GOVERNMENT COLLEGE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University)

Coimbatore - 641 013

B. E. Degree Programme for working Professionals

Mechanical Engineering

2025

Regulations

OFFICE OF THE CONTROLLER OF EXAMINATIONS
GOVERNMENT COLLEGE OF TECHNOLOGY

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GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013
B.E. DEGREE PROGRAMME FOR WORKING PROFESSIONALS
MECHANICAL ENGINEERING
2025 REGULATIONS
(Candidates admitted during 2025-2026 and onwards)

FIRST SEMESTER

Sl. No.	Course Code	Course Title	CA Marks	End Sem Marks	Total Marks	Hours/Week			
						L	T	P	C
THEORY									
1	25WPM1Z1	APPLIED MATHEMATICS I (Common to CIVIL, EEE & ECE Branches)	40	60	100	3	0	0	3
2	25WPM1Z2	ENVIRONMENTAL SCIENCES AND ENGINEERING (Common to CIVIL, EEE & ECE Branches)	40	60	100	3	0	0	3
3	25WPM103	APPLIED ENGINEERING MECHANICS	40	60	100	3	0	0	3
4	25WPM104	MANUFACTURING TECHNOLOGY	40	60	100	3	0	0	3
PRACTICAL									
5	25WPM105	MANUFACTURING TECHNOLOGY LABORATORY	60	40	100	0	0	3	1.5
TOTAL			**220**	**280**	**500**	**12**	**0**	**3**	**13.5**

SECOND SEMESTER

Sl. No.	Course Code	Course Title	CA Marks	End Sem Marks	Total Marks	Hours/Week			
						L	T	P	C
THEORY									
1	25WPM2Z1	APPLIED MATHEMATICS II (Common to EEE & ECE Branches)	40	60	100	3	0	0	3
2	25WPM202	SOLID MECHANICS	40	60	100	3	0	0	3
3	25WPM203	APPLIED THERMAL ENGINEERING	40	60	100	3	0	0	3
4	25WPM204	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	40	60	100	3	0	0	3
PRACTICAL									
5	25WPM205	THERMAL ENGINEERING LABORATORY I	60	40	100	0	0	3	1.5
TOTAL			**220**	**280**	**500**	**12**	**0**	**3**	**13.5**

25WPM1Z1	APPLIED MATHEMATICS I *(Common to CIVIL, EEE & ECE Branches)*	SEMESTER I

PREREQUISITES	L	T	P	C
NIL	3	0	0	3

Course Objectives	This course mainly deals with topics such as linear algebra, single variable calculus andnumerical methods and plays an important role in the understanding of engineeringscience.	
UNIT – I	**LINEAR ALGEBRA**	**9 Periods**
Consistency of System of Linear Equations, Eigen values and eigenvectors, Diagonalization of matricesby orthogonal transformation, Cayley-Hamilton Theorem, Quadratic form to canonical forms.		
UNIT – II	**DIFFERENTIAL CALCULUS**	**9 Periods**
Radius of curvature, Centre of curvature, Circle of curvature, Evolutes of a curve, Envelopes.		
UNIT – III	**INTEGRAL CALCULUS**	**9 Periods**
Evaluation of definite and improper integrals, Applications: surface area and volume of revolution (Cartesian coordinates only).		
UNIT – IV	**NUMERICAL SOLUTION OF EQUATIONS**	**9 Periods**
Algebraic and Transcendental equation: Fixed point iteration method, Bisection method, Newton-Raphson method, Simultaneous equation: Gauss elimination method, Gauss-Jordan method, Gauss Seidal method.		
UNIT – V	**NUMERICAL INTERPOLATION**	**9 Periods**
Equal interval: Newton's forward and Backward difference interpolation formulae, Gauss forward andBackward difference interpolation formulae, Unequal interval: Lagrange's interpolation, Newton'sdivided difference interpolation.		
Contact Periods: **Lecture: 45 Periods Tutorial: 0Periods Practical: 0 Periods Total: 45 Periods**		

TEXT BOOKS:

1	*VeerarajanT., **"Engineering Mathematics I"**, Tata McGraw-Hill Education(India)Pvt. Ltd, New Delhi,2015.*
2	*P. Kandasamy, K. Thilagavathy, K. Gunavathi, **"Numerical Methods"**, S. Chand &Company, 3rd Edition, Reprint 2013.*

