



A CMI INSTITUTION

**CHRIST COLLEGE OF ENGINEERING
(AUTONOMOUS)**

**DEPARTMENT OF MECHANICAL
ENGINEERING**

**B. Tech. CURRICULUM AND SYLLABUS
SEMESTER 3**

CURRICULUM AND SYLLABUS

2025 REGULATION



A CMI INSTITUTION

CHRIST COLLEGE OF ENGINEERING (AUTONOMOUS)

DEPARTMENT OF MECHANICAL ENGINEERING

CURRICULUM AND SYLLABUS 2025 REGULATION (SEMESTER 3)

Approved by BoS meeting held on: 16-06-2026

Approved by Academic Council meeting held on: 23-06-2026

BoS Chairperson

Dr. Viswanath K. Kaimal
CHAIRPERSON
Board of Studies
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Principal

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Christ College of Engineering
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THIRD SEMESTER: Mechanical Engineering															
Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit				SS	Total		Credits	Hrs./Week	
						L	T	P	R		CAE	ESE			
THEORY															
1	A	G25MAT321	BS	GC	Complex analysis, Partial differential equations and Transforms	2	1	0	0	3.5	40	60	3	3	
2	B	M25FMR302	PC-PBL*	PC	Fluid Mechanics and Machinery	2	1	0	1	4.5	60	40	4	4	
3	C	M25SMT303	PC	PC	Solid Mechanics	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	A25SDT306	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	M25CDP308	PC	PC	Computer Aided Machine Drawing Lab	0	0	3	0	1.5	50	50	2	3	
9	I	A25EDR309	SE	CC	Engineering Design and Innovation Studio (EDIS-I)	0	0	0	2	2	50	-	1	2	
10	J	M25MTP310	PC	PC	Materials Testing 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										28/33*			24/28*	27/31*	

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

SEMESTER S3**COMPLEX ANALYSIS, PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS**

Course Code	G25CDT321	CAE Marks	40
Teaching Hours/Week (L:T:P:R)	2:1:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. and 30 Mins.
Prerequisites (if any)		Course Type	

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 $w = z^2$, $w = e^z$, $w = 1/z$, $w = \sin z$.	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 Assessment Method
(CAE: 40 Marks, ESE: 60 Marks)

Continuous Assessment and Evaluation (CAE):

Assignment (Application Based)	Continuous Evaluation Test - I (CET - I)	Continuous Evaluation Test - II (CET - II)	Continuous Evaluation Test - III (CET - III)	Total
15	30	30	30	40
	A total of 90 marks will be scaled to 25			

End Semester Examination Marks (ESE)

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

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	PSO1	PSO2
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								

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	10 th 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	3 rd edition, 2015
2	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education	39 th edition, 2023
3	Fast Fourier Transform - Algorithms and Applications	K.R. Rao, Do Nyeon Kim, Jae Jeong Hwang	Springer	1 st edition, 2011
4	Advanced Engineering Mathematics	Peter V. O'Neil	Cengage	7th Edition, 2012

SEMESTER 3

FLUID MECHANICS AND MACHINERY

Course Code	M25FMR302	CAE Marks	60
Teaching Hours/Week (L:T:P:R)	2:1:0:1	ESE Marks	40
Credits	4	Exam Hours	2 Hrs. and 30 Mins.
Prerequisites (if any)	Nil	Course Type	Theory

Course Objective:

- To establish fundamental knowledge of fluid mechanics and its applications.
- To familiarize students to find solutions to engineering problems and understand the relevance of turbomachines.

