B. Tech - MECHANICAL ENGINEERING

III B.Tech I SEMESTER

Sl.No	Course Code	CourseTitle	Category	L	T	P	Credit
1	19ME3111	Design of Machine Members-I	PC	3	-	-	3
2	19ME3112	Thermal Engineering-I	PC	3	-	-	3
3	19ME3113	Metrology & Machine Tools	PC	3	-	-	3
4	**Open Elective–I**		OE	3	-	-	3
5	**Professional Elective-I**		PE	3	-	-	3
	19ME3171	Composite Materials					
	19ME3172	Automobile Engineering					
	19ME3173	Industrial Engineering & Management					
	19ME3174	Advanced Mechanics of Solids					
6	19MC0005	Professional Ethics	MC	2	-	-	-
7	19ME3151	Thermal Engineering Lab	PC	-	-	3	1.5
8	19ME3152	Machine Tools Lab	PC	-	-	3	1.5
9	19HS3151	Advanced English Communication Skills Lab	HS	-	-	2	1
10	19ME3181	Summer Internship*	PW	-	-	2	1
Total				17	0	10	20

***Note:**Summer Internship to be carried out during summerbreak after II-year II semester.

III B.Tech - II SEMESTER

Sl.No	Course Code	CourseTitle	Category	L	T	P	Credit
1	19EE3218	Basic Electrical Engineering	PC	3	-	-	3
2	19ME3211	Design of Machine Members-II	PC	3	-	-	3
3	19ME3212	Thermal Engineering–II	PC	3	-	-	3
4	19ME3213	Heat Transfer	PC	3	-	-	3
5	**Open Elective–II**		OE	3	-	-	3
6	**Professional Elective– II**		PE	3	-	-	3
	19ME3271	Alternative Fuels for IC Engines					
	19ME3272	Unconventional Machining Processes					
	19ME3273	Finite Element Methods					
	19ME3274	Lean Manufacturing					
7	19ME3251	Heat Transfer Lab	PC	-	-	3	1.5
8	19EE3258	Basic Electrical Engineering Lab	PC	-	-	3	1.5
9	19ME3291	Technical Paper Presentation	PW	-	-	2	1
Total				21	0	8	22

(19ME3111) DESIGN OF MACHINE MEMBERS-I

B. Tech. III Year I Semester

L	T	P	C
3	0	0	3

NOTE: Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria**.**

Pre-requisites: Engineering mechanics, Mechanics of Solids, Manufacturing Processes, Metallurgy and Material science.

Course Objectives:

1. To understand the general design procedures and principles in the design of machine elements.
2. To study the construction of different materials and their properties and factors determining the selection of material for various applications.
3. To determine stresses under different loading conditions.
4. To learn the design procedure of different fasteners, joints, shafts and couplings.

Course Outcomes: At the end of the course student will be able to

1. Demonstrate understanding of various design considerations and understand the concepts of principal stresses, theories of failure, stress concentration and fatigue loading.
2. Design on the basis of strength and rigidity and analyze the stresses and strains induced in a machine element.
3. Design and analyze the temporary joints (bolted joints) and permanent joints (riveted and welded joints) under various load conditions.
4. Design keys, flywheel design, and analysis of stresses.
5. Design solid and hollow shafts, analyze under various load conditions and their selection.

UNIT I:

Introduction: General Considerations in the Design of Engineering Materials and their Properties – Selection –Manufacturing Consideration in Design- BIS Codes of Steels.

Design for Static Strength: Simple Stresses – Combined Stresses – Torsional and Bending Stresses – Impact Stresses –Various Theories of Failure – Factor of Safety – Design for Strength and Rigidity – Preferred Numbers.

UNIT II:

Design for Fatigue Strength: Stress Concentration–Theoretical Stress Concentration Factor– Fatigue Stress Concentration Factor- Notch Sensitivity – Design for Fluctuating Stresses – Endurance Limit – Estimation of Endurance Strength – Gerber‟s Curve– Modified Goodman‟s Line– Soderberg‟s Line.

UNIT III:

Welded Joints: Design of Fillet Welds-Axial Loads-Circular Fillet Welds under Bending, Torsion. Welded Joints under Eccentric Loading.