REFERENCES:

1	*B.S.Grewal, **Higher Engineering Mathematics**, Khanna Publishers, 44th Edition, 2021.*
2	*David C.Lay, **"Linear Algebra and Its Application"**, PearsonPublishers, 6th Edition,2021.*
3	*Howard Anton, **"Elementry Linear Algebra"**,11th Edition,WileyPublications, 2013.*
4	*Narayanan.S and Manicavachagom Pillai. T.K., **"CalculasVol I and Vol II"**,S.chand & Co, 6th Edition, 2014.*
5	*S.S. Sastry, "**Introductory methods of numerical analysis"**, PHI, New Delhi, 5th Edition, 2015.*
6	*Ward Cheney, David Kincaid, **Numerical Methods and Computing,** Cengage Learning**,** Delhi, 7th Edition 2013.*
7	*Jain R.K. and Iyengar S.R.K.,**"Advanced Engineering Mathematics"**, NarosaPublications, 8th Edition, 2012.*

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Use the essential tool of matrices and linear algebra in a comprehensive manner.	K3
CO2	Explain the fallouts of circle of curvature, evolute and envelops that is fundamental to application of analysis to Engineering problems.	K3
CO3	Interpret the integral calculus to notions of definite and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.	K3
CO4	Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to polynomial and transcendental equations.	K3
CO5	Derive numerical methods for various mathematical operations andtasks, such as interpolation, differentiation, integration, the solution oflinear and nonlinear equations.	K3

25WPM1Z2	ENVIRONMENTAL SCIENCE AND ENGINEEREING *(Common to CIVIL, EEE & ECE Branches)*	SEMESTER I

PREREQUISITES	L	T	P	C
NIL	3	0	0	3

Course Objectives	The course is aimed at creating awareness among the students and also inseminates thecritical ideas of preserving environment.	
UNIT – I	**ENVIRONMENTAL ENERGY RESOURCES**	**9 Periods**
Food-effects of modern agriculture, fertilizers, pesticides, eutrophication & biomagnifications-Energy resources: renewable resources - Hydro Energy, Solar & Wind. Non-renewable resources – Coal and Petroleum - harnessing methods.		
UNIT – II	**ECO SYSTEM AND BIODIVERSITY**	**9 Periods**
Eco system and its components - biotic and abiotic components. Biodiversity: types and values of biodiversity,hot spots of biodiversity, endangered and endemic species, conservation of biodiversity: In situ and ex situconservation. Threats to biodiversity-destruction of habitat, habit fragmentation, hunting, over exploitationand man-wildlife conflicts. The IUCN red list categories.		
UNIT – III	**ENVIRONMENTAL POLLUTION**	**9 Periods**
Air pollution, classification of air pollutants – sources, effects and control of gaseous pollutants SO_2, NO_2, H_2S,CO, CO_2 and particulates. Water pollution - classification of water pollutants, organic and inorganic pollutants,sources, effects and control of water pollution. Noise pollution - decibel scale, sources, effects and control.		
UNIT – IV	**ENVIRONMENTAL THREATS**	**9 Periods**
Global warming-measure to check global warming - impacts of enhanced Greenhouse effect, Acid rain- effectsand control of acid rain, ozone layer depletion- effects of ozone depletion, disaster management - flood,drought, earthquake and tsunami.		
UNIT – V	**SOCIAL ISSUES AND ENVIRONMENT**	**9 Periods**
Water conservation, rain water harvesting, e-waste management, Pollution Control Act, Wild life ProtectionAct. Population growth- exponential and logistic growth, variation in population among nations, populationpolicy. Women and Child welfare programs. Role of information technology in human and health, COVID-19 -effects and preventive measures.		
Contact Periods: **Lecture:45 Periods Tutorial: 0 Periods Practical: 0 Periods Total:45 Periods**		

TEXT BOOKS:

1	*Sharma J.P., **"Environmental Studies"**, 4th Edition, University Science Press, New Delhi, 2016.*
2	*AnubhaKaushik and C.P.Kaushik, **"Environmental Science and Engineering"**, 7th Edition, New age international publishers, New Delhi, 2021.*

REFERENCES:

1	*A k de, **"Environmental Chemistry"**, 8th edition, Newage international publishers, 2017.*
2	*G. Tyler miller and scott e. Spoolman, **"Environmental Science"**, cengage learning indiapvt. Ltd., delhi, 2014.*
3	*ErachBharucha, **"Textbook of Environmental Studies"**, Universities press(I) pvt, Ltd., Hydrabad, 2015.*
4	*Gilbert M.Masters, **"Introduction to Environmental Engineering and Science"**, 3rd Edition, Pearson Education, 2015.*

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Recognize and understand about the various environmental energy resources and the effective utility of modern agriculture.	K2
CO2	Acquire knowledge about the interaction of biosphere with environment and conservation methods of bio diversity.	K2
CO3	Be aware of the sources of various types of pollution, their ill effects and preventive methods.	K2
CO4	Identify and take the preventive measures to control the environmental threats and effects of Global warming, Ozone depletion, Acid rain, and natural disasters.	K2
CO5	Demonstrate an idea to save water and other issues like COVID -19.	K2

25WPM103	APPLIED ENGINEERING MECHANICS	SEMESTER I			
PREREQUISITES		**L**	**T**	**P**	**C**
NIL		**3**	**0**	**0**	**3**

Course Objectives	To study the forces and moments in various types of mechanical systems and to enable students to understand the relationship between processes, kinetics and kinematics.	
UNIT – I	**INTRODUCTION TO MECHANICS AND FORCE CONCEPTS**	**9 Periods**
Principles and Concepts – Laws of Mechanics – system of forces – resultant of a force system – resolution and composition of forces – Lami's theorem – moment of a force – physical significance of moment-Varignon's theorem – resolution of a force into force and couple – forces in space – addition of concurrent forces in space – equilibrium of a particle in space, Classification of beams based on supports.		
UNIT – II	**FRICTION**	**9 Periods**
Frictional resistance – classification of friction- laws of friction – coefficient of friction-angle of friction– angle of repose — cone of friction – free body diagram-advantages-equilibrium of a body on a roughinclined plane – non-concurrent force system - ladder friction – rope friction – wedge friction.		
UNIT – III	**GEOMETRICAL PROPERTIES OF SECTION**	**9 Periods**
Centroids – Determination by integration – centroid of an area – simple figures - composite sections – bodies with cut parts - moment of inertia – theorems of moment of inertia – moment of inertia of composite sections – principal moment of inertia of plane areas - radius of gyration.		
UNIT – IV	**BASICS OF DYNAMICS**	**9 Periods**
Kinematics and kinetics – displacements, velocity and acceleration - Equations of motion – Rectilinearmotion of a particle with uniform velocity, uniform acceleration, varying acceleration – motion curves– motion under gravity – relative motion – curvilinear motion of particles – projectiles – angle ofprojection – range – time of flight and maximum height. Newton's second law of motion – linearmomentum – D'Alembert's principle, Dynamics equilibrium — work energy equation of particles– lawof conservation of energy – principle of work and energy.		
UNIT – V	**IMPULSE MOMENTUM AND IMPACT OF ELASTIC BODIES**	**9 Periods**
Principle of impulse and momentum – Equations of momentum – Laws of conservation of momentum.Impact – Time of compression, restitution, collision – Co-efficient of restitution – types of impact –collision of elastic bodies by direct central impact and oblique impact – collision of small body with amassive body – Kinetic energy of a particle.		
Contact Periods: **Lecture: 45 Periods** **Tutorial: 0 Periods** **Practical: 0 Periods** **Total: 45 Periods**		

TEXT BOOKS:

1	*S.S. Bhavikatti and K.G. Rajasekarappa, **"Engineering Mechanics"**,New age international (P) ltd, 1999.*
2	*S.C. Natesan, **"Engineering Mechanics"** Umesh Publications, 2005.*

REFERENCES:

1	*F.B. Beer and E.R. Johnson, **"Vector Mechanics for Engineers"**, Tata McGraw Hill Pvt. Ltd, 10th Edition, 2013.*
2	*S. Timoshenko, D.H.Young, J.V.Rao and Sukumar Pati, **"Engineering Mechanics"**,McGraw Hill Education, 5th Edition, 2017.*
3	*Irving Shames and Krishna Mohana Rao, **"Engineering Mechanics"**, Prentice Hall of India Ltd, Delhi, 2006.*
4	*R.C. Hibbeller, **"Engineering Mechanics"**, Prentice Hall of India Ltd, 13th Edition, 2013.*
5	*Vela Murali, **"Engineering Mechanics",** Oxford university Press, 1st Edition, 2010.*

