PSG INSTITUTE OF TECHNOLOGY AND APPLIED RESEARCH

COIMBATORE – 641 062

(Autonomous college affiliated to Anna University)

R2025

Courses of Study, Scheme of Assessment and Syllabi for First, Second, Third and Fourth Semesters

for

B.E. Mechanical Engineering

B.E. MECHANICAL ENGINEERING

(Minimum No. of credits to be earned: 168)

S. No.	Course Code	Course Title	Hours/ Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER I										
THEORY										
1	25MA101	Calculus and its Applications	3	1	0	4	40	60	100	BS
2	25PH102	Physics for Mechanical Engineering	3	0	0	3	40	60	100	BS
3	25CY104	Chemistry of Engineering Materials	3	0	0	3	40	60	100	BS
4	25EE102	Basics of Electrical and Electronics Engineering	3	0	0	3	40	60	100	ES
5	25HS101	English Language Proficiency	3	1	0	4	40	60	100	HS
6	25HS102	தமிழர் மரபு / Heritage of Tamils	1	0	0	1	40	60	100	HS
PRACTICALS										
7	25ME111	Engineering Drawing with CAD	0	0	4	2	60	40	100	ES
8	25GE111	Design Thinking for Innovation	0	0	2	1	100	0	100	ES
9	25BS112	Basic Sciences Laboratory	0	0	4	2	60	40	100	BS
MANDATORY COURSES										
10	25GEM01	Induction Programme**	-	-	-	-	Grade	-	-	MC
Total 28 periods			**16**	**2**	**10**	**23**	**460**	**440**	**900**	

S. No.	Course Code	Course Title	Hours/ Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER II										
THEORY										
1	25MA201	Complex Variables and Transforms	3	1	0	4	40	60	100	BS
2	25ME201	Engineering Mechanics	3	1	0	4	40	60	100	ES
3	25ME202	Manufacturing Processes	3	0	0	3	40	60	100	PC
4	25ME203	Fluid Mechanics	3	1	0	4	40	60	100	ES
5	25ME204	Industrial Metallurgy	3	0	0	3	40	60	100	ES
6	25HS201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	40	60	100	HS
PRACTICALS										
7	25EE213	Electrical and Electronics Engineering Laboratory	0	0	2	1	60	40	100	ES
8	25ME211	Makers Laboratory	0	0	2	1	60	40	100	ES
9	25HS21_	Language Elective	0	0	4	2	60	40	100	HS
10	25EEC01	Workplace Communication Skills	0	0	2	Grade	100	0	100	EEC
MANDATORY COURSES										
11	25GEM02	Activity Point Programme I*	-	-	-	Grade	-	-	-	MC
Total 29 periods			**16**	**3**	**10**	**23**	**520**	**480**	**1000**	

****As per AICTE norms;**
*** As per AICTE norms; Grade: Non-Credit Course**

CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE - Open Elective; EEC - Employability Enhancement Course; MC – Mandatory Course; CA-Continuous Assessment; FE-Final Exam.

S. No.	Course Code	Course Title	Hours/ Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER III										
THEORY										
1	25MA306	Computational Mathematics	3	1	0	4	40	60	100	BS
2	25HS301	Project and Finance Management	3	0	0	3	40	60	100	HS
3	25ME301	Mechanics of Materials	3	0	0	3	40	60	100	ES
4	25ME302	Kinematics of Machinery	3	1	0	4	40	60	100	PC
5	25ME303	Engineering Thermodynamics	3	1	0	4	40	60	100	ES
PRACTICALS										
6	25ME311	Metallurgy and Mechanics of Materials Laboratory	0	0	4	2	60	40	100	ES
7	25ME312	Manufacturing Processes Laboratory	0	0	4	2	60	40	100	PC
8	25EEC02	Foundations of Problem Solving	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
9	25MC0__	Mandatory Course I	2	0	0	Grade	100	0	100	MC
10	25GEM03	Activity Point Programme II*	-	-	-	Grade	-	-	-	MC
Total 30 periods			**17**	**3**	**10**	**23**	**520**	**380**	**900**	

S. No.	Course Code	Course Title	Hours/ Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER IV										
THEORY										
1	25MA405	Probability and Statistics	2	1	0	3	40	60	100	BS
2	25ME401	Metal Cutting Theory	3	0	0	3	40	60	100	PC
3	25ME402	Dynamics of Machinery	3	1	0	4	40	60	100	PC
4	25ME403	IC Engines and Thermal Systems	3	0	0	3	40	60	100	PC
5	25MEP__	Professional Elective I	3	0	0	3	40	60	100	PE
PRACTICALS										
6	25ME411	Thermal Engineering Laboratory	0	0	4	2	60	40	100	PC
7	25ME412	Python Programming Laboratory	0	0	4	2	60	40	100	ES
8	25EEC03	Problem Solving	0	0	2	1	100	0	100	EEC
9	25MEE01	Mini Project I	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25MC0__	Mandatory Course II	2	0	0	Grade	100	-	100	MC
11	25GEM04	Activity Point Programme III*	-	-	-	Grade	-	-	-	MC
Total 30 periods			**16**	**2**	**12**	**22**	**620**	**380**	**1000**	

*** As per AICTE norms; Grade: Non-Credit Course**

CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE - Open Elective; EEC - Employability Enhancement Course; MC – Mandatory Course; CA-Continuous Assessment; FE-Final Exam.

S. No.	Course Code	Course Title	Hours/ Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER V										
THEORY										
1	25ME501	Design of Machine Elements	3	1	0	4	40	60	100	PC
2	25ME502	Cooling and Propulsion Technologies	3	1	0	4	40	60	100	PC
3	25ME503	Operations Research	3	0	0	3	40	60	100	PC
4	25ME504	Turbomachinery	3	1	0	4	40	60	100	PC
5	25ME505	Metrology and Instrumentation	3	0	0	3	40	60	100	PC
PRACTICALS										
6	25ME511	Fluid Mechanics and Machinery Laboratory	0	0	4	2	60	40	100	ES
7	25ME512	Machine Drawing	0	0	4	2	60	40	100	PC
8	25MEE02/ 25MEE03	Internship I / Community Project	0	0	0	1	100	0	100	EEC
9	25EEC04	Aptitude Skills	0	0	2	1	100	-	100	EEC
MANDATORY COURSES										
10	25GEM05	Activity Point Programme IV*	-	-	-	Grade	-	-	-	MC
Total 28 periods			**15**	**3**	**10**	**24**	**520**	**380**	**900**	

S. No.	Course Code	Course Title	Hours/ Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER VI										
THEORY										
1	25ME601	Mechanical System Design	3	1	0	4	40	60	100	PC
2	25ME602	Heat and Mass Transfer	3	1	0	4	40	60	100	PC
3	25ME603	Design for Manufacture and Assembly	3	0	0	3	40	60	100	PC
4	25MEP__	Professional Elective II	3	0	0	3	40	60	100	PE
5	25__O__	Open Elective I	3	0	0	3	40	60	100	OE
PRACTICALS										
6	25ME611	Heat Transfer Laboratory	0	0	4	2	60	40	100	PC
7	25ME612	Dynamics and Metrology Laboratory	0	0	4	2	60	40	100	PC
8	25EEC05	Enhancing Problem Solving Ability with Code	0	0	2	1	100	0	100	EEC
9	25MEE04	Mini Project II	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25GEM06	Activity Point Programme V*	-	-	-	Grade	-	-	-	MC
Total 29 periods			**15**	**2**	**12**	**23**	**520**	**380**	**900**	

*** As per AICTE norms; Grade: Non-Credit Course**

CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE - Open Elective; EEC - Employability Enhancement Course; MC – Mandatory Course; CA-Continuous Assessment; FE-Final Exam.

S. No.	Course Code	Course Title	Hours/ Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER VII										
THEORY										
1	25ME701	Finite Element Analysis	3	0	0	3	40	60	100	PC
2	25ME702	Industrial Automation	3	0	0	3	40	60	100	PC
3	25MEP__	Professional Elective III	3	0	0	3	40	60	100	PE
4	25MEP__	Professional Elective IV	3	0	0	3	40	60	100	PE
5	25__O__	Open Elective II	3	0	0	3	40	60	100	OE
PRACTICALS										
6	25ME711	Finite Element Analysis Laboratory	0	0	2	1	60	40	100	PC
7	25ME712	Manufacturing Automation Laboratory	0	0	2	1	60	40	100	PC
8	25MEE05	Project Work I	0	0	4	2	100	0	100	EEC
9	25MEE06	Internship II	0	0	0	1	100	0	100	EEC
Total 23 periods			**15**	**0**	**8**	**20**	**520**	**380**	**900**	

S. No.	Course Code	Course Title	Hours/ Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER VIII										
THEORY										
1	25MEP__	Professional Elective V	3	0	0	3	40	60	100	PE
2	25MEP__	Professional Elective VI	3	0	0	3	40	60	100	PE
PRACTICALS										
3	25MEE07	Project Work II	0	0	8	4	60	40	100	EEC
Total 14 periods			**6**	**0**	**8**	**10**	**140**	**160**	**300**	

CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE - Open Elective; EEC - Employability Enhancement Course;

SUMMARY OF CREDIT DISTRIBUTION

B.E. MECHANICAL ENGINEERING										
S. No.	Course Category	Credits per Semester								Total Credits
		1	2	3	4	5	6	7	8	
1	HS	5	3	3	0	0	0	0	0	**11**
2	BS	12	4	4	3	0	0	0	0	**23**
3	ES	6	13	9	2	2	0	0	0	**32**
4	PC	0	3	6	12	20	15	8	0	**64**
5	PE	0	0	0	3	0	3	6	6	**18**
6	OE	0	0	0	0	0	3	3	0	**6**
7	EEC	0	0	1	2	2	2	3	4	**14**
8	MC	-	-	-	-	-	-	-	-	**-**
Total		**23**	**23**	**23**	**22**	**24**	**23**	**20**	**10**	**168**

CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE - Open Elective; EEC - Employability Enhancement Course; MC – Mandatory Course.

LIST OF PROFESSIONAL ELECTIVE COURSES: VERTICALS

S. No.	Vertical I Design	Vertical II Manufacturing and Automation	Vertical III Thermal	Vertical IV Materials
1.	25MEP01 Design for X	25MEP10 Additive Manufacturing	25MEP19 Power Plant Engineering	25MEP28 Casting and Welding Metallurgy
2.	25MEP02 CAD/CAM	25MEP11 Non-traditional Machining Processes	25MEP20 Renewable Energy	25MEP29 Principles of Materials Selection
3.	25MEP03 Product Life Cycle Management	25MEP12 Process Planning and Cost Estimation	25MEP21 Fuel cell technologies	25MEP30 Composite Materials
4.	25MEP04 Ergonomics in Design	25MEP13 Industrial Management	25MEP22 Computational Fluid Dynamics	25MEP31 Mechanical Behaviour of Materials
5.	25MEP05 Automobile Engineering	25MEP14 Computer Integrated Manufacturing	25MEP23 Hydraulics and Pneumatics	25MEP32 Non-Destructive Testing of Materials
6.	25MEP06 Statistical Quality Control (SQC)	25MEP15 Industrial Robotics	25MEP24 Heat Exchanger Design	25MEP33 Materials Characterization Methods
7.	25MEP07 Dynamics of Ground Vehicles	25MEP16 Industry 4.0	25MEP25 Alternate Fuels	25MEP34 Nanomaterials and Applications
8.	25MEP08 Mechanical Vibration	25MEP17 Drone Structures and Dynamics	25MEP26 Cryogenic Engineering	25MEP35 Materials for Energy Storage and Conversion
9.	25MEP09 Artificial Intelligence for Mechanical Engineers	25MEP18 Electric Vehicle Technology	25MEP27 Energy Storage Technologies	25MEP36 Non-Metallic Materials

LIST OF PROFESSIONAL ELECTIVE COURSES FOR MINOR DEGREE PROGRAMME

S. No.	Course Code	Course Title
1	25MEM01	Fundamentals of Thermal Engineering
2	25MEM02	Basic Production Techniques
3	25MEM03	Robotics and Mechanism Design
4	25MEM04	Internal Combustion Engines
5	25MEM05	Engineering Materials
6	25MEM06	Product Modelling and Visualization Techniques
7	25MEM07	Mechanics of Rigid and Deformable Bodies
8	25MEM08	Fundamentals of Heat Transfer
9	25MEM09	Lean Manufacturing
10	25MEM10	Metrology and Quality Control Systems

SEMESTER I

25MA101 CALCULUS AND ITS APPLICATIONS
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

3 1 0 4

DIFFERENTIAL CALCULUS: Functions of two variables, limits and continuity, partial derivatives, chain rule, extreme values and saddle points, Lagrange multipliers, Taylor's formula for two variables. **(9+3)**

INTEGRAL CALCULUS: Double and iterated integrals over rectangles, double integrals over general regions, Fubini's theorem, area and volume by double integration, reversing the order of integration, double integrals in polar form. **(9+3)**

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS: Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, modeling - mixing problems, Newton's law of cooling, decay and growth problems. **(9+3)**

SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS: Homogeneous linear equations of second order, homogeneous linear ODEs with constant coefficients, Euler–Cauchy equations, solution by variation of parameters, free oscillations mass spring systems, electric circuits. **(9+3)**

VECTOR CALCULUS: Gradient and directional derivative of a scalar field, divergence and curl of a vector field. Integration in vector field – line integrals, path independence of line integrals, Green's theorem in the plane, divergence theorem of Gauss and Stokes' theorem. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. J. Hass, C. Heil, and D.W. Maurice, '*Thomas Calculus*'. Pearson Education, New Delhi, 2018.
2. Erwin Kreyszig, '*Advanced Engineering Mathematics*'. Wiley India, New Delhi, 2018.