Riveted Joints: Methods of Failure of Riveted Joints-Strength Equations-Efficiency of Riveted Joints-Eccentrically Loaded Riveted Joints.

UNIT IV:

Keys Design: Design of Keys- Introduction. Types of Keys. Sunk Keys. Saddle Keys. Tangent Keys. Round Keys, Splines, Forces Acting on a Sunk Key, Strength of a Sunk Key. Effect of Keyways. Design and Stresses in Keys

Flywheel Design: Introduction, Coefficient of Fluctuation of Speed and Energy. Maximum Fluctuation of Energy. Coefficient of Fluctuation of Energy. Energy Stored in a Flywheel. Stresses in a Flywheel Rim, Flywheel Arms. Design of Flywheel Arms. Design of Shaft, Hub and Key. Construction of Flywheels.

UNIT V:

Shafts: Design of Solid and Hollow Shafts for Strength and Rigidity – Design of Shafts for Combined Bending and Axial Loads – Shaft Sizes – BIS Code.

Shaft Couplings: Design of Unprotected Type Flange Coupling, Protected Type Flange Coupling, Marine Flange Coupling.

TEXT BOOKS:

1. V. Bhandari “Design Machine Elements” Mc GrawHill 4th Edition 2016.
2. Pandya & Shah “Machine Design” Charotar 20th Edition 2015.

REFERENCES :

1. R.S. Khurmi, J.K. Gupta “Machine Design” S Chand Publishers 25th Edition 2018
2. UCJindal “Machine Design” Pearson.1st Edition 2010.
3. JEShigley “Mechanical Engineering Design” Mc GrawHill 11th Edition 2020.
4. T.Krishna Rao “Design of Machine Elements (Vol.1)” IK International Publishing House 3rdEdition Vol 1&2 2021.

(19ME3112) THERMAL ENGINEERING- I

B.Tech. III Year I Sem

L	T	P	C
3	0	0	3

Pre-Requisites: Thermodynamics.

Course Objectives:

1. To apply the laws of Thermodynamics to analyze air standard cycles.
2. To understand the working of major components and combustion processes of IC engines.
3. To evaluate the performance analysis of IC engines for different applications.
4. To understand the working of different types of compressors and its applications.
5. To understand the working of major components and combustion processes of gas turbines and its improvement methods.

Course Outcomes: At the end of the course student will be able to

1. Demonstrate the working and performance of IC Engines on Thermodynamic Cycle.
2. Compare the combustion phenomenon in CI Engines and SI Engines.
3. Analysis of Constant speed and Variable speed tests on IC Engine and interpret their performance.
4. Identify different types of compressor and understand their principle of operations.
5. Demonstrate the concepts gas turbines with in realistic constraints and methods of modifications.

UNIT I

Power Cycles: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition. – Fuels, Fuel properties and Combustion Stoichiometry.

UNIT II

IC Engines Combustion: Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types of SI engines. Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating.

UNIT III

Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

Engine Emission and Controls: Engine emissions and its harmful effect. Methods of measuring pollutants and control of engine emission.

UNIT IV

Compressors: Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression.

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation

– velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

UNIT V

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytrophic efficiency.

Gas Turbines: Simple Gas Turbine Plant – Ideal Cycle – Closed Cycle and Open Cycle for Gas Turbines, Constant Pressure Cycle, Constant Volume Cycle, Efficiency – Work Ratio and Optimum Pressure Ratio for Simple Gas Turbine Cycle. Parameters of Performance, Actual Cycle, Regeneration, inter cooling and Reheating – Closed and Semi-Closed Cycle.

TEXT BOOKS:

1. V. Ganesan "I.C. Engines" Mc Graw Hill, 4th Edition, 2017.
2. Mahesh M Rathore "Thermal Engineering" Mc Graw Hill, 2nd Edition, 2010.

REFERENCE:

1. Eastop "Applied Thermodynamics for Engineering Technologists" Pearson, 5th Edition, 1993.
2. Vanwylen G.J., Sonntag R.E "Fundamentals of Classical Thermodynamics" Wiley Eastern, 2nd Edition, 1994.
3. John B. Heywood "Internal Combustion Engines Fundamentals" McGraw Hill Ed.2nd Edition, 2018.
4. Thermal Engineering, R. Rudramurthy, Tata McGraw-Hill Education.

