Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya (SCSVMV)

(University U/S 3 of UGC Act 1956)
(Accredited with "A" Grade by NAAC)
Enathur, Kanchipuram - 631 561

DEPARTMENT OF MECHANICAL ENGINEERING

CURRICULUM AND SYLLABUS
(Regulation – 2025)

B.E. (Part Time) Mechanical Engineering

Choice Based Credit System

(Students Admitted from AY-2025-26)

PROGRAM OUTCOMES [PO's]	
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex Mechanical engineering problems
PO 2	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering scien ces
PO 3	Design/development of solutions: Design solutions for complex Mechanical engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, 5analysis and interpretation of data, and synthesis of the information to provide valid conclusions
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools that are relevant to Mechanical engineering, including prediction and modeling to complex engineering activities with an understanding of the limitations
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Mechanical engineering practice
PO 7	Environment and sustainability: Understand the impact of the Mechanical engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Mechanical engineering practice
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOME (PSO's) – Mechanical Engineering	
PSO 1	Apply modern engineering tools such as CAD/CAM, Finite Element Analysis (FEA), Computational Fluid Dynamics (CFD), and automation technologies to analyze and solve complex problems in mechanical and interdisciplinary engineering domains.
PSO 2	Demonstrate technical competencies and innovative problem-solving abilities to address real-world challenges in sectors like automotive, aerospace, energy, and manufacturing through internships, industry-driven projects, and collaborative engagements

PROGRAM SPECIFIC OUTCOME (PSO's) – Mechatronics Engineering	
PSO 1	Graduates will be able to apply the integrated knowledge of mechanical, electrical, electronics, and computer engineering to design, develop, and implement intelligent mechatronic systems and automation solutions for real-world applications.
PSO 2	Graduates will be capable of designing and deploying embedded systems, control algorithms, and real-time interfaces to address challenges in automation, robotics, and various industrial domains.

SEMESTER - I (First year)										
SL. No	**Course Category**	**Course Code**	**Name of the Course**	**Hours per week**			**Credit**	**IA**	**EA**	**TM**
				L	**T**	**P**				
1.	BSC		Mathematics III (PDE, Probability & Statistics)	3	1	-	**4**	40	60	100
2.	ESC		Engineering Mechanics	3	-	-	**3**	40	60	100
3.	PCC		Engineering Thermodynamics	3	-	-	**3**	40	60	100
4.	PCC		Manufacturing Science	3	-	-	**3**	40	60	100
5.	PCC		Materials Engineering	3	-	-	**3**	40	60	100
Total				**15**	**01**	**-**	**16**			

SEMESTER - II (First year)										
SL. No	**Course Category**	**Course Code**	**Name of the Course**	**Hours per week**			**Credit**	**IA**	**EA**	**TM**
				L	**T**	**P**				
1.	ESC		Electronics Engineering	3	-	-	**3**	40	60	100
2.	PCC		Thermal Engineering	3	-	-	**3**	40	60	100
3.	PCC		Fluid Mechanics & Machinery	3	-	-	**3**	40	60	100
4.	PCC		Machine Tools and Metal Cutting	3	-	-	**3**	40	60	100
5.	PCC		Strength of Materials	3	-	-	**3**	40	60	100
Total				**15**	**0**	**-**	**15**			

SEMESTER – I

Course Code	Course Name	Semester	Credits	L T P C
	MATHEMATICS - III (PDE, Probability & Statistics)	**1**		3 1 0 4

COURSE OBJECTIVES

- To provide an overview of probability and statistical inferences to engineers
- To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering

UNIT-I BASIC PROBABILITY **9**

Probability spaces, conditional probability, Independent random variables, sums of independent random variables, Bayes' Theorem, Discrete and Continuous one-dimensional random variables - Expectations, Moments, Variance of a sum, Moment generating function, Tchebyshev's Inequality.

UNIT-II PROBABILITY DISTRIBUTIONS **9**

Discrete Distributions – Binomial, Poisson and Negative Binomial distributions, Continuous Distributions - Normal, Exponential and Gamma distributions.

UNIT-III BASIC STATISTICS **9**

Measures of Central tendency: Averages, mean, median, mode, Measures of dispersion – Range, Mean deviation, Quartile deviation and Standard deviation, Moments, skewness and Kurtosis, Correlation and regression – Rank correlation.