REFERENCES:

1. H. Anton, I. Bivens, and S. Davis, '*Calculus*'. John Wiley and Sons, USA, 2016.
2. C. R. Wylie and L.C. Barrett, '*Advanced Engineering Mathematics*'. Tata McGraw-Hill, New Delhi, 2019.
3. D. G. Michael, '*Foundations of Applied Mathematics*'. Dover Publications, New York, 2013.
4. Gilbert Strang, '*Calculus*'. Wellesley Cambridge Press, USA, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the concepts related to Calculus, Differential Equations and Vector Calculus.	**K2**
CO2	Apply the techniques of Calculus, Differential Equations and Vector Calculus to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Calculus, Differential Equations and Vector Calculus.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Calculus, Differential Equations and Vector Calculus.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											2	
CO3		1										2	
CO4					1							2	
	3	**1**			**1**							**2**	

1-low, 2-medium, 3-high

25PH102 PHYSICS FOR MECHANICAL ENGINEERING

3 0 0 3

STATICS OF PARTICLES: Introduction to Newtonian mechanics - vector mechanics; Forces on a particle, parallelogram law, resolution of a force, rectangular components of a force; Resultant of several concurrent forces: Equilibrium of a particle, free-body diagrams, forces in space - equilibrium of a particle in space. **(10)**

KINEMATICS OF PARTICLES: Introduction to dynamics; Rectilinear motion of particles: Analytical and graphical solutions to problems, motion of several particles; Curvilinear motion of particles: projectile motion, rotary motion and rolling motion. **(9)**

KINETICS OF PARTICLES - NEWTON'S SECOND LAW AND FRICTION: Rectilinear and rotary motion: Newton's second law, D'Alembert's principle, dependent motion of several particles; Friction: concepts of friction, problems involving dry friction; Wedges, square-threaded screws, journal bearings - axle friction, thrust bearings - disk friction, wheel friction - rolling resistance, belt friction. **(9)**

KINETICS OF PARTICLES – ENERGY METHODS: Work-energy and power**:** Work of a force, Conservative and non-conservative forces, kinetic energy, principle of work and energy, potential energy, conservation of energy, power and efficiency; Solving problems using the concepts of friction wherever applicable. **(9)**

KINETICS OF PARTICLES – MOMENTUM METHODS: Concept of conservation of momentum, co-efficient of restitution, Impulse-momentum principle, Impact – direct central impact, oblique central impact, problems involving impulse and momentum. **(8)**

Total L: 45 periods

TEXT BOOKS:

1. Ferdinand P. Beer, E. Russell Johnston, David F. et al. '*Vector Mechanics for Engineers Statics and Dynamics*'. 12th edition, McGraw Hill Education (India) Private Ltd., New Delhi, 2019,
2. A. Nelson, '*Engineering Mechanics -Statics and Dynamics*'. 1st edition, Tata McGraw Hill Education (India) Private Ltd., New Delhi, 2017,

REFERENCES:

1. S. Rajasekaran and G. Sankarasubramanian, '*Engineering Mechanics-Statics and Dynamics*'. Vikas Publishing House Pvt. Ltd., New Delhi, 2015.
2. R. C. Hibbler, '*Engineering Mechanics -Statics and Dynamics*'. 15th edition, Pearson, 2022.
3. James L. Meriam, L. et al. , '*Engineering Mechanics Statics*'. Wiley India Private Limited, 2018.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the fundamental concepts of force systems, equilibrium conditions, particle kinematics, and kinetics principles in mechanics.	**K2**
CO2	Apply Newton's laws, energy methods, and momentum principles to solve numerical problems and infer the concepts involving forces, motion, friction, and impact.	**K3**
CO3	Analyze dynamic systems involving rectilinear and curvilinear motion, energy transformations, and momentum changes to identify optimal mechanical responses.	**K4**
CO4	Present the understanding on the effects of friction, energy loss, and momentum transfer in mechanical systems considering societal, safety, and sustainability aspects.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	
CO3		1										3	
CO4						1			1		1	3	
	3	**1**				**1**			**1**		**1**	**3**	

1-low, 2-medium, 3-high

25CY104 CHEMISTRY OF ENGINEERING MATERIALS

3 0 0 3

FUELS AND COMBUSTION: Petroleum - refining, cracking and polymerisation- petrol and diesel knocking-octane and cetane rating of fuels-reforming of gasoline. Liquefaction of coal- Bergius process. Alternate fuels-methanol, ethanol, CNG, biodiesel. Calorific value -determination by Bomb calorimeter-calculation of heat of combustion. Calorific intensity- calculation of theoretical flame temperature. Combustion of fuels- theoretical air calculations for solid and gaseous fuels. Emission tests, catalytic convertors-principles, Euro and Bharath emission standards. Propellants-requisites-examples. Explosives –Lead azides-applications. **(9)**

BATTERIES & FUEL CELLS: Electrode potential, Nernst equation. Performance characteristics of batteries. Construction, reactions, characteristics of Zn-Carbon, lithium primary cells. Lead - acid battery and lithium-ion secondary batteries. Super capacitors – EDLC – fundamentals, electrode materials, electrolytes, pseudo capacitors. Fuel cell-working principles of proton exchange membrane and direct methanol fuel cells. Specialty batteries for satellites and torpedoes. **(9)**

CORROSION AND PROTECTIVE COATINGS: Forms of corrosion- uniform, pitting, crevice, inter-granular and stress corrosion. Corrosion protection by design, anodic and cathodic protection, corrosion inhibitors - mention of types and applications. Protective coatings - Anodizing, electroplating of Cu, Ni and Cr. Galvanizing and Tinning. Paints-constituents and functions. Electrophoretic painting, super hydrophobic and self-healing coatings. **(9)**

POLYMERS AND COMPOSITES: Polymers: Classification, degree of polymerization molecular weight - Mn and Mw. Structure related to thermal and mechanical properties of polymers. Degradation of polymers-Thermal and mechanical, Additives- protective additives-thermal stabilizers, UV stabilizers, Antioxidants, functional additives-metal deactivators, flame retardants, vulcanization. **Composites:** classification, role of matrix and reinforcements, polymer matrix-thermoplastic and thermoset, reinforcements – glass, carbon, aramids, nanomaterials. **(9)**

MISCELLANEOUS MATERIALS: Lubricants-classification- properties, mechanisms of lubrication- additives and improvers. Solid lubricants (graphite and MoS_2). Abrasives: Natural abrasives (diamond and corundum)-synthetic abrasives (silicon carbide and boron carbide). Refractories- characteristics – classification – alumina, magnesite and zirconia bricks- applications. Adhesives-pressure sensitive, epoxy, acrylic and plastics based. Boiler feed water-requisites-estimation of hardness – demineralization process. **(9)**

Total L: 45 periods

TEXT BOOKS:

1. Shikha Agarwal, '*Engineering Chemistry Fundamentals and Applications*'. Cambridge University Press, 2015.
2. Shashi Chawla, '*A Text Book of Engineering Chemistry*'. Dhanpat Rai and Co., New Delhi, 2005.

REFERENCES:

1. S. Samir, '*Fuels and Combustion*'. India Universities Press, Hyderabad, 2009.
2. Vladimir S. Bagotsky, Alexander M. Skundin and Yurij V.M. Volfkovich., '*Electrochemical Power Sources: Batteries, Fuel Cells, and Supercapacitors*'. John Wiley and Sons Inc., 2015.

COURSE OUTCOMES

At the end of the course, students will be able to		Bloom's Level
CO1	Learn the basic concepts of engineering materials	**K1**
CO2	Use suitable fuels, energy storage devices, coatings and materials for engineering applications.	**K2**
CO3	Compare and contrast the properties of engineering materials and select efficient materials for engineering applications.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3										3	3	
CO3								1	1			3	
	3							**1**	**1**		**3**	**3**	

1-low, 2-medium, 3-high

Third ACM

25EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

3 0 0 3

INTRODUCTION TO AC AND DC CIRCUITS: Charge and Current, Voltage, Energy and Power - Sinusoidal Voltage and Current - Average value - RMS value - Power factor - Phasor representation. - Circuit elements and symbols - Ohm's law - Kirchhoff's law - Mesh and Nodal analysis - Thevenin's theorem - Norton's theorem - Superposition theorem - Maximum Power transfer theorem. **(11)**

DC MACHINES: Types of DC motors, Construction and Principle of operation: Shunt motor - Series motor - Compound motor, Speed-torque characteristics, Starting, Speed Control, Braking. **(7)**

AC AND SPECIAL MACHINES: Types of AC motors - Single phase induction motor - Three phase induction motor - Synchronous motor – Starting – single phase transformers: Construction, EMF equation- variable reluctance stepper motor- brushless DC motor- servo motors. **(7)**

ELECTRONIC DEVICES: PN junction diode - Zener diode - LED – BJT: Biasing, Amplifier and switch, Frequency response characteristics – MOSFET: Types, Biasing, Current-voltage characteristics, Amplifier, High frequency model, Junction Field-Effect Transistor (JFET) - Comparison of BJT and FET - Optocouplers - SCR- TRIAC – DIAC. **(10)**

ELECTRONIC CIRCUITS: Half wave and full wave rectifiers: analysis, ripple factor, filtering – Clippers and Clampers – Zener voltage regulator- series voltage regulators – RC coupled amplifier - RC phase shift oscillator. **(10)**

Total L: 45 periods

TEXT BOOKS:

1. William Hayt, Jack Kemmerly, Jaime Phillips and Steven Durbin, '*Engineering Circuit Analysis*'. Tata McGraw Hill, New Delhi, 2019.
2. D. P. Kothari and I. J. Nagrath, '*Basic Electrical and Electronics Engineering*'. Tata McGraw Hill, New Delhi, 2014.

REFERENCES:

1. Charles Alexander and Mathew Sadiku, '*Fundamentals of Electric Circuits*'. Tata McGraw Hill, New Delhi, 2021.
2. V. N. Mittle and Aravind Mittal, '*Basics of Electrical Engineering*'. Tata Mc Graw Hill, New Delhi, 2017.
3. Warsame Hassan Ali, Samir Ibrahim Abood and Matthew N. O. Sadiku, '*Fundamentals of Electric Machines*'. CRC press, New York, 2019.
4. Robert L. Boylestad and Louis Nashelsky, '*Electronic Devices and Circuit Theory, Pearson*'. New Delhi, 2013.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the concepts and applications of basic electrical and electronics circuits.	**K2**
CO2	Apply basic laws and theorems to solve simple problems related to electrical and electronic circuits.	**K3**
CO3	Demonstrate an application of electrical and electronic circuits as a team using any simulation tool.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3											3	2
CO3		1			1							3	2
	3	**1**			**1**							**3**	**2**

1-low, 2-medium, 3-high

25HS101 ENGLISH LANGUAGE PROFICIENCY
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

3 1 0 4

VOCABULARY: Etymology-Prefixes and suffixes–Synonyms–Antonyms–Guessing meanings from context–Word formation- Single-word substitutes- Different forms of a word–Phrasal verbs–Collocations. **(9+3)**

LISTENING AND SPEAKING: Understanding listening – Listening techniques - Introducing oneself and others – Seeking and sharing information– Description-Conversation skills– Extempore speaking– Speech practice in varied formal contexts. **(9+3)**

GRAMMAR: Wh-questions – Yes/no questions– Parts of speech – Articles– Prepositions–Gerunds–Conjunctions- Degrees of comparison– Tenses– Modal verbs – Adverbs - Direct and indirect questions. **(9+3)**

READING: Reading strategies: Skimming and scanning, predicting– Reading comprehension: techniques –Practice reading. **(9+3)**

WRITING: Discourse markers – Dialogue writing - Completing sentences – Jumbled sentences – Paragraph writing –Writing compare & contrast paragraphs – Letter writing. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXTBOOKS:

1. K.N. Shoba and Lourdes Joavani Rayen, '*Communicative English*'. Cambridge University press, Cambridge, 2021.
2. Raymond Murphy, '*Intermediate English Grammar*'. Cambridge University Press, New Delhi, 2020.
3. Dr M. Sambaiah, '*Technical English an integrated text book*'. Wiley India Pvt. Ltd., 2025.

REFERENCES:

1. Raymond Murphy, '*English Grammar in Use*'. Cambridge University Press, New Delhi 2020.
2. N. P. Sudharshana and C. Savitha, '*English for Engineers*'. Cambridge University Press, New York, 2018.
3. Helen Naylor with Raymond Murphy, '*Essential English Grammar*'. Cambridge University Press, New Delhi, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Demonstrate the ability to recognize and use a wide range of vocabulary and key grammatical structures accurately, while developing inferential reading skills to comprehend, interpret, and analyze written texts across diverse contexts.	**K2**
CO2	Organize their ideas logically in essay writing, develop paragraphs with clear topic sentences and adapt their letter-writing skills to various real-world scenarios.	**K3**
CO3	Develop and demonstrate clear and confident speaking skills in formal and informal contexts.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1									3		3	3	
CO2									3		3	3	
CO3									1		1	3	
									3		**3**	**3**	

1-low, 2-medium, 3-high

25HS102 *தமிழர் மரபு*

(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

1 0 0 1

மொழி மற்றும் இலக்கியம்: *இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச்சார் பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின்பங்களிப்பு.* **(3)**

மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக்கலை: *நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரி முனையில் திருவள்ளுவர் சிலை – இசைக்கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வியல் கோவில்களின் பங்கு.* **(3)**

நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்: *தெருக்கூத்து, கரகாட்டம், வில்லுப் பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.* **(3)**

தமிழர்களின் திணைக்கோட்பாடுகள்: *தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்க கால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்தநாடுகளில்சோழர்களின்வெற்றி.* **(3)**

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: *இந்தி விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப் பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப் படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.* **(3)**

Total L: 15 periods

25HS102 HERITAGE OF TAMILS
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

1 0 0 1

LANGUAGE AND LITERATURE: Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan. **(3)**

HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE: Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils. **(3)**

FOLK AND MARTIAL ARTS: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils. **(3)**

THINAI CONCEPT OF TAMILS: Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas. **(3)**

Third ACM

CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE: Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books. **(3)**

Total L: 15 periods

Text – Cum – Reference Books:

1. *தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை* (*வெளியீடு - தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்*).
2. *கணினித்தமிழ் - முனைவர் இல. சுந்தரம்.* (*விகடன் பிரசுரம்*)
3. *கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்* (*தொல்லியல் துறை வெளியீடு*)
4. *பொருநை - ஆற்றங்கரை நாகரிகம்* (*தொல்லியல் துறை வெளியீடு*)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.)
7. Historical Heritage of the Tamils (Dr. S. V. Subrahmanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the Dravidian language family, outline the features of Tamil classical literature, and explain the development of Tamil art, sculpture, and temple-related traditions in a historical context.	**K2**
CO2	Demonstrate the cultural relevance of Tamil folk and martial arts, apply the concepts of Sangam landscape classification to social contexts, and relate Tamil contributions to India's freedom struggle, cultural legacy, and Siddha medicine.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1							2				2		
CO2							2				2		
							2				**2**		

1-low, 2-medium, 3-high

25ME111 ENGINEERING DRAWING WITH CAD

0 0 4 2

Orthographic Projection **(12)**

1. Projection of lines - only first angle projections
2. Projection of planes - inclined to the principal planes

Solids and Perspective Projections **(12)**

1. Projection of solids - inclined to one of the principal planes
2. Perspective projection of simple solids

Development and Sections of Solids **(12)**

1. Section of solids - cutting plane inclined to the one of the principal planes
2. Development - sectioned solids (cutting plane inclined to one of the principal planes)

Pictorial Projections **(12)**

1. Orthographic views from pictorial views
2. Isometric views from orthographic views

Computer Graphics **(12)**

1. Modeling of simple engineering components
2. Extraction of 2D views from 3D models

Total P: 60 periods

TEXT BOOKS:

1. K. Venugopal and V. Prabhu Raja, '*Engineering Graphics*'. New Age International Publishers, 16th edition, 2021.
2. K. C. John, '*Engineering Graphics for Degree*'. PHI Learning Private Limited, 2009.

