DEPARTMENT OF MECHANICAL ENGINEERING

INSTITUTION VISION AND MISSION

VISION

To make this institution the unique of its kind in the field of Research and Developmentactivities in this part of world

MISSION

To impart highly innovative and technical knowledge to the urban and unreachablerural students folks through "TOTAL QUALITY EDUCATION"

DEPARTMENT OF MECHANICAL ENGINEERING

VISION

To make the Department of Mechanical Engineering the unique of its kind in the field ofResearch and Development activities in the prominent filed of Mechanical Engineering in this part of the world.

MISSION

To impart highly innovative and technical knowledge in the field of Mechanical Engineering to the urban and unreachable rural students folks through "TOTALQUALITY EDUCATION"

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DEPARTMENT OF MECHANCAL ENGINEERING

REGULATIONS – 2021

CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES:

Bachelor of Mechanical Engineering curriculum is designed to impart Knowledge, Skill and Attitude on thegraduates to

PEO 1: Graduates of the Programme will excel in technical knowledge and apply innovative skills in the field ofMechanical Engineering.

PEO 2: Graduates will contribute to the technological development and research   activities through "TotalQuality Education".

PEO 3: Graduates of the Programme will accomplish the leadership Qualities and social responsibilities through "Life Long Learning".

PROGRAMME OUTCOMES

Engineering Graduates will be able to:

PO1 ENGINEERING KNOWLEDGE: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 PROBLEM ANALYSIS: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 DESIGN/DEVELOPMENT OF SOLUTIONS: Design solutions for complex 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.

PO4 CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 MODERN TOOL USAGE: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6 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 professional engineering practice.

PO7 ENVIRONMENT AND SUSTAINABILITY: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 ETHICS: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 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.

PO11 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.

PO12 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.

PROGRAMME SPECIFIC OUTCOME

PSO 1 Graduates will be able to create and analyze the Research and Development activities related to designand manufacturing

PSO 2 Graduates will be able to design, develop need based products in Mechanical Engineering and alliedIndustries.

PEO/PO MAPPING

PEO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	H	H	M	M	H	M	M	M	H	H	M	H
2	H	M	M	M	L	L	L	L	H	H	M	H
3	-	-	-	-	-	M	M	H	H	H	M	H

DEPARTMENT OF MECHANICAL ENGINEERING

SECOND YEAR COURSES

(Regulations 2021 – Autonomous)

SEMESTER III

Sl.No	Course Code	Course Name	Credits			
			L	T	P	C
Theory						
1	GE2201	Design Thinking	3	0	0	3
2	ME2201	Engineering Mechanics	3	0	0	3
3	ME2202	Engineering Thermodynamics	3	0	0	3
4	EE2208	Electrical Drives and Control	3	0	0	3
5	ME2203	Fluid Mechanics and Machinery	3	0	0	3
6	ME2204	Manufacturing Technology –I	3	0	0	3
7		Audit Course	3	0	0	0
Practicals						
8	ME2205	Computer Aided Machine Drawing	0	0	4	2
9	EE2209	Electrical Engineering	0	0	4	2

10	EM2202	Interpersonal skills - Laboratory Listening and Speaking	0	0	2	1
		Total Credits	21	1	10	23

SEMESTER IV

Sl.No.	Course Code	Course Name	Credits			
			L	**T**	**P**	**C**
Theory						
1	MA2255	Probability Statistics and Numerical methods	3	1	0	4
2	ME2251	Engineering Materials and Metallurgy	3	0	0	3
3	ME2252	Kinematics of Machinery	3	0	0	3
4	ME2253	Manufacturing Technology-II	3	0	0	3
5	ME2254	Strength of Materials for Mechanical Engineers	3	0	0	3
6	ME2255	Thermal Engineering	3	0	0	3
Practicals						
7	ME2256	IC Engines and Steam Laboratory	0	0	4	2
8	ME2257	Manufacturing Technology Laboratory	0	0	4	2
9	ME2258	Strength of materials and Fluid Mechanics Laboratory	0	0	3	1
10	EM2252	An Introduction to Advanced Reading and Writing	0	0	2	1
		Total Credits	18	1	13	25

Course Code	Course Name	L	T	P	C
GE2201	Design Thinking	3	0	0	3

Category: Employability Enhancement Courses

a. Preamble

This course introduces the various principles of design thinking to achieve an effective design and to examine the implementation of the model or process for its successful operation

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Describe the basic principles of design and various stages of design thinking for better conceiving of idea and refinement	K2
CO2	Elucidate the concepts of idea generation and refinement	K3
CO3	Apply various prototype models for solving complex problems	K3
CO4	Analyze real-time problems for effective design, implementation and operation	K3
CO5	Device idea/solution towards development of a prototype for a chosen problem of interest	K4

c. Course Syllabus   **Total: 45 Periods**

INTRODUCTION TO DESIGN THINKING   9

Introduction - Product life cycle – Design Ethics – Design Process – Stages in design thinking: Immersion, Analysis and synthesis, Ideation, Prototyping.

IDEA GENERATION AND REFINEMENT   9

Basic design - directions - Themes of thinking - Inspiration and references - Brainstorming - Value - Inclusion – Sketching - Presenting ideas - Thinking in images - Thinking in signs - Appropriation - Personification - Visual metaphors - Modification - Thinking in words – Words and language - Thinking in shapes - Thinking in proportions - Thinking in color - Outside the Box.

PROTOTYPING   9

Developing designs - Types of prototype - Prototyping for Designing Complex Systems – The Efficacy of Prototyping under Time Constraints

IMPLEMENTATION   9

Format - Materials - Finishing - Media - Scale - Series/Continuity - Emerging Landscapes of Design - Real-Time Design Interaction Capture and Analysis - Enabling Efficient Collaboration in Digital Design - Spaces Across Time and Distance - Software used in Developing in Virtual Environments

DESIGN THINKING IN VARIOUS SECTORS   9

Design & Development of Prototypes for Wall Plastering, Rubber shredding, Separation of Corn seeds, Electric vehicles, Smart gates, Burglar alarm, Tyre pressure monitor, Development of Online Voting System, Online Proctoring System, Online Health Monitoring System, IoT based Home Automation and any other problem of interest in your domain

d. Activities

Design & Development of Prototypes for Wall Plastering, Rubber shredding, Separation of Corn seeds, Electric vehicles, Smart gates, Burglar alarm, Tyre pressure monitor, Development of Online Voting System, Online Proctoring System, Online Health Monitoring System, IoT based Home Automation and any other problem of interest in your domain

e. Learning Resources

i. TEXT BOOKS

1. Nagrath .I.J. & Kothari .D.P, "*Electrical Machines*", Tata McGraw-Hill, 2006

2. Vedam Subrahmaniam, "*Electric Drives (Concepts and Applications)*", Tata McGraw-Hill, 2010.

ii. REFERENCE BOOK

1. Singh. M.D., K.B.Khanchandani, "*Power Electronics*", Tata McGraw-Hill, 2006

Course Code	Course Name	L	T	P	C
ME2201	**Engineering Mechanics**	3	0	0	3

Category: Foundation Courses (Engineering Science courses)

a. Preamble

This course promotes the students to understand basic concepts of force and its relative effects in engineering problems. It also helps in developing the capacity to predict the effect of force and motion while carrying out the design in Mechanical engineering.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Apply basic engineering principles such as laws of mechanics and vector calculus for solving problems related to particles at rest.	K3
CO2	Examine the various reactive forces and couples for equilibrium of rigid bodies using free body diagram	K3

CO3	Determine the various section properties (Centroid, Moment of Inertia, Product Moment of Inertia and Mass moment of Inertia) for simple and composite sections	K3
CO4	Solve simple application problems related to dynamics of particles (velocity, acceleration, forces that induce motion and work done)	K3
CO5	Calculate the frictional forces exerted when a body is sliding & Rolling over another body	K3

c. Course Syllabus **Total: 45 Periods**

BASICS AND STATICS OF PARTICLES 9

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces - Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components -Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of Transmissibility.