UNIT-IV APPLIED STATISTICS **9**

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations- Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

UNIT-V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **9**

Method of separation of variables – Vibration of a stretched string: Wave equation – Solution of Wave equation - D'Alembert's solution of wave equation – One dimensional heat flow – Solution of heat equation.

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	They understand the concept of basic probability, conditional probability and Baye's theorem and its application of analysis the Engineering problems.
2.	They Know to apply the discrete and continuous distributions in probability for the real life problems.
3.	They identify and improve their basic ideas of statistics including measures of central tendency, dispersion, correlation and regression.
4.	Analyzing the large and small samples using tools like z, t, F and chi-square.
5.	Design solution to PDE and to solve field problems in engineering involving PDEs.

TEXT BOOKS

1.	T. Veerarajan, Probability, Statistics and Random Processes, Third edition, Tata McGraw-Hill, New Delhi, 2017.
2.	S.P. Gupta, Statistical Methods, 46th edition, Sultan Chand & sons, New Delhi, 2021.
3.	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

REFERENCES	
1.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 45th Edition, 2012.
2.	S. Ross, A First Course in Probability, 8th Ed., Pearson Education India, 2019.
3.	W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
4.	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 9th edition, 2016.

Mapping of COs with POs and PSOs													
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	✓	✓											✓	
CO2	✓	✓											✓	
CO3	✓	✓		✓			✓				✓		✓	
CO4	✓	✓		✓			✓				✓		✓	
CO5	✓	✓		✓			✓				✓		✓	

Course Code	Course Name	Semester	Credits	L T P C
	ENGINEERING MECHANICS	1		3 0 0 3

COURSE OBJECTIVES

- To familiarize the basics laws of physics, vector operations and forces.
- To understand the principles of beams, supports and equilibrium of rigid bodies.
- To know the area and mass property calculations of various sections and solids.
- To study and analyse the dynamics of particles by various methods.
- To understand the applications of friction and rigid body dynamics.

UNIT-I STATICS OF PARTICLES **9**

Introduction – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces, Principle of transmissibility, Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Single equivalent force.

UNIT-II EQUILIBRIUM OF RIGID BODIES **9**

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT-III PROPERTIES OF SURFACES AND SOLIDS **9**

Determination of Area and Volume – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moment of inertia.

UNIT-IV DYNAMICS OF PARTICLES **9**

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse- Momentum principle – Impact of elastic bodies.

UNIT-V FRICTION AND RIGID BODY DYNAMICS **9**

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction-Ladder friction- Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of bodies.

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	Get familiarized with the basic laws of physics, vector operations and forces.
2.	Understand the principles of beams, supports and equilibrium of rigid bodies.
3.	Calculate the area and mass properties of various sections and solids.
4.	Know about dynamics of particles and their analysis by various methods.
5.	Know about the applications of friction and rigid body dynamics.

TEXT BOOKS	
1.	Rajas Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., 3rd edition, Reprint 2011.
2.	Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, Tata McGraw-Hill International Edition, 2017, 12th edition.
REFERENCES	
1.	Hibbeler, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 14th edition, 2017.
2.	Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill, 3rd edition, 2004.
3.	Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd.,(2008).
4.	Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).
5.	K.L. Kumar, "Engineering Mechanics" Tata McGraw-hill,, 4th Edition, 2017.
6.	S.S. Bhavikatti, " Engineering Mechanics", New Age International Publishers, 3rd edition, 2019.
7.	R. S. Khurmi, " Engineering Mechanics", S. Chand Publishers, 22nd edition, 2018.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√		√								√	√
CO2	√	√	√		√								√	√
CO3	√	√	√		√								√	√
CO4	√	√	√		√								√	√
CO5	√	√	√		√								√	√

Course Code	Course Name	Semester	Credits	L T P C
	ENGINEERING THERMODYNAMICS	1		3 0 0 3

COURSE OBJECTIVES

- To learn about the basic concepts of thermodynamics & first law of thermodynamics
- To learn about application of II law and to understand the concept of entropy/availability
- To evaluate the changes in properties of pure substances
- To understand various thermodynamic relations & ideal gas concept
- To learn about the concept of psychrometry

UNIT - I BASIC CONCEPTS AND FIRST LAW **9**

Concept of continuum- microscopic and macroscopic approach-Path and point functions - Properties – Thermodynamics system and their types - Thermodynamic Equilibrium - State, path and process - Quasi-static, reversible and irreversible processes - Modes of work - P-V diagram - Zeroth law of thermodynamics – Concept of temperature & heat - First law of thermodynamics - application to closed and open systems – steady and unsteady flow processes