SYLLABUS

Module No.	Description	Contact Hours
1	Definition of Fluid and Continuum. Fluid Properties and Types of Fluids. Statics -Pascal's Law and Hydrostatic Pressure. Manometry: U-tube, differential manometers. Hydrostatic Forces on plane and inclined surfaces, Buoyancy and Stability of Submerged and Floating Bodies, Centre of Buoyancy.	12
2	Fluid Flow: Lagrangian and Eulerian approaches. Types of Flow: steady/unsteady, uniform/non-uniform, laminar/turbulent, rotational/irrotational. Concept of Control Volume: Material Derivative, and Acceleration of a Fluid Particle. Streamlines, Pathlines, Streaklines, Stream Function and Velocity Potential Function Bernoulli's Equation and Applications: Venturimeter, Orificemeter, Pitot Tube. Momentum Equation and Applications: forces on pipe bends. Introduction to Navier-Stokes Equations.	12
3	Viscous Flow in Pipes: Laminar and Turbulent flow: Hagen-Poiseuille Equation. Turbulent flow: Darcy-Weisbach Equation, friction factor, Use of Moody Chart, Major and Minor Losses. Dimensional Analysis: Buckingham π Theorem and its application, Non-dimensional Numbers, Model Laws and Similarity. Boundary Layer Theory: Laminar and turbulent boundary layers. Boundary layer thickness, Boundary Layer Separation, and control methods.	12
4	Hydraulic Turbines: Classification and working: Pelton wheel, Francis turbine and Kaplan turbine. Specific Speed and Selection of Turbines. Pumps: Types, Working principle, developed, Pump output and efficiency. Priming, Cavitation and prevention. Pump performance, and characteristics.	12

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

Continuous Assessment and Evaluation (CAE):

Assignment (Application based)	Continuous Evaluation Test - I (CET - I)	Continuous Evaluation Test - II (CET - II)	Continuous Evaluation Test - III (CET - III)	Project	Total
15	30	30	30	20	60
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 2 marks (8 x 2 = 16 Marks)	- Each question carries 6 marks. - Two questions will be given from each module, out of which 1 question should be answered. - Each question can have a maximum of 2 subdivisions. (4 x 6 = 24 Marks)	40

Course Outcomes (Cos)

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

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Identify the fundamental fluid properties, their relationships and apply them to estimate the fluid pressure and hydrostatic forces on bodies.	1, 2, 3
CO2	Classify the fluid flow and apply the principles of kinematics and dynamics using the conservation of mass and momentum equations.	2, 3
CO3	Analyse viscous flow through pipes and estimate the major and minor losses associated with the piping network.	2, 3
CO4	Select suitable turbomachine for specific application by identifying the pertinent parameters.	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	3	3	-	-	-	-	-	-	-	-	-			
CO2	3	3	2	-	-	-	-	-	-	-	-			
CO3	3	3	2	-	2	-	-	-	-	-	-			
CO4	3	2	-	-	-	2	-	-	-	-	2			

Text Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	Introduction to Fluid Mechanics and Fluid Machines	Som S. K., Gautam Biswas, Chakraborty S.	McGraw-Hill	2017
2	Fluid Mechanics: Fundamentals and Applications	Yunus A. Çengel and John M. Cimbala	McGraw Hill	4 th Edition, 2019

Reference Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	Introduction to Fluid Mechanics	Fox and McDonald	Wiley	10 th Edition, 2020
1	Fluid Mechanics	White F.M.	Tata McGraw Hill	2003
2	Engineering applications of fluid dynamics	Fisher and Henley	Willford Press	2023

Video Links (NPTEL, SWAYAM, etc.)

Module No.	Link
Module - I	Fluid Statics - https://www.youtube.com/watch?v=rY7bvZn75Do&list=PLwdnzlV3ogoWrAmpEcsPXayfsXnFfYY1O&index=4 Bouyancy, Metacentre and stability - https://www.youtube.com/watch?v=gMuucNxc7eI&list=PLwdnzlV3ogoV-ATGY2ptuLS9mwLFOJoDw&index=7&pp=iAQB

Module - II	Fluid kinematics - https://www.youtube.com/watch?v=rY7bvZn75Do&list=PLwdnzlV3ogoWrAmpEcsPXayfsXnFfYY1O&index=4
Module - III	Internal viscous flow - https://www.youtube.com/watch?v=qLx7ip0eBps&list=PLCoE5wxWtHFYiVGswvsWRaHjv18vxZzE2&index=17
Module - IV	Introduction to turbomachines - https://www.youtube.com/watch?v=ocVzrn4DLj8&list=PLbMVogVj5nJQQp3QLuzbcHrt0XncZZTiE&index=2