REFERENCES:

1. '*Bureau of Indian Standards*'. Engineering Drawing Practices for Schools and Colleges SP 46-2003, BIS, 2003.
2. M. B. Shaw and B. C. Rana, '*Engineering Drawing*'. Pearson Education India, 2009.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Apply projection techniques to create basic shapes, solids, and sectioned objects.	**K3**
CO2	Model a simple 2D and 3D object using CAD software.	**K2**
CO3	Use the standards and specifications for engineering drawing.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3											3	1
CO2					1							3	1
CO3											1	3	1
	3				**1**						**1**	**3**	**1**

1-low, 2-medium, 3-high

25GE111 DESIGN THINKING FOR INNOVATION
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 2 1

Foundations of Design Thinking History & Origins: Roots in Creative Problem Solving: Traces back to mid-20th century practices in architecture, engineering, and psychology. Herbert Simon's "Sciences of the Artificial" (1969): Introduced design as a way of thinking distinct from scientific inquiry. IDEO and the Rise of Human-Centered Design: Popularized design thinking as a repeatable, user-focused innovation process. Stanford school's Influence: Helped institutionalize design thinking in education and entrepreneurship.

Variations of Design Thinking Phases: IDEO's 3-Phase Model: Inspiration, Ideation, Implementation A flexible, non-linear approach emphasizing creativity and action. Stanford school's 5-Phase Model: Empathize, Define, Ideate, Prototype, Test A structured yet iterative framework centered on user empathy. Double Diamond Model (Design Council UK): Divides the process into Discover, Define, Develop, and Deliver—highlighting divergent and convergent thinking.

Related Concepts & Frameworks: Human-Centered Design (HCD): Focuses on designing solutions that deeply resonate with users' needs and contexts. Systems Thinking: Encourages understanding the broader ecosystem and interdependencies within a problem space. Agile & Lean UX: Integrates design thinking with iterative development and minimal viable experimentation. Service Design: Applies design thinking to orchestrate holistic user experiences across touchpoints. Participatory Design: Involves stakeholders directly in the design process to ensure relevance and inclusivity.

EMPATHIZE: Apply Human-Centric Design Principles: Focus on designing solutions that prioritize user needs, experiences, and values throughout the process. Consult Experts: Engage with subject matter experts to gain foundational knowledge about the problem space. Competitive Analysis: Identify & studying similar products or services to identify gaps and opportunities. Stakeholder Interviews: Engaging with people who influence or are affected by the product or service. Conduct Observations: Observe users in their natural environment to understand behaviors, challenges, and interactions. Engage with Users: Use interviews, conversations, and other methods to connect with users and hear their stories. Immerse Yourself: Step into the users' context to experience their environment and challenges firsthand. Create Empathy Maps: Visualize what users say, think, feel, and do to synthesize insights. Identify User Needs and Pain Points: Extract meaningful patterns and needs from user interactions and observations. Set Aside Assumptions: Approach the research with an open mind, suspending personal biases and preconceptions. Document Insights: Capture quotes, observations, and emotional cues to inform the next stage (Define). **(6)**

DEFINE: Organize Research Findings: Review and structure the data collected during the Empathize stage. Analyze Observations: Identify patterns, themes, and insights from user interactions and behaviors. Craft a Human-Centered Problem Statement: Frame the problem from the user's perspective, focusing on their needs—not business goals. Avoid Business-Centric Framing: Refrain from defining problems based on company objectives alone (e.g., market share). Persona Development: Synthesizing research into user personas to guide design decisions. Use Empathy to Guide Definition: Ensure the problem statement reflects real user challenges and motivations. Develop Point-of-View Statements: Create concise summaries that capture who the user is, what they need, and why. Prepare for Ideation: Formulate "How Might We" questions to spark creative thinking in the next phase. **(6)**

IDEATE: Review the Problem Statement: Revisit the user-centric problem defined in the previous stage to guide ideation. Explore Multiple Perspectives: Encourage diverse viewpoints to broaden the range of potential solutions. Use Ideation Techniques: Apply methods like Brainstorming, Brain writing, SCAMPER, and Worst Possible Idea to spark creativity. Encourage Free Thinking: Create a judgment-free space to generate as many ideas as possible without filtering. Expand the Problem Space Push boundaries and explore unconventional or extreme ideas to uncover hidden opportunities. Refine and Select Ideas: Use evaluation techniques to identify promising concepts that address user needs effectively. Prepare for Prototyping: Choose ideas that are feasible and impactful to develop into tangible prototypes in the next stage. **(6)**

PROTOTYPE: Build Low-Cost Prototypes: Create simple, scaled-down versions of the product or its features to explore ideas. Experiment with Solutions: Implement different solutions from the Ideate stage into prototypes for testing. Test Internally and Externally: Share prototypes with team members, other departments, or a small group of users. Observe User Interactions: Watch how users engage with the prototypes to uncover usability issues and insights. Evaluate and Iterate: Accept, refine, or discard prototypes based on user feedback and performance. Identify Limitations: Discover constraints and challenges in the proposed solutions through hands-on testing. Gain Deeper User Understanding: Learn how users think, feel, and behave when interacting with the product. **(6)**

TEST: Conduct Rigorous Testing: Evaluate the complete product using the most promising prototypes. Observe Real User Interactions: Study how users behave, think, and feel while using the product. Gather Feedback and Insights: Collect qualitative and quantitative data to assess usability and effectiveness. Identify Remaining Issues: Detect limitations, pain points, and areas for improvement. Refine and Iterate: Use test results to improve the product and revisit earlier stages if needed. Redefine Problems if Necessary: Reframe or adjust problem statements based on new insights. Enhance Understanding of Users: Deepen empathy and knowledge of user needs through real-world testing. **(6)**

Design Thinking & Customer Centricity: A human-centered approach that blends empathy and innovation to create solutions that truly resonate with customer needs. Practical Examples of Customer Challenges: Real-world scenarios where customers face friction, unmet needs, or emotional disconnects in their product or service journey. Use of Design Thinking to Enhance Customer Experience: Applying iterative problem-solving and user insights to craft experiences that are intuitive, delightful, and deeply relevant. Parameters of Product Experience: Key dimensions like usability, accessibility, emotional impact, and consistency that shape how customers perceive and interact with a product. Alignment of Customer Expectations with Product Design: Ensuring that every design decision reflects what customers value, expect, and aspire to achieve through the product.

Total L: 30 periods

TEXT BOOKS

1. T. Brown '*Change by Design*'. Harper Business, 2009.
2. J. Liedtka and T. Ogilvie '*Designing for Growth*'. Columbia Business School Publishing, 2011.

REFERENCES

1. T. Kelley and D. Kelley '*Creative Confidence*'. Crown Business, 2013.
2. Stanford d. School resources: https://dschool.stanford.edu/
3. https://apphaus.sap.com/toolkit/methods#design-thinking

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Apply empathy-driven research to understand user needs.	**K3**
CO2	Develop and test prototypes to refine innovative solutions to the real-world problems.	**K4**
CO3	Frame actionable problem statements and generate creative ideas.	**K5**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3					3	3	3	3	-	3	1	1
CO2		2				2	2	2	2	-	2	1	1
CO3			1			1	1	1	1	-	1	1	1
	3	**2**				**3**	**3**	**3**	**3**		**3**	**1**	**1**

1-low, 2-medium, 3-high

25BS112 BASIC SCIENCES LABORATORY
(Common to EEE, ECE, Mech and EE-VLSI)

0 0 4 2

Physics (Any eight experiments)

1. Determination of specific resistance of a given wire – Carey foster's bridge.
2. Determination of Young's modulus of the material- Uniform Bending
3. Measurement of Hall coefficient of a semiconductor using Hall effect setup.
4. Determination of electrical resistivity of a given material using four probe setups.
5. Determination of wavelength of laser using diffraction grating - LASER.
6. Determination of Thickness of a thin wire – Air wedge method.
7. Study of I-V characteristics of solar cell and determination of its efficiency
8. Determination of velocity of sound and compressibility of liquid - Ultrasonic Interferometer.
9. Determination of Planck's constant and work function of a metal -Photoelectric Effect
10. Determination of bandgap of a semiconductor – Post office box.

Demonstration:

1. Determination of Numerical Aperture and Acceptance angle - Optical Fiber
2. Study the energy loss of a ferrite magnetic material specimen by B-H curve.

REFERENCES:

1. Department of Physics, Physics Laboratory Observation, 2025.
2. Jerry D Wilson, A. Cecilia and Hernandez Hall, '*Physics Laboratory Experiments*'. Boston, Cengage Learning, 2016.

Chemistry (Any eight experiments):

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of strength of acids in a mixture of acids using conductivity meter.
3. Determination of strength of given hydrochloric acid using pH meter.
4. Estimation of iron content of the given solution using potentiometer.
5. Corrosion experiment-weight loss method.
6. Electroplating of copper and Nickel and determination of coulombic efficiency.
7. Designing a battery and determination of its characteristics.
8. Construction of phase diagram of a simple eutectic system.
9. Determination of kinematic viscosity and acid value of a lubricating oil.
10. Anodizing of aluminium and determination of thickness of anodised film.

Total P: 60 periods

REFERENCE:

1. J. Mendham, Vogel's '*Textbook of Quantitative Chemical Analysis*'. 6th Edition, Pearson Education, 2009**.**

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Relate the scientific principles and compare the experimental results with theoretical calculations and apply graphical analysis to visualise the importance of precise measurements.	**K3**
CO2	Analyse the experimental result outcomes using analytical and experimental skills for various engineering materials and applications.	**K4**
CO3	Demonstrate the measurement of water quality parameters in the given water sample	**K2**
CO4	Analyze the properties of materials for Engineering applications	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3											2	1
CO2		3										2	1
CO3	3											2	1
CO4		3										2	1
	3	**3**										**2**	**1**

1-low, 2-medium, 3-high

25GEM01 INDUCTION PROGRAMME
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

All students shall undergo an induction programme at the beginning of the first semester for a duration of three weeks as per the guidelines of All India Council for Technical Education (AICTE). A student completing the induction programme will be awarded a completed grade in the grade sheet, and only the students who complete the induction programme shall be considered as eligible for award of degree subject to satisfying other conditions. A student who does not complete the induction programme in the first semester shall redo the same in the subsequent semester.

SEMESTER II

25MA201 COMPLEX VARIABLES AND TRANSFORMS
(Common to CIVIL, EEE, ECE, ICE, MECH and EE-VLSI)

3 1 0 4

COMPLEX DIFFERENTIATION: Derivative, analytic function, Cauchy-Riemann equations, Laplace's equation, linear fractional transformations. **(9+3)**

COMPLEX INTEGRATION: Cauchy's integral theorem, Cauchy's integral formula, derivatives of analytic functions, Laurent series, singularities and zeros, residue integration method (Residue integration of complex integrals only). **(9+3)**

LAPLACE TRANSFORMS: Laplace transform, linearity, first shifting theorem, transforms of derivatives and integrals, unit step function, second shifting theorem, Dirac's delta function, periodic functions, differentiation and integration of transforms, solving ODEs with constant coefficients and initial value problems. **(9+3)**

FOURIER ANALYSIS: Fourier series – arbitrary period, even and odd functions, half range expansions. Fourier transforms, Fourier cosine and sine transforms. **(9+3)**

PARTIAL DIFFERENTIAL EQUATIONS: Basic concepts of PDEs, wave equation, heat equation, steady state two-dimensional heat problems, solution by Fourier series. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. Erwin Kreyszig, '*Advanced Engineering Mathematics*'. Wiley India, New Delhi, 2018.
2. G. Z. Dennis, '*Advanced Engineering Mathematics*'. Jones and Bartlett Pvt Ltd, New Delhi, 2017.