UNIT- II SECOND LAW & AVAILABILITY ANALYSIS **9**

Statements of second law and its corollaries – Carnot theorem - Carnot cycle & Reversed Carnot cycle - Clausius inequality. Concept of entropy, entropy of ideal gas - Principle of increase in entropy. Applications of II Law. Available and non-available energy of a source and finite body. Energy and irreversibility. Expressions for the energy of a closed system and open systems. Energy balance and entropy generation. Irreversibility. I and II law Efficiency

UNIT - III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE **9**

Formation of steam & its thermodynamic properties - P-v, P-T, T-v, T-s, h-s diagrams. P-v-T surface. Use of Steam Table & Mollier Chart - Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and Regenerative cycles.

UNIT - IV IDEAL GAS & THERMODYNAMIC RELATIONS **9**

Properties of Ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases- Reduced properties. Compressibility factor- Generalized Compressibility Chart -. Simple Calculations.
Maxwell relations, Tds equations, Specific heat capacities - Energy equation - Joule-Thomson co-efficient, Clausius -Clapeyron equation – Third law of thermodynamics.

UNIT V PSYCHROMETRY **9**

Psychrometric properties - Psychrometric chart - Psychrometric processes – Adiabatic saturation - Sensible heating and cooling, humidification, dehumidification, Evaporative cooling and adiabatic mixing of air streams - Property calculations

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	Apply the first law of thermodynamics for simple open and closed systems under steady and unsteady conditions.
2.	Apply second law of thermodynamics to open and closed systems and calculate entropy and availability
3.	Apply Rankine cycle to steam power plant and compare few cycle improvement methods.
4.	Derive simple thermodynamic relations of ideal and real gases.
5.	Calculate the properties of gas mixtures and moist air and its use in psychrometric processes.

TEXT BOOK

1. Yunus A, Cengel & Michael A. Boles, "Thermodynamics – An Engineering Approach", McGraw Hill Education, 8th edition, 2017.

REFERENCES	
1.	Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2012.
2.	Borgnakke & Sonnatag, "Fundamental of Thermodynamics", John Wiley, 8th edition, 2016.
3.	Chattopadhyay P, "Engineering Thermodynamics", Oxford University Press, 2nd edition, 2016.
4.	J.P Holman, Thermodynamics – Tata McGraw Hill, 2019, 9th edition.
5.	Nag. P. K., "Engineering Thermodynamics", 6th edition, Tata McGraw-Hill, New Delhi, 2017.
6.	Vanwylen & Sonntag, Introduction to Thermodynamics, Classical & Statistical – Wiley Eastern, 2007, 4th edition.

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	√	√	√			√						√		√
CO2	√	√	√			√						√		√
CO3	√	√	√			√						√		√
CO4	√	√	√			√						√		√
CO5	√	√	√			√						√		√

Course Code	Course Name	Semester	Credits	L T P C
	MANUFACTURING SCIENCE	1		3 0 0 3

COURSE OBJECTIVES

- To understand the concepts casting techniques.
- To understand the concepts of basic metal forming processes
- To understand the concepts of sheet metal forming processes
- To understand the various joining process.
- To understand the basic manufacturing concepts of plastic components

UNIT–I CASTING AND MOLDING **9**

Sand casting – Sand moulds - Type of patterns – Pattern materials – Pattern allowances – Types of Moulding sand – Properties – Core making– Working principle of Special casting processes – Shell, investment casting -die casting – Centrifugal casting – Sand Casting defects – Inspection methods

UNIT–II METAL FORMING PROCESSES **9**

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – Characteristics of the process – Types of Forging Machines – Typical forging operations – Rolling of metals – Types of Rolling mills - Shape rolling operations – Defects in rolled parts - Principle of rod and wire drawing - Tube drawing –– Principles of Extrusion – Types of Extrusion – Hot and Cold extrusion –– Equipment used

UNIT–III SHEET METAL FORMING **9**

Forming Operations- Blanking-blank size calculation, draw ratio, drawing force, Piercing, Punching, Trimming, Stretch Forming, Deep Drawing, Shearing, Metal Spinning, Bending, Tube bending, Tube forming -Embossing & Coining, Types of Dies, Progressive, Compound and Combination dies. Forming Methods - Explosive Forming, Electro Hydraulic Forming, Electro Magnetic Forming, Dynapack Machine, Rubber Forming, Super Plastic Forming.