(19ME3113) METROLOGY AND MACHINE TOOLS

B.Tech. III Year I Sem

L	T	P	C
3	0	0	3

Pre-requisites: Manufacturing process – I.

Course Objectives: To learn

1. Impart the fundamental aspects of the metal cutting principles and their application in studying the behavior of various machining processes.
2. Train in knowing the fundamental parts of various machine tools and their kinematic schemes.
3. Discuss various principles of jigs and fixtures which will be used to hold and guide the work pieces and cutting tools in various machine tools.
4. Acquire the knowledge of Engineering metrology and its practice which is becoming great importance in industry.
5. Specifically make the student to improve applications aspect in the measurements and control of process of manufacture.

Course Outcome: At the end of the course, the student would be able to

1. Understand working of lathe, shaper, and planer, drilling, milling and grinding machines.
2. Comprehend speed and feed mechanisms of machine tools.
3. Estimate machining times for machining operations on machine tools.
4. Identify techniques to minimize the errors in measurement.
5. Identify methods and devices for measurement of length, angle, and gear& thread parameters, surface roughness and geometric features of parts.

UNIT – I

Metal cutting: Introduction, elements of cutting process – Geometry of single point tools. Chip formation and types of chips. Engine lathe – Principle of working, types of lathe, specifications. Taper turning,– Lathe attachments. Capstan and Turret lathe – Single spindle and multi-spindle automatic lathes – tool layouts.

UNIT – II

Drilling and Boring Machines – Principles of working, specifications, types, and operations performed; twist drill. Types of Boring machines and applications. Shaping, slotting and planing machines – Principles of working – machining time calculations.

UNIT – III

Milling machines: Principles of working – Types of milling machines – Geometry of milling cutters methods of indexing. Grinding – theory of grinding – classification of grinding machines. Types of abrasives, bonds. Selection of a grinding wheel. Lapping, honing and broaching machines, comparison and Constructional features, machining time calculations.

UNIT – IV

Limits, fits and tolerances- Types of Fits - Unilateral and bilateral tolerance system, hole and shaft basis system. Interchangeability and selective assembly. Limit Gauges: Taylor‟s principle, Design of GO and NO-GO gauges, Measurement of angles using Bevel protractor and Sine bar. Measurement of flatness using straight edges, surface plates, optical flat and auto collimator.

UNIT – V

Surface Roughness Measurement: Roughness, Waviness. CLA, RMS, Rz Values. Methods of measurement of surface finish, Talysurf. Screw thread measurement, Gear measurement; Machine Tool Alignment Tests on lathe, milling and drilling machines. Coordinate Measuring Machines: Types and Applications of CMM.

TEXT BOOKS:

1. Machine Tool Practices/ Kibbe, Johne. Neely, T. White, Rolando O. Meyer/ Pearson
2. Engineering Metrology/ R.K. Jain/ Khanna Publishers.

REFERENCES :

1. Principles of Machine Tools, Bhattacharyya A and Sen.G.C / New Central Book Agency.
2. Fundamentals of Dimensional Metrology / Connie Dotson / Thomson.
3. Fundamentals of Metal Machining and Machine Tools/Geoffrey Boothroyd /McGraw Hill.
4. Principles of Engineering Metrology/ RegaRajendra/ Jaico Publishers.
5. Metrology and Measurement/ Bewoor& Kulkarni/ Tata Mc Graw Hill.

(19ME3171) COMPOSITE MATERIALS

(PROFESSIONAL ELECTIVE – I)

B.Tech. III Year I Sem

L	T	P	C
3	0	0	3

Pre-Requisites: Metallurgy and Material Science, Strength of Materials.

Course Objectives: To learn

1. To study the importance of composites.
2. To identify the components of composites for fabrication.
3. To learn the manufacturing methods of composites.
4. To study the various mechanical joints for composite joining.
5. To predict the machining behavior of composite materials.

Course Outcomes: At the end of the course Student will be able to

1. Understand the importance of composites and their applications.
2. Understand the use of reinforcements in composite production.
3. Comprehend various composite manufacturing methods.
4. Examine the various mechanical joints for composite part assembly.
5. Apply the machining operations to composites to know the material behavior.