EQUILIBRIUM OF RIGID BODIES 9

Free body diagram – Types of supports –Action and reaction forces –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 – Single equivalent force -Equilibrium of Rigid bodies in two dimensions.

PROPERTIES OF SURFACES AND SOLIDS 9

Centroid and Moment of Inertia – Centroid of lines and areas – Theorems of Pappus - Parallel axis theorem and perpendicular axis theorem for Second moment of Plane area - First and Second moment of plane area , Principal Moment of Inertia for T section- I section, - Angle section, Hollow section by using standard formula. Mass moment of

Inertia for prismatic, cylindrical and spherical solids - Relation to area moments of inertia.

DYNAMICS OF PARTICLES   9

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

FRICTION   9

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance

d. Activities

Students shall be given exposure to understand the concepts of force and motion behaviour of objects by framing the basic equations using Newton's Law of Motion.

e. Learning Resources

  i. TEXT BOOKS

1. Beer, F.P and Johnston Jr. E.R., "*Vector Mechanics for Engineers (In SI Units): Statics and Dynamics*", Tata McGraw-Hill Publishing Company, 2019
2. Vela Murali, *"Engineering Mechanics"*, Oxford University Press, 2014

  ii. REFERENCE BOOK

1. Bhavikatti, S.S and Rajashekarappa, K.G., *"Engineering Mechanics",* New Age International (P) Limited Publishers, 2021.
2. Hibbeller, R.C and Ashok Gupta, *"Engineering Mechanics: Statics and Dynamics,"* Pearson Education, 2017.
3. Irving H. Shames and Krishna Mohana Rao. G., *"Engineering Mechanics – Statics and Dynamics",* Pearson Education, 2016.
4. Meriam J.L. and Kraige L.G.*, "Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2"*, John Wiley & Sons, 2017.
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", Vikas Publishing House Pvt. Ltd, 2017.

Course Code	Course Name	L	T	P	C
ME2202	**Engineering Thermodynamics**	3	0	0	3

Category: Professional core courses

a. Preamble

This course promotes the students to understand basic concepts of thermodynamics and its applications.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the zeroth and first law of thermodynamics in calculating the property changes for closed and open engineering systems	K3
CO2	Apply the principles of second law of thermodynamics in identifying the performance of thermal devices through energy, entropy and availability calculations	K3
CO3	Evaluate the various properties of steam and derive thermodynamic relations of ideal and real gases.	K3
CO4	Apply Rankine cycle to steam power plant.	K3
CO5	Identify the properties of ideal, real gases and gas mixtures.	K3

c. Course Syllabus   **Total: 45 Periods**

BASICS, ZEROTH AND FIRST LAW OF THERMODYNAMICS   9

Review of Basics – Thermodynamic systems, Properties and processes, Thermodynamic Equilibrium - Heat and work transfer, definition and comparison, sign convention - Displacement work - P-V diagram - Thermal equilibrium - Zeroth law – Concept of

temperature and Temperature Scales. First law – application to closed and open systems – steady and unsteady flow processes.

SECOND LAW OF THERMODYNAMICS AND AVAILABILITY 9

Second law statements and its equivalence - Heat Engine, Refrigerator, Heat pump - Carnot cycle and Reversed Carnot cycle, Efficiency and COP – Carnot theorm - Entropy – concept and causes - Clausius in equality - Change in entropy for reversible and irreversible processes - principle of increase in entropy. Available (Exergy) and Unavailable energy (Anergy) – Irreversibility – simple calculations.

PROPERTIES OF PURE SUBSTANCES AND THERMODYNAMIC RELATIONS 9

Steam - formation and its thermodynamic properties - p-v, p-T, T-v, T-s, h-s diagrams. PVT surface. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart. Maxwell relations, Tds Equations, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase Change Processes.

STEAM POWER CYCLES 9

Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and Regenerative cycles – performance calculations - Binary and Combined cycles (descriptive only).

IDEAL, REAL GASES AND GAS MIXTURES 9

Properties of Ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases- Reduced properties. Compressibility factor- Principle of Corresponding states -Generalized Compressibility Chart and its use - Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy

d. Activities

Students shall be given exposure to understand the basic concepts of thermodynamics and its applications.

e. Learning Resources

i. TEXT BOOKS

1. R.K.Rajput, "A Text Book of *"Engineering Thermodynamics"*, Laxmi Publications, 2017
2. Yunus A. Cengel and Michael A. Boles, *"Thermodynamics",* Tata McGraw Hill, 2016

ii. REFERENCE BOOK

1. Nag.P.K, "*Engineering Thermodynamics*", Tata McGraw Hill, 2019
2. Claus Borgnakke and Richard E. Sonntag, *"Fundamentals of Thermodynamics"* Wiley Eastern, 2019
3. A.Valan Arasu, *"Engineering Thermodynamics",* Vijay Nicole Imprints, 2016

Course Code	Course Name	L	T	P	C
EE2208	**Electrical Drives and Control**	3	0	0	3

Category: Foundation Courses (Engineering Science courses)

a. Preamble

This course introduces the basic concepts of different types of electrical machines and their performance. It comprehensively details the different methods of starting D.C motors and induction motors. It describes the conventional and solid-state speed control of DC/AC drives.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Explain the various classes of duty and Selection of power rating.	K2
CO2	Summarize the working principle of DC &AC motors, their characteristics and its braking methods.	K2
CO3	Describe the Starting methods of DC &AC motors.	K2
CO4	Illustrate the various methods of conventional and solid state speed control schemes of DC drives.	K2
CO5	Illustrate the various methods of conventional and solid state speed control schemes of AC drives	K2

c. Course Syllabus   **Total: 45 Periods**

INTRODUCTION   9

Basic Elements of a drive – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors.

DRIVE MOTOR CHARACTERISTICS   9

Torque – Multiquadrant operation- Speed-Torque characteristics of DC motors: Shunt, series and compound – Single Phase and Three Phase Induction Motors(Construction and Working)-Torque Slip Characteristics- Braking –Regenerative, Dynamic and Plugging.