UNIT–IV JOINING/FASTENING PROCESSES **9**

Fusion welding processes – Types of Gas welding – Equipments used – Flame characteristics – Filler and Flux materials - Arc welding equipments - Electrodes – Coating and specifications – Principles of Resistance welding – Spot/butt, seam welding – Gas metal arc welding – Flux cored – Submerged arc welding – Electro slag welding – TIG welding – Principle and application of special welding processes - Plasma arc welding – Electron beam welding – Friction welding – Diffusion welding – Weld defects – Brazing and soldering process – Methods and process capabilities – Filler materials and fluxes – Types of Adhesive bonding.

UNIT–V MANUFACTURE OF PLASTIC COMPONENTS **9**

Types and characteristics of plastics — Moulding of thermoplastics — working principles and typical applications — injection moulding — Plunger and screw machines — Compression moulding, Transfer Moulding — Typical industrial applications — introduction to blow moulding –Rotational moulding — Film blowing — Extrusion — Thermoforming — Bonding of Thermoplastics

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	Apply the concepts of different metal casting processes, associated defects
2.	Gain the knowledge in various metal forming processes.
3.	Understand the sheet metal and forming processes.
4.	Understand the application of welding process
5.	Understand the different unconventional Manufacturing Methods employed for making different products.

TEXT BOOKS	
1.	Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014.
2.	Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, Wiley, 7th Edition, 2019.
3.	J.T. Black & Ronald A. Kohser, Degarmo's Materials and Processes in Manufacturing, John Wiley & Sons, 12th Edition 2017.
REFERENCES	
1.	Banga T.R, Agarwal. R.K. & Manghrani. T.M., "Foundry Engineering", Khanna Publishers, New Delhi, 1995.
2.	Jain.R.K. "Production Technology" Khanna Publishers, 17th edition, 2013.
3.	Bhattacharyya.A. "Metal Cutting Theory and Practice", Central Book Publishers, 1984.
4.	S. K. Hajra Chowdhery, & A. K. Hajra Chowdhery, Elements of Workshop Technology, Vol 1 & 2, Media Promoters and Publishers, 2007, 14th Edition.
5.	B.S. Magendran Parashar & R.K. Mittal,"Elements of Manufacturing Processes", Prentice Hall of India, 2003.
6.	P.N. Rao,"Manufacturing Technology",Tata McGraw-Hill Publishing Limited, 4th Edition, 2019.
7.	P.C. Sharma, "A text book of production technology",S. Chand and Company, 10th Revised Edition, 2010.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	√		√	√	√	√	√		√				√	
CO2	√	√	√	√	√	√	√		√				√	
CO3	√	√	√	√	√	√	√		√				√	
CO4	√		√	√	√	√	√		√				√	
CO5	√		√	√	√	√	√		√				√	

Course Code	Course Name	Semester	Credits	L T P C
	MATERIALS ENGINEERING	1		3 0 0 3

COURSE OBJECTIVES

- Understanding of the correlation between the internal structure of materials, their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
- To provide a detailed interpretation of equilibrium phase diagrams.
- Learning about different phases and heat treatment methods to tailor the properties of Fe-C alloys.

UNIT-I CRYSTAL STRUCTURE **9**

Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

UNIT-II MECHANICAL PROPERTY MEASUREMENT **9**

Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery; Hardness: Rockwell, Brinell and Vickers and their relation to strength. Fracture mechanics: Introduction to Stress-intensity factor approach and Griffith criterion. Fatigue failure: High cycle fatigue, Stress-life approach, SN curve, endurance and fatigue limits, Introduction to nondestructive testing (NDT).

UNIT-III ALLOYS, SOLID SOLUTIONS AND PHASE DIAGRAMS **9**

Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron-carbon phase diagram and microstructure aspects of ledeburite, austenite, ferrite and cementite, cast iron.

UNIT-IV HEAT TREATMENT OF STEEL **9**

Annealing, tempering, normalizing and spheroidising, isothermal transformation diagrams for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening.

UNIT-V METALS AND ALLOYS **9**

Introduction to Nano Materials Alloying of steel, properties of stainless steel and tool steels, maraging steels-cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys; brass, bronze and cupro-nickel; Aluminum and Al-Cu – Mg alloys- Nickel based super alloys and Titanium alloys.

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	Identify crystal structures for various materials and understand the defects in such structures.
2.	Understand how to tailor material properties of ferrous and non-ferrous alloys and how to quantify mechanical integrity and failure in materials
3.	Understand the micro structural aspects and phases of Fe-C systems.
4.	Understand the various heat treatment process.
5.	properties and applications of ferrous and non ferrous metals.

