS LAB

Course Code	E25CMP310	**CIE Marks**	50
Teaching Hours/Week (L: T:P: R)	0: 0: 3: 0	**ESE Marks**	50
Credits	2	**Exam Hours**	NA
Prerequisites (if any)	Basics of Electrical Engineering	**Course Type**	Lab

Course Objectives:

1. To train the students to familiarize and practice various measuring instruments and different transducers for measurement of physical parameters.
2. Students will also be introduced to a team working environment where they develop the necessary skills for planning, preparing and implementing basic instrumentation systems

SYLLABUS

Expt. No.	Experiments
1	Verification of Superposition theorem.
2	Verification of Thevenin's theorem.
3	Determination of impedance, admittance and power factor in RLC series/ parallel circuit and to study the effect of reactive components on power factor.
4	3-phase power measurement using one-wattmeter and two-wattmeter methods, and determination of reactive/apparent power drawn.
5	Resistance measurement using Wheatstone's bridge and Kelvin's double bridge.
6	Extension of instrument range using instrument transformers (CT and PT).
7	Calibration of 1-phase Energy meter at various power factors (minimum 3 conditions).
8	Calibration of 3-phase Energy meter using standard wattmeter.
9	Measurement of self inductance, Mutual inductance and Coupling coefficient of a 1-phase transformer.
10	Measurement of Capacitance/ Inductance/ frequency using AC bridges.
11	Determination of characteristics of Thermal sensors: Thermistor, Thermocouple and RTD.
12	Determination of P-V characteristics of solar PV array and determination of fill factor (study of partial shading may be included).
13	Determination of insulation resistance and earth resistance.
14	Calibration of meters (Ammeter/Voltmeter) using Potentiometers.
15	Determination of characteristics of transducers: LVDT and Strain gauge.

*Carryout Minimum 12 Experiments

Course Assessment Method
(CIE: 50 Marks, ESE: 50 Marks)

Continuous Internal Evaluation Marks (CIE):

Preparation/Pre-Lab Work, Viva, and Timely Lab Reports (Continuous Assessment)	Internal Examination	Total
30	20	50

End Semester Examination Marks (ESE)

Procedure/ Preparatory work/ Design/ Algorithm	Conduct of experiment/ Execution/ Troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)	WKs Addressed	SDG
CO1	Apply circuit laws, theorems, and measurement techniques to analyze and validate the performance of electrical networks, components, and power measurement systems.	Analyze	WK1, WK2, WK3, WK6	12
CO2	Demonstrate proficiency in the use, calibration, and testing of electrical instruments, sensors, and transducers to evaluate circuit and system parameters under different operating conditions.	Analyze	WK1, WK2, WK3, WK6	
CO3	Work in groups as member with professional ethics while conducting experiments and effectively communicate through orally and written reports.	Understand	WK9	

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2								2
CO2	3	3	2								2
CO3								3	3		

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	A course in Electrical and Electronic Measurements & Instrumentation	A. K. Sawhney	Dhanpat Rai Publishers	
2	A course in Electrical & Electronic Measurement & Instrumentation	J. B. Gupta	S. K. Kataria & Sons Publishers	
3	Electronic Instrumentation	Kalsi H. S.	Tata McGraw Hill, New Delhi.	3

SEMESTER S3 – 2025 Scheme

STRATEGIC COMMUNICATION AND DOCUMENTATION IN ENGINEERING PRACTICE

Course Code	A25AET306	**CIE Marks**	50
Teaching Hours/Week (L:T:P:R)	2:0:0:0	**ESE Marks**	0
Credits	2	**Exam Hours**	Nil
Prerequisites (if any)	-	**Course Type**	Theory

Course Objective:

1. Develop proficiency in advanced professional and technical communication required in engineering and workplace contexts.
2. Develop the ability to organize, analyze, interpret, and present technical information effectively.
3. Develop competence in professional writing, research-oriented writing, and preparation of technical reports.
4. Strengthen team communication, leadership, negotiation, interview, and professional presentation skills.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Advanced Professional Language and Communication** **Advanced Language Use** Appropriate use of tenses, adjectives and adverbs in professional contexts. Technical vocabulary and appropriate use of jargon; abbreviations in technical communication. Editing mechanics: punctuation, proofreading, language accuracy, clarity and coherence. **Professional Communication** Professional and business correspondence; job application letter, resume and statement of purpose, with emphasis on engineering-specific and role-targeted formats. ATS (Applicant Tracking System) optimisation techniques, LinkedIn profile writing, and cover-letter drafting. Professional writing for engineering and workplace contexts. **Task-Based Activities** Editing and proofreading exercises; professional correspondence; ATS-optimised resume tailored to a specific engineering job posting; cover-letter and LinkedIn-summary drafting; peer recruiter-style resume review; context-based language exercises.	7
2	**Research, Information Analysis and Technical Writing** **Research and Analysis** Analysing and synthesising technical information from newspapers, magazines, articles and electronic content. Writing an introduction and literature review based on relevant technical information. **Organisation of Information** Systematic organisation of objective-oriented information for different technical reports. Questionnaire preparation for collection of relevant information. **Data Interpretation and Visual Communication**	7

	Interpretation of data presented through graphs, tables, charts, imagery and infographics. Converting information between textual and visual forms. **Task-Based Activities** Analysis of technical information; introduction and literature-review writing; questionnaire preparation; data interpretation and transcoding exercises.	
3	**Technical Report Preparation and Documentation** **Fundamentals of Technical Reports** Purpose, characteristics and major types of reports. organization of reports: title, preface, acknowledgement, abstract/summary, introduction, materials and methods, results, discussion, conclusion and suggestions/recommendations. **Report Preparation** Collection of information, preparation of an outline, organisation of content and drafting of technical reports. Supplementary components: appendix, index, glossary, references, bibliography and notes. Review of reports for structure, content, style, layout, clarity, coherence and referencing. **Task-Based Activities** Identification of report types and structure; drafting sections of technical reports; organisation of supplementary material; review and editing of completed reports.	8
4	**Team, Leadership and Professional Presentation** **Team and Leadership Communication** Advanced workplace communication: negotiation strategies, leadership styles, and conflict de-escalation in professional contexts. Collaborative interaction and cross-functional team management in engineering workplaces. **Professional Interaction** Participation in professional meetings and structured group interaction. Advanced interview communication in professional and technical contexts, including panel interviews and combined technical-HR interview formats. **Technical Presentation** Planning, organising and digitally presenting technical reports and professional information. Effective presentation of technical content and response to audience interaction. **Task-Based Activities** Negotiation role-play between cross-functional teams; conflict de-escalation simulation; leadership-rotation task within group projects; cross-functional meeting simulation; panel-style mock interview combining technical and HR rounds; video-recorded self-review of interview performance; planning and digital presentation of a technical report.	8

Course Assessment Method (CIE: 50 Marks)

Assignments / Quiz / Language & Editing Tasks	Professional / Research Writing Activities	Technical Report Preparation	Professional Interaction / Presentation	Total
10	10	15	15	50

Course Outcomes (COs)

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

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Apply appropriate language, editing, and professional communication practices in engineering and workplace contexts.	K3
CO2	Apply technical writing practices to organize technical information, interpret data, and communicate information in textual and visual forms.	K3
CO3	Apply appropriate content organization, documentation and referencing conventions in technical report preparation	K3
CO4	Demonstrate effective communication in teamwork, leadership, negotiation and professional interactions, and deliver clear digital presentations of technical reports.	K3

Note: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, and K6 – Create

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1				1		2		3		1
CO2	2	2		1	2		1		3		2
CO3	1	1		1	1		1		3		2
CO4					2		2	3	3	1	1

Mapping level: 1 – Low, 2 – Moderate, 3 – High

Reference Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher
1	Technical Communication: Principles and Practice	Meenakshi Raman & Sangeeta Sharma	Oxford University Press
2	Effective Technical Communication	M. Ashraf Rizvi	McGraw Hill Education
3	Practical English Usage	Michael Swan	Oxford University Press

SEMESTER S3
ENVIRONMENTAL SCIENCE

Course Code	G25EST307	**CIE Marks**	40
Teaching Hours/Week (L:T:P:R)	1:0:0:0	**ESE Marks**	60
Credits	0	**Exam Hours**	2 Hrs. and 30 Mins.
Prerequisites (if any)		**Course Type**	Theory

Course Objective:

1. To understand environmental systems, biodiversity, natural resources, pollution, and their conservation and management.
2. To develop awareness of sustainability, climate change, renewable energy, green technologies, and sustainable development practices.