SEMESTER S3

SOLID MECHANICS

Course Code	M25SMT303	CAE Marks	40
Teaching Hours/Week (L:T:P:R)	2:1:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. and 30 Mins.
Prerequisites (if any)	Basic knowledge in Engineering Mechanics	Course Type	Theory

Course Objectives

1. To introduce fundamental concepts of stress, strain, and deformation of solids and apply them in structural analysis and design. (*Bloom's: Remember, Understand, Apply*)
2. To design and analyse structural and machine components subjected to bending, torsion, and axial loads. (*Bloom's: Apply, Analyse, Evaluate*)

SYLLABUS

Module No.	Description	Contact Hours
1	Fundamentals of Stress and Strain: Concept of stress and strain; normal and shear stress; Hooke's law; elastic constants and their relationships; Poisson's ratio; stress-strain diagrams; thermal stresses; compound bars. Plane stress and plane strain, principal stresses, and Mohr's circle. Determination of principal stresses using Mohr's circle.	12
2	Shear Force, Bending Moment, and Bending Stress: Types of beams, supports and loads; shear force and bending moment diagrams of Cantilever and Simply supported beam with Point load/UDL; relation between load, shear force and bending moment; Point of Inflection. Theory of simple bending; bending equation; section modulus; flexural rigidity; problems for rectangular section only; shear stress in beams; comparison of sections for strength and economy (<i>basic concepts only</i>).	14
3	Torsion and Deflection of Beams: Torsion of circular shafts, torsion theory – assumptions and limitations; polar modulus, torsional rigidity; power transmission; shaft design for torsional load; deflection of beams; Moment-curvature relation – assumption and limitations; double integration method; Macaulay's method; strain energy and resilience (<i>self-study</i>).	11
4	Columns and Pressure Vessels: Buckling and stability of columns – Euler's critical/buckling load for various end conditions; slenderness ratio and limitations; Rankine's formula; Thin and thick cylinders – hoop and longitudinal stresses. Failure theories and real-world case study on failures due to various engineering stresses (for internal assessment only).	11

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

Continuous Assessment and Evaluation (CAE):

Assignment (Activity based)	Assignment (Activity based)	Continuous Evaluation Test - I (CET - I)	Continuous Evaluation Test - II (CET - II)	Continuous Evaluation Test - III (CET - III)	Total
10	10	30	30	30	
		A total of 90 marks will be scaled to 20			40

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:

CO No.	Description	Bloom's Level
CO1	Apply the concept of solid mechanics to determine the stresses and strains in deformable bodies subjected to various external loads and thermal effects.	K3
CO2	Analyse shear force, bending moment, and bending stress in beams subjected to transverse loads.	K4
CO3	Analyse torsional behaviour of shafts and deflection beams.	K3, K4
CO4	Evaluate stresses and failure conditions in columns and pressure vessels.	K4
CO5	Model a simple load-bearing member or structural component using ANSYS software and evaluate the results.	K4, K5

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.	3	3	–	–	–	–	–	–	–	–	–	3	–	–
CO2	3	3	–	–	–	2	–	–	–	–	–	3	–	–
CO3	3	3	2	–	–	–	–	–	–	–	–	3	–	–
CO4	3	3	2	–	–	–	–	–	–	–	–	3	–	–
CO5.	3	3	–	–	3	2	–	3	3	–	–	3	–	3

Text Books

Sl. No.	Title of the Book	Author(s)	Publisher	Edition/Year
1	Mechanics of Materials	Beer, Johnston, DeWolf, Mazurek	McGraw Hill	7 th Edn., 2014
2	Engineering Mechanics of Solids	E.P. Popov	Pearson Education	3 rd Edn., 2015
3	Strength of Materials	R.K. Bansal	Laxmi Publications	6 th Edn., 2018

Reference Books

Sl. No.	Title	Author(s)	Publisher	Edition/Year
1	Mechanics of Materials	R.C. Hibbeler	Pearson Education	10th Ed., 2022
2	Advanced Mechanics of Solids	L.S. Srinath	Tata McGraw Hill	3rd Ed., 2008
3	Strength of Materials	W.A. Nash	Schaum's Outline Series	4th Ed., 2007

Video Links (NPTEL, SWAYAM, etc.)