TEXT BOOKS

1. W. D. Callister, 2018, "Materials Science and Engineering-An Introduction", 10th Edition, Wiley India.
2. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.

REFERENCES

1. V. Raghavan, "Material Science and Engineering', Prentice Hall of India Private Limited, 2015, 6th Edition.
2. Jin U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 1st edition, 2011.

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	√	√	√					√			√	√	√	√
CO2	√	√	√	√			√		√	√	√	√	√	√
CO3	√					√					√	√	√	√
CO4	√		√		√	√	√	√	√	√	√	√	√	√
CO5	√						√			√	√	√	√	√

SEMESTER - II

Course Code	Course Name	Semester	Credits	L T P C
	ELECTRONICS ENGINEERING	2		3 0 0 3

COURSE OBJECTIVES

- To provide an overview of electronic device components to Mechanical engineering students.

UNIT-I SEMICONDUCTOR DEVICES AND APPLICATIONS **9**

Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator. Regulated power supply IC based on 78XX and 79XX series, Introduction to BJT, its input-output and transfer characteristics, BJT as a single stage CE amplifier, frequency response and bandwidth.

UNIT-II OPERATIONAL AMPLIFIER AND ITS APPLICATIONS **9**

Introduction to operational amplifiers, Op-amp input modes and parameters, Op-amp in open loop configuration, op-amp with negative feedback, study of practical op-amp IC 741, inverting and non-inverting amplifier applications: summing and difference amplifier, unity gain buffer, comparator, integrator and differentiator.

UNIT-III TIMING CIRCUITS AND OSCILLATORS **9**

RC-timing circuits, IC 555 and its applications as table and mono-stable multi-vibrators, positive feedback, Barkhausen's criteria for oscillation, R-C phase shift and Wein bridge oscillator.

UNIT-IV DIGITAL ELECTRONICS FUNDAMENTALS **9**

Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters, Block diagram of microprocessor/microcontroller and their applications.

UNIT-V ELECTRONIC COMMUNICATION SYSTEMS **9**

The elements of communication system, IEEE frequency spectrum, Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, Mobile communication systems: cellular concept and block diagram of GSM system.

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	Understand the principles of semiconductor devices and their applications.
2.	Design an application using Operational amplifier.
3.	Understand the working of timing circuits and oscillators.
4.	Understand logic gates, flip flop as a building block of digital systems.
5.	Learn the basics of Electronic communication system.

TEXT BOOKS

1.	Floyd ," Electronic Devices" Pearson Education 9th edition, 2015.
2.	R.P. Jain , "Modern Digital Electronics", Tata Mc Graw Hill, 4th Edition, 2010.
3.	Frenzel, "Communication Electronics: Principles and Applications", Tata Mc Graw Hill, 3rd Edition, 15th Reprint, 2008.

REFERENCES

1.	Floyd ," Electronic Devices" Pearson Education 9th edition, 2015.
2.	R.P. Jain , "Modern Digital Electronics", Tata Mc Graw Hill, 4th Edition, 2010.
3.	Frenzel, "Communication Electronics: Principles and Applications", Tata Mc Graw Hill, 3rd Edition, 15th Reprint, 2008.

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	√	√			√								√	
CO2		√		√	√								√	
CO3	√	√			√								√	
CO4	√	√											√	
CO5	√				√					√			√	

Course Code	Course Name	Semester	Credits	L T P C
	THERMAL ENGINEERING	2		3 0 0 3

COURSE OBJECTIVES

- To apply the concept of thermodynamics to steam Nozzle & to understand the velocity triangle diagram of various turbines
- To understand the various systems of I.C. Engines
- To analyse the different gas power cycles
- The principles of reciprocating & rotary air compressors are studied
- To apply the concepts of thermodynamics to refrigeration & Air conditioning

UNIT- I FLOW THROUGH NOZZLE & STEAM TURBINES **9**

One-dimensional flow of steam through nozzle – Nozzle types - Critical pressure ratio – Nozzle efficiency - Super saturated flow in nozzles.
Impulse and Reaction turbine Principles - Compounding – Types - Velocity diagrams for simple and multistage turbines - Speed regulations – Governors.