SYLLABUS

Module No.	Description	Contact Hours
1	Environment, ecosystem structure and functions, energy flow, food chains, food webs, ecological pyramids, biogeochemical cycles, ecosystem services, biodiversity, threats, in-situ and ex-situ conservation.	6
2	Causes and Effects of Water, Soil, Air and Noise Pollutions, Environmental Quality Standards Solid Waste, Hazardous Waste, and E-Waste Management; Cleaner Production Techniques	6
3	Sustainability: Concept, Need, and Challenges; Economic, Social, and Environmental Dimensions of Sustainability; Transition from Unsustainable to Sustainable Development; Sustainable Development Goals (SDGs) – Targets, Indicators, and Intervention Areas. Climate change- Global, Regional and local environmental issues and possible solutions Concept of Carbon Credit and Carbon Footprint.	6
4	Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles- carbon cycle, emission and sequestration. Green Engineering: Sustainable urbanization- Socio-economic and technological change.	6

Course Assessment Method (CAE: 40 Marks, ESE: 60 Marks)

Continuous Assessment and Evaluation Marks (CAE):

Assignment	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Internal Examination- 3 (Written)	Total
15	30	30	30	40
	A total of 90 marks will be scaled to 25			

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
2 Questions from each module. Total of 8 Questions, each carrying 3 marks (8x3 =24marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 9 marks (4x9 = 36 marks)	60

Course Outcomes (Cos)

At the end of the course students should be able to:

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Explain the fundamental concepts of environment, ecosystems, biodiversity, and ecological processes, and evaluate the importance of biodiversity conservation.	2
CO2	Identify the causes and effects of environmental pollution and waste management practices, and interpret relevant environmental regulations.	2, 3
CO3	Apply the principles of sustainability, climate change mitigation, carbon management, and environmental management to support sustainable development goals.	2,3
CO4	Apply the principles of circular economy, environmental impact assessment, green technologies, sustainable energy, and sustainable urbanization for environmental protection and resource conservation.	2,3

Note: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, and K6 – Create

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2					3								
CO2	2					3								
CO3	2					3								
CO4	2					3								

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Perspectives in Environmental Studies	Anubha Kaushik, C.P. Kaushik	New Age International Publishers	7th Edition, 2024
2	Environmental Science and Engineering	Benny Joseph	McGraw Hill Education India	3rd Edition, 2017
3	Introduction to Environmental Engineering and Science	Gilbert M. Masters, Wendell P. Ela	Pearson Education	3rd Edition, 2008

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Sustainability Engineering: Concepts, Design and Case Studies	David T. Allen, David R. Shonnard	Pearson / Prentice Hall	2nd Edition, 2011
2	Engineering Applications in Sustainable Design and Development	Bradley A.S., Adebayo A.O., Maria P.	Cengage Learning	1st Edition, 2015
3	Environmental Impact Assessment Notification and Guidelines	Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India	Government of India	Latest Amendment Version
4	Basic Concepts in Environmental Management	Kenneth M. Mackenthun	Lewis Publishers	Reprint Edition
5	Environmental Science: A Global Concern	William P. Cunningham, Mary Ann Cunningham	McGraw Hill Education	15th Edition, 2021

Video Links (NPTEL, SWAYAM, etc.)