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Know the concept of mechanics and system of forces and moments.	K5
CO2	Calculate the frictional properties at different bodies.	K5
CO3	Identify the locations of centre of gravity and moment of inertia for different sections.	K5
CO4	Understand the basics of dynamics of particles	K5
CO5	Know the impulse and momentum principle and impact of elastic bodies.	K5

25WPM104	MANUFACTURING TECHNOLOGY	SEMESTER I			
PREREQUISITES		**L**	**T**	**P**	**C**
NIL		**3**	**0**	**0**	**3**

Course Objectives	To acquire knowledge about various types of manufacturing processes this includes casting, joining, forming and conventional machining to produce a product for competitive industrial applications.	
UNIT – I	**METAL CASTING AND JOINING PROCESSES**	**9 Periods**
Introduction to Concepts of Manufacturing Process -Sand casting – Sand moulds -Type of patterns – Pattern materials – Pattern allowances – Core making – Special casting processes: Investment casting, die casting. Fusion welding – Types – Gas welding - Shielded metal arc welding - Gas metal arc welding - Gas tungsten arc welding - Submerged arc welding – Electro slag welding - Principles of resistance welding – Spot, butt, seam, projection and percussion welding.		
UNIT – II	**BULK DEFORMATION AND SHEET METAL FORMING**	**9 Periods**
Hot working and cold working of metals – Forging processes – Open and close die forging – Types of forging machines - Forging operations –Mechanism of rolling – Types of Rolling mills– Principles of Extrusion – Typical shearing operations, bending and drawing operations - Metal spinning.		
UNIT – III	**THEORY OF METAL CUTTING**	**9 Periods**
Mechanics of chip formation – forces in machining – types of chips – cutting tools – single point cutting tool nomenclature – orthogonal and oblique metal cutting – thermal aspects – cutting tool materials – tool wears – tool life – surface finish – cutting fluids and machinability.		
UNIT – IV	**LATHE, SHAPING, PLANING AND DRILLING MACHINES**	**9 Periods**
Lathe – construction – types – operations – working principle of single and multi - spindle automats – shaping and planning machines – principle – types – construction - mechanism – different shaping operations – work holding devices - Drilling machines – types, operations – drill tool nomenclature.		
UNIT – V	**GRINDING AND MILLING MACHINES**	**9 Periods**
Grinding – types of grinding machines – grinding wheels, specifications – bonds – mounting and reconditioning of grinding wheels - Milling –types - cutter nomenclature – types of cutters – milling processes – indexing –gear generation - gear shaping and gear hobbing – gear finishing methods.		
Contact Periods: **Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods**		

TEXT BOOKS:

1	*P. N. Rao,* ***"Manufacturing Technology: Foundry, Forming and Welding"****,McGraw Hill, 5th Edition, 2018.*
2	*P.N. Rao,* ***"Manufacturing Technology Vol II: Metal Cutting and Machine Tools"****, McGraw Hill Education, 4thEdition, 2018.*

REFERENCES:

1	*SeropeKalpakjian and Steven R. Schmid,* ***"Manufacturing Engineering and Technology"****, Pearson Education, 7th Edition, 2018.*
2	*P. C. Sharma,* ***"A Text book of Production Technology"****, S. Chand and Co. Ltd., 2021.*
3	*S. K. Hajra Choudhry, and Nirjhar Roy and A. K. Hajra Choudhury,* ***"Elements of Workshop Technology Vol II: Machine Tools"****, Media Promoters and Publishers Pvt. Ltd., 2018.*
4	*R.K. Rajput,* ***"Manufacturing Technology"****, Laxmi Publication Pvt Ltd, 2nd Edition, 2007.*
5	*Mikell P. Groover,* ***"Fundamentals of Modern Manufacturing: Materials, Processes, and System"****,John Wiley and Sons, 2010.*

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Apply the principle of metal casting and welding processes for engineering applications.	K3
CO2	Identify the suitable forging, rolling and metal forming processes.	K3
CO3	Apply the theory of metal cutting to solve the problems in industries.	K3
CO4	Understand the operating mechanism of lathe, shaping, planning and drilling machines.	K3
CO5	Familiarize the grinding, milling and gear generation process and its uses in industries.	K3

25WPM105	MANUFACTURING TECHNOLOGY LABORATORY	SEMESTER I			
PREREQUISITES		**L**	**T**	**P**	**C**
NIL		**0**	**0**	**3**	**1.5**

Course Objectives	To provide an understanding of advanced manufacturing methods with idea of the dimensional and form accuracy of products.