REFERENCES:

1. G. Z. Dennis and D. S. Patrick, '*A first course in Complex Analysis with Applications*'. Jones and Bartlett Pvt Ltd, New Delhi, 2015.
2. C. R. Wylie and L. C. Barret, '*Advanced Engineering Mathematics*'. Tata McGraw-Hill, New Delhi, 2019.
3. Peter V.O Neil, '*Advanced Engineering Mathematics*'. Cengage, New Delhi, 2018.
4. G. D. Dean, '*Advanced Engineering Mathematics with MATLAB*'. CRC Press, USA, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the concepts related to Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations.	**K2**
CO2	Apply the techniques of Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1												3	1
CO2	3											3	1
CO3		1										3	1
CO4					1						1	3	1
	3	**1**			**1**						**1**	**3**	**1**

1-low, 2-medium, 3-high

25ME201 ENGINEERING MECHANICS

3 1 0 4

STATICS OF RIGID BODIES: Equivalent systems of forces acting on a rigid body in 2D space: Transmissibility, moment of a force, Varignon's theorem, moment of a couple, resolution of a given force, reduction of a system of forces; Equilibrium of a rigid body in 2D space - reactions at supports and connections; Analysis of structures: Simple trusses - method of joints, method of sections, joints under special loading conditions, analysis of frames and machines. **(11+3)**

APPLICATIONS OF FRICTION: Clutches: Role of clutches, overview of positive and gradually engaged clutches, friction clutches - single plate, multiple plate, cone and centrifugal clutches; Brakes: Role of brakes, Single shoe, double shoe and band brakes - self-locking, self-energizing and de-energizing actions; Overview of disc brakes and internally expanding shoe brakes. **(9+3)**

CENTROIDS, CENTRES OF GRAVITY AND MOMENTS OF INERTIA: Centroids of areas, lines, composite areas, moment of inertia of plane figures, polar moment of inertia, radius of gyration, Mass Moments of inertia of thin plates, and composite bodies. **(8+3)**

KINEMATICS OF RIGID BODIES - PLANE MOTION: Kinematics of rigid bodies: Plane motion, translation and rotation; General plane motion: Absolute velocity, relative velocity, instantaneous centre of rotation, absolute acceleration, relative acceleration. **(8+3)**

KINETICS OF RIGID BODIES - PLANE MOTION: Equations of motion of a rigid body - angular momentum, D'Alembert's principle; Principle of work and energy for a rigid body, work of forces acting on a rigid body, kinetic energy of a rigid body in plane motion, conservation of energy; Impulse-momentum principle for the plane motion of a rigid body; Overview of Lagrange's equations of motion. **(9+3)**

Total L: 45 +T: 15 = 60 periods

TEXT BOOKS:

1. Ferdinand P. Beer, E. Russell Johnston, David F. et al., '*Vector Mechanics for Engineers Statics and Dynamics*'. McGraw Hill Education (India) Private Ltd., New Delhi, 12th edition, 2019
2. A. Nelson, '*Engineering Mechanics -Statics and Dynamics*'. Tata McGraw Hill Education (India) Private Ltd., New Delhi,1st edition, 2017.

REFERENCES:

1. S. Rajasekaran and G. Sankarasubramanian, '*Engineering Mechanics-Statics and Dynamics*'. Vikas Publishing House Pvt. Ltd., New Delhi, 2006.
2. James L. Meriam, L. et al., '*Engineering Mechanics – Statics*'. Wiley India Private Limited, 2017.
3. James L. Meriam, L. et al., '*Engineering Mechanics – Dynamics*'. Wiley India Private Limited, 2018.
4. S. S. Rattan, '*Theory of Machines*'. Tata McGraw Hill Publishers, New Delhi, 4th edition, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain fundamental engineering mechanics concepts like force systems, equilibrium, friction, centroid, moment of inertia, and dynamics.	**K2**
CO2	Apply principles of equilibrium, friction, centroid, inertia, and motion to solve real-world engineering problems.	**K3**
CO3	Analyse static and dynamic systems including trusses, frames, rotating bodies, and mechanical systems using laws of mechanics.	**K4**
CO4	Design mechanical systems for stability and efficiency using appropriate tools.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3											3	1
CO3		2										3	1
CO4		1			1						1	3	1
	3	**2**			**1**						**1**	**3**	**1**

1-low, 2-medium, 3-high

25ME202 MANUFACTURING PROCESSES

3 0 0 3

METAL CASTING: Casting process: Terminology, green sand molding, investment casting, die casting, patterns, molds, and cores; solidification and cooling; riser and gating systems; casting defects. **(8)**

JOINING PROCESSES: Gas welding: flame types, equipment; Electric Arc Welding (EAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW); Resistance welding - Spot, seam, projection and flash; Welding defects; Laser beam and friction-stir welding; Principles of brazing, soldering and adhesive bonding. **(8)**

SHEET METAL PROCESSES: Principle of shearing, punch-die clearance; Sheet metal operations: blanking, punching, bending, drawing, spinning; Blanking force calculation; Die-set: simple, progressive, compound; Press: open back inclinable press, hydraulic press; Deep drawing and bending processes. **(8)**

BULK DEFORMATION PROCESSES: Plastic deformation, hot and cold working; Rolling - Rolling mills, defects in rolled parts; Drawing - Wire and rod drawing; Forging - Open and closed die forging, forging hammers, rotary swaging; Extrusion- direct and indirect extrusion. **(8)**

POWDER METALLURGY AND PLASTIC PROCESSING: Production of metal powder: Atomization, crushing; Blending; Compacting: Die pressing, isostatic pressing; Sintering; Plastic processing: Injection, blow molding **ADDITIVE MANUFACTURING**: Fundamentals of additive manufacturing (AM); AM technologies: Stereolithography, fused deposition modeling, selective laser sintering and overview of metal additive manufacturing. **(13)**

Total L: 45 periods

TEXT BOOKS:

1. P. N. Rao, '*Manufacturing Technology*'. Tata McGraw Hill Education Private Limited, New Delhi, 2013.
2. Serope Kalpakjian and Stephen Schmid, '*Manufacturing Engineering and Technology*'. Pearson Education, 2018.

REFERENCES:

1. Mikell P Groover, '*Fundamentals of Modern Manufacturing: Materials, Processes, and Systems*'. Wiley, 2015.
2. R. P. Arora, '*Manufacturing Technology*'. Macmillan India Limited, New Delhi, 2011.
3. Ian Gibson, David Rosen and Brent Stucker, '*Additive Manufacturing Technologies 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing*'. 2nd edition, Springer, 2015.
4. Amitabha Ghosh and Ashok Kumar Mallik, '*Manufacturing Science*'. East-West Press Pvt. Ltd., 2010.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the principles of various metal production and fabrication processes, including their design and defects.	**K2**
CO2	Apply the principles of manufacturing to perform force calculations in various production processes	**K3**
CO3	Analyze various manufacturing processes by simulating the process parameters to achieve products of desired quality	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3											3	1
CO3		1			1							3	1
	3	**1**			**1**							**3**	**1**

1-low, 2-medium, 3-high

25ME203 FLUID MECHANICS

3 1 0 4

FLUID STATICS AND KINEMATICS: Properties of fluids, concept of gauge and absolute pressure, measurement of pressure using manometers; Types of flow - laminar, turbulent, steady, unsteady, uniform and non-uniform flows; Flow visualization: Stream, streak and path lines; Lagrangian and Eulerian descriptions of fluid motion. **(9 + 3)**

DIFFERENTIAL ANALYSIS OF FLUID FLOW: Irrotational and rotational flows, vorticity, stream function, potential function, continuity equation - derivation and applications to one dimensional flow, differential momentum equation, impact of jets - force on fixed and moving vanes; Navier Stokes equation, Euler's equation and Bernoulli's energy equation, applications of energy equations. **(9 + 3)**

FLOW THROUGH PIPES: Hagen Poiseuille equation: Velocity profile, power calculation; Laminar flow between parallel plates: Couette flow; Pipes in series and parallel, Darcy-Weisbach equation, use of Moody diagram; Minor losses: Sudden expansion, contraction and losses in pipe fittings. **(9 + 3)**

FLOW MEASUREMENTS: Orifice meter, mouthpiece, venturi meter, flow nozzle, pitot tube, multi-hole probe, anemometer, rotameter, hotwire anemometer, displacement meter, vortex flow meter, selection of flow meters.**(9 + 3)**

DIMENSIONAL ANALYSIS AND BOUNDARY LAYER THEORY: Buckingham Pi theorem, Reynolds, Froude and Mach numbers and their applications in model testing; Boundary layer theory, development of boundary layer, drag on a flat plate, boundary layer separation and its control, streamlined and bluff bodies, flow around circular bodies and airfoil, calculation of lift and drag. **(9 + 3)**

Total L: 45 +T: 15 = 60 periods

TEXT BOOKS:

1. B. R. Munson, D. F. Young, T. H. Okiishi and W. W. Huebsch, '*Fundamentals of Fluid Mechanics*'. 9th Edition, John Wiley and Sons, 2021.
2. Yunus A Cengel and John M Cimbala, '*Fluid Mechanics*'. 4th edition, McGraw Hill Education, 2019.

REFERENCES:

1. D. S. Kumar, '*Fluid Mechanics and Fluid Power Engineering*'. 2nd edition, Kataria and Sons, 2016.
2. Frank M White, '*Fluid Mechanics*'. 8th edition, McGraw Hill Education, 2016.
3. E. Victor Streeter, K. Benjamin Wylie and W. Bedford, '*Fluid Mechanics*'. 9th edition, McGraw Hill Higher Education, 2010.
4. K. Subramanya, '*Fluid Mechanics and Hydraulic Machines*'. 2nd edition, McGraw Hill Education, 2018.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Describe fluid properties, fluid statics and dynamics, flow through pipes, dimensional analysis, and boundary layer concepts.	**K2**
CO2	Apply fluid mechanics principles to solve problems involving pressure, flow, energy losses, flow measurement, boundary layer behaviour, and model studies.	**K3**
CO3	Analyse fluid systems using force and energy equations, flow characteristics, similarity laws, and boundary layer effects for performance evaluation.	**K4**
CO4	Apply fluid mechanics principles to a practical application through a team-based micro project and communicate findings through a presentation and report.	**K1**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	
CO3		2										32	
CO4	1						1	1	1		1	32	
	3	**2**					**1**	**1**	**1**		**1**	**32**	

1-low, 2-medium, 3-high

25ME204 INDUSTRIAL METALLURGY

3 0 0 3

MATERIAL CLASSIFICATION AND CRYSTAL STRUCTURES: Classification of materials, functional classification of materials; Crystal structures: Fundamental concepts, unit cells, metallic crystal structures, density computations, crystallographic points, directions, and planes; Imperfections in crystal structures: Point defects, dislocations, Schmid's Law, surface defects, bulk or volume defects. **(9)**

CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS: Solid solutions: substitutional and interstitial solutions, Hume-Rothery rules; Phases, Gibbs phase rule; Binary phase diagrams: Isomorphous systems, eutectic systems, eutectoid and peritectic reactions, Iron- Iron carbide diagram, development of microstructures. **(9)**

HEAT TREATMENT AND STRENGTHENING METHODS: Annealing: Full annealing, stress relief annealing, recrystallization annealing, spheroidizing; Normalizing, hardening and tempering of steel; Concept of TTT and CCT diagrams, hardenability - Jominy end quench test, austempering and martempering; Surface hardening techniques: Carburizing, nitriding, cyaniding, carbonitriding, flame and induction hardening; Strengthening of metals and alloys: Cold working/strain hardening, solid solution strengthening, dispersion hardening, precipitation hardening and grain size strengthening. **(9)**

MECHANICAL PROPERTIES AND NDT OF MATERIALS: Mechanism of plastic deformation, deformation by slip, critical resolved shear stress, deformation by twinning; Types of fracture; Tensile testing: Stress-strain curve; Hardness tests (Brinell, Vickers and Rockwell); Impact test :Izod and Charpy, fracture toughness tests; Fatigue: Types, mechanism, S-N curves; Creep: Mechanisms, stages, creep curve; Fatigue and creep tests; ASTM standards for different mechanical tests; Introduction to NDT techniques: LPT, MPT, UT and RT. **(9)**

FERROUS AND NON-FERROUS ALLOYS: Cast iron: Compositions, types, properties, applications, effect of alloying elements in steels; Plain carbon steels, stainless steels and tool steels: Types, properties, applications and heat treatment; Copper and aluminum alloys: Types, properties, microstructure and applications. **(9)**

Total L: 45 periods

TEXT BOOKS:

1. William D. Callister Jr. and David G. Rethwisch, '*Callister's Materials Science and Engineering*'. John Wiley and Sons, 2020
2. Sydney H Avner, '*Introduction to Physical Metallurgy*'. McGraw Hill, 2017

REFERENCES:

1. Kenneth G Budinski and Michael K Budinski, '*Engineering Materials*'. 4th edition, Prentice-Hall of India Pvt. Ltd., 2013.
2. V. Raghavan, '*Materials Science and Engineering*'. Prentice Hall of India Pvt. Ltd, 2018.
3. Donald R Askeland, et al., '*The Science and Engineering of Materials*'. Thomson brooks, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the fundamental principles of metallurgical engineering, including phase diagram, heat treatment and testing of materials.	**K2**
CO2	Apply the concepts of metallurgical and materials engineering to select the suitable material for a specific engineering application.	**K3**
CO3	Analyze binary phase diagrams, TTT diagrams and test curves obtained through various mechanical tests of different engineering materials.	**K4**
CO4	Examine the microstructural features, such as phase fraction and grain size, using an appropriate software.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	
CO3		2										3	
CO4		1			1							3	
	3	**2**			**1**							**3**	

1-low, 2-medium, 3-high

25HS201 *தமிழரும் தொழில்நுட்பமும்*
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

1 0 0 1

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: *சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.* **(3)**

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: *சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள், சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.* **(3)**

உற்பத்தித் தொழில் நுட்பம்: *கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணங்கள் – நாணயங்கள் அச்சடித்தல்- மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.* **(3)**

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: *அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.* **(3)**

அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்: *அறிவியல் தமிழின் வளர்ச்சி –* ***கணினித்தமிழ்*** *வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.* **(3)**

Total L: 15 periods

25HS201 TAMILS AND TECHNOLOGY
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

1 0 0 1

WEAVING AND CERAMIC TECHNOLOGY: Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries. **(3)**

DESIGN AND CONSTRUCTION TECHNOLOGY: Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period. **(3)**

MANUFACTURING TECHNOLOGY: Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram. **(3)**

AGRICULTURE AND IRRIGATION TECHNOLOGY: Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society. **(3)**

SCIENTIFIC TAMIL & TAMIL COMPUTING: Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project. **(3)**

Total L: 15 periods

TEXT – CUM – REFERENCE BOOKS

1. கே. கே. பிள்ளை, தமிழக வரலாறு - மக்களும் பண்பாடும் - (வெளியீடு - தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.)
7. Historical Heritage of the Tamils (Dr. S. V. Subrahmanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Identify the significance of ancient Tamil technologies in weaving, pottery, metallurgy, and architecture, with emphasis on traditional design and construction methods across historical periods.	**K2**
CO2	Use insights from traditional Tamil knowledge systems in agriculture, irrigation, and marine sciences, and connect the development of Tamil language to its applications in digital platforms and computing.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1							3				3		
CO2							3				3		
							3				**3**		

1-low, 2-medium, 3-high

25EE213 ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

0 0 2 1

List of Experiments:

1. Verification of Ohm's law and Kirchoff's laws.
2. Mechanical Characteristics of DC shunt Motor.
3. Load test on self-excited DC shunt generator.
4. Load test on single-phase transformer.
5. Load test on Three phase squirrel cage Induction Motor.
6. Characteristics of PN junction diode and Zener diode.
7. Implementation of Half wave rectifier with and without filter.
8. Implementation of Full wave rectifier with and without filter.
9. Verification of logic gate IC's.
10. Measurement of linear displacement using LVDT.