Module No.	Link
1	https://nptel.ac.in/courses/105105157
2	https://nptel.ac.in/courses/102104001

B.Tech. 2025 – S3 EEE

ENGINEERING DESIGN AND INNOVATION STUDIO - I

Course Code	A25EDR339	**CIE Marks**	50
Teaching Hours/Week (L:P)	0: 0 : 0 : 2	**ESE Marks**	–
Credits	1	**Exam Hours**	2 Hrs (Lab Exam)
Prerequisites (if any)	NIL	**Course Type**	Project-Based / Skill Enhancement

Course Objectives:

1. To develop practical competence in building IoT systems using ESP8266/ESP32, applying real-time sensor data transmission via MQTT and cloud integration for remote monitoring and control.
2. To introduce system modelling and dynamic simulation using ETAP/PSCAD for the analysis of power systems.
3. To enable students to design, simulate, and critically evaluate engineering systems by comparing simulation outputs with expected theoretical behaviour.
4. To build interdisciplinary prototyping skills by integrating IoT hardware, cloud services, and computational simulation tools into a coherent micro-project.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**MODULE I: Internet of Things – Sensing, Connectivity & Cloud Integration** **Lab Sessions (minimum 4 must be completed and recorded):** • **Lab 1 – Real-Time Environmental Data Acquisition and MQTT Streaming** • **Lab 2 – I2C Master–Slave Communication:** Establish I2C between two ESP boards; master reads sensor data via slave • **Lab 3 – Cloud Integration (ThingSpeak / Firebase):** Connect ESP8266 to ThingSpeak/Firebase; plot live sensor graph on cloud dashboard; set threshold alert. • **Lab 4 – IoT Dashboard for Remote Monitoring and Control:** Create a multi-widget dashboard (gauge, graph, switch) on ThingSpeak or Node-RED; control an LED/relay remotely from dashboard. • **Lab 5 –Assistive Elder-Care Emergency Beacon System** using ESP32 , Bluetooth-BLE and cloud. • **Lab 6 - Real-Time Industrial system Monitoring for Predictive Maintenance System via Zigbee Mesh Network** • **Lab 7 – GPS Location Logger:** Interface NEO-6M GPS with ESP32 over UART and post latitude/longitude to ThingSpeak/Firebase.	**10 P**

2	**MODULE II: Power System Modelling, Analysis, and Transient Simulation using ETAP and PSCAD (Basic Level)** **Lab Sessions (minimum 4 must be completed and recorded):** **Lab 1 – Familiarisation with ETAP Software Interface, Component Library, and Single-Line Diagram Environment** **Lab 2 – Modelling and Configuration of a 2 Node electrical network in ETAP as per Given Specifications** **Lab 3 –Voltage change analysis on a 2 Node electrical network using ETAP: Voltage Profile and Power Distribution Study** **Lab 4 – Modelling and Configuration of a 3 Node electrical network in ETAP as per Given Specifications** **Lab 5 – Study of a 2 Node electrical network to see current build up when there is a short between the 3 phases at different locations using ETAP: Fault Current and Bus Voltage Study** **Lab 6 – Familiarisation with PSCAD Software Interface, Component Library, and Simulation Environment** **Lab 7 – Transient Response Simulation of a Series RLC Circuit using PSCAD: Voltage and Current Waveform Analysis** **Lab 8 – Transient Response Simulation of a Series RLC Circuit using PSCAD: Voltage and Current Waveform Analysis**	**10 P**

Course Assessment Method

1. **Integrated Lab Performance Report (10 Marks):**
   Students must maintain a structured laboratory log for both Module I and Module II. A comprehensive performance report covering a minimum of 8 experiments (at least 4 from IoT and 4 from ETAP /PSCAD) must be submitted at the end of the term. The assessment criteria include: (i) complete schematic/block diagrams, (ii) clean data tables with accurate readings, (iii) comparative analysis of simulated/observed outputs and (iv) qualitative engineering discussions.

2. **Literature Survey Report (10 Marks):**
   Conducted in teams of three (3) students. Each group will select a contemporary problem statement at the intersection of IoT, automation, and dynamic electrical / power systems. Deliverables include a formal A4 PDF report (max 8 pages) comprising: (i) abstract, (ii) taxonomy of existing technical solutions, (iii) rigorous comparative matrix of previous implementations, (iv) identification of specific research or technology gaps, and (v) complete bibliography indexed in a standard formatting style (e.g., IEEE).