UNIT I

Introduction: Conventional Engineering Materials, Functions of Fibbers and Matrix, Special Features of Composites, drawbacks of Composites, Composites Processing, Composites Product Fabrication, Composites Markets, Barriers in Composite Markets.

UNIT II

Raw Materials for Part Fabrication: Reinforcements - Glass Fiber Manufacturing, Carbon Fiber Manufacturing, Aramid Fiber Manufacturing; Matrix Materials - Thermoset Resins, Thermoplastic Resins; Fabrics, Prepregs, Performs, Honeycomb and Other Core Materials.

UNIT III

Manufacturing Techniques: Manufacturing Process Selection Criteria, Product Fabrication Needs, Basic Steps in a Composites Manufacturing Process, Manufacturing Processes for Thermo set Composites - Prepreg Lay-Up Process, Wet Lay-Up Process, Spray-Up Process, Filament Winding Process, Pultrusion Process, Resin Transfer Molding Process; Manufacturing Processes for Thermoplastic Composites - Thermoplastic Pultrusion Process, Autoclave Processing.

UNIT IV

Joining of Composite Materials: Adhesive Bonding, Types of Adhesives, Advantages of Adhesive Bonding over Mechanical Joints, Adhesive Selection Guidelines, Mechanical Joints.

UNIT V

Machining and Cutting of Composites: Machining and Cutting of Composites, Challenges during Machining of Composites, Failure Mode during Machining of Composites, Cutting Tools, Types of Machining Operations, Drilling Operation.

TEXT BOOKS:

1. Isaac and M Daniel "Engineering Mechanics of Composite Materials" Oxford University Press.
2. R. M. Jones, "Mechanics of Composite Materials" McGraw-Hill Company.

REFERENCES :

1. B. D. Agarwal and L.J. Broutman, Wiley "Analysis and Performance of Fiber composites", Interscience.
2. Autar K. Kaw "Mechanics of Composite Materials" CRC Publications.
3. L. R. Calcote, Van NostrandRainfold "Analysis of Laminated Composite Structures".
4. Madhujit Mukhopadhyay "Mechanics of Composite Materials and Structures", Univ Press.

(19ME3172)AUTOMOBILE ENGINEERING

(PROFESSIONAL ELECTIVE – I)

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

Pre- requisites: Applied Thermodynamics-I.

Course Objectives: To Learn
1. Study the components of automobile.
2. Understand the importance of injection and ignition system.
3. Study the functioning of the transmission and suspension
4. Know the working of Steering and braking system.
5. Recognize the disadvantages of emissions and emission standards.

Course Outcomes: After completion of this course, the students will be able to
1. Classify various types of cooling systems, lubrication systems and discuss about various components of an automobile
2. Categorize the types of injection system, ignition system and study about electrical system of an automobile.
3. Identify the importance of transmission and suspension system in an automobile.
4. Analyze the various types of Steering and Breaking system.
5. Examine the pollutants from exhaust and identify the various alternative fuels for an automobile.

UNIT-I

Introduction: Types of Automobiles, Components of four wheeler automobile – chassis, frame and body, types of layouts- rear wheel drive-front wheel drive- 4-wheel drive, types of automobile engines, engine construction, turbo charging and super charging, engine lubrication- splash and pressure lubrication systems, oil filters, oil pumps.

Cooling System: Cooling requirements, types of cooling, Air cooling, Water cooling- components-radiator-types-cooling fans-water pump-thermostat, evaporative cooling, liquid cooling.

UNIT-II

Injection System: Types of fuel injection System-Common rail direct injection system (CRDI)-Multipoint fuel injection system (MPFS), Carburetor, Nozzle, fuel filters, fuel pumps.

Ignition System: Function an Ignition system, Types-Battery ignition system-components- battery-contact breaker points-condenser-spark plug, Magneto ignition system, Transistor based coil ignition system, capacitive discharge ignition system.

Electrical System: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism, solenoid switch, lighting systems, horn, wiper, fuel gauge, oil pressure gauge, engine temperature indicator etc.

UNIT-III

Transmission System: Clutches, principle, types-cone clutch-single plate clutch- multi plate clutch-magnetic and centrifugal clutches, fluid fly wheel, gear boxes-types-sliding mesh- construct mesh-synchro mesh gear boxes-epicyclic gear box, torque converter, propeller shaft – Hotchkiss Drive-Torque tube drive, universal joint, differential rear axles – types, wheel and tyres.