LIST OF EXPERIMENTS

1. Facing, Step Turning, Taper Turning using Lathe.
2. External Thread Cutting. Groove Cutting, Knurling and Chamfering using Lathe.
3. Drilling and Counter Sinking using Lathe.
4. Drilling, Reaming, Tapping and Surface Grinding using Surface Grinder and Radial Drilling Machine.
5. External Cylindrical Grinding of Shaft.
6. V-Groove Cutting in Shaping Machine.
7. Spur Gear Milling.
8. Helical Gear Milling in Universal Milling Machine.
9. Gear Shaping.
10. Gear Hobbing.
11. Making Hexagonal Hole using Slotting Machine.
12. Letter Cutting in Vertical Milling Machine.
13. CNC Part Programming for Machining of Facing, Step Turning, Taper Turning, Milling in CNC machine.

Contact Periods:
Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Have the capability of selecting suitable manufacturing processes to manufacture the products optimally.	K2
CO2	Maintain the accuracy and tolerance of components produced.	K4
CO3	Set up machines like lathe, shaper, grinding and milling machine for various applications.	K2
CO4	Prepare gears using forming and generating methods of gear manufacturing.	K3
CO5	Write the part programming and perform machining in CNC Machines.	K4

25WPM2Z1	APPLIED MATHEMATICS II *(Common to EEE & ECE* Branches*)*	SEMESTER II

PREREQUISITES		L	T	P	C
NIL		3	0	0	3
Course Objectives	To focus on differential equations and Numerical Techniques which is important for comprehending engineering science.				
UNIT–I	**ORDINARY DIFFERENTIAL EQUATIONS**				**(9 Periods)**
Higher order linear differential equations with constant coefficients –variable coefficients: Cauchy Euler equation, Cauchy-Legendre equation-Method of variation of parameters.					
UNIT–II	**PARTIAL DIFFERENTIAL EQUATIONS**				**(9 Periods)**
Formation of partial differential equations – First order partial differential equations: Standard types and Lagrange's linear equation – Homogeneous linear partial differential equations of second and higher order with constant coefficients.					
UNIT–III	**NUMERICAL DIFFERENTIATION AND INTEGRATION**				**(9 Periods)**
Numerical Differentiation (using Newton's interpolation formula) – Numerical integration: Trapezoidal rule and Simpson's rules (Both single and double integrals).					
UNIT–IV	**NUMERICAL SOLUTION OF FIRST ORDINARY DIFFERENTIAL EQUATIONS**				**(9 Periods)**
Single Step Methods: Taylor's series Method-Euler's and modified Euler's methods–Runge–Kutta method of fourth order Multi Step methods - Milne's and Adam's predicator-corrector methods.					
UNIT–V	**NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS**				**(9 Periods)**
Finite difference solution of two dimensional Laplace equation and Poisson equation- Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods)–Finite difference explicit method for one dimensional wave equation.					
Contact Periods: **Lecture:45 Periods** **Tutorial:0 Periods** **Practical:0 Periods** **Total:45 Periods**					

TEXTBOOK

1	*Veerarajan.T, **"Engineering Mathematics"**, Tata McGraw Hill Education (India) Private Limited, New Delhi, 2018*
2	*P. Kandasamy, K. Thilagavathy, K. Gunavathi, **"Numerical Methods"**, S. Chand & Company, 3rd Edition, Reprint 2013.*

REFERENCES

1	*B.S.Grewal, **"Higher Engineering Mathematics"**, Khanna Publishers, New Delhi, 45thEdition, 2024.*
2	*SrimantaPal, **"Numerical Methods Principles, Analyses and Algorithms"**, Oxford University Press, New Delhi, I Edition 2012.*
3	*Raisinghania.M..D, **"Ordinary And Partial Differential Equations"**, 20thEdition, S. Chand Publishing, 2020.*
4	*S.Larsson and V.Thomee, **"Partial Differential Equations with Numerical Methods"**, Springer, **2003**, 2nd printing 2008 Edition*

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Solve higher order linear differential equation with constant and variable coefficients and simultaneous differential equation.	K3
CO2	Form partial differential equations and find solutions of first and higher order partial differential equations	K3
CO3	Obtain approximate solutions for transcendental equations and problems on interpolation, differentiation, integration.	K3
CO4	Find the numerical solutions of first order ordinary differential equations using single and multi-step techniques.	K3
CO5	Solve second order partial differential equations using explicit and implicit methods.	K3

25WPM202	SOLID MECHANICS	SEMESTER II

PREREQUISITES	L	T	P	C
NIL	3	0	0	3

Course Objectives	To learn the basics techniques to evaluate stresses, strain, bending moment and shear force distribution in engineering structures.