Total P: 30 periods

REFERENCE:

1. EEE Department, 'Electrical and Electronics Engineering Laboratory Manual'. PSG Institute of Technology and Applied Research, 2025.

COURSE OUTCOMES:

At the end of the course, students will be able to:		Bloom's Level
CO1	Determine the characteristics of electrical, electronic devices and verify the laws of electric circuits and digital IC's.	**K3**
CO2	Analyze the performance characteristics electrical machines under different loading conditions.	**K4**
CO3	Work effectively in teams to perform experiments, analyze data and present findings through well-documented reports and presentations.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3											2	1
CO2		3										2	1
CO3								1	**1**			2	1
	3	**3**						**1**	**1**			**2**	**1**

1-low, 2-medium, 3-high

25ME211 MAKERS LABORATORY

0 0 2 1

1. Foundry: Study of the tool; Preparation of green sand mould using different types of patterns.
2. Welding: Study of arc welding tools and equipment; Exercises: Preparation of joints using arc welding.
3. Carpentry: Study of wood working tools. Exercises: Preparation of "L" and "V" Joints.
4. Plumbing: Study of tools and operations; Exercises: External thread cutting and preparation of PVC pipe joints.
5. Sheet metal work and Soldering: Study of tools and operations; Exercise: Preparation of a rectangular tray.
6. Introduction to Arduino – based experiments. **Total P: 30 Periods**

COURSE OUTCOMES:

At the end of the course, students will be able to:		Bloom's Level
CO1	Comprehend the basic principles, tools, and techniques involved in various workshop practices	
CO2	Demonstrate the practical skills by performing mould preparation, pipe joining, metal tray fabrication, welding and carpentry joints	**K1**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	2
	3											**3**	**2**

1-low, 2-medium, 3-high

LANGUAGE ELECTIVES

25HS211 COMMUNICATION SKILLS FOR ENGINEERS
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 4 2

COMMUNICATION CONCEPTS: Process of Communication – Inter and Intrapersonal Communication – Essentials for effectiveness. **(9)**

ORAL COMMUNICATION: Oral presentations with visual aids and Group discussions. **(16)**

FOCUS ON SOFT SKILLS: Etiquette – Work Place etiquette – Telephone etiquette- Body Language – Critical Reasoning and Conflict Management based on Case Studies – Group Communication- Meetings -Interview Techniques. **(14)**

TECHNICAL WRITING: Technical Writing Principles - Style and Mechanics - Technical Definitions – Physical, Functional and Process Descriptions – Technical Report Writing – Preparing Instructions – Interpretation of Technical Data. **(14)**

BUSINESS CORRESPONDENCE: Writing Emails, Preparing Resumes. **(7)**

Total P: 60 periods

TEXT BOOKS:

1. Course materials prepared by the Faculty, Department of English.

REFERENCES:

1. Jeff Butterfield, '*Soft Skills for Everyone*'. Cengage Learning, New Delhi, 2020.
2. Sabina Pillai and Agna Fernandez, '*Soft skills and Employability Skills*'. Cambridge University Press, New Delhi, 2019.
3. Prashant Sharma, '*Soft Skills Personality Development for Life Success*'. BPB Publications, New Delhi, 2021.
4. K. N. Shoba and D. Praveen Sam, '*Technical English*'. Cambridge University Press, New York, 2020.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Produce clear and concise technical reports, compose professional and effective emails and develop well-structured and impactful resumes	**K2**
CO2	Plan, organize, and deliver engaging and informative presentations using appropriate visual aids and participate positively in group discussions	**K3**
CO3	Resolve disagreements constructively, embody professional conduct and a strong work ethic and apply critical thinking to generate effective solutions	**-**

25HS212 BASIC GERMAN
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 4 2

Guten Tag! - Learning: To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages; **Vocabulary:** related to the topic; **Grammar:** W – Questions, Verbs & Personal pronouns I.

Freunde, Kollegen und ich - Learning: To speak about hobbies, jobs, learn numbers from 20; **Vocabulary:** related to the topic; **Grammar:** Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural.

In der Stadt – Learning: To know places, buildings, question, know transport systems, understand international words; **Vocabulary**: related to the topic; **Grammar:** Definite & indefinite articles, Negotiation, Imperative with Sie.

Guten Appetit! – Learning: To speak about food, shop, converse; **Vocabulary:** related to the topic; **Grammar:** Sentence position, Accusative, Accusative with verbs.

Tag für Tag and Zeit mit Freunden – Learning: To learn time related expressions, speak about family, ask excuse, fix appointments on phone, birthdays, understand & write invitations, converse in the restaurant; **Vocabulary:** related to the topic; **Grammar:** Preposition – am, im, um, von…bis, Possessive articles, Modal verbs.

Total L: 60 periods

TEXT BOOK:

1. Dengler, Stefanie et al., '*Netzwerk A1.1*'. Klett-Langenscheidt Gmbh, München, 2013.

REFERENCES:

1. Dengler, Stefanie et al., '*Netzwerk A1*'. Klett-Langenscheidt Gmbh, München, 2013.
2. Sandra Evans,Angela Pude, '*Franz Specht-Menschen A1*'–Hueber Verlag ,2012.
3. Hermann Funk, Christina Kuhn, Silke Demme, '*Studio d A1*'. Goyal Publishers & Distributors Pvt. Ltd ,2009.
4. Rosa-Maria Dallapiazza, Eduard von Jan, Til Schönherr, '*Tangram Aktuell 1 (Deutsch als Fremdsprache)*'. Max Hueber Verlag, 2004.

25HS213 BASIC JAPANESE
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 4 2

Orientation Session, Geographic & Socio, economic perspective to Japan, Japanese people and culture and Basic greetings and responses.

Basic script, Method of writing hiragana and katakana, and Combination sounds and simple words.

Topic marker "wa", Desu / dewa arimasen cupolas, Interrogative particle "ka", Grammar particles "mo", "no", "Introducing someone: "Kochira wa ~" and Self introductions: Hajimemashite"

Demonstratives "Kore", "Sore", "Are", Demonstrative "Kono", "Sono", "Ano", Possessive noun particle "no" and Japanese apartments: Greeting your neighbor.

Place markers "Koko", "Soko", "Asoko", Direction markers "Kochira", "Sochira", "Achira" and Japanese department stores: Asking for and buying something.

Asking for and telling the time, Particle "ni (at)" for time, kara (from) ~ made (until), Particle "to (and)", Time periods: Days of the week, months, time of day, Verbs (Present / future and past tense) and Telephone enquiry: Asking for a phone no. And business hours.

Destination particle "e", Particles "de (mode of transportation)" and "to (with) and Japanese train station: Asking for Fare and track no. / types of trains.

Direct object particle "o", Particle "de (place of action)", Verbs ("~masen ka", "~mashou") and "Ohanami" Cherry blossom viewing.

Particle "de (by means of)", Particle "ni (to)", Aaemasu (give) and Moraimasu (receive) and Visiting a Japanese house.

Adjectives ("i" and "na" type), Adjectives (Positive and negative usage), Particle "ga (however, but), "Dore which?)" and Leaving a room, thanking someone for hospitality.

Likes and dislikes, Potential verbs (wakarimasu and dekimasu), "Kara (~ because)", Adverbs and Asking someone out over the phone.

Verbs denoting presence: "Imasu" and "arimasu", Particle "ni (in)", "Dare (who?)", Adverbs ("Chikaku ni ~ "), Particle "dare mo (negative ~ no one)" , Dare ka (anyone), dare ga (who) , Nani ka (anything) , nani ga (what) - ~ya (and) ~ nado (etc.) and Asking for directions.

Counters and Counting suffixes.

Introduction to Adjectives (na and ii type), Different usages of adjectives, Comparison, Likes and dislikes and Going to a trip.

Need and desire (ga hoshii), Wanting to … (Tabeti desu), Going for a certain purpose (mi –ni ikimasu) and Choosing from a menu.

Verb groups, I, II and III and Exercises to group verbs.

Please do (te kudasai), Present continuous tenses (te imasu), Shall I? (~ mashou ka) and Describing a natural phenomenon (It is raining).

To grant permission (~te mo ii desu), Asking for permission (~ te mo ii desu ka) and Should not do (~ te waikemasen) Describing a continuing state and Describing a habitual action.

Roleplays in Japanese.

A demonstration on usage of chopsticks and Japanese tea party.

Total L: 60 periods

TEXT BOOK

1. '*Minna no nohongo – Romaji ban*'. (first 10 lessons of this book).

REFERENCE

1. '*Minna no Nihongo I Honsatsu Roma – ji ban*'. (Main Textbook Romanized Version). International publisher – 3A Corporation,Tokyo, Indian distributor – Goyal Publishers & Distributors, New Delhi.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understand the importance of soft skills for employability and fine tune their writing skills – Resume writing	**K2**
CO2	Present with clarity and coherence while speaking in formal contexts.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2									3			1	
									3			**1**	

1-low, 2-medium, 3-high

25EEC01 WORKPLACE COMMUNICATION SKILLS
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 2 0

BUILDING COMMUNICATION SKILLS:

1. Introduction to Workplace Communication
2. Profile Building for Internships
3. English in the Workplace (Grammar & Vocabulary)
4. Professional Communication (Speaking & Writing)
5. Workplace Communication Tools
6. Career Exploration
7. Resume Update

Total P: 30 periods

REFERENCES:

1. P. C. Wren and H. Martin, '*High school English Grammar and Composition*'. S Chand Publishing, New Delhi, 2017.
2. Norman Lewis, '*Word Power Made Easy*'. Goyal Publisher, New Delhi, 2011.

COURSE OUTCOMES:

At the end of the course, students will be able to		**Bloom's Level**
CO1	Understand the importance of soft skills for employability and fine tune their writing skills – Resume writing	**K3**
CO2	Present with clarity and coherence while speaking in formal contexts.	**K2**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2									**3**			2	2
									3			**2**	**2**

1-low, 2-medium, 3-high

SEMESTER III

25MA306 COMPUTATIONAL MATHEMATICS

3 1 0 4

SYSTEM OF LINEAR EQUATIONS, EIGENVALUES AND EIGENVECTORS: Approximations and errors. System of linear equations - Naïve Gauss elimination method, Cholesky method, Gauss–Seidel method. Eigenvalues and eigenvectors - Jacobi method, Applications - analysis of statically determinate truss, spring-mass systems. **(10+3)**
NON-LINEAR EQUATIONS: False-position method, Newton-Raphson method, Graeffe's root squaring method, Applications – Open channel flow model, vibration analysis. **(8+3)**

INTERPOLATION, DIFFERENTIATION, AND INTEGRATION: Interpolation - Newton's forward and backward, Lagrange, cubic-spline, approximation - Bezier curves, Numerical differentiation, Numerical integration - Newton-Cotes formulae, Trapezoidal rule, Simpson's1/3rd rule, Gaussian Quadrature, Applications – temperature gradient, velocity and pressure distribution, relation between stress and strain **(12+4)**

ORDINARY DIFFERENTIAL EQUATIONS: Taylor-series method, Euler method, 4th order Runge-Kutta method, Milne's method. Finite element method – Rayleigh Ritz method, Galerkin method, Applications - swinging pendulum, heat flow models. **(6+2)**

PARTIAL DIFFERENTIAL EQUATIONS: Finite difference method: elliptic equations - Laplace equation, Poisson equation **–** Liebmann method, deflection of a plate, steady state heat conduction, parabolic equations – Crank Nicolson's method, transient heat conduction, hyperbolic equations – vibrating string. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. Steven C Chapra and Raymond P Canale, '*Numerical Methods for Engineers'.* Tata McGraw Hill, New Delhi, 2021.
2. Curtis F Gerald and Patrick O Wheatly, '*Applied Numerical Analysis'.* Pearson Education, New Delhi, 2017.

REFERENCES:

1. Richard L. B and Douglas J. F, *'Numerical Analysis'.* Thomas Learning, New York, 2017.
2. G. Miller, '*Numerical Analysis for Engineers and Scientists'*. Cambridge University Press, UK, 2014.
3. Amos G and Vish S, '*Numerical Methods for Engineers and Scientists'.* Wiley India, New Delhi 2014.
4. Tai-Ran, '*Applied Numerical Analysis'*. Wiley India, New Delhi, 2018.