Suspension System: Objects of suspension systems – rigid axle suspension System-Independent suspension system, torsion bar, shock absorber.

UNIT-IV

Steering System: Steering geometry – camber- castor-king pin rake-combined angle toe in &toe out-center point steering, types of steering mechanism – Ackerman steering mechanism- Davis steering mechanism, steering gears – types, steering linkages.

Braking System: Mechanical brake system, hydraulic brake system, master cylinder, wheel cylinder, tandem master cylinder, and requirement of brake fluid, pneumatic and vacuum brakes, Antilock braking system, electronic brake force distribution and traction control.

UNIT-V

Engine Emission Control: Introduction – types of pollutants, mechanism of formation, concentration measurement, methods of controlling-engine modification needed- exhaust gas treatment-thermal and catalytic converters.

Alternative Fuels for Emission Controls: Natural gas, LPG, bio diesel, bio ethanol, hydrogen fuels– National and International pollution standards.

TEXT BOOKS:

1. Automobile Engineering, Volume 1, Dr .Kripal Singh, Standard Publishers, 13th Edition, 2020.
2. Automobile Engineering, Volume 2, Dr .Kripal Singh, Standard Publishers, 2020.

REFERENCES:

1. A Systems Approach to Automobile Technology, Jack Erjavec, Yessdee Publishers Pvt. Ltd, 2008.
2. Automotive Mechanics ,Heitner, CBS Publishers, Second edition, 2004.
3. Automobile Engineering , K.K Ramalingam ,Scitech Publications, 2011.
4. Automotive Engineering , Newton steeds & Garrett, Butterworth- Heinemann Ltd, 2009.

(19ME3173)INDUSTRIAL ENGINEERING &MANAGEMENT

(PROFESSIONAL ELECTIVE – I)

B.Tech. III Year I Sem

L	T	P	C
3	0	0	3

Pre-Requisites: Nil

Course Objectives: To learn

- To impart knowledge in concepts and tools of Industrial management.
- To understand applications of different types of layouts.
- To apply work-study and Method study techniques for finding standard time of jobs.
- To implement the line balancing techniques.
- To calculate the project completion time.

Course Outcomes: After completion of this course, the students will be able to

- Outline the functions and importance of Industrial Management.
- Analyze the different organization structures and developing suitable organization structures for different organizations.
- .Identify different types of production systems and Plant layouts.
- Identify suitable method and standard time for different jobs.
- Identify the critical path and project completion time for different projects.

UNIT I

Introduction to Management: Entrepreneurship and organization - Nature and Importance of Management, Functions of Management, Taylor‟s Scientific Management Theory, Fayol‟s Principles of Management, Maslow‟s Theory of Human Needs, Douglas McGregor‟s Theory X and Theory Y, Herzberg‟s Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

UNIT II

Designing Organizational Structures: Departmentation and Decentralization, Types of Organization structures - Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT III

Operations Management: Objectives- product design process- Process Selection-Types of production system (Job, batch and Mass Production),Plant location-factors- Urban- Rural sites comparison- Types of Plant Layouts-Design of product layout- Line balancing(RPW method)

Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram.

UNIT IV

Work Study: Introduction – definition – objectives – steps in work study – Method study – definition – objectives – steps of method study. Work Measurement – purpose – types of study – stop watch methods – steps – key rating – allowances – standard time calculations – work sampling.

Statistical Quality Control: variables-attributes, Shewart control charts for variables- X chart, R chart, - Attributes-Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling- Double sampling plans-OC curves.

UNIT V

Job Evaluation: methods of job evaluation – simple routing objective systems – classification method – factor comparison method – point method – benefits of job evaluation and limitations.

Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems).

TEXT BOOKS:

1. O.P. Khanna"Industrial Engineering and Management"Dhanpat Rai Publishers, 2018.
2. NVS Raju"Industrial Engineering Management" Cengage Learning,2013.

REFERENCE BOOKS:

1.T.R. Banga and S.C.Sarma "Industrial Engineering and Management Science" Khanna Publishers,2017.