Module No.	Link
1	Strength of Materials - Prof. S.K. Mondal (NPTEL IIT Kharagpur) — https://onlinecourses.nptel.ac.in/noc24_me03/preview
2	Mechanics of Solids - Prof. S.R. Gandhi (NPTEL IIT Bombay) — https://onlinecourses.nptel.ac.in/noc23_ce04/preview
3	Strength of Materials - Prof. K. Ramesh (NPTEL IIT Madras) — https://onlinecourses.nptel.ac.in/noc24_me16/preview
4	Introduction to Finite Element Method - Prof. P. Seshu (NPTEL IIT Hyderabad) — https://onlinecourses.nptel.ac.in/noc24_me14/preview
5	ANSYS Tutorials for Beginners - YouTube (CAD/CAM Tutorials Channel) — https://www.youtube.com/watch?v=oypXQkIRK6E

SEMESTER S3**INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND
DATA SCIENCE**

Course Code	A25AIT304	CAE Marks	40
Teaching Hours/Week (L:T:P:R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. and 30 Mins.
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.	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
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Course Assessment Method (CAE: 40 marks, ESE: 60 marks)

Continuous Assessment and Evaluation (CAE):

Assignment (Application Based)	Continuous Evaluation Test - I (CET - I)	Continuous Evaluation Test - II (CET - II)	Continuous Evaluation Test - III (CET - III)	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)	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. (4x9 = 36 marks)	60

Course Outcomes (COs)

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

	Course Outcomes	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

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	2 nd edition, 2018
2	Probability and Statistics for Data Science	Carlos Fernandez- Granda	Center for Data Science in NYU	1 st edition, 2017
3	Foundations of Data Science	Avrim Blum, John Hopcroft, and Ravi Kannan	Cambridge University Press	1 st edition, 2020
4	Statistics for Data Science	James D. Miller	Packet Publishing	1 st edition, 2019
5	Probability and Statistics - The Science of Uncertainty	Michael J. Evans and Jeffrey S. Rosenthal	University of Toronto	1 st 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	CAE Marks	40
Teaching Hours/Week (L:T:P:R)	2:0:0:0	ESE Marks	60
Credits	2	Exam Hours	2 Hrs. and 30 Mins.
Prerequisites (if any)	-	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.	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).	06
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.	06

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	06
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. 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).	06

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

Continuous Assessment and Evaluation (CAE):

Assignment (Application Based)	Continuous Evaluation Test - I (CET - I)	Continuous Evaluation Test - II (CET - II)	Continuous Evaluation Test - III (CET - III)	Total
15	30	30	30	40
	A total of 90 marks will be scaled to 25			

End Semester Examination Marks (ESE)

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:

CO No.	Description	Blooms 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, and K6 – Create

CO-PO Mapping

	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

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	9 th Edition, 2024

2	Fundamentals of Engineering Economics	Chan S. Park	Pearson Education	5 th Edition, 2022
3	Principles of Economics	N. Gregory Mankiw	Cengage Learning	10 th Edition, 2024
4	Engineering Economy	William G. Sullivan, Elin M. Wicks & C. Patrick Koelling	Pearson	17 th 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 S3**STRATEGIC COMMUNICATION AND DOCUMENTATION IN
ENGINEERING PRACTICE**

Course Code	A25SDT306	CAE 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, analyse, 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.	7

Module No.	Syllabus Description	Contact Hours
	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 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 (CAE: 50 Marks)**Continuous Assessment and Evaluation (CAE):**

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	CAE Marks	40
Teaching Hours/Week (L:T:P:R)	1:0:0:0	ESE Marks	60
Credits	1	Exam Hours	2 Hrs. and 30 Mins.
Prerequisites (if any)	G25MCT105	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 (CAE):

Assignment (Activity based)	Assignment (Activity based)	Continuous Evaluation Test - I (CET - I)	Continuous Evaluation Test - II (CET - II)	Continuous Evaluation Test - III (CET - III)	Total
10	10	30	30	30	
		A total of 90 marks will be scaled to 20			40

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 question from each module - 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:

CO No.	Description	Blooms 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	7 th Edition, 2024
2	Environmental Science and Engineering	Benny Joseph	McGraw Hill Education India	3 rd Edition, 2017
3	Introduction to Environmental Engineering and Science	Gilbert M. Masters, Wendell P. Ela	Pearson Education	3 rd 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



Semester S3

COMPUTER AIDED MACHINE DRAWING AND MODELLING
LAB

Course Code	M25CDP308	CAE Marks	40
Teaching Hours/Week (L:T:P:R)	0-0-3-0	ESE Marks	60
Credits	2	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	Engineering Graphics, Engineering Drawing	Course Type	Practical

Course Objective:

- To introduce modern CAD packages for drafting and modelling of engineering components.
Bloom's Levels: Remember, Understand, Apply Analyse, Evaluate, Create
- To learn the conventions of dimensioning, Tolerancing, and the application of GD&T in machine design and drafting. *Bloom's Levels: Remember, Understand, Apply Analyse, Evaluate, Create*

LIST OF EXPERIMENTS (Any 10 out of 12)

Exp. No.	Title of Experiment	Software / Tool Used
1	Introduction to drafting & modelling software - basic commands, keyboard shortcuts. Coordinate and unit setting, Drawing, Editing, Measuring, Dimensioning, Plotting Commands, Layering Concepts, Matching, Detailing, Detailed drawings, 3D modelling, Assembly & Surface Design Tools	Any CAD Software
2	Drawing different types of rigid shaft couplings used for connecting shafts with collinear axes using 2D drafting software (Flange Coupling, Protected Flange Coupling etc)	Any CAD Software
3	Fits and Tolerances: Limits, Fits – Tolerances of individual dimensions – Specification of Fits – basic principles of geometric & dimensional tolerances - Preparation of detailed drawings with limits, fits, and GD & T. Surface Roughness: Preparation of production drawings and reading of part and assembly drawings, surface roughness, indication of surface roughness,	Any CAD Software
4	Creating a 2D Assembled Drawing with required Sectional Views (Screw Jack or Plummer Block)	Any CAD Software
5	Creating a 2D Assembled Drawing with required Sectional Views and prepare BOM (Steam Stop Valve)	Any CAD Software
6	Creating a simple MEP layout with required symbols & dimensions	Any CAD Software
7	Creating a simple Piping Isometric Drawing with required symbols & dimensions	Any CAD Software

8	Creating 3D assembly model of Screw jack	Any CAD Software
9	Creating 3D assembly model and detailing of Body in white (BIW) fixture parts or a Pressure Vessel .	Any CAD Software
10	Modeling of surfaces of the given geometry like helmet, mouse, fender of automobiles etc	Any CAD Software
11	Parametric Modeling of standard parts such as nuts, bolts, rivets, washers etc	Any CAD Software
12	Creating Sheet metal modelling of standard parts	Any CAD Software

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

Continuous Assessment and Evaluation (CAE):

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:

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Apply the knowledge of engineering drawings to interpret 2D drawings and model them using software.	K3
CO2	Prepare standard assembly models and drawings of machine components using part drawings	K1
CO3	Practice GD & T in models as well as drawings	K2
CO4	Apply parameterisation for the quick Modelling of standard parts	K3
CO5	Model external surfaces & Sheet metal design of common objects	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	PSO1	PSO2	PSO3
CO1	3		2		3				2					2
CO2	3		2		3				2					2
CO3	3		2		3				2					2
CO4	3		2		3				2					2
CO5	3		2		3				2					2

Text Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	Machine Drawing	K.L. Narayana, P. Kannaiyah, K. Venkata Reddy	New Age International	4th Edition, 2020
2	Machine Drawing	N.D. Bhatt	Charotar Publishing	53rd Edition, 2022
3	Engineering Drawing and Design	David A. Madsen & David P. Madsen	Cengage	7th Edition, 2021

Reference Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	AutoCAD for Mechanical Design	Prof. Sham Tickoo	Purdue University Press	2021
2	Engineering Graphics with AutoCAD	James D. Bethune	Pearson	6th Edition, 2019
3	CATIA V5 Workbook	Richard Cozzens	SDC Publications	2nd Edition, 2020

Video Links (NPTEL, SWAYAM, etc.)