COURSE OUTCOMES:

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the concepts related to Matrix Theory and Numerical Methods.	**K2**
CO2	Apply the techniques of Matrix Theory and Numerical Methods to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Matrix Theory and Numerical Methods.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Matrix Theory and Numerical Methods.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3											3	1
CO3		1										3	1
CO4					1						1	3	1
	3	**1**			**1**						**1**	**3**	**1**

1-low, 2-medium, 3-high

25HS301 PROJECT AND FINANCE MANAGEMENT

3 0 0 3

INTRODUCTION TO PROJECT MANAGEMENT: Project: Trends in project management, project management versus general management, agile project management, the three goals of a project, life cycle of projects, project selection methods, project portfolio process, case study – friendly assisted living facility. **(9)**

ROLE OF PROJECT MANAGER AND ORGANISATION: Project manager's roles and responsibilities, selection of a project manager, project management as a profession, fitting projects into the parent organisation, the project team and agile team roles, case study – the company with traditional functional organizational structure setting up teams for the new initiatives. **(9)**

PROJECT ACTIVITIES: The planning process, work-breakdown structure and other aids, risk management, methods of budgeting, cost estimation, scheduling the project with PERT and CPM networks, allocating resources, resource loading and leveling, Goldratt's Critical Chain, application – using Project Libre for project management, case study – success of Chandrayan-3. **(9)**

INTRODUCTION TO FINANCE MANAGEMENT: Overview - finance and related disciplines, scope and objectives of financial management, time value of money, valuation of securities, and risk and return and calculations with spread sheet, analysis using cash flow statement and financial statements. **(9)**

PERSONAL FINANCE: Compounding, debt, equity and financial markets and investments- debt and bonds. Equity, mutual funds, hedge funds, real estate, and commodities, Personal financial plan to enhance wealth and job marketability, components of a financial plan, tools for planning – financial statements, applying time value concept of money and tax planning. **(9)**

Total L: 45 periods

TEXT BOOKS:

1. Jack R. Meredith and Scott M. Shafer, '*Project Management in Practice'.* Wiley, 2021.
2. Khan M. Y. and Jain P. K., *'Basic Financial Management'*. Tata McGraw Hill, 2012.
3. Michael Fisher, '*Saving and Investing'.* Author House, 2005.
4. Jeff Madura, '*Personal Finance'*. Pearson, 2020.

REFERENCES:

1. National Finance Olympiad, '*Personal Finance Handbook'.* Pockvue Solutions, 2024.
2. Glen Arnold, *'Investing'*. Financial Times Guides, 2020.
3. Rachel Siegel and Carol Yacht, '*Personal Finance'*. Open Textbook Library, Saylor Foundation, 2009.
4. Google, '*Google Project Management: Professional Certificate'.* Google Project Management: Professional Certificate, Coursera.

COURSE OUTCOMES:

At the end of the course, students will be able to		**Bloom's Level**
CO1	Identify various budgeting and cost estimation techniques suited to different project scenarios and the uses of project scheduling methods.	**K1**
CO2	Understand the basic concepts of project management, phases of project life cycle, the roles and responsibilities of project manager and how projects are integrated into different types of organizational structures.	**K2**
CO3	Apply theoretical knowledge and practical tools to support sound financial decision-making in real-world scenarios.	**K3**
CO4	Differentiate between various financial instruments and application of financial planning to enhance personal wealth.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1										2		1	2
CO2										3		1	2
CO3										2	2	1	2
CO4										3	3	1	2
										3	**3**	**1**	**2**

1-low, 2-medium, 3-high

25ME301 MECHANICS OF MATERIALS

3 0 0 3

CONCEPTS OF STRESS AND STRAIN: Stresses and strains, types; Axial and shear stresses and strains: Elastic limit, Hooke's law, lateral strain, Poisson's ratio, volumetric strain, elastic constants, factor of safety; Stepped bars, uniformly varying sections, stresses in composite bar due to axial force and temperature; Strain energy due to axial force: Stresses due to gradual load, sudden load and impact loads. **(9)**

SHEAR FORCE AND BENDING MOMENT: Relationship between load, shear force and bending moment; Shear force and bending moment diagrams: Cantilever, simply supported and overhanging beams under concentrated load, uniformly distributed load, uniformly varying load, concentrated moments, maximum bending moment and point of contra flexure. **(9)**

BENDING STRESS AND DEFLECTION OF DETERMINATE BEAMS: Theory of simple bending: Assumptions and derivation, section modulus, bending stresses in symmetrical and unsymmetrical sections; Shear stresses in beams; Deflection of beams: Double integration method, Macaulay's method and moment area method; Euler's theory of columns. **(9)**

TORSION: Theory of torsion: Assumptions and derivation, polar modulus; Stresses in solid and hollow circular shafts, power transmission, design for strength and stiffness; Stresses and deflection in close coiled helical spring, springs in series and parallel **(8)**

THIN CYLINDERS, PRINCIPAL STRESSES AND STRAINS: Stresses in thin cylindrical and spherical shells subjected to internal pressure; State of stress at a point: Normal and tangential stresses on a given plane, principal stresses and their planes, plane of maximum shear stress, analytical method, Mohr's circle method. **(10)**

Total L: 45 periods

TEXT BOOKS:

1. James M Gere, '*Mechanics of Materials'*. Cengage Learning, Inc, 7th edition,2008.
2. Beer, Johnston and Dewolf, '*Mechanics of Materials'.* Tata McGraw-Hill Education, 7th edition,2012.

REFERENCES:

1. S S Rattan, '*Strength of Materials'*. McGraw-Hill Education (India) Pvt. Ltd., 3rd edition, 2017.
2. Don H Morris, et al., '*Mechanics of Materials'*, John Wiley and Sons Inc., 6th edition,2007.
3. Russell C Hibbler, *'Mechanics of Materials'*. Pearson, 10th edition,2016.
4. Popov E P, '*Engineering Mechanics of Solids'*, Prentice-Hall, 2nd edition,1999.

COURSE OUTCOMES:

At the end of the course, students will be able to		**Bloom's Level**
CO1	Understand the fundamental concepts of deformable body mechanics, including stress, strain, and the fundamentals of elasticity.	**K2**
CO2	Construct Mohr's circle, stress–strain distributions, shear force, and bending moment diagrams.	**K3**
CO3	Analyze structural members under various loading conditions.	**K4**
CO4	Model and simulate structural members using appropriate tools.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	
CO3		1										3	
CO4		1			1							3	
	3	**1**			**1**							**3**	

1-low, 2-medium, 3-high

25ME302 KINEMATICS OF MACHINERY

3 1 0 4

BASICS AND SYNTHESIS OF MECHANISMS: Terminology-rigid link, kinematic pairs, kinematic chain, mechanism, degree of freedom; Kinematic inversions-four bar chain, single slider and double slider chains; Indices of merit; Synthesis: Type, number and dimensional synthesis, function generation-two, three position synthesis of slider crank and four bar mechanisms using graphical method, analytical synthesis-Freudenstein's equation, precision positions, structural error, Chebyshev's spacing, defects in mechanisms. **(9+3)**

KINEMATIC ANALYSIS: Displacement, velocity and acceleration analysis of simple mechanisms-graphical method, instantaneous centre method; Kinematic analysis of four bars linkages-loop closure equation; Computer aided kinematic analysis of mechanisms. **(9+3)**

GEARS AND GEAR TRAINS: Fundamentals of gears, gear nomenclature, law of gearing, tooth forms, contact ratio, interference and undercutting; Gear trains-velocity ratio of simple, compound and epicyclic gear trains, holding torque. **(9+3)**

KINEMATICS OF CAM: Cam nomenclature, classifications, follower displacement and derivatives-uniform velocity, simple harmonic and cycloidal motions, and, uniform acceleration and retardation motion; Layout of cam profiles for different types of followers-knife edged, roller, flat faced followers; Pressure angle and jump speed. **(9+3)**

GYROSCOPIC COUPLE AND SPATIAL MECHANISMS: Gyroscopic couple and its effect on aircraft, ship, two and four wheeled automobiles; Spatial mechanisms – introduction, series and parallel manipulator, mobility, topological arrangements, DH parameters. **(9+3)**

Total: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. John J. Uicker Jr., Gordon R. Pennock, Joseph E. Shigley, '*Theory of Machines and Mechanisms'*, Oxford University Press, New Delhi, 5th edition, 2017.
2. Rattan S S, '*Theory of Machines'*. Tata McGraw -Hill Publishers, New Delhi, 4th edition, 2017.

REFERENCES:

1. Robert L. Norton, '*Design of Machinery'*, McGraw Hill Higher Education, 6th edition, 2020.
2. David H Myszka, '*Machines and Mechanisms'.* Pearson, 4th edition, 2015.
3. Kenneth J. Waldron, et al., '*Kinematics, Dynamics, and Design of Machinery'.* Wiley, 3rd edition 2016.
4. Kevin Russell, Qiong Shen, et al., '*Kinematics and Dynamics of Mechanical Systems'*. CRC Press, 2nd edition, 2019.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understand the structure, motion characteristics, and functional behaviour of mechanical systems.	**K2**
CO2	Apply analytical and graphical techniques to evaluate motion parameters in mechanical linkages.	**K3**
CO3	Analyse the interaction and performance of mechanical components involved in motion transmission.	**K4**
CO4	Evaluate dynamic responses of mechanical systems and recommend solutions for improved vibration performance.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	
CO3		3										3	
CO4			2		1	1						3	
	3	**3**	**2**		**1**	**11**						**3**	

1-low, 2-medium, 3-high

25ME303 ENGINEERING THERMODYNAMICS

3 1 0 4

FIRST LAW OF THERMODYNAMICS: system, properties, zeroth law of thermodynamics and application, thermodynamic state and equilibrium, process and cycle, work, heat and other forms of energy; First law of thermodynamics, application to open and closed systems, general energy equation and applications. **(9 + 3)**

PROPERTIES OF PURE SUBSTANCES: Ideal gas properties, equations of state, properties of mixtures, compressibility, pure substances, P-V-T surfaces, phase change processes, vapor pressure, properties of steam, use of property tables, T-S diagrams, Mollier chart, Rankine cycle. **(9 + 3)**

SECOND LAW OF THERMODYNAMICS: Kelvin-Planck and Clausius statements, heat engines and heat pump, reversibility, Carnot cycle, Carnot theorem, thermodynamic temperature scale; Third law of thermodynamics, types of irreversibility; first and second law efficiencies. **(9+3)**

ENTROPY: Clausius theorem, property of entropy, Clausius inequality, entropy and its applications, microscopic interpretation of entropy, maximum work obtainable from finite heat reservoirs, entropy generation in open and closed systems, isentropic work in a steady flow open system. **(9 + 3)**

AVAILABILITY AND IRREVERSIBILITY: Availability, available energy referred to a cycle, maximum work in a reversible process, reversible work-open and closed systems; Availability and irreversibility; Thermodynamic relations, Maxwell's equations, Joule Kelvin effect, Clausius-Clapeyron equation, conditions of thermodynamic equilibrium and stability. **(9 + 3)**

Total: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. Sonntag R E, Borgnakke C, Van Wylen G.J , '*Fundamentals of Engineering Thermodynamics'.* 9th Edition, John Wiley & Sons, USA, 2017.
2. Nag P K , '*Engineering Thermodynamics'*, 6th Edition, Tata McGraw Hill, India, 2017.

REFERENCES:

1. Yunus A Cengel, Boles M A , '*Thermodynamics: An Engineering Approach'*, 8th Edition, Tata McGraw Hill, USA, 2017.
2. Michael Moran J, Howard Shapiro N, Daisie Boettner D, Margaret Bailey D, '*Fundamentals of Engineering Thermodynamics'.* 8th Edition, John Wiley & Sons, USA, 2014.
3. Onkar Singh , "Engineering Thermodynamics", 1stEdition, New Age International, India, 2007.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understand the fundamental laws of thermodynamics and its interrelation in real life activities/ simple systems.	**K2**
CO2	Apply the thermodynamics concepts to open and closed systems for evaluating the system performance	**K3**
CO3	Investigate the effect of design parameter modifications on the performance of simple thermodynamic systems.	**K4**
CO4	Present orally as individual and team the latest research developments in the field of thermodynamics	

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3											3	
CO3				1								3	
CO4								1	1			2	
	3			1				1	1			**3**	

1-low, 2-medium, 3-high

Third ACM

25ME311 METALLURGY AND MECHANICS OF MATERIALS LABORATORY

0 0 4 2

METALLURGY LABORATORY:

1. Study of metallurgical microscope and practice of metallographic sample preparation.
2. Microstructural analysis of steels using optical microscope.
3. Microstructure analysis of cast irons using optical microscope.
4. Determination of grain size and phase fraction using an appropriate software.
5. Heat treatments of high carbon steels: Annealing, Normalizing and Hardening

MECHANICS OF MATERIALS LABORATORY:

1. Tension test on metals: Stress-strain characteristics
2. Hardness test on metals: Brinell, Vicker and Rockwell hardness tests
3. Impact test on metals: Charpy and izod impact test
4. Torsion test on shafts: Torque and angle of twist characteristics
5. Compression tests on helical springs: Load deformation characteristics and stiffness
6. Deflection test on beams.

Total P: 60 periods

REFERENCES:

1. Department of Mechanical Engineering, '*Metallurgy and Mechanics of Materials Laboratory*'. PSG iTech, 2025.
2. ASTM E8/E8M – Standard Test Methods for Tension Testing of Metallic Materials.
3. ASTM E23 – Standard Test Methods for Notched Bar Impact Testing of Metallic Materials (Charpy).
4. ASTM E10 – Standard Test Method for Brinell Hardness of Metallic Materials.
5. ASTM E18 – Standard Test Methods for Rockwell Hardness of Metallic Materials.
6. ASTM E384 – Standard Test Method for Microindentation Hardness of Materials (Vickers).