2.Ralph M. Barnes"Motion and Time Study Design and Measurement of Work" Wiley, Seventh Edition, 2009

3. Paneer Selvam "Production & Operation Management" PHI Publisher, Third Edition, 2012.

4. ILO, Geneva"Introduction to Work study"Oxford & IBHPublisher, Third Edition, 2015.

(19ME3174)ADVANCED MECHANICS OF SOLIDS

(PROFESSIONAL ELECTIVE – I)

B.Tech. III Year I Sem

L	T	P	C
3	0	0	3

Pre-equisites: Engineering Mechanics, Mechanics of Solids.

Course Objectives:

1. Understand the nature of stresses developed in shafts for various types of loads according to theories of failure.
2. Know different types of principal stresses considered in design of structural members.
3. Understand how to calculate stresses and deformations in a bar due to axial loading under uniform and non-uniform conditions.
4. Understand the nature of stresses developed in columns for various types of loads.
5. Understand the nature of stresses developed in springs under different loading conditions.

Course Outcomes: At the end of the course Student will be able to:

1. Describe the concept, principle and performance calculations, relative to the strength and twist.
2. Analyze various situations involving in structural members subjected to plane and shear stresses by Mohr‟s circle method.
3. Evaluate the strain and deformation caused due to elastic stresses developed within the materials during simple loading.
4. Analyze strength and stability of structural members subjected to Direct and bending stresses.
5. Analyze the behavior of the springs (Leaf and Helical) under different loading conditions.

UNIT I

TORSION OF CIRCULAR SHAFTS: Theory of pure torsion – Derivation of Torsion equations: $T/J = \tau/r = G\theta/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion- according to Maximum normal and Shear stress theory.

UNIT II

PRINCIPAL STRESSES AND STRAINS: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr‟s circle of stresses – Principal stresses and strains – Analytical and graphical methods.

UNIT III

BENDING OFCURVED BEAMS: Introduction - Assumptions for the Stresses during Bending of Curved Bars. Types of Curved Bars on the Basis of initial curvature. Bars with Small and
Large Initial Curvature (no derivation for Large Initial Curvature). Link Radius for Standard Sections - Value of Link Radius for a Rectangular Section - Value of Link Radius for a Triangular Section - Value of Link Radius for a Circular Section.

UNIT IV

COLUMNS AND STRUTS: Introduction – Types of columns – Shortened long columns – Axially loaded compression members – Crushing load – Euler‟s theorem for long columns assumptions-derivation of Euler‟s critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler‟s critical stress – Limitations of Euler‟s theory– Long columns subjected to loading – Empirical formulae — Rankine formula.

UNIT V

SPRINGS: Introduction - Stiffness of a Spring. Types of Springs, Bending Springs, Torsion Springs, Forms of Springs - Carriage Springs or Leaf Springs (Semi-elliptical Type).Helical Springs. Close-coiled Helical Springs, Close-coiled Helical Springs Subjected to an Axial Load. Open-coiled Helical Springs. Springs in Series and Parallel.

TEXT BOOKS:

1. R.S. Khurmi and Gupta–Strength of materials – S. Chand & Company Ltd – Revised edition–2008.
2. R.K Rajput– Strength of materials – S. Chand & Company Ltd – Fourth edition – 2008.

REFERENCES:

1. Dr. R. K. Bansal– Strength of materials – Lakshmi Publications House Pvt. Ltd – Fourth edition –2009.
2. S. S. Rattan– Strength of materials – Tata McGraw Hill Education PvtLtd – Second edition –2011.
3. S.Ramamrutham and R. Narayanan– Strength of materials – Dhanpat Rai Publishing Company – Eighteenth edition –2014.
4. Timoshenko and Gere– Strength of materials – CBS Publishers– Latest edition –2001.

(19MC0005) PROFESSIONAL ETHICS

B. Tech. III Year I Sem

L	T	P	C
2	0	0	0

Course Objective:
To enable the students to imbibe and internalize the Values and EthicalBehaviour in the personal and Professional lives.

Course Outcome:
The students will understand the importance of Values and Ethics in theirpersonal lives and professional careers. The students will learn the rights and responsibilitiesas an employee, team member and a global citizen.

UNIT - I
Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal &Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts ofEthics, Value Education, Dimensions of Ethics, Profession and professionalism, ProfessionalAssociations, Professional Risks, Professional Accountabilities, Professional Success, Ethics.
and Profession.