UNIT-II I.C. ENGINES **9**

Classification – Working Principle - Components and their function. Valve timing & port timing diagram - actual and theoretical p-V diagram of four stroke and two stroke engines. Simple Carburettor Diesel pump and injector system - Ignition System - Principles of Combustion and knocking in SI and CI Engines. Lubrication and Cooling systems. Performance calculations.

UNIT-III GAS POWER CYCLES **9**

Air Standard Cycles - Otto, Diesel, Dual & Brayton cycle Analysis – methods of cycle improvement. Regenerative, intercooled, reheated cycles and their combinations –Performance Calculations.

UNIT-IV AIR COMPRESSORS **9**

Reciprocating Air Compressors – Classifications - Working principle – work done - Effect of clearance volume - Single and multi-stage compressors, Volumetric efficiency – calculation of power requirement – Rotary compressors (Working Principle).

UNIT-V REFRIGERATION & AIR CONDITIONING **9**

Refrigeration cycles- Reversed Carnot – Bell Coleman cycle - Vapour compression system –Super heating/Sub cooling - Vapour absorption refrigeration system- Properties of refrigerants. – Simple Problems on VCR system
Principles of air-conditioning - Types of A/C Systems –Industrial, Summer, Winter - Comfort and Year-round air conditioners – Window & Centralised A/C - Concept of GSHF – RSHF – ESHF.

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	Analyse the problems of nozzles & turbines.
2.	Explain the functioning & features of I.C. Engines & Calculate the performance of I.C. Engines.
3.	Analyse & solve the problems of air standard cycles.
4.	Analyse the performance behaviour of single & multi stage reciprocating air compressors.
5.	Understand the different Refrigeration & A/C systems and solve the problems of VCR system.

TEXT BOOKS

1.	Kothandaraman.C.P., Domkundwar. S,Domkundwar. A.V., "A course in thermal Engineering", Fifth Edition, "Dhanpat Rai & sons , 2016
2.	Rajput. R. K., "Thermal Engineering" S. Chand Publishers, 2017

REFERENCES	
1.	Arora.C.P, "Refrigeration and Air Conditioning ," Tata McGraw-Hill Publishers, 3rd edition, 2017.
2.	Ganesan V.." Internal Combustion Engines",4th Edition, Tata McGraw-Hill 2017.
3.	Rudramoorthy, R, "Thermal Engineering ",Tata McGraw-Hill, New Delhi,2003.
4.	Sarkar, B.K,"Thermal Engineering" Tata McGraw-Hill Publishers, 2007.
5.	P. L. Ballaney, Thermal Engineering, Khanna Publishers, 2007, 24th Edition.

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	√	√	√			√						√	√	
CO2	√	√	√			√						√	√	
CO3	√	√	√			√						√	√	
CO4	√	√	√			√						√	√	
CO5	√	√	√			√						√	√	

Course Code	Course Name	Semester	Credits	L T P C
	FLUID MECHANICS & MACHINERY	2		3 0 0 3

COURSE OBJECTIVES

- To understand the properties of fluids and concept of control volume.
- To understand the applications of the conservation laws to flow through pipes.
- To understand the importance of dimensional analysis
- To understand the importance of various types of flow in pumps.
- To understand the importance of various types of flow in turbines.

UNIT-I FLUID PROPERTIES & FLOW CHARACTERISTICS **9**

Units and dimensions - Types of flows - Properties of fluids - mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure – Gas laws - Surface tension and capillarity. Flow characteristics – concept of control volume – Bernoulli's Theorem – Concept of control volume – Application of continuity equation, energy equation, momentum equation and moment of momentum equation

UNIT - II FLOW THROUGH CIRCULAR CONDUITS **9**

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli- Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel

UNIT-III DIMENSIONAL ANALYSIS **9**

Dimensional analysis – methods of dimensional analysis - Similitude –types of similitude – Dimensionless parameters- Application of dimensionless parameters – Model analysis

UNIT-IV HYDRAULIC PUMPS **9**

Impact of jets - Euler's equation - Theory of roto-dynamic machines – various efficiencies - velocity triangles - Centrifugal pumps– Multi stage centrifugal pumps - working principle - work done by the impeller - performance curves – Priming – Cavitation - Reciprocating pump- working principle – Air vessels – Indicator diagram - Rotary pumps – Working Principles.