UNIT – I	**STRESS AND STRAIN**	**(9 Periods)**

Tension, compression, shear stresses - Hooke's law - Compound bars – lateral strain - Poisson's ratio - Volumetric strain - Bulk modulus - Relationship among elastic constants – stress strain diagrams- Ultimate stress - Yield stress-Factor of safety - Thermal stresses -Strain energy due to axial force - Resilience- Stress due to gradual load, suddenly applied load and Impact load.

UNIT – II	**SHEAR FORCE AND BENDING MOMENT**	**(9 Periods)**

Beams – Types of Beams - Types of loads, supports - Shear force – Bending moment – shear forces and bending moment diagrams for cantilever, simply supported and over hanging beams with concentrated ,uniformly distributed, uniformly varying load and couple- Point of contra flexure.

UNIT – III	**THEORY OF BENDING AND COMPLEX STRESSES**	**(9 Periods)**

Bending equation-Section Modulus-Stress distribution at a cross section due to bending moment and shear force for cantilever, simply supported beams with point, UDL loads (Rectangular, circular, I & T sections only) -Principal stresses and Principal planes - Principal Strains- Mohr's circle of stress (Two dimension only).

UNIT – IV	**DEFLECTION OF BEAMS AND THEORY OF LONG COLUMNS**	**(9 Periods)**

Determinations of deflection curve – Relation between slope, deflection and radius of curvature – Slope and deflection of beam at any section by Macaulay's method -Euler's theory of long Columns- Expression of crippling load for various end conditions-Effective length-Slenderness ratio- Rankine formula for columns.

UNIT – V	**THEORY OF TORSION**	**(9 Periods)**

Torsion of shafts - Torsion equation - Polar modulus- Stresses in Solid and Hollow circular shafts – Torsional rigidity - Power transmitted by the shaft – Importance of angle of Twist - Strain energy due to Torsion -Modulus of rupture – Torsional resilience – Combined bending and Torsion- Stresses in helical springs -Deflection of helical spring.

Contact Periods:

Lecture: 45 Periods **Tutorial: 0 Periods** **Practical: 0 Periods** **Total: 45 Periods**

TEXT BOOK:

1	*Sadhu Singh, **"Strength of Materials"**, Khana Publishers, 11th Edition, 2024.*
2	*R.K.Rajput, **"Strength of Materials"**, S. Chand & Company Ltd., 7th Edition, 2022.*

REFERENCES:

1	*S.S. Bhavikatti, **"Strength of Materials"**, Vikas Publishing House, 5th Edition, 2023.*
2	*James M.Gere and Barry J.Goodno, **"Mechanics of Materials"**, Cengage Learning India Pvt., 9th Edition, 2022.*
3	*Srinath L., **"Advanced Mechanics of Solids"**, McGraw Hill Education, 3rd Edition, 2017.*
4	*Kazimi, **"Solid Mechanics"**, McGraw Hill Education, 1st Revised Edition, 2022.*
5	*Jacob Lubliner and Panayiotis Papadopoulos, **"Introduction to Solid Mechanics – An Integrated Approach"**, Springer, 2014th Edition, 2013.*

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Evaluate stresses and strains for various types of loading.	K2
CO2	Estimate the shear force and bending moment and find the point of contraflexure.	K2
CO3	Create shear stress distribution drawings for simple sections and evaluate principal stresses and strains.	K3
CO4	Use theory of beams and long columns to find slope, deflection, radius of curvature of beams and crippling load of long columns.	K3
CO5	Apply theory of torsion for problems involving torsion of circular shafts and leaf spring.	K3

25WPM203	APPLIED THERMAL ENGINEERING *(Use of Approved Steam Tables and Charts are Permitted)*	SEMESTER II