STARTING METHODS   9

Need for starter-D.C Motor starters-3point and 4point starter– A.C. Motor starters- DOL starter, Star Delta starter, Autotransformer starter, Primary Resistance starter and Rotor Resistance starter.

CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C.
DRIVES   9

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Controlled rectifier based drives-Single Phase half controlled and fully controlled- DC chopper based drive-Class A & Class E Chopper –applications.

CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C.
DRIVES   9

Speed control of squirrel cage and slip ring induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Inverter based drives(Single phase and Three Phase)

d. Activities
Students shall be exposed to the different machine parts, starters and the drive in the college premises.

e. Learning Resources
i. TEXT BOOKS
1. Nagrath .I.J. & Kothari .D.P, *"Electrical Machines",* Tata McGraw-Hill, 2006
2. Vedam Subrahmaniam, *"Electric Drives (Concepts and Applications)",* Tata McGraw-Hill, 2010.

ii. REFERENCE BOOK
1. Singh. M.D., K.B.Khanchandani, "*Power Electronics*", Tata McGraw-Hill, 2006

Course Code	Course Name	L	T	P	C
ME2203	**Fluid Mechanics and Machinery**	3	0	0	3

Category: Foundation Courses (Engineering Science courses)

a. Preamble

This course introduces basic concepts and performance of fluid characteristics, losses in fluid flows, turbine and pumps.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the fundamental properties of fluids and law of conservation of mass, momentum, energy concepts.	K3
CO2	Apply the boundary layer and Reynolds number concept to flow of fluids.	K3
CO3	Apply the concept of Dimensional and model analysis to build a prototype.	K3
CO4	Calculate the efficiencies of Pelton, Francis, Kaplan turbines.	K2
CO5	Determine the performance of centrifugal pump.	K2

c. Course Syllabus   **Total: 45 Periods**

FLUID PROPERTIES AND FLOW CHARACTERISTICS   9

Units and dimensions – Properties of fluids - mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, surface tension and capillarity. Flow characteristics – Concept of control volume – Application of

continuity equation, energy equation and momentum equation – Significance of fluids in Hydraulics and Pneumatics.

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.

DIMENSIONAL AND MODEL ANALYSIS 9

Need for dimensional analysis – Methods of dimensional analysis – Similitude – Types of similitude – Dimensionless parameters – Application of dimensionless parameters – Model analysis.

TURBINES 9

Introduction to Impact of Jets – Euler's equation – Classification of turbines – heads and efficiencies – Velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines – Working principles – Work done by water on the runner – Draft tube. Specific speed – unit quantities – Performance curves for turbines.

PUMPS 9

Theory of roto-dynamic machines – Rotary pumps – Classification – Centrifugal pumps – Working principle – Work done by the impeller – performance curves – various efficiencies – velocity components at entry and exit of the rotor – velocity triangles – Reciprocating pump – working principle(Descriptive only).

d. Activities
Students shall be exposed to proper selection of pump and turbine based on the requirement.

e. Learning Resources
   i. TEXT BOOKS

1. R.K. Bansal., "*Fluid Mechanics & Hydraulic Machines*", Laxmi Publications Pvt. Ltd., 2017.

2. Streeter, V. L. and Wylie E. B., *"Fluid Mechanics"* – Tata McGraw Hill, 2010

ii. REFERENCE BOOK

1. R.K.Rajput., "*A Textbook of Fluid Mechanics & Hydraulic Machines*", S. Chand Publications, 2016.

2. Robert W.Fox, Alan T. McDonald and Philip J.Pritchard., "*Fluid Mechanics*", Wiley Publishers, 2016

Course Code	Course Name	L	T	P	C
ME2204	**Manufacturing Technology - I**	3	0	0	3

Category: Professional Core Courses

a. Preamble

This course introduces the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the knowledge of different metal casting processes for casting simple components by considering its defects, merits and demerits	K3
CO2	Explain the appropriate selection of welding process for the given situation, its construction and working principle.	K2

CO3	Summarize the various hot working and cold working methods of metals.	K2
CO4	Explain various sheet metal making processes.	K2
CO5	Apply the appropriate method of manufacturing simple plastic components.	K3

c. Course Syllabus   **Total: 45 Periods**

METAL CASTING PROCESSES   9

Sand Casting: Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Melting furnaces: Blast and Cupola Furnaces; Principle of special casting processes: Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting – CO_2 process – Stir casting; Defects in Sand casting. Numerical problems involving calculation of cooling time, fluid flow in the mold.

JOINING PROCESSES   9

Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding – Plasma arc welding – Thermit welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure. Laser beam welding. Numerical problems involving heat output and power requirement in electric arc/resistance welding.

METAL FORMING PROCESSES   9

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – forging operations. Rolling of metals– Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts. Principle of rod and wire

drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion. Numerical problems involving change in size of forged components, forging force, rolling bite angle, rolling force, draft.

SHEET METAL PROCESSES   9

Sheet metal characteristics – shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods – special forming processes-Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning– Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Introduction to Micro forming. Numerical problems on die and punch clearance, shearing force, bending force, drawing blank size calculations.

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

d. Activities
Students shall be given practical exposure in preparing green sand moulding and welding at Manufacturing Technology laboratory.

e. Learning Resources
  i. TEXT BOOKS
    1. Hajra Chouldhary S.K and Hajra Choudhury. AK., *Elements of workshop Technology"*, Volume I and II, 15th edition, Media promoters and Publishers Private Limited, Mumbai, 2010.
    2. Kalpakjian. S, *Manufacturing Engineering and Technology*", Pearson Education 8th Edition, 2020
  ii. REFERENCE BOOK
    1. Gowri P. Hariharan, A.Suresh Babu, *Manufacturing Technology I*", Pearson

Education, 2011

2. Rao, P.N, *"Manufacturing Technology Foundry, Forming and Welding"*, 5th Edition, TMH, 2019

Course Code	Course Name	L	T	P	C
ME2205	**Computer Aided Machine Drawing**	0	0	4	2

Category: Professional Core Courses

a. Preamble

This course introduces the CAD Standards and families the conversion from Isometric to 2D CAD.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Describe the Indian Standards on drawing practices and standard components	K2
CO2	Draw assembly drawings using manual drafting.	K3
CO3	Create the 2D drawing manually from Isometric view.	K3
CO4	Draw part drawing using 2D drafting AUTOCAD software.	K3
CO5	Draw assembly drawing using AUTOCAD software.	K3

c. Course Syllabus   **Total: 60 Periods**

DRAWING STANDARDS & FITS AND TOLERANCES 12

Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. - Limits, Fits – Tolerancing of individual dimensions – Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of geometric dimensioning & Tolerancing.

INTRODUCTION TO 2D DRAFTING 16

Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed drawing - Bearings - Bush bearing, Plummer block - Valves – Safety and non-return valves. Minor losses.

2D GEOMETRIC MODELING AND ASSEMBLY 26

Assembly of Flange Coupling – Assembly of Muff Coupling – Assembly of Knuckle Joint – Assembly of Sleeve and Cotter Joint – Assembly of Stuffing Box – Assembly of Screw Jack -Assembly of Machine vice.