COURSE OUTCOMES:

At the end of the course, students will be able to		**Bloom's Level**
CO1	Prepare metallographic specimens and operate metallurgical microscopes for microstructural evaluation of metallic materials.	K3
CO2	Analyze microstructures to determine grain size and phase fractions in steels, cast irons, and non-ferrous alloys using appropriate software tools.	K4
CO3	Perform standard mechanical tests including tensile, hardness, impact, torsion, and deflection tests on engineering materials as per relevant standards.	K3
CO4	Analyze experimental results to assess mechanical behaviour of materials under different loading conditions.	K4

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3											3	
CO2		3			1							3	
CO3	3											3	
CO4		3										3	
	3	**3**			**1**							**3**	

1-low, 2-medium, 3-high

25ME312 MANUFACTURING PROCESSES LABORATORY

0 0 4 2

List of Experiments:

1. Taper Turning and Eccentric Turning on circular parts using lathe machine.
2. Knurling, external and internal thread cutting on circular parts using lathe machine.
3. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
4. Perform Drilling and Reaming using vertical drilling machine.
5. Perform metal spinning operation using lathe.
6. Milling contours on plates using vertical milling machine.
7. Manufacture spur and helical gear using horizonal milling machine.
8. Generating gears using gear hobbing machine.
9. Generating gears using gear shaping machine.
10. Grinding components using cylindrical, centreless & surface grinding machine.
11. Cutting force calculation using dynamometer in milling machine.
12. Cutting force calculation using dynamometer in lathe machine.
13. Prepare part program (canned cycle) and perform machining using CNC Lathe.
14. Prepare part program (canned cycle) and perform machining using CNC Milling M/c

Total P: 60 periods

REFERENCES:

Department of Mechanical Engineering, '*Manufacturing Processes Laboratory'*, PSG iTech, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Understand various manufacturing techniques and produce components according to requirements.	**K2**
CO2	Apply the concepts of manufacturing to perform experiments and calculate machining parameters.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3										1	3	
	3										**1**	**3**	

1-low, 2-medium, 3-high

25EEC02 FOUNDATIONS OF PROBLEM SOLVING

0 0 2 1

PROBLEM SOLVING:

1.Speed Mathematics (SAW, Oz, Mirror methods)
2. Speed Mathematics (High5, Minion, Butterfly methods)
3. Speed Mathematics (Inception, Goldeneye methods)
4. Thinking with Numbers
5. Problem Solving with Visual information
6. Words Puzzles
7. Resume Writing Essentials

Total P: 30 Periods

REFERENCES:

1. R.S. Aggarwal, '*Quantitative Aptitude for Competitive Examination'.* S Chand Publishing, New Delhi, 2017.

SEMESTER IV

25MA405 PROBABILITY AND STATISTICS

2 1 0 3

PROBABILITY AND DISCRETE RANDOM VARIABLES: Probability, axiomatic approach to probability, Baye's theorem, discrete random variables, probability mass functions, cumulative distribution functions, mean and variance, binomial, Poisson and geometric distributions. **(6+3)**

CONTINUOUS RANDOM VARIABLES: Continuous random variables, probability density functions, cumulative distribution functions, mean and variance, uniform, exponential, and normal distributions. **(6+3)**

JOINT PROBABILITY DISTRIBUTIONS: Two dimensional discrete and continuous random variables, marginal and conditional probability distributions, independence, covariance, correlation. **(6+3)**

STATISTICAL INFERENCE: Point estimation - interval estimation – hypotheses concerning means – large, small samples and matched pairs – hypotheses concerning proportions, chi square test for goodness of fit. **(6+3)**

VARIANCE TESTS AND ANALYSIS OF VARIANCE: Hypotheses concerning variances - analysis of variance - completely randomized design, randomized block design. **(6+3)**

Total L: 30 + T: 15 = 45 periods

TEXT BOOKS:

1. Douglas C Montgomery and George C Runger, '*Applied Statistics and Probability for Engineers'.* Wiley India, New Delhi, 2018.
2. Richard A Johnson, '*Miller & Freund's Probability and Statistics for Engineers'.* Pearson education, New Delhi, 2017.

REFERENCES:

1. Ronald E. W, Raymond H. M, Sharon L. M and Keying Ye, '*Probability & Statistics for Engineers & Scientists'.* Pearson Education, New Delhi, 2016
2. Robert V. H, Elliot T and Dale Z, '*Probability and Statistical Inference'.* Pearson Education, New Delhi, 2021.
3. Jay L Devore, '*Probability and Statistics for Engineering and the Sciences'.* Cengage Learning**,** Delhi 2020.
4. Sheldon M Ross, '*Introduction to Probability and Statistics for Engineers and Scientists'.* Academic press, USA, 2020.

COURSE OUTCOMES:

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the concepts related to Probability and Statistics	**K2**
CO2	Apply the techniques of Probability and Statistics to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Probability and Statistics.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Linear Algebra.	

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3											3	2
CO3		1										3	2
CO4					1						1	3	2
	3	**1**			**1**						**1**	**3**	**2**

1-low, 2-medium, 3-high

25ME401 METAL CUTTING THEORY

3 0 0 3

THEORY OF METAL CUTTING AND CUTTING TOOL TECHNOLOGY: Introduction: Material removal processes; Metal cutting fundamentals: Theory of chip formation, types of chips, orthogonal cutting and oblique cutting; Nomenclature of single-point cutting tools; Mechanics of metal cutting: Machining forces and Merchant's Circle Diagram (MCD) – simple calculations, cutting tool materials, tool wear, tool life, cutting fluids; Overview of high-speed machining. **(10)**

CENTRE LATHE AND CNC LATHES: Centre lathe, constructional features, various operations, machining time calculation; Fundamentals of NC technology, Computer Numerical Control: CNC turning center - Constructional features, part programming techniques, applications. **(9)**

MACHINING OF PRISMATIC COMPONENTS: Shaper, milling: up milling, down milling, milling cutters, operations; Constructional features of CNC machining centers; Drilling: Column and radial drilling machines, reaming, tapping and boring; Broaching machines: Push, pull broaching processes. **(9)**

ABRASIVE PROCESSES AND GEAR MACHINING: Abrasive processes: Grinding wheel designation and selection; Types of grinding processes: cylindrical grinding, surface grinding, centreless grinding; Honing, lapping; Gear machining methods: Gear hobbing, gear shaping and gear grinding. **(8)**

NONTRADITIONAL MACHINING: Mechanical energy processes: abrasive water jet machining, ultrasonic machining; Thermal Energy Processes: electric discharge machining (EDM), laser beam machining (LBM). **(9)**

Total L: 45 periods

TEXTBOOKS:

1. Rao P N, '*Manufacturing Technology-Vol.2'.* 4th Edition, McGraw-Hill Education, USA, 2018.
2. Milton C Shaw, '*Metal Cutting Principles'*. 2nd Edition, Oxford University Press, USA, 2012.

REFERENCES:

1. Serope Kalpakjian and Stephen Schmid, '*Manufacturing, Engineering and Technology'.* 7th Edition, Pearson Education, USA, 2018.
2. Mikell P Groover, '*Principles of Modern Manufacturing*'. 5th Edition, Wiley & Sons Pvt. Ltd, India, 2013.
3. Radhakrishanan P, '*Computer Numerical Control Machining and Computer-Aided Manufacturing'*, 1st Edition, New Age International Publishers, India, 2018.
4. Peter Scallan, '*Process Planning'*. The Design/Manufacture Interface, 1st Edition, Elsevier, 2003

COURSE OUTCOMES:

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the principles of machining in manufacturing	**K2**
CO2	Apply the concepts of manufacturing in determining machining parameters for machining processes	**K3**
CO3	Analyse machining processes by simulating to produce mechanical components which meet varied service conditions	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3											3	
CO3		1			1							3	
	3	**1**			**1**							**3**	

1-low, 2-medium, 3-high

25ME402 DYNAMICS OF MACHINERY

3 1 0 4

STATIC FORCE ANALYSIS OF MECHANISM: Free body diagram: Conditions of equilibrium, two, three and four force members, effect of friction in rolling and sliding pair. **(9+3)**

DYNAMIC FORCE ANALYSIS OF MECHANISM: Inertia force and D'Alembert's principle, dynamic force analysis of mechanisms; Turning moment diagram: Fluctuation of energy and speed, mass of flywheel required for IC engines and mechanical presses. **(9+3)**

BALANCING: Balancing of rotating masses - masses in single plane and several planes; Balancing of reciprocating masses - primary and secondary forces and couples, balancing of in-line multi-cylinder engines, balancing of V and radial engines- direct and reverse crank technique; Balancing machines - field balancing. **(9+3)**

FREE VIBRATION: Basic features of vibratory systems: Elements, single degree of freedom system; Undamped free vibration - equation of motion, natural frequency; Damped free vibration - damping ratio, logarithmic decrement; Transverse vibration - Dunkerley's method, critical speed of shaft. **(9+3)**

FREE TORSIONAL VIBRATION AND FORCED VIBRATION: Torsional vibration: Two and three rotor systems, geared systems; Response to periodic force: Forcing by unbalance, support motion, force and amplitude transmissibility, vibration isolation; Vibration measurement and analysis: General considerations, vibration measurement, vibration pickups, signature analysis, preparation of Campbell diagram for rotating equipment, ISO severity code. **(9+3)**

Total L: 45 +T: 15 = 60 periods

TEXT BOOKS:

1. Shigley J E,Uicker J J, '*Theory of Machines and Mechanisms'.* Oxford University Press, 5th edition, 2016.
2. Rattan S S, '*Theory of Machines'*. McGraw Hill Education, 5th edition, 2019.

REFERENCES:

1. Singiresu S. Rao, '*Mechanical Vibrations'*, Pearson India, 6th edition, 2018.
2. Ghosh,Mallick, '*Theory of Mechanisms and Machines'.* Affiliated East-West Pvt. Ltd., 3rd edition, 2008.
3. Graham Kelly.S, '*Fundamentals of Mechanical Vibrations'*. McGraw-Hill Corporation, 2ndedition, 2000.
4. William L. Cleghorn, Nikolai Dechev, '*Mechanics of Machines'* Oxford University Press, 2nd edition, 2014.

COURSE OUTCOMES:

At the end of the course, students will be able to		Bloom's Level
CO1	Understand the fundamental concepts of static and dynamic force analysis, balancing, and vibrations in mechanical systems.	**K2**
CO2	Apply principles of force analysis and vibration theory to solve engineering problems related to mechanisms, flywheels, and rotors.	**K3**
CO3	Analyse mechanical systems for balancing, free and forced vibration responses, and evaluate their dynamic behaviour.	**K4**
CO4	Use modern engineering tools to analyse mechanical systems, and interpret their data.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	
CO3		2										3	
CO4		1			1	1						3	
	3	**2**			**1**	**1**						**3**	

1-low, 2-medium, 3-high

25ME403 IC ENGINES AND THERMAL SYSTEMS

3 0 0 3

AIR STANDARD CYCLES AND IC ENGINES: Air standard assumptions, Carnot, Otto, Diesel and Dual cycles, comparison of Otto, Diesel, and Dual cycles; Classification and comparison of engines, working principle of Wankel engine, four stroke and two stroke engines, petrol and diesel engines with P-V and T-S diagrams, valve and port timing diagrams. **(9)**

ENGINE AUXILIARY SYSTEMS: Working principles and types of carburetors, ignition systems, fuel pumps and injectors, MPFI, CRDI, lubricating and cooling systems; Super and turbo charging. **(9)**

PERFORMANCE OF IC ENGINES: Engine testing: Constant speed and variable speed tests, indicated power, brake power, frictional power - Willan 's line and Morse test, volumetric efficiency, heat balance test. **(9)**

BOILERS: Requirements of boiler; Types: Water tube, fire tube, fluidized bed boilers; Boiler draught; Boiler performance: Direct and indirect heat balance. **(9)**

COMPRESSORS: Classification, working principle of reciprocating compressors, equations for shaft work and efficiencies, effect of clearance on volumetric efficiency, multi-stage compression, inter-cooler and optimum intermediate pressure in a two-stage compressor; Rotary compressor: Roots-type blower, sliding vane and screw compressors - working principle and performance. **(9)**

Total L: 45 periods

TEXT BOOKS:

1. John B. Heywood, '*Internal Combustion Engine Fundamentals'.* 2nd Edition, McGraw-Hill Education, 2018.
2. Ganesan V, '*Internal Combustion Engine'*. 4th Edition, McGraw Hill Publishers, India, 2012.

REFERENCES:

1. Allan T Kirkpatrick, Colin R Ferguson , *'Internal Combustion Engines: Applied Thermo Sciences'.* 3rd Edition, Wiley, India, 2015.
2. Kothandaraman C P, Domkundwar S , '*Thermodynamics and Thermal Engineering'*, 3rd Edition, Dhanpat Rai and Sons, India, 2013.
3. Rudramoorthy R , '*Thermal Engineering'*, 3rd Edition, Tata McGraw Hill Publishers Co. Ltd, India, 2017.
4. Willard W Pulkrabek, "Engineering Fundamentals of the Internal Combustion Engine", 2nd Edition, Pearson Education, USA, 2003.

.

COURSE OUTCOMES:

At the end of the course, students will be able to		**Bloom's Level**
CO1	Explain the working principles, classifications, and key characteristics of thermal systems.	**K2**
CO2	Apply thermodynamic and mechanical principles to calculate the performance of IC engines, boilers, and compressors.	**K3**
CO3	Analyse the performance and application suitability of various thermal systems.	**K4**
CO4	Work as a team to gather vehicle data, calculate engine performance, and compare costs of bikes and cars with similar engine sizes, and then present their findings	**K1**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	
CO3		2										3	
CO4	1					1	1	1	1	1	1	3	
	3	**2**				**1**	**1**	**1**	**1**	**1**	**1**	**3**	

1-low, 2-medium, 3-high

25ME411 THERMAL ENGINEERING LABORATORY

0 0 4 2

List of Experiments

1. Valve Timing and Port Timing diagrams.
2. Performance Test on four – stroke Diesel Engine with hydraulic loading.
3. Performance test on a single cylinder petrol engine with mechanical loading.
4. Heat Balance Test on 4 – stroke Diesel Engine.
5. Morse Test on Multi-Cylinder Petrol Engine.
6. Retardation Test on a Diesel Engine.
7. Actual p-v diagrams and determination of p-θ diagram and heat release characteristics of an IC engine.
8. Determination of Flash Point and Fire Point of various fuels / lubricants
9. Performance test on a two stage Reciprocating Air compressor.
10. Determination of COP of a Refrigeration system
11. Performance and Energy Balance Test on a Steam Generator.
12. Performance and Energy Balance Test on Steam Turbine.