UNIT - II
Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism,Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral.
Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas,Moral Autonomy.

UNIT - III
Professional Practices in Engineering: Professions and Norms of Professional Conduct,Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and MoralValues in Professional Ethics, Professional codes of ethics, the limits of predictability andresponsibilities of the engineering profession.Central Responsibilities of Engineers - The Centrality of Responsibilities of ProfessionalEthics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt RegencyWalk away Collapse.

UNIT - IV
Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineersand Managers; Organizational Complaint Procedure, difference of Professional Judgmentwithin the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation.Ethics in changing domains of research - The US government wide definition of researchmisconduct, research misconduct distinguished from mistakes and errors, recent history ofattention to research misconduct, the emerging emphasis on understanding and fosteringresponsible conduct, responsible authorship, reviewing & editing.

UNIT - V

Global issues in Professional Ethics: Introduction – Current Scenario, TechnologyGlobalization of MNCs, International Trade, World Summits, Issues, Business Ethics andCorporate Governance, Sustainable Development Ecosystem, Energy Concerns, OzoneDeflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio
Ethics, Intellectual Property Rights.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, CambridgeUniversity Press 2015.

REFERENCES:

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard,Michael J Rabins, 4e , Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

(19ME3151) THERMAL ENGINEERING LAB

B.Tech. III Year I Sem.

L	T	P	C
0	0	3	1.5

Pre-Requisite: Thermodynamics & Thermal Engineering – I.

Course Objectives: To learn

1. Understand the working principles of IC Engines.
2. Understand the working principles of Reciprocating Air Compressors.
3. Understand the mechanism of valve and ports in IC Engines.
4. Understand various Heat energy losses in IC Engines.

Course Outcomes: At the end of the laboratory Student will be able to:

1. Determine the valve timing and port timing of four stroke and two stroke engines.
2. Conduct constant speed tests on internal combustion engines and interpret their performance.
3. Analyze the reciprocating air compressor characteristics.
4. Apply the concept of Morse test and Retardation test to determine frictional power.
5. Demonstrate the different parameters of Boilers.

List of Experiments:

1. I.C. Engines Valve / Port Timing Diagrams.
2. I.C. Engines Performance Test for 4 Stroke SI engines.
3. I.C. Engines Performance Test for 2 Stroke SI engines.
4. I.C. Engines Morse, Retardation, Motoring Tests.
5. I.C. Engine Heat Balance – CI/SI Engines.
6. I.C. Engines Economical speed Test on a SI engine.
7. I.C. Engines effect of A/F Ratio in a SI engine.
8. Performance Test on Variable Compression Ratio Engine.
9. IC engine Performance Test on a 4S CI Engine at constant speed.
10. Volumetric efficiency of Air – Compressor Unit.
11. Dis-assembly / Assembly of Engines.
12. Study of Boilers.

NOTE: Perform any 10 out of the 12 Exercises.

(19ME3152) MACHINE TOOLS LAB

B.Tech. III Year I Sem. **L T P C**
0 0 3 1.5

Prerequisites: Theoretical exposure to machine tools.
Course Objectives: To learn

1. Understand the parts of various machine tools and operate them.
2. Import practical exposure to use Machine Tools.
3. Understand the different shapes of products that can be produced by using machine tools.
4. Conduct experiments on machine tools and their importance in industry.

COURSE OUTCOMES: At the end of the course student will be able to,

1. Demonstrate the configuration, function and working principle of lathe, drilling machine, milling machine, shaper, planing machine, slotting machine, cylindrical grinder, surface grinder and tool and cutter grinder.
2. Perform different operations on Lathe machine.
3. Perform the various drilling operations on drilling machine.
4. Perform the grinding operation on various grinding machines.
5. Perform the Spur gear cutting on milling machine and SPCT on tool and cutter grinding machine.

List of Experiments:

1. Demonstration of general purpose machines -lathe, drilling machine, milling machine, shaper, planing machine, slotting machine, cylindrical grinder, surface grinder, tool and cutter, grinder, vernier caliper and Micrometer.