INTRODUCTION TO 3D MODELLING 6

Introduction to Extrude, Revolve, Sweep, Loft, Fillet, Chamfer, Pattern, Mirror in AutoCAD using basic primitives.

Note: 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using AUTOCAD software

d. Activities
Students shall be exposed to the Isometric to 2D Diagram conversion using AUTOCAD Software and Manually.

e. Learning Resources
  i. TEXT BOOKS
   1. Gopalakrishna K.R, "*Machine Drawing*", 22nd Edition, Subhas Stores Books

Corner, Bangalore, 2013.

ii. **REFERENCE BOOK**

1. N. D. Bhatt and V.M. Panchal, "*Machine Drawing",* 48th Edition, Charotar Publishers, 2013.

2. S. Trymbaka Murthy.,. "*A Text Book of Computer Aided Machine Drawing".* CBS Publishers, New Delhi

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No.	Description of Equipment	Quantity Required
1.	Intel core 2 duo or above versions of processor with 2GB RAM	30 Nos
2.	AUTOCAD software for Drafting and Modeling	30 Licenses
3.	Laser Printer	1 No

Course Code	Course Name	L	T	P	C
EE2209	**Electrical and Electronics Engineering Laboratory**	0	0	4	2

Category: Foundation Course (Engineering Science)

a. Preamble

This course introduces the concepts of various electrical and electronic components. It includes the different types of DC and AC starters, design of simple digital circuits and standard tests on basic electrical machines used in domestic and industrial applications.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Analyze the characteristics of semiconductor devices.	K3
CO2	Demonstrate the working of simple digital logic circuits.	K3
CO3	Analyze the various characteristics of AC and DC Machines.	K3
CO4	Evaluate the performance of single phase Transformer.	K3
CO5	Illustrate the necessity of AC and DC starters.	K3

c. Course Syllabus   **Total: 60 Periods**

1. Verification of Ohm's Law & Kirchhoff's Laws.
2. Characteristics of PN Junction Diode.
3. Study of Logic gates.
4. O.C.C & Load characteristics of DC self-excited Shunt generator
5. Load test on DC Series motor
6. Speed control of DC Shunt motor (Armature, Field control)
7. O.C & S.C test on a single phase transformer
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Study of DC & AC Starters

d. Activities

Students shall be exposed to the hands on experience on different machine parts, starters and the drive in the college premises.

e. Learning Resources

   i. REFERENCE BOOK

1. Nagrath .I.J. & Kothari .D.P, "*Electrical Machines*", Tata McGraw-Hill, 2006
2. Sudhakar A and Shyam Mohan SP, "*Circuits and Network Analysis and*

Synthesis", McGraw Hill, 2015.

3. Bell, D.A., 2009. *Fundamentals of electronic devices and circuits*. Oxford University Press, Inc.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No.	Description of Equipment	Quantity Required
4.	Semiconductor device (PN Junction Diode)	5
5.	Resistors, Capacitors and inductors	15 each
6.	Necessary digital ICs and Trainer Kit	1
7.	Regulated 3 output Power Supply 5, ± 15V	5
8.	Bread boards	5
9.	DC self-excited Shunt generator coupled with DC shunt motor	1
10.	DC Shunt Motor	1
11.	DC Series Motor with Loading Arrangement	1
12.	Single Phase Transformer	1
13.	Three Phase Squirrel cage Induction Motor	1
14.	Three Phase Slip ring Induction Motor	1
15.	Three Phase Resistive Loading Bank	1

Course Code	Course Name	L	T	P	C
EM2202	**Interpersonal Skills – Listening and Speaking**	0	0	2	1

Category: Employability and Enhancement courses

a. Preamble

The Course will enable learners to:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- Improve general and academic listening skills
- Make effective presentations

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Develop their communicative competence in English with specific reference to listening	K3
CO2	Prepare conversation with reasonable accuracy	K3
CO3	Apply lexical Chunking for accuracy in speaking	K3
CO4	Demonstrate their ability to communicate effectively in GDs	K3
CO5	Explain directions and instructions in academic and business contexts	K3

c. Course Syllabus   **Total: 30 Periods**

LISTENING AS A KEY SKILL 6

Listening as a key skill- its importance- speaking – give personal information – ask for personal information – express ability – enquire about ability – ask for clarification - Improving pronunciation– pronunciation basics — stressing syllables and speaking clearly – intonation patterns – conversation starters: small talk.

LISTEN TO A PROCESS INFORMATION 6

Listen to a process information- give information, as part of a simple explanation — taking lecture notes – preparing to listen to a lecture – articulate acomplete idea as opposed to producing fragmented utterances - compare andcontrast information and ideas from multiple sources- converse with reasonable accuracy overa wide range of everyday topics.

LEXICAL CHUNKING 6

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minuteinformal talk – greet – respond to greetings – describe health and symptoms – invite and offer –accept – decline – take leave – listen for and follow the gist- listen for detail.

GROUP DISCUSSION 6

Being an active listener: giving verbal and non-verbal feedback – participating in a group discussion – summarizing academic readings and lectures conversational speech listening to and participating in conversations – persuade- negotiate disagreement in group work.

GROUP & PAIR PRESENTATIONS 6

Formal and informal talk – listen to follow and respond to explanations, directions and instructions in academic and business contexts – strategies for presentations and interactive communication – group/pair presentations

d. Activities

Students shall be taken to the Language lab for enhancing their listening and speaking skills.

e. **Learning Resources**

   i. TEXT BOOKS

   1. Brooks,Margret, *Skills for Success. Listening and Speaking. Level 4*, Oxford University Press,Oxford, 2011

   2. Richards, C, Jack and David Bholke, *Speak Now Level 3*,Oxford University Press, Oxford, 2010

   ii. REFERENCE BOOK

   1. Bhatnagar, Nitin and MamtaBhatnagar, *Communicative English for Engineers and Professionals,* Pearson, New Delhi, 2010

   2. Hughes, Glyn and Josephine Moate, *Practical English Classroom*, Oxford University Press, Oxford,2014

   3. Vargo, Mari, *Speak Now Level 4*, Oxford University Press, Oxford,2013.

   4. Richards, C, Jack,*Person to Person (Starter)*, Oxford University Press, Oxford, 2006.

   5. Ladousse, Gillian Porter, *Role Play*. Oxford University Press, Oxford,2014

   iii. **WEB RESOURCES:**

   - https://www.cambridge.org/elt/blog/wp-content/uploads/2019/10/Learning-Language-in-Chunks.pdf

   - https://english.eagetutor.com/english/628-how-to-greet-your-boss-people-in-office.html

   - https://www.groupdiscussionideas.com/group-discussion-topics-with-answers/

   - https://www.bbc.co.uk/worldservice/learningenglish/business/talkingbusiness/unit3presentations/1opening.shtml

Course Code	Course Name	L	T	P	C
MA2255	**Probability, Statistics and Numerical Methods**	3	1	0	4

Category: Foundation Courses (Basic Science Courses)

a. Preamble

This course introduces the basic concepts and techniques of Random variables, Probability distributions, Testing of Hypothesis, Design of Experiments and Numerical Methods and highlights their applications in various fields such as Engineering and Technology.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concepts of probability distributions to solve engineering problems.	K3
CO2	Apply the concept of testing of hypothesis for small and large samples in real life problems.	K3
CO3	Apply the basic concepts of classifications of design of experiments in Engineering.	K3
CO4	Compute intermediate values of unknown function using interpolation.	K3
CO5	Apply the numerical techniques of integration for engineering problems.	K3

c. Course Syllabus   **Total: 60 Periods**

PROBABILITY AND RANDOM VARIABLES   12

Probability – Conditional Probability – Baye's Theorem – Random variables – Mathematical Expectations – Moments – Moment generating functions – Distributions:

Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

TESTING OF HYPOTHESIS   12

Sampling distributions – Statistical Hypothesis – Type I and Type II errors – Tests for single mean and difference of means of large samples (Z – test) and small samples (t – test) – F – test for variance – Chi-square test for goodness of fit – Independence of attributes.