UNIT-V HYDRAULIC TURBINES **9**

Hydraulic turbines – Classification - working principles - Pelton wheel, Kaplan turbine - Francis turbine - velocity triangles - theory of draft tubes – Performance – Specific speed – Unit Quantities - Selection of turbines - governing of turbines - hydraulic coupling - Torque converter

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	Apply mathematical knowledge to predict the properties and characteristics of a fluid.
2.	Analyse and calculate major and minor losses associated with pipe flow in piping networks.
3.	Mathematically predict the nature of physical quantities
4.	Analyse the performance of pumps
5.	Analyse the performance of turbines

TEXT BOOKS

1.	K.L. Kumar, Engineering Fluid Mechanics, S. Chand Publishing, 2016.
2.	Modi P.N. & Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 23rd edition, 2022.

REFERENCES	
1.	S. K. Som, G. Biswas, S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill, 2017, 3rd Edition.
2.	K. R. Arora, Fluid Mechanics Hydraulics and Hydraulic Machines, Standard Publishers, 2017, 9th Edition.
3.	C. P. Kothandaraman & R. Rudramoorthy. Fluid Mechanics and Machinery, New Academia Science, 2012, 3rd Edition.
4.	Douglas J.F, Solving Problems in Fluid Mechanics Vol I & II, John Wiley & Sons Inc., 3rd edition, 1996.
5.	Victor L. Streeter and E. Benjamin Wylie & Keith W.Bedford. Fluid Mechanics, Mc Graw-Hill 1999, 8th Edition.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√	√	√	√			√			√	√
CO2	√	√	√	√	√	√	√			√	√	√	√	√
CO3	√	√	√	√	√					√			√	√
CO4	√	√	√	√	√	√	√			√	√	√	√	√
CO5	√	√	√	√	√	√	√			√	√	√	√	√

Course Code	Course Name	Semester	Credits	L T P C
	MACHINE TOOLS AND METAL CUTTING	2		3 0 0 3

COURSE OBJECTIVES

- To understand the concepts metal cutting
- To provide knowledge on various types of lathes used
- To understand the difference between shaper planner and slotter in manufacturing domain
- To provide knowledge on different types of grinding machines and related tools for manufacturing various components
- To identify the basic gear manufacturing machines used in industries

UNIT - I THEORY OF METAL CUTTING **9**

Introduction, mechanics of metal cutting –Chip formation, Types of Chips, Cutting force calculations, Torque and Power Calculations in Machining, nomenclature of single point cutting tool, Tool materials, Influence of tool Geometry, Tool Life, machining time calculation, Machinability – evaluating and rating, metal cutting economics, problems in Merchant's circle, tool life, and machining time.

UNIT - II LATHE **9**

Centre lathe, constructional features, cutting tool geometry, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes – automats – single spindle, Swiss type, automatic screw type, multi spindle - Turret Indexing mechanism, bar feed mechanism.

UNIT - III SHAPER, PLANER AND SLOTTER **9**

Introduction, types, specification, mechanism - holding devices, hydraulic drives in shaper, difference between shaper and planer.

UNIT - IV ABRASIVE PROCESSES **9**

Grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding, internal grinding- micro finishing methods - Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines. Introduction, types and specifications, mechanisms, holding devices, types of milling operation. Milling tool nomenclature and its specifications, Indexing – Types-Simple, Compounding and differentials.

UNIT - V GEAR MANUFACTURING PROCESSES **9**

Gear manufacturing processes - Gear Machining-Forming or Form cutting - Gear generating process-Gear shaping, Gear hobbing Gear planning, Gear broaching. Bevel gear generation.
Gear finishing process- Gear Finishing Methods – Gear Shaving, Gear Grinding, Gear lapping, Gear honing.

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	Understand the mechanics of metal cutting process
2.	Understand the various types of lathe machines
3.	Understand the shaper, planer and slotter machines
4.	Understand the application grinding operation in manufacturing
5.	Understand the gear manufacturing used in industries

TEXT BOOKS

1.	Kalpakjian and Schmid, Manufacturing processes for engineering materials (6th Edition)-Pearson India, 2014.
2.	Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, Wiley, 5th Edition, 2013.
3.	Degarmo's Materials and Processes in Manufacturing, Black & Kohser, Wiley, 13th edition, 2021.
4.	Hajra Choudhury, "Elements of Workshop Technology, Vol. I and II", Media Promotors Pvt Ltd., Mumbai, 2005.