Module No.	Link
1	Engineering Drawing and Computer Graphics – IIT Roorkee https://nptel.ac.in/courses/112107147
2	Computer Aided Design and Manufacturing – IIT Kharagpur https://onlinecourses.nptel.ac.in/noc25_me63/preview

3	CAD Modelling for Mechanical Design – IIT Bombay https://swayam.gov.in/nd1_noc24_me54/preview
4	3D Modelling and Assemblies using SolidWorks – YouTube NPTEL https://www.youtube.com/watch?v=2cbY8YbUjWQ
5	Geometric Dimensioning and Tolerancing (GD&T) – IIT Delhi https://nptel.ac.in/courses/112107221



Semester S3**ENGINEERING DESIGN AND INNOVATION STUDIO - I**

Course Code	A25EDR309	CAE Marks	50
Teaching Hours/Week (L:P)	0:0:0:2	ESE Marks	—
Credits	1	Exam Hours	2 Hrs (Lab Exam)
Prerequisites (if any)	A25ILE211	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 MATLAB/Simulink and Simscape for the analysis of physical, mechanical, and electrical engineering 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 – MQTT Live Sensor Streaming: Interface DHT22 with ESP32 • Lab 2 – I2C Master-Slave Communication: Establish I2C between two ESP boards; master reads sensor data via slave; display on master Serial Monitor. Establishing master-slave model using I2C Protocols. • Lab 3 – Cloud Integration (ThingSpeak / Firebase): Connect ESP8266 to ThingSpeak; plot live sensor graph on cloud dashboard; set threshold alert. Optionally write to Firebase node • 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 via MQTT command from dashboard. • Lab 5 – Gesture-Controlled IoT System: Bluetooth-Based Gesture Control System using ESP32	15 P

	• Lab 6 – Voice-Controlled IoT using Sinric Pro: Register ESP8266 on Sinric Pro; control a relay/LED via Google Assistant voice commands; observe cloud log of switch events. • Lab 7 – GPS Location Logger: Interface NEO-6M GPS with ESP32 over UART; parse NMEA \$GPRMC sentence; post latitude/longitude to ThingSpeak. Assignment I – IoT Lab Report (10 Marks): Students select any 4 completed lab experiments. For each, they submit: (i) labelled circuit/block diagram, (ii) annotated screenshots of simulation or cloud dashboard output, (iii) data table of at least 10 readings, (iv) a half-page analysis comparing observed results with expected behaviour, and (v) one proposed improvement. Submission format: A4 PDF report, max 6 pages.	
2	MODULE II: System Modelling and Analysis using MATLAB/Simulink & Simscape Lab Sessions (minimum 4 must be completed and recorded): • Lab 1 – Mass-Spring-Damper System • Lab 2 – Inverted Pendulum Stabilisation • Lab 3 – Solar PV I-V & P-V Characteristic Curves • Lab 4 – Stress-Strain Curve Analysis • Lab 5 – Forced Vibration Response of a Mechanical System • Lab 6 – Vehicle on Inclined Surface • Lab 7 – ML Classification using MATLAB. Assignment II – Simulation Analysis Report (10 Marks): Students select any 4 completed lab experiments from Module II. For each, submit: (i) Simulink/Simscape block diagram screenshot, (ii) clearly labelled output plots (minimum 2 per experiment), (iii) tabulated results comparing simulation output with theoretical values, (iv) a half-page discussion on model assumptions, limitations, and sources of error, and (v) one design suggestion to improve system performance. Submission format: A4 PDF report, max 6 pages.	15 P

Course Assessment Method

Continuous Assessment and Evaluation (CAE: 50 Marks)

Assignment I (Module I)	Assignment II (Module II)	Micro-Project (Both Modules)	Lab Examination	Total
IoT Report: circuit	Simulink/Simscape Analysis Report:	Integrated IoT + Simulation	On-spot lab task: IoT	50 Marks

diagram, dashboard screenshots, data table, analysis	block diagrams, labelled plots, comparative results	prototype with report, schematic and demonstration	wiring/cloud OR Simulink modelling – completed in 2 hrs	
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 + Simulink): **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	Analyse the dynamic behaviour of mechanical, structural, and energy systems by building mathematical models in MATLAB/Simulink and Simscape, and interpreting simulation results against theoretical expectations.	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	MATLAB/Simulink for Dynamic System Analysis and Control	William J. Palm III	McGraw-Hill	4e, 2019
3	System Dynamics	William J. Palm III	McGraw-Hill	3e, 2014