DESIGN OF EXPERIMENTS   12

Basic Principles of Experimental Design – Completely randomized design – Randomized block design – Latin square design – 22 factorial design

INTERPOLATION AND APPROXIMATION   12

Difference operators and relations – Interpolation with equal intervals: Newton's forward and backward difference formulae – Cubic Splines – Interpolation with unequal intervals: Lagrange's interpolation – Newton's divided difference interpolation.

NUMERICAL INTEGRATION AND INITIAL VALUE PROBLEMS   12

Numerical Integration: Trapezoidal – Simpson's 1/3rd rule and 3/8th rule (double integration excluded) – Two point and three point Gaussian quadrature formulae – Single step methods: Euler's method – Modified Euler's method – Fourth order Runge – Kutta method for solving first order equations.

d. Activities

Students shall be exposed to Microsoft Excel for Design of Experiments and MATLAB programming to solve ordinary differential equations with initial condition.

e. Learning Resources
   i. TEXT BOOKS
      1. Grewal, B.S, "*Numerical Methods in Engineering and Science*", Eighth Edition Reprint, Khanna Publishers, New Delhi, India, 2018.
      2. Johnson, R.A, Miller, I., & Freund, J.E, "Miller & Freund's "*Probability and Statistics for Engineers*", Eighth Edition, Pearson Education, Asia,2015.

ii. REFERENCE BOOK

1. Gerald, C.F, Wheatley, P.O, "*Applied Numerical Analysis*", Seventh Edition, Pearson Education, Asia, New Delhi, 2007.

2. Walpole, R.E, Myers, R.H, Myers, S.L, & Ye, K, "*Probability and Statistics for Engineers and Scientists*", Ninth Edition, Pearson Education, Asia, 2012.

3. Kandasamy, P, Thilagavathy, K, & Gunavathy, K, "*Numerical Methods*", Third Edition Reprint, S. Chand & Co. Ltd., New Delhi, 2014.

4. Gupta, S.C, & Kapoor, V.K, "*Fundamentals of Mathematical Statistics*", Twelth Edition Reprint, Sultan Chand & Sons, 2020.

5. Veerarajan, T, "*Probability, Statistics and Random Processes*", Fourth Edition, Tata McGraw Hill Education, New Delhi, 2014.

Course Code	Course Name	L	T	P	C
ME2251	**Engineering Materials and Metallurgy**	3	0	0	3

Category: Professional Core courses

a. Preamble

To impart knowledge on the structure, properties, treatments, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Explain the microstructure of steel and its classifications	K2
CO2	Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.	K2
CO3	Describe the effect of alloying elements on ferrous and non-ferrous metals	K2
CO4	Summarize the properties and applications of non-metallic materials.	K2
CO5	Explain the testing of mechanical properties	K2

c. Course Syllabus   **Total: 45 Periods**

ALLOYS AND PHASE DIAGRAMS   9

Constitution of alloys – Solid solutions, substitution and interstitial – Phase diagrams – Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron –carbon equilibrium diagram. Classification of steel and cast iron microstructure, properties and applications.

HEAT TREATMENT   9

Definition – Full annealing, stress relief, recrystallization and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – Cooling curves superimposed on I.T diagram CCR – Hardenability, Jominy end quench test – Austempering, martempering – case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening.

FERROUS AND NON-FERROUS METALS   9

Effect of alloying addition on steel – α and β stabilisers – stainless and tool steels – HSLA, Maraging steels – Cast iron –Grey, white, malleable, spheroidal –Alloy cast irons, Copper and copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-

Cu –Precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

NON-METALLIC MATERIALS   9

Polymers –types of polymer, commodity and engineering polymers –Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI,PPO,PPS,PEEK,PTFE, Polymers- Urea and Phenol formaldehydes) –Engineering Ceramics – Properties and applications of Al2O3, Sic, Si3N4, PSZ and SIALON –Composites – Classifications- Metal Matrix and FRP – Application of Composites.

MECHANICAL PROPERTIES AND DEFORMATION MECHANICS   9

Mechanisms of plastic deformation, slip and twinning –Types of fracture –Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test izod and charpy, fatigue and creep failure mechanisms

d. Activities

Students shall be exposure to understand the basics concepts of various materials and mechanical properties.

e. Learning Resources

  i. TEXT BOOKS

1. Avner, S.H., "*Introduction to Physical Metallurgy*", Mc Graw Hill Book Company. 1997
2. Williams D Callister, "*Material Science and Engineering*" Wiley India Pvt Ltd, Revised Indian Edition, 2014

  ii. REFERENCE BOOK

1. Kenneth G.Budinski and Michael K. Budinski , 2010, " *Engineering Materials*" , Printice Hall of India Private Limited, 2010.
2. Raghavan.V, *" Materials Science and Engineering*", Prentice Hall of India Pvt.Ltd. 2015,

3. U.C.Jindal : *Material Science and Metallurgy*,. First Edition, Dorling Kindersley, 2012.

4. Upadhyay .G.S and Anish Upadhya, " *Materials Science and Engineering*" Viva Books Pvt. Ltd., New Delhi, 2006

Course Code	Course Name	L	T	P	C
ME2252	**Kinematics of Machinery**	3	0	0	3

Category: Professional core courses

a. Preamble

This course promotes the students to understand basic concepts of relative motion and their effects in various machine elements.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Explain various components of mechanisms and its inversions used in machineries.	K3
CO2	Illustrate the kinematic linkages with respect to displacement, velocity, and acceleration at any point	K3
CO3	Draw the cam profile for specified follower motions	K2
CO4	Demonstrate the basic concepts of toothed gearing and the kinematics of gear trains	K3
CO5	Compute the frictional forces in various power transmission systems such as Clutches and Brakes	K2

c. Course Syllabus **Total: 45 Periods**

BASICS OF MECHANISMS 9

Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, Mobility – Kutzbach criterion, Gruebler's criterion – Grashof's Law – Kinematic inversions of four bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission Angle – Description of some common mechanisms – Quick return mechanisms, Straight line generators, Universal Joint – rocker mechanisms.