REFERENCES	
1.	B.S. Magendran Parashar & R.K. Mittal,"Elements of Manufacturing Processes", Prentice Hall of India, 2003.
2.	P.N. Rao,"Manufacturing Technology",Tata McGraw-Hill Publishing Limited, 4th Edition, 2019.
3.	P.C. Sharma, "A text book of production technology",S. Chand and Company, 10th Revised Edition, 2010.
4.	Beddoes.J and Bibby M.J, 'Principles of Metal Manufacturing Processes', Elsevier, 2006.

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	√	√	√	√	√							√	√	√
CO2	√	√	√	√	√							√	√	√
CO3	√	√	√	√	√							√	√	√
CO4	√	√	√	√	√							√	√	√
CO5	√	√	√	√	√							√	√	√

Course Code	Course Name	Semester	Credits	L T P C
	STRENGTH OF MATERIALS	2		3 0 0 3

COURSE OBJECTIVES

- To understand the nature of stresses developed in simple and composite bars.
- To understand the nature of stresses developed in beams.
- To understand the slope and deflection developed in beams.
- To calculate the elastic deformation occurring in various simple geometries for different types of loading.
- To understand the nature of stresses developed in cylinders and spheres for various types of simple loads.

UNIT - I SIMPLE STRESS AND STRAIN **9**

Deformation in solids– Hooke's law– stress and strain –tension, compression and shear stresses– composite bars - elastic constants and their relations–Volumetric, linear and shear strains.

UNIT - II SHEAR FORCE AND BENDING MOMENT DIAGRAM **9**

Beams and types–Transverse loading on beams– shear force and bend moment diagrams– Types of beam supports–Simply supported, over-hanging beams and cantilevers– Theory of bending of beams–bending stress distribution and neutral axis–shear stress distribution– point and distributed loads.

UNIT - III DEFLECTION OF BEAMS **9**

Deflection of a beam using double integration method, moment area method and macaulay's method– computation of slopes and deflection in beams–Maxwell's reciprocal theorems.

UNIT - IV TORSION OF SHAFT AND SPRINGS **9**

Torsion–Stresses and deformation in circular and hollow shafts– stepped shafts–Deflection of shafts fixed at both ends–Stresses and deflection of helical springs, laminated spring - principal stresses and principal planes– Mohr's circle.

UNIT- V THIN AND THICK CYLINDER **9**

Axial and hoop stresses in cylinders subjected to internal pressure–Deformation of thick and thin cylinders– Deformation in spherical shells subjected to internal pressure.

LIST OF EXPERIMENTS FOR LABORATORY COURSE

1.	Tensile test on MS rod and twisted bar (Electronic UTM)
2.	Comparison of hardness value of steel, copper and aluminium using Rockwell and Brinell hardness measuring machines
3.	Estimation of notch toughness of steel using impact testing machine
4.	Estimation of spring constant under tension and compression
5.	Tension test on MS wire (Tensile Testing Machine)
6.	Torsion test on mild steel rod.
7.	Deflection Test on Steel and Wooden Beam

CO	COURSE OUTCOMES
Upon completion of this course, Students should be able to	
1.	Recognize various types loads applied on machine components of simple and composite bars.
2.	Recognize the stresses developed on various types of beams.
3.	Recognize the slope and deflection developed on various types of beams.
4.	Evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
5.	Understand the nature of internal stresses.

TEXT BOOKS	
1.	S. Ramamrutham and R. Narayan, Strength of Materials, Dhanpat Rai and Sons, New Delhi.2022, 20th Editon.
2.	L.S. Srinath, Advanced Mechanics of Solids, Tata McGraw HIll, 2017, 3rd Edition.
REFERENCES	
1.	Beer & Johnson, Mechanics of materials, SI Metric Edition, McGraw Hill, ISE, 17th edition, 2017.
2.	Gere and Timensenko, Mechanics of Materials, CBS Publishers, 7th edition, 2006.
3.	S.P. Timoshenko J.N Goodier, Theory of Elasticity, Mc Graw Hill International Edition, 3rd edition, 2017.
4.	S.M.A.Kazimi, Solid Mechanics, Tata McGraw Hill Publishing Company Ltd., First revised edition, 2006.
5.	Timoshenko & D.H. Young, J.V. Rao, Sukumar Pati, Engineering Mechanics, McGraw Hill, 5th edition, 2017.
6.	J. B. K Das & P.L. Srinivasa Murthy, Mechanics of Materials, Sapna Book House, 2018.

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	√	√	√	√								√	√	
CO2	√	√	√	√								√	√	
CO3	√	√	√	√	√							√	√	
CO4	√	√	√	√								√	√	
CO5	√	√	√	√								√	√	