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	1 st e, 2013
2	Practical Electronics for Inventors	Paul Scherz & Simon Monk	McGraw-Hill	4 th e, 2016
3	Engineering Mechanics of Solids	E.P. Popov	Pearson Education	3 rd e., 2015
4	Mechanics of Materials	Beer, Johnston, DeWolf, Mazurek	McGraw Hill	7 th e., 2014

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	MathWorks MATLAB/Simulink Onramp (Free Official Training)	https://matlabacademy.mathworks.com/details/simulink-onramp/simulink
II	MathWorks Simscape Physical Modelling Series	https://www.mathworks.com/videos/series/simscape-multibody-fundamentals.html
II	MATLAB Classification Learner App – Official Tutorial	https://www.mathworks.com/help/stats/classificationlearner-app.html

SEMESTER S3

MATERIAL TESTING LAB -1

Course Code	M25MTP310	CAE Marks	50
Teaching Hours/Week (L:T:P:R)	0:0:3:0	ESE Marks	50
Credits	2	Exam Hours	2 Hrs. and 30 Mins.
Prerequisites (if any)	Engineering Mechanics	Course Type	Lab

Course Objective:

1. To provide hands-on experience for the students to determine the material properties
2. To impart the knowledge of material properties to identify and make use of it in various fields of engineering

SYLLABUS

Expt. No.	Experiments
1	Test on mild steel rod specimen – uniaxial tension test (Universal Testing Machine)
2	Shear Test on mild steel rod specimens (Universal Testing Machine & Shear Shackle)
3	Torsional behaviour and estimation of modulus of rigidity of steel by conducting torsion test on rod specimen
4	Estimation of toughness of steel specimens by conducting (a) Izod & (b) Charpy impact tests.
5	Estimation of hardness properties of engineering materials such as brass, aluminium, copper, steel etc. by performing Brinell Hardness test, Rockwell Hardness test and Vicker's Hardness test
6	Estimation of modulus of rigidity of steel by performing tension and compression tests on spring specimen
7	Flexural behaviour of timber material by performing bending tests on beam specimen
8	Compression test on timber

Expt. No.	Experiments
9	Flexural behaviour of steel by conducting bending test on Rolled Steel I Section
10	Experiment on verification of Maxwell's reciprocal theorem
11	Torsion test on wires
12	Demonstration of Fatigue Test
13	Microstructure of mild steel/copper/ brass/aluminium using optical microscope, double disc polishing machine, emery papers and etchant.
14	Analyse the fracture surface morphology of a ductile or brittle material using an optical microscope for fractographic characterisation.
15	Evaluate the fracture toughness of a material with a Universal Testing Machine (UTM)
16	To study the procedure for plotting S-N curve using Fatigue testing machine
17	Measure the deformation (strain) of an object using strain gauges.

**Course Assessment Method
(CAE: 50 Marks, ESE: 50 Marks)**

Continuous Assessment and Evaluation (CAE):

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:

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Analyze the behavior of engineering materials under different loading conditions, identifying material responses and failure modes	K4
CO2	Determine and interpret the properties of engineering materials using relevant laboratory techniques	K4
CO3	Assess the strength, stiffness, and toughness parameters of materials, demonstrating critical analysis	K4

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

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	3		2	2	2	2	3	2		2	2	2	2
CO2	2	3		2	2	2	2	3	2		2	2		2
CO3	2	3		2	2	2	2	3	2		2	2		

Text Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	History of Strength of Materials	S.P. Timoshenko	Dover publications	2003
2	Engineering Mechanics of Solids	Egor P. Popov	Pearson	2015
3	IS 1500/1501/1586: Methods for Brinell, Vickers, and Rockwell Hardness Tests			
4	IS 1757: Method for Charpy Pendulum Impact Test of Metals			
5	IS 1598: Method for Izod Impact Test of Metals			
6	IS 5242: Method for Determining Shear Strength of Metals			
7	IS 1608 (Part 1): Metallic Materials – Tensile Testing			
8	IS 1717: Metallic materials – wire – Simple Torsion Test			
9	IS 17415: Metallic materials – torsion test at room temperature			
10	IS 883: Design of Structural Timber in Building–Code of Practice			

Video Links (NPTEL, SWAYAM...)