KINEMATICS OF LINKAGE MECHANISMS 9

Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method– Velocity and acceleration polygons – Velocity analysis using instantaneous centres – kinematic analysis of simple mechanisms – Coincident points – Coriolis component of Acceleration – Introduction to linkage synthesis problem.

KINEMATICS OF CAM MECHANISMS 9

Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and Cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams – Pressure angle and undercutting – sizing of cams.

GEARS AND GEAR TRAINS 9

Law of toothed gearing – Involutes and Cycloidal tooth profiles – Spur Gear terminology and definitions –Gear tooth action – contact ratio – Interference and undercutting. Helical, Bevel, Worm, Rack and Pinion gears [Basics only]. Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains.

FRICTION IN MACHINE ELEMENTS 9

Surface contacts – Sliding and Rolling friction – Friction in Plate clutches – Axial clutches – Cone Clutches-Internal expanding rim clutches – Electromagnetic clutches.

Friction in Band and Block brakes – External shoe brakes – Internal expanding shoe brake.

d. Activities

Students shall be given exposure to understand the basic Woking of various mechanism by developing the models of the same.

e. Learning Resources

  i. TEXT BOOKS

   1. Rattan, S.S, *Theory of Machines*, 4th Edition, Tata McGraw-Hill, 2014.
   2. F.B.Sayyad, *Kinematics of Machinery*. MacMillan Publishers Pvt Ltd., Tech-max educational resources, 2011.
   3. Uicker J.J., Pennock G.R and Shigley, J.E., *Theory of Machines and Mechanisms*,4th Edition, Oxford University Press, 2014

  ii. REFERENCE BOOK

   1. Khurmi, R.S., *Theory of Machines* ,14th Edition, S Chand Publications, 2005.
   2. Allen S.Hall Jr., *Kinematics and Linkage Design*, Prentice Hall, 1961.
   3. Thomas Bevan, *Theory of Machines*, 3rd Edition, CBS Publishers and Distributors, 2005
   4. Robert L. Norton, *Kinematics and Dynamics of Machinery*, Tata McGraw-Hill, 2009

Course Code	Course Name	L	T	P	C
ME2253	**Manufacturing Technology – II**	3	0	0	3

Category: Professional Core Courses

a. Preamble

This course introduces the mechanics of metal cutting, chip formation, cutting forces developed during metal cutting. It comprehensively details the machine tools for cylindrical and prismatic jobs, gears, surface finish improvements and CNC machines.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	To calculate the tool wear and tool life by applying the fundamentals concepts of theory of metal cutting, chip formation mechanism, various cutting tool materials and cutting fluids-	K2
CO2	Demonstrate the metal removal processes using conventional lathe and drilling machines.	K2
CO3	Comprehend the various types milling, and gear cutting machine.	K2
CO4	Illustrate the different types of grinding & broaching machines and their operations.	K2
CO5	Demonstrate the elements of NC machine tools, and write manual part program.	K2

c. Course Syllabus   **Total: 45 Periods**

THEORY OF METAL CUTTING   9

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

TURNING MACHINES AND DRILLING MACHINES   9

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout. Drilling machine types, construction of radial

drilling machine. Drilling, reaming, boring, tapping operations. Estimation of drilling time.

MILLING AND GEAR CUTTING MACHINES 9

Milling machine types, construction of column and knee type machines, operations-types of milling cutter. Estimation of machining time in milling. Gear cutting – forming and generation principle and construction of gear hobbing and gear shaping processes – finishing of gears.

ABRASIVE PROCESS AND BROACHING 9

Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines.

CNC MACHINING 9

Numerical Control (NC) of machine tools – CNC types, constructional details, special features, of machining center. Manual part programs for simple milling and turning features involving only external operations – micromachining – wafer machining.

d. Activities

Students will be taught to understand the chip formation mechanism, forces in orthogonal cutting, and how to calculate machining time. Students will also be given exposure to tool layout for turret, CNC machining part program..

e. Learning Resources

 i. TEXT BOOKS

   1. Hajra Choudhury, "*Elements of Workshop Technology*", Vol.II., Media Promoters   2014
   2. Rao. P.N "*Manufacturing Technology - Metal Cutting and Machine Tools*", 4th Edition, Tata McGraw-Hill, New Delhi, 2019

 ii. REFERENCE BOOKS

1. Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White "*Machine Tool Practices*", Prentice Hall of India, 1998

2. Geofrey Boothroyd, "*Fundamentals of Metal Machining and Machine Tools*", Mc Graw Hill, 1984

3. HMT, "*Production Technology*", Tata McGraw Hill, 1998.

4. Roy. A.Lindberg, "*Process and Materials of Manufacture,*" Fourth Edition, PHI/Pearson Education 2006.

5. Kalpakjian. S, "*Manufacturing Engineering and Technology*", Pearson Education 7th edition, 2018

Course Code	Course Name	L	T	P	C
ME2254	**Strength of Materials for Mechanical Engineers**	3	0	0	3

Category: Foundation Courses (Engineering Science courses)

a. Preamble

This course promotes the students to understand the basic concepts of stress, strain, principal planes& stresses and also helps to determine stresses and deformation in circular shafts and helical spring due to torsion.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Determine the stress and strain for uniform and uniformly varying cross-sectional bar subjected to axial loading condition.	K3
CO2	Calculate the torsional stress developed in circular shafts and springs	K3

CO3	Determine the stresses induced in thin, thick and spherical shells.	K3
CO4	Draw the shear force, bending moment and induced stresses for the cantilever, simply supported and over hanging beam under the transverse load.	K3
CO5	Determine the deformation behavior of the cantilever, simply supported and over hanging beam under the transverse load and understand the concept of Euler Column theory.	K3

c. Course Syllabus   **Total: 45 Periods**

STRESS, STRAIN & DEFORMATION OF SOLIDS AND PRINCIPLE

STRESS AND PLANES   10

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – impact and shock loading – Thermal stresses – Elastic constants – Volumetric strains – Stresses on inclined planes – principal stresses and principal planes - Mohr's circle of stress.

TORSION   9

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

THIN, THICK CYLINDER & SPHERES   8

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theorem.

TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM   9

Beams & its types – transverse loading on beams – Shear force and bending moment in

beams - Cantilevers – Simply supported beams and over hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity.