PREREQUISITES	L	T	P	C
NIL	3	0	0	3

Course Objectives	To learn the basic laws of thermodynamics, understand the behaviour of energy and entropy in various processes and develop fundamental knowledge of thermal systems.	
UNIT – I	**THERMODYNAMIC LAWS AND ENTROPY**	**(9 Periods)**
Basic concepts - Thermodynamic systems - Zeroth law of thermodynamics - First law of thermodynamics – Application to closed and open systems -Steady flow energy equation - Second law of thermodynamics –Carnot theorem, Carnot cycle, Efficiency and COP - Concept of entropy - Entropy of ideal gas - Principle of increase of entropy.		
UNIT – II	**STEAM POWER CYCLES AND IDEAL GAS MIXTURES**	**(9 Periods)**
Properties of pure substances – Thermodynamic properties of steam - Dryness Fraction - Rankine cycle, Reheat and regenerative cycle and Binary vapour cycle - Maxwell's equations - Joule Thomson coefficient - Clausius Clapeyron equation -Ideal and real gas - Gas mixtures - Dalton's law of partial pressures - P-V-T behavior of gas mixtures.		
UNIT – III	**AIR STANDARD CYCLES AND IC ENGINES**	**(9 Periods)**
Otto cycle, Diesel cycle, Brayton cycle and Dual cycle – Calculation of mean effective pressure and air standard efficiency - SI and CI Engines - Classification - Components - Simple carburettor – MPFI - Diesel pump and injector systems - Ignition systems -Lubrication and cooling systems - Combustion and knocking in SI and CI Engines.		
UNIT – IV	**COMPRESSORS AND TURBINES**	**(9 Periods)**
Introduction - Compressor types - Reciprocating and rotary compressors - Performance of compressors - Flow through nozzles - Shape of nozzles, Effect of friction, Critical pressure ratio - Turbines - Steam and gas turbines - Impulse and reaction principles – Compounding of steam turbines.		
UNIT – V	**PSYCHROMETRY AND REFRIGERATION**	**(9 Periods)**
Psychrometric processes – Sensible heating and cooling, Cooling and dehumidification, Heating and humidification, Adiabatic mixing and evaporative cooling - Methods of refrigeration- Air refrigeration systems – Refrigerants- Properties - Vapour compression refrigeration system -Vapour absorption refrigeration system.		
Contact Periods: **Lecture: 45 Periods** **Tutorial: 0 Periods** **Practical: 0 Periods** **Total: 45 Periods**		

TEXT BOOK:

1	*P. K. Nag, **"Engineering Thermodynamics"**, Tata McGraw Hill Company, 6th Edition, 2017.*
2	*Mahesh M. Rathore, **"Thermal Engineering Vol I & II"**, McGraw Hill Education, 1st Edition, 2018.*

REFERENCES:

1	*C. P. Arora, **"Thermodynamics"**, McGraw Hill Education, 2017.*
2	*Prasanna Kumar, **"Engineering Thermodynamics"**, Pearson Education India, 1st Edition,2013.*
3	*Yunus A. Cengel and Michael A. Boles., **"Thermodynamics: An Engineering Approach"**,McGraw Hill Education, 9th Edition, 2019.*
4	*R. K. Rajput, **"Thermal Engineering"**, Lakshmi Publications, 11th Edition, 2023.*
5	*M. L. Mathur and F. S. Mehta, **"Thermal Science and Engineering"**, Jain Brothers, 3rdEdition, 2021.*

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Apply the first and second laws of thermodynamics along with entropy concepts to analyse different thermodynamic systems.	K4
CO2	Understand the behaviour of steam under various conditions used in power generation and develop basic thermodynamic relations for ideal and real gases.	K4
CO3	Identify the key characteristics of refrigeration systems and understand the fundamental concepts of psychrometry.	K3
CO4	Analyse basic air-standard cycles and understand the working principles of IC engines.	K4
CO5	Apply thermodynamic principles to analyse air compressors, nozzles and turbines.	K3