Sl.No.	Link ID
1	https://eerc01-iiith.vlabs.ac.in/

Semester 3 and Semester 4 Minor Courses

Basket 1	MANUFACTURING PROCESS AND TECHNOLOGY PRODUCT DESIGN
Basket 2	ENERGY SYSTEMS
Basket 3	ADVANCED DYNAMICS AND VIBRATION

Instructions

*Minimum 2 courses to be listed from each NPTEL Semesters - (JULY-DEC) Odd Semester and (JAN-APRIL) Even Semester

*Total 4 courses to be listed in one basket (Preferably 4 to 6 courses)

*Choose 12-week course of 4 credits, preferably re-run courses (Refer summary of course in course link to check credits)

*Course link may change every year; refer the course list issued by NPTEL at the start of every semester

LIST OF NPTEL COURSES

BASKET 1 - MINOR IN MANUFACTURING PROCESS AND TECHNOLOGY PRODUCT DESIGN

	Course ID	Course Name	Institute	Duration	Credits	Course link
NPTEL JULY-DEC SEMESTER	noc26-me157	Production Technology: Theory and Practice	IIT Kanpur	12 Weeks	4	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_me157
	noc26-me188	Fundamentals of Additive Manufacturing Technologies	IIT Guwahati	12 Weeks	4	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_me188
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NPTEL JAN-APRIL SEMESTER	noc26-me98	Computer Integrated Manufacturing: From Concept to Implementation	IIT Kharagpur	12 Weeks	4	https://onlinecourses.nptel.ac.in/noc26_me98/preview
	noc26-me01	Robotics: Basics and Selected Advanced Concepts	IISc Bangalore	12 Weeks	4	https://onlinecourses.nptel.ac.in/noc26_me01/preview

BASKET 2 - MINOR IN ENERGY SYSTEMS

	Course ID	Course Name	Institute	Duration		Click here to Join the course
NPTEL JULY-DEC SEMESTER	noc26-me171	Energy Conservation and Waste Heat Recovery	IIT Kharagpur	12 Weeks	4	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_me171
	noc26-me179	Fundamentals of Conduction And Radiation	IIT Guwahati	12 Weeks	4	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_me179
	noc26-me194	Thermal Management of Electronics	IIT Mandi	12 Weeks	4	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_me194

NPTEL JAN-APRIL SEMESTER	noc26-me102	Advanced Refrigeration Systems	IIT BHU Varanasi	12 Weeks	4	https://onlinecourses.nptel.ac.in/noc26_me102/preview
	noc26-me42	Elements of Solar Energy Conversion	IIT Kanpur	12 Weeks	4	https://onlinecourses.nptel.ac.in/noc26_me42/preview
	noc26-me101	Autotronics	IIT Indore	12 Weeks	4	https://onlinecourses.nptel.ac.in/noc26_me101/preview
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BASKET 3 - MINOR IN AEROSPACE ENGINEERING						
NPTEL JULY-DEC SEMESTER	noc26-ae28	Introduction to Aerospace Engineering - Flight	IIT Bombay	12 Weeks	4	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ae28
	noc26-ae31	Aircraft Stability and Control	IIT Kanpur	12 Weeks	4	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ae31
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NPTEL JAN-APRIL SEMESTER	noc26-ae08	Introduction to Aircraft Control System	IIT Kanpur	12 Weeks	4	https://onlinecourses.nptel.ac.in/noc26_ae08/preview
	noc26-ae19	Fundamentals of Theoretical and Experimental Aerodynamics	IIT Kharagpur	12 Weeks	4	https://onlinecourses.nptel.ac.in/noc26_ae19/preview
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