DEFLECTON OF BEAM AND EULER COLUMN THEORY   9

Double Integration method – Macaulay's method – Area moment method for computation of slopes and deflections in beams – Fundamentals of conjugate beam and strain energy - Maxwell's reciprocal theorem – Columns with different end conditions – Slenderness ratio – Euler's and Rankine's column theory.

d. Activities

Students shall be given exposure to understand the Stress, strain, elastic, plastic deformation and how to calculate the strength of the material under axial, shear, bending and torsional loading

e. Learning Resources

  i. TEXT BOOKS

   1. Bansal, R.K., *Strength of Materials*, Laxmi Publications (P) Ltd, 2016

 ii. REFERENCE BOOK

   1. Jindal U.C., *Strength of Materials*, Asian Books Pvt. Ltd., New Delhi, 2009.

   2. Egor. P. Popov, *Engineering Mechanics of Solids*, Prentice Hall of India, New Delhi., 2002

   3. Ferdinand P. Been, Russell Johnson, J.r.and John J. Dewole, *Mechanics of Materials*, Tata McGraw Hill Publishing 'co. Ltd., New Delhi., 2005

   4. Hibbeler, R.C., *Mechanics of Materials*, Pearson Education, Low Price Edition., 2013

   5. Subramanian R., *Strength of Materials,* Oxford University Press, Oxford Higher Education, 2016

Course Code	Course Name	L	T	P	C
ME2255	**Thermal Engineering**	3	0	0	3

Category: Professional Core Courses

a. Preamble

This course promotes the students to understand basic concepts of thermodynamics and its applications.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Apply the concepts, laws and methodologies of thermodynamics in gas power cycles.	K3
CO2	Understand the various terminologies of IC engines and their performance.	K3
CO3	Apply the thermodynamic concepts in steam turbines.	K3
CO4	Apply the fundamental principles of thermodynamics in air compressors.	K3
CO5	Apply the working principles of refrigerating and air-conditioning systems in calculating performance parameters	K3

c. Course Syllabus **Total: 45 Periods**

GAS POWER CYCLES 9

Otto, Diesel, Dual and Brayton cycle - Performance calculation, Improvisations of gas turbines – Intercooling, Reheating and Regeneration (Description only).

IC ENGINE AND ITS PERFORMANCE 9

Classification - Components and their function. Valve timing diagram and port timing diagram – actual and theoretical p-V diagram of four stroke and two stroke engines. Simple and complete Carburettor. MPFI, Diesel pump and injector system. Battery and

Magneto Ignition System - Principles of Combustion and knocking in SI and CI Engines. Lubrication and Cooling systems. Performance calculations.

STEAM TURBINES 9

Impulse and Reaction principles, compounding, velocity diagrams for simple stage turbines and multi stage turbines, speed regulations – Governors.

AIR COMPRESSOR 9

Classification and working principle of various types of compressors, work of compression with and without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency of reciprocating compressors, Multistage air compressor and inter cooling –work of multistage air compressor.

REFRIGERATION AND AIR CONDITIONING 9

Refrigerants - Vapour compression refrigeration system – Principles and Performance calculations- working principle of vapour absorption system, Ammonia – Water, Lithium bromide – water systems (Description only). Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – Simple Applications. Air conditioning system - Types and Working Principles. Recent developments in HVAC systems

d. Activities

Students shall be given exposure to understand the basic concepts of thermodynamics and its applications.

e. Learning Resources

i. TEXT BOOKS

1. R.K.Rajput, "*Thermal Engineering*", Laxmi Publications, 2017
2. Yunus A. Cengel and Michael A. Boles., "Thermodynamics", Tata McGraw Hill, 2018

ii. REFERENCE BOOK

1. Nag.P.K, "*Engineering Thermodynamics*", Tata McGraw Hill, 2018.

2. Claus Borgnakke and Richard E. Sonntag, "*Fundamentals of Thermodynamics*", Wiley Eastern, 2016.

3. A.Valan Arasu., "*Thermal Engineering*", Vijay Nicole Imprints, 2016.

Course Code	Course Name	L	T	P	C
ME2556	**IC engines and Steam Laboratory**	**0**	**0**	**4**	**2**

Category: Foundation Course (Engineering Science)

a. Preamble

This course introduces the concepts of IC engines, boiler and steam turbine components. It includes the performance of IC engines, boiler, steam turbine and characteristics of fuels and lubricants used in automobiles and power generation.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Conduct tests to draw valve and port timing diagram of a model IC engine.	K3
CO2	Conduct tests to find out the performance of IC engines.	K3
CO3	Draw heat balance sheet of IC engines.	K3
CO4	Evaluate flash and fire point of given fuels/lubricants	K3
CO5	Conduct tests to find out the performance of steam generator and steam turbine	K3

c. Course Syllabus   **Total: 45 Periods**

I.C. ENGINE LAB

1. Valve Timing and Port Timing diagrams.
2. Actual p-v diagrams of IC engines.
3. Performance Test on 4 – stroke Diesel Engine.
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. Determination of Flash Point and Fire Point of various fuels / lubricants.

STEAM LAB

8. Study on Steam Generators and Turbines.
9. Performance and Energy Balance Test on a Steam Generator.
10. Performance and Energy Balance Test on Steam Turbine.

d. Activities

Students shall be exposed to the hands on experience on estimating the performance of IC engines, steam boiler and steam turbine.

e. Learning Resources

REFERENCE BOOK

1. Nagrath .I.J. & Kothari .D.P, "*Electrical Machines*", Tata McGraw-Hill, 2006
2. Sudhakar A and Shyam Mohan SP, "*Circuits and Network Analysis and Synthesis*", McGraw Hill, 2015.
3. Bell, D.A., 2009. *Fundamentals of electronic devices and circuits*. Oxford University Press, Inc.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No.	Description of Equipment	Quantity Required
1.	I.C Engine – 2 stroke and 4 stroke model	1 set

S. No.	Description of Equipment	Quantity Required
2.	Apparatus for Flash and Fire Point	1 No.
3.	4-stroke Diesel Engine with mechanical loading.	1 No
4.	4-stroke Diesel Engine with hydraulic loading.	1 No.
5.	4-stroke Diesel Engine with electrical loading.	1 No.
6.	Multi-cylinder Petrol Engine	1 No.
7.	Single cylinder Petrol Engine	1 No.
8.	Data Acquisition system with any one of the above engines	1 No.

Course Code	Course Name	L	T	P	C
ME2257	**Manufacturing Technology Laboratory**	**0**	**0**	**4**	**2**

Category: Program Core

a. Preamble

Students will be given hands on training/practice on sand molding, fusion and non-fusion welding, sheet metal work using hand tools, various metal cutting machine tools and CNC program and simulation. Determination of shear angle during orthogonal cutting is practiced. Students will be exposed to processing of plastic components.

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Demonstrate the use of molding tools, welding processes and sheet metal fabrication tools.	K3
CO2	Practice making simple components comprising steps, taper, eccentric turning, knurling and thread cutting using lathe.	K3
CO3	Utilize shaping machine, milling and other machines to convert round work into other forms like hexagon and cut slot and gears.	K3
CO4	Apply various machine tools to grind specimen and tools.	K3
CO5	Construct manual part program for machining in CNC.	K3

c. Course Syllabus   **Total: 60 Periods**

1. Preparation of green sand mold
2. Joining of plates using arc welding and sheets using resistance welding
3. Upsetting a square head by smith forging.
4. Making simple sheet metal components involving shearing and bending operation.
5. Turing a component involving features; taper turning, knurling, grooving and thread cutting.
6. Eccentric turning
7. Cutting internal threads
8. Shaping a hexagon and slotting internal keyway
9. Cutting a helical gear using horizontal milling machine.
10. Cutting a slot and measuring cutting force during end milling.
11. Surface grind square rod
12. Cylindrical grinding
13. Single point tool grinding