Total P: 60 Periods

REFERENCES:

1. Department of Mechanical Engineering, '*Thermal Engineering Laboratory Manual'*, PSG Institute of Technology and Applied Research, 2025.
2. Ganesan V, '*Internal Combustion Engines'*. Tata McGraw Hill, 2013.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understand the principles, construction, and operation of engines and thermal systems.	**K2**
CO2	Conduct experiments and apply principles to evaluate the performance of thermal and fluid machines.	**K3**
CO3	Analyze data to evaluate timing diagrams, performance, heat balance, and efficiency of thermal systems.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3											3	
CO3		1										3	
	3	**1**			**1**							**3**	

1-low, 2-medium, 3-high

25ME412 PYTHON PROGRAMMING LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

1. Simulate Cantilever Beam Reactions Using Flowcharts and Pseudocode
2. Thermodynamic Property Calculator with Data Types and Type Checking
3. Factor of Safety Estimation with Conditions and I/O
4. Gear Ratio and Torque Calculation Using Operators
5. Piston Kinematics: Displacement vs Crank Angle Simulation with Loops
6. Manufacturing Part Code Validator Using String Methods
7. Temperature Logging in Heat Treatment Process
8. CNC Machine Coordinate Data Processor Using Tuples
9. Material Properties Filter Using Sets and Frozensets
10. Component Metadata Manager Using Dictionaries
11. Truss Load Distribution Using Recursive Functions
12. Heat Transfer Calculator as a Custom Python Package
13. Stress-Strain Data Plotter Using NumPy and Matplotlib
14. File-Based Logger and Error Handler for Vibration Analysis

Total P: 60 periods

REFERENCES:

1. Department of Mechanical Engineering, '*Python Programming Laboratory Manual'.* PSG Institute of Technology and Applied Research, 2025.

COURSE OUTCOMES:

At the end of the course, students will be able to		**Bloom's Level**
CO1	Understand fundamental programming constructs and explain their relevance in mechanical engineering.	**K2**
CO2	Apply Python programming concepts to solve mechanical engineering problems.	**K3**
CO3	Analyse engineering data using Python libraries like NumPy and matplotlib.	**K4**
CO4	Create efficient, reusable Python programs for real-world mechanical engineering problems.	**K5**

COs-POs & PSOs MAPPING

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

1-low, 2-medium, 3-high

Third ACM

25EEC03 PROBLEM SOLVING

0 0 2 1

PROBLEM SOLVING:

1. Algorithmic Thinking, Branching & Repetition Problems
2. Logical Reasoning - Data Arrangements & Relations
3. Solving problems based on Coding & decoding, Series, Analogy, Odd man out and Visual reasoning
4. Problems based on Ages, Logical Connectives, Syllogisms, Data Interpretation & Data Sufficiency
5. Solving problems on Clocks Calendars, Direction Sense & Cubes
6. Problems based on Number system, Percentages, Simple & Compound Interest
7. Resume Update

Total P: 30 periods

REFERENCES:

1. R.S. Aggarwal, '*Quantitative Aptitude for Competitive Examination'.* S Chand Publishing, New Delhi, 2017.

MANDATORY COURSES

25MC001 ENVIRONMENTAL SCIENCES
(Common to Civil, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

3 0 0 3

INTRODUCTION TO ENVIRONMENT: Environment - Definition, scope and importance. Types and composition of atmosphere – particles, ions and radicals. Ozone layer- significance, formation and depletion. Ecosystems- Structure and functions, components, energy flow, food chains, food web, Biodiversity-levels, values and threats – India as a mega-diversity nation, hotspots of biodiversity, endangered and endemic species of India, conservation of biodiversity. **(9)**

ENERGY RESOURCES: Introduction – National and International status- exploitation - sustainable strategies- Fossil fuels-classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas; solar energy - introduction, harnessing strategies. Wind energy - availability, wind power plants, wind energy conversion systems, site characteristics, and types of wind turbines. Supporting renewable energy resources - tidal, geothermal, hydroelectric. **(9)**

ENVIRONMENTAL POLLUTION: Definition, Sources, causes, impacts and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, RF hazards, Role of an individual in prevention of pollution. Disaster Management: Floods, earthquake, cyclone and landslides – Case studies, consequences and rescue measures. **(9)**

WASTE MANAGEMENT: Waste water - Characteristics of domestic and industrial wastewater - COD and BOD, Various stages of treatment – primary, secondary, tertiary treatment- Biological and advanced oxidation processes. Solid waste management – Characteristics of municipal solid waste (MSW), biomedical, automobile and e-wastes and their management, landfills, incineration, pyrolysis, gasification and composting**.** **(9)**

SOCIAL ISSUES AND THE ENVIRONMENT: Environmentally Sustainable work practices- Rain water harvesting, Role of non-governmental organizations. Human ethics and rights- impact on environment and human health, role of information technology on environment and human kind. Green IT policies, Process of EIA - ISO 14000. Legislation- Environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act. **(9)**

Total L: 45 periods

TEXT BOOKS:

1. Gilbert M. Masters, '*Introduction to Environmental Engineering and Science*', Pearson Education, New Delhi, 2004.
2. Deswal S and Deswal A, '*A Basic Course in Environmental Studies*', Dhanpat Rai and Co, New Delhi, 2004.

REFERENCES:

1. Benny Joseph, '*Environmental Science and Engineering*', Tata McGraw - Hill, New Delhi, 2006.
2. Koteswara Rao M V R, '*Energy Resources: Conventional & Non – Conventional*', BSP Publications, New Delhi, 2006.
3. Botkin and Keller, '*Environmental Science*', Wiley India Private Limited, New Delhi, 2013.

COURSE OUTCOMES:

At the end of the course, students will be able to:		Bloom's Level
CO1	Explain the basic concepts of environment, energy sources and waste management	**K2**
CO2	Use different renewable energy resources and environment protection measures for sustainable development	**K3**
CO3	Conduct a case study and real-time environmental issues and present as a team	

COs-POs & PSOs MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	1												
CO3						2	2	2			2		
	1					**2**	**2**	**2**			**2**		

1-low, 2-medium, 3-high

25MC002 INDIAN CONSTITUTION
(Common to Civil, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

2 0 0 0

INTRODUCTION: Evolution of Indian Constitution; significance of constitution; Composition; Preamble and its Philosophy. **(4)**

RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES: Fundamental Rights- Writs and Duties, Directive Principles of State Policy **(5)**

UNION GOVERNMENT: Union Government, President and Vice President, Houses of the Parliament and their functions; Types of Bills, Stages of passing of Bill into an Act, Veto Power, Constitution Amendment Procedure, Various Amendments made and their significance for India. **(6)**

STATE GOVERNMENT AND FEDERALISM: Composition of State Legislature; Powers, Functions and Position of Governor, Function of Chief Ministers, Council of Ministers; The Indian Federal System, Administrative Relationship between Union and States **(8)**

JUDICIARY: Supreme Court, High Court; District Court and Lower Courts - Functions and Powers – Judges – Qualifications and Powers - Judicial Review. **(7)**

Total P: 30 periods

TEXT BOOKS:

1. Subash C Kashyap, '*Our Political System*', National Book Trust, 2011.
2. Praveenkumar Mellalli E, '*Constitution of India, Professional Ethics and Human Rights*', Sage Publications India Pvt. Ltd., 2015.

REFERENCES:

1. Briji Kishore Sharma, '*Introduction to the Constitution of India*', Prentice Hall of India, 2010.
2. Basu D D, '*Introduction to the Constitution of India*', Prentice Hall of India, 2016.
3. Jain. M C, '*The Constitution of India*', Law House, New Delhi, 2001.
4. Shukla V N, '*Constitution of India*', Eastern Book Company Ltd., New Delhi, 2011.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the evolution, significance, and philosophy of the Indian Constitution, including its Preamble, composition, and core principles.	**K2**
CO2	Analyze the structure, powers, and functions of the Union and State Governments, including the roles of the President, Parliament, Governor, and Council of Ministers, as well as the legislative process, types of bills, and constitutional amendments.	**K3**
CO3	Conduct a case study on the Indian Constitution, demonstrating understanding of its evolution, fundamental rights and duties, structure of Union and State governments, federal system, and the role of the judiciary in governance.	

COs-POs & PSOs MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	2												
CO3								2	2		2		
	2							**2**	**2**		**2**		

1-low, 2-medium, 3-high

25MC003 INDUSTRIAL SAFETY

(Common to Civil, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

2 0 0 0

SAFETY TERMINOLOGIES: Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators-Flammability- Toxicity Time-weighted Average (TWA) - Threshold Limit Value (TLV) - Short Term Exposure Limit (STEL)- Immediately dangerous to life or health (IDLH)- acute and chronic Effects-Routes of Chemical Entry-Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet MSDS. **(6)**

STANDARDS AND REGULATIONS: Indian Factories Act-1948- Health- Safety- Hazardous materials and Welfare- ISO 45001:2018 occupational health and safety (OH&S) - Occupational Safety and Health Audit IS14489:1998- Hazard Identification and Risk Analysis- code of practice IS 15656:2006. **(6)**

SAFETY ACTIVITIES: Toolbox Talk- Role of safety Committee- Responsibilities of Safety Officers and Safety Representatives- Safety Training and Safety Incentives- Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment. **(6)**

WORKPLACE HEALTH AND SAFETY: Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition- Electrical Hazards- Crane Safety- Toxic gas Release. **(6)**

HAZARD IDENTIFICATION TECHNIQUES: Job Safety Analysis-Preliminary Hazard Analysis-Failure mode and Effects Analysis- Hazard and Operability- Fault Tree Analysis- Event Tree Analysis Qualitative and Quantitative Risk Assessment- Checklist Analysis- Root cause analysis- What-If Analysis- and Hazard Identification and Risk Assessment. **(6)**

Total L: 30 periods

TEXTBOOKS

1. Jain R. K. and Sunil S. Rao, '*Industrial Safety, Health and Environment Management Systems*'. Khanna Publisher, 4th Edition, 2000.
2. Deshmukh L. M., *'Industrial Safety Management: Hazard Identification and Risk Control'.* McGraw-Hill Education, 2007.

REFERENCES

1. John Ridley, John Channing, '*Safety at Work*'. Routledge, 7th Edition, 2008.
2. Dan Petersen, '*Techniques of Safety Management*: *A System Approach*'. Amer Society of Safety Engineers, 4th Edition, 2003.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Describe the safety protocols and standard operating procedures in industrial settings to ensure compliance with safety regulations and minimize hazards in the workplace.	**K2**
CO2	Implement and test emergency response plans tailored to the industrial environments, ensuring effective action during emergencies such as fires, chemical spills or equipment malfunctions.	**K3**
CO3	Review and present on risk assessments and hazards using industry-specific tools to identify potential safety risks and choose appropriate corrective actions to prevent accidents and injuries.	**-**

CO - PO & PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	2	2	-	-	-	-	-	-
CO3	-	-	-	-	-	1	1	1	1	-	1	-	1
	2	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**	**-**	**1**	**-**	**1**

1 - low, 2- medium, 3 – high

25MC004 DISASTER RISK REDUCTION AND MANAGEMENT
(Common to CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

2 0 0 0

HAZRADS, VULNERABILITY AND DISASTER RISKS: Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced – Earthquake, Landslide, Flood, Drought, Fire, etc. – Technological disasters - Structural collapse, Industrial accidents, oil spills - Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies, Inter relations between Disasters and Sustainable development Goals. **(6)**

DISASTER RISK REDUCTION (DRR): Sendai Framework for Disaster Risk Reduction, Disaster cycle - Community Based DRR, Structural – Non-structural measures, Roles and responsibilities of - community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders - Early Warning System – Relevance of indigenous Knowledge, appropriate technology and Local resources. **(6)**

DISASTER MANAGEMENT: Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction - Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Institutional Processes and Framework at State and Central Level - (NDMA – SDMA – DDMA – NRDF - Civic Volunteers). **(6)**

TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT: Early warning systems - Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness) – Role of GIS and Information Technology in Disaster Management – Disaster Damage Assessment - Elements of Climate Resilient Development – Standard operation Procedure for disaster response – Financial planning for disaster Management. **(6)**

DISASTER MANAGEMENT: CASE STUDIES: Case studies in the context of disasters - Landslide Hazard Zonation, Earthquake Vulnerability Assessment of Buildings and Infrastructure, Drought Assessment, Coastal Flooding, Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding, Forest Fire, Man Made disasters. **(6)**

Total L: 30 periods

TEXTBOOKS

1. Thomas D. Schneid, and Larry Collins, '*Disaster Management and Preparedness*'. CRC Publications, 2016.
2. R. Singh, '*Disaster Management Guidelines: Earthquakes, Landslides, Avalanches and Tsunami'*. Horizon Press Publications, 2017.
3. J. P. Singhal, '*Disaster Management'*. Laxmi Publications, 2024.
4. T. Bhattacharya, '*Disaster Science and Management'*. McGraw Hill India Education Pvt. Ltd., 2012.

REFERENCES

1. Government of India, '*Disaster Management Act'*. New Delhi, 2005.
2. Government of India, '*National Disaster Management Policy'*. New Delhi, 2009.
3. R. Shaw, '*Community based Disaster risk reduction*'. Natural Hazard Science, Oxford Research Encyclopedias, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts, tools, technologies and strategies for disaster risk reduction and management.	**K2**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1					1	1	1	1	1		1		
					1	**1**	**1**	**1**	**1**		**1**		

1-low, 2-medium, 3-high