25WPM204	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	SEMESTER II

PREREQUISITES	L	T	P	C
NIL	3	0	0	3

Course Objectives	To study the basic concepts of electric circuits, electrical machines, analog and digital electronics, house wiring and electrical installations.	
UNIT – I	**ELECTRICAL CIRCUITS**	**(9 Periods)**
Electrical circuit elements (R,L and C) - Voltage and current sources – Ohm's Law – Kirchoff laws – Time domain analysis of first order RL and RC circuits – Representation of sinusoidal waveforms – Average, RMS and Peak values – Phasor representation – Real, reactive, apparent power and power factor.		
UNIT – II	**ELECTRICAL MACHINES AND MEASUREMENTS**	**(9 Periods)**
Construction, Principle of operation, Basic equations and types, Characteristics and applications of DC generators, DC motors, Single phase transformer, Single phase and three phase induction motor. Operating principles of moving coil, Moving iron instruments (Ammeter and Voltmeters).		
UNIT – III	**ANALOG AND DIGITAL ELECTRONICS**	**(9 Periods)**
Analog Electronics: Semiconductor devices – P-N junction diode, Zener diode, BJT, Operational amplifier –principle of operation, Characteristics and applications. Digital Electronics: Introduction to numbers systems, basic Boolean laws, reduction of Boolean expressions and implementation with logic gates.		
UNIT – IV	**FUNDAMENTAL OF COMMUNICATION ENGINEERING**	**(9 Periods)**
Types of Signals: Analog and digital signals – Modulation and demodulation: Principles of amplitude and frequency modulations – Introduction to resistive, inductive and capacitive transducers.		
UNIT – V	**ELECTRICAL INSTALLATIONS AND ENERGY CONSERVATION**	**(9 Periods)**
Single phase and three phase system – Phase, neutral and earth, basic house wiring -Tools and components, Different types of wiring - Basic safety measures at home and industry – Energy efficient lamps - Energy billing. Introduction to UPS and SMPS.		
Contact Periods: **Lecture: 45 Periods** **Tutorial: 0 Periods** **Practical: 0 Periods** **Total: 45 Periods**		

TEXT BOOK:

1	*R.Muthusubramaniam, R.Salivaganan, Muralidharan K.A., **"Basic Electrical and Electronics Engineering"**, Tata McGraw Hill, 2nd Edition, 2024.*
2	*Mittle V.N and Aravind Mittal, **"Basic Electrical Engineering"**, Tata McGraw Hill, 2nd Edition, 2005.*

REFERENCES:

1	*D.P.Kothari, I.J. Nagrath, **"Basic Electrical and Electronics Engineering"**, Tata McGraw Hill, 2nd Edition, 2020.*
2	*Nagsarkar T.K and Sukhija M.S, **"Basic Electrical Engineering"**, Oxford Press, 2011.*
3	*E.Hughes, **"Electrical and Elecronics Technology"**, Pearson, 10th Edition, 2010.*
4	*Mohmood Nahvi and Joseph A. Edminister, **"Electric Circuits"**, Shaum Outline series, McGraw Hill, I Edition, 2020.*
5	*Premkumar N and Gnanavadivel J, **"Basic Electrical and Electronics Engineering"**, Anuradha Publishers, 8th Edition, 2019.*

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Analyze the DC and AC circuits	K4
CO2	Describe the operation and characteristics of electrical machines	K4
CO3	Classify and compare various semiconductor devices and digital electronics.	K3
CO4	Infer the concept of communication engineering and transducers.	K2
CO5	Assemble and implement electrical wiring and electrical installations	K6

25WPM205	THERMAL ENGINEERING LABORATORY I	SEMESTER II

PREREQUISITES	L	T	P	C
NIL	0	0	3	1.5

Course Objectives	To demonstrate and analyze the performance characteristics of an internal combustion engines, compressors and blowers.

LIST OF EXPERIMENTS

1. Port timing diagram of single cylinder petrol engine.
2. Valve timing diagram of single cylinder diesel engine.
3. Performance test on variable compression ratio petrol and diesel engines.
4. Economic speed test on diesel engine.
5. Retardation test to find frictional power of a diesel engine.
6. Heat balance test on 4 stroke Diesel Engine.
7. Emission test on internal combustion engine.
8. Performance test on constant speed blower.
9. Performance test on variable speed blower.
10. Performance test on reciprocating air compressor.

Contact periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**Bloom's Taxonomy Mapped**
CO1	Understand the valve timing and port timing diagrams of IC engines	K2
CO2	Analyze the performance characteristics of petrol and diesel engines.	K4
CO3	Interpret the emission characteristics of internal combustion engines.	K4
CO4	Evaluate the performance parameters of blowers.	K5
CO5	Analyze the air compressor characteristics.	K4