14. Hobbing a spur gear

15. Shear angle measurement

16. Manual part program to turn a component

17. Manual part program to mill a component

18. Exercise on Capstan lathe

19. Demonstration of plastic processing machines (Injection, blow, extrusion, and compression molding)

d. Activities

Students will be simple exercises like making sand mold using solid/split pattern, butt, lap welding, making sheet metal tray, turning, knurling, taper turning, threading, converting disc into hexagon, slot/keyway, grinding a square and cylindrical rod, grinding a single point tool and manual part program using FANUC controller.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Sl. No.	NAME OF THE EQUIPMENT	Qty.
1	Centre Lathes	7 Nos.
2	Shaper and slotting machine	1 No each
3	Sheet metal forming tools and equipment	2 Nos.
4	Arc welding transformer and resistance welding unit with cables and holders	1 No each
5	Molding table, Molding equipment	2 Nos.
6	Sheet metal forming tools and equipment	2 Nos.
7	Turret and Capstan Lathes	1 No each
8	Horizontal Milling Machine	2 No
9	Vertical Milling Machine	1 No
10	Surface Grinding Machine	1 No.
11	Cylindrical Grinding Machine	1 No.

12	Milling Tool Dynamometer	1 No
13	Gear Hobbing Machine	1 No
14	CNC Lathe	1 No
15	CNC Milling machine	1 No
16	Tool and cutter grinder	1 No

Course Code	Course Name	L	T	P	C
ME2258	**Strength of Materials and Fluid Mechanics Laboratory**	0	0	3	1

Category: Foundation Course (Engineering Science)

a. Preamble

This course introduces the concepts of various structural testing equipment and performance of various pumps and turbines

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Estimate the mechanical properties of materials when subjected to axial load, transverse load & shear loading.	K3
CO2	Evaluate the properties of material by using various heat treatment processes.	K3
CO3	Calculate the Coefficient of discharge and friction for the given various test rigs.	K2
CO4	Experiment and draw the characteristic curves of various pumps.	K3

CO5	Experiment and draw the characteristic curves of various turbines.	K3

c. Course Syllabus   **Total: 45 Periods**

1. Tension test on a mild steel rod

2. Double shear test on Mild steel rods

3. Torsion test on mild steel rod

4. Impact test on metal specimen

5. Hardness test on metals - Brinnell and Rockwell Hardness Number

6. Deflection test on beams

7. Compression test on helical springs

8. Strain Measurement using strain gauge

9. Effect of hardening- Improvement in hardness and impact resistance of steels.

10. Tempering- Improvement Mechanical properties Comparison (i) Unhardened specimen (ii) Quenched Specimen and (iii) Quenched and tempered specimen.

11. Determination of the Coefficient of discharge of given Orifice meter.

12. Determination of the Coefficient of discharge of given Venturi meter.

13. Calculation of the rate of flow using Rota meter.

14. Determination of friction factor for a given set of pipes.

15. Conducting experiments and drawing the characteristic curves of centrifugal pump

16. Conducting experiments and drawing the characteristic curves of reciprocating pump.

17. Conducting experiments and drawing the characteristic curves of Gear pump.

18. Conducting experiments and drawing the characteristic curves of Pelton wheel.

19. Conducting experiments and drawing the characteristics curves of Francis turbine.

20. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

d. Activities

Students shall be exposed to the hands on experience on different Structural testing rig pump and turbines in the college premises.

e. Learning Resources

  i. REFERENCE BOOK

1. Rajput. R.K, "*A Textbook of Strength of Materials*", Chand.S, 2018
2. Majumdar Bireswar, "*Fluid Mechanics With Laboratory Manual*", PHI Learning Pvt Ltd., 2015.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No.	Description of Equipment	Quantity Required
1.	Universal Tensile Testing machine with double shear attachment –40 Ton capacity	1
2.	Torsion Testing Machine (60 Nm capacity)	1
3.	Impact Testing Machine (300 J capacity)	1
4.	Brinell Hardness Testing Machine	1
5.	Rockwell Hardness Testing Machine	1
6.	Spring Testing Machine for tensile and compressive loads (2500 N)	1

S. No.	Description of Equipment	Quantity Required
7.	Muffle Furnace	1
8.	Strain Gauge	1
9.	Orifice meter setup	1
10.	Venturimeter setup	1
11.	Rota meter setup	1
12.	Pipe Flow analysis setup	1
13.	Centrifugal pump	1
14.	Reciprocating pump setup	1
15.	Gear pump setup	1
16.	Pelton wheel setup	1
17.	Francis turbine setup	1
18.	Kaplan turbine setup	1

Course Code	Course Name	L	T	P	C
EM2252	**An Introduction to Advanced Reading and Writing**	0	0	2	1

Category: Employability and Enhancement courses

a. Preamble

The course will enable learners to

- To strengthen the reading skills of students of engineering.

- To enhance their writing skills with specific reference to technical writing
- To develop their critical thinking skills.
- To provide more opportunities to develop their project and proposal writing skills

b. Course Outcome

After successful completion of the course, the students will be able to

CO. No.	Course Outcome	Knowledge Level
CO1	Understand how the text positions the reader	K3
CO2	Develop critical thinking while reading a text	K3
CO3	Develop a descriptive paragraph	K3
CO4	Make use of sentence structures effectively when creating an essay.	K3
CO5	Demonstrate proper usage of grammar in writing E-Mails, Job application and project proposals	K3

c. Course Syllabus   **Total: 30 Periods**

EFFECTIVE READING   6

Reading – Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title. Reading-Read for details-Use of graphic organizers to review and aid comprehension.

CRITICAL READING   6

Reading– Understanding pronoun reference and use of connectors in a passage- speed reading techniques. Reading– Genre and Organization of Ideas- Reading– Critical reading and thinking- understanding how the text positions the reader.

PARAGRAPH WRITING   6

Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences,

concluding sentence.-Write a descriptive paragraph Writing-State reasons and examples to support ideas in writing– Write a paragraph with reasons and examples- Write an opinion paragraph.

ESSAY WRITING   6

Writing– Elements of a good essay - Types of essays- descriptive-narrative- issue-based-

argumentative-analytical..

EFFECTIVE WRITING   6

Writing– Email writing- visumes – Job application- Report Writing - Project writing- Writing   convincing proposals

d. Activities

Students shall be exposed to various passages for reading and trained to write in different forms.

e. Learning Resources

   i. TEXT BOOKS

   1. Gramer, F, Margot & Colin, S, Ward, Reading and Writing (Level 3) Oxford University Press, Oxford, 2011.
   2. Debra Daise, CharlNorloff, and Paul Carne, Reading and Writing (Level 4) Oxford University Press: Oxford, 2011

   ii. REFERENCE BOOK

   1. Davis, Jason & Rhonda LIss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
   2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills, Second Edition, Orient Black swan: Hyderabad, 2012.
   3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills, Cambridge University Press: Cambridge, 2004.
   4. Goatly, Andrew, Critical Reading and Writing, Routledge: United States of America, 2000

5. Petelin, Roslyn & Marsh Durham, The Professional Writing Guide: Knowing Well and Knowing Why, Business & Professional Publishing: Australia, 2004