Continuous Assessment and Evaluation Marks (CAE):

Assignment I	Assignment II	Micro-Project	Lab Examination	Total
Integrated Lab Performance Report:	Literature Survey Submission: (Submitted by a team of 3 students).	Integrated IoT / Simulation prototype with report, schematic and demonstration (Submitted by a team of 3 students).	On-spot lab task: IoT wiring/cloud , ETAP and PSCAD based modelling – completed in 2 hrs	**50 Marks**
10 Marks	**10 Marks**	**15 Marks**	**15 Marks**	**50 Marks**

Micro-Project Guidelines

Group size: 2–3 students.The micro-project must integrate at least one IoT hardware element (ESP32/ESP8266 with sensor and cloud connectivity).

Deliverables and Marks Distribution (15 Marks):

- Working prototype / simulation model (hardware + ETAB/PSCAD): **5 Marks**
- Technical report (problem statement, design, results, conclusion, references): **4 Marks**
- Live demonstration and Q&A (lab viva): **6 Marks**

Course Outcomes (COs)

At the end of the course, students should be able to:

CO No.	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Implement a complete IoT system using ESP32/ESP8266 by interfacing sensors, applying MQTT/cloud protocols, and designing a remote monitoring dashboard for real-time data acquisition and actuation.	**K3 (Apply)**
CO2	Analyze the dynamic and steady-state behavior of electrical power networks by constructing system models in software environments (ETAP/PSCAD) and validating simulation results against theoretical principles.	**K4 (Analyse)**
CO3	Design and evaluate an integrated micro-project that combines IoT hardware demonstrating functional performance, critical analysis of results, and professional documentation.	**K5 (Evaluate)**

Note: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 – Create

CO-PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	3	2	3	1	--	--	2	2	2
CO2	3	3	3	3	2	1	--	--	2	1	2
CO3	3	3	3	3	3	2	--	2	3	3	3

Text Books

Sl. No.	Title of the Book	Name of the Author/s	Publisher	Edition and Year
1	Internet of Things: A Hands-On Approach	Arshdeep Bahga & Vijay Madisetti	Universities Press	1e, 2014

2	Software Tools for the Simulation of Electrical Systems.	L. Ashok Kumar, V. Indragandhi, and Y. Uma Maheswari	Academic Press / Elsevier	2020

Reference Books

Sl. No.	Title of the Book	Name of the Author/s	Publisher	Edition and Year
1	Designing the Internet of Things	Adrian McEwen & Hakim Cassimally	Wiley	1e, 2013
2	Introduction to IoT	Sudip Misra, Anandarup Mukherjee, Arijit Roy	Cambridge University Press	2021
3	Transient Analysis of Power Systems: Solution Techniques, Tools and Applications	Juan A. Martinez-Velasco	Wiley-IEEE Press	1e, 2015

Video Links (NPTEL, SWAYAM, etc.)

Module	Resource	Link
I	NPTEL – Introduction to Internet of Things (IIT Kharagpur)	https://nptel.ac.in/courses/106105166
I	NPTEL – Cloud Computing (IIT Kharagpur)	https://nptel.ac.in/courses/106105143
I	IoT Virtual Lab – Experiments (MQTT, I2C, Cloud, Dashboard)	https://iotvirtuallab.github.io/vlab/Experiments/index.html
I	Random Nerd Tutorials – ESP32/ESP8266 Projects & Protocols	https://randomnerdtutorials.com
II	NPTEL – Modelling and Simulation of Dynamic Systems (IIT Bombay)	https://nptel.ac.in/courses/112101010
II	PSCAD/EMTDC Video Training & Knowledge Base Webinars	https://www.pscad.com/training-events/webinars
II	Free ETAP Course Online	https://www.youtube.com/watch?v=vM0y9U_b3QQ&list=PLUb-dsaDs9TNE8jLbNlTvUtA62Q-Lj7mAl
II	Power System with PSCAD	https://www.youtube.com/watch?v=rQbnLzt1QvQ&list=PL6aGbB4RiJPYgD-afxnEnZ8eWTz5iWIZo