2. Step turning on lathe machine.

3. Taper turning and Knurling on lathe machine.

4. Thread cutting and grooving on lathe machine.

5. Drilling, boring and step boring on Lathe machine

6. Performing of drilling operations using Drilling machine.

7. Spur Gear cutting on Milling machine.

8. Grinding of Flat Surfaces Using Surface Grinder.

9. Grinding of Cylindrical Surfaces Using Cylindrical Grinder.

10. Preparation of Single point Cutting tools on Tool and Cutter Grinder.

11. Key way cutting on Slotting Machining.

12. Grooving and dovetail cutting on Shaper.

NOTE: Perform any 10 out of the 12 Exercises.

(19HS3151) Advanced English Communication Skills Lab

B.Tech.III Year I Sem.

L	T	P	C
0	0	2	1

Introduction

A course on Advanced English Communication Skills (AECS) Lab is considered essential at the third year level of B.Tech and Pharmacy courses. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

Course Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve students' fluency in spoken English
- To enable them to listen to English spoken at normal conversational speed
- To help students develop their vocabulary
- To read and comprehend texts in different contexts
- To communicate their ideas relevantly and coherently in writing
- To make students industry-ready
- To help students acquire behavioural skills for their personal and professional life
- To respond appropriately in different socio-cultural and professional contexts

Course Outcomes: Students will be able to:

- Acquire vocabulary and use it contextually
- Listen and speak effectively
- Develop proficiency in academic reading and writing
- Increase possibilities of job prospects
- Communicate confidently in formal and informal contexts

Syllabus

The following course activities will be conducted as part of the Advanced English Communication Skills (AECS) Lab:

Unit-I: Inter-personal Communication and Building Vocabulary –Starting a Conversation– Responding Appropriately and Relevantly –Using Appropriate Body Language –Role Play in Different Situations –Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.

Unit-II: Reading Comprehension –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, , Skimming, Scanning, Inferring Meaning.

Unit-III: Writing Skills –Structure and Presentation of Different Types of Writing –Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.

Unit-IV: Presentation Skills –Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ emails/Assignments…etc.,

Unit-V: Group Discussion and Interview Skills –Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation-Concept and Process, Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

REFERENCES:

1. Kumar, Sanjay and Pushp Lata. English for Effective Communication, Oxford University Press, 2015.
2. Konar, Nira. English Language Laboratories –A Comprehensive Manual, PHI Learning Pvt. Ltd., 2011

(19EE3218) BASCIC ELECTICAL ENGINEERING

B.Tech.III Year-II Sem **L T P C**
3 0 0 3

Pre-Requisites: Mathematics and physics

Course Objectives:

1. To introduce the concepts of electrical circuits and itscomponents
2. To understand magnetic circuits, DC circuits and three phasecircuits
3. To study and understand the different types of DC/AC machines andTransformers.
4. To study the concepts of control systems

Course Outcomes: At the end of the course, the student will be able to:

1. **Analyze** and solve electrical circuits using network laws andtheorems.
2. **Understand** and **analyze** basic Electric and Magneticcircuits
3. **Study** the working principles of Electrical Machines
4. **Demonstrate** the concepts of control systems

UNIT - I:

D.C. CIRCUITS: Electrical circuit elements, Ohm's law, voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

A.C. CIRCUITS: Representation of sinusoidal waveforms, Peak and Rms values, Phasor representation, Real power, Reactive power, Apparent power, Power factor, Three-phase balanced circuits, Star-Delta connections.

UNIT - II:

D C MACHINES: Working principle of DC Generator, constructional features, Types and EMF equation of generator, DC motor working principle, Back EMF and its significance, torque equation, Types of D.C. motors, characteristics and applications; Necessity of a starter for DC motor, Brake Test, Swinburne's test.

UNIT - III:

AC MACHINES-I: SINGLE PHASE TRANSFORMERS: Principle of operation and construction of single phase transformers (core and shell types), EMF equation, Equivalent circuit, losses, efficiency, open circuit test and short circuit test

UNIT - IV:

AC MACHINES-II: THREE PHASE INDUCTION MOTORS: Concept of rotating magnetic field; Principle of operation, types and constructional features; Slip and its significance; Torque equation, Torque –slip characteristics, Applications of squirrel cage and slip ring motors.

SYNCHRONOUS GENERATORS: Working principle-Construction.

UNIT - V:

INTRODUCTION TO CONTROL SYSTEMS: Open Loop and closed loop control systems and their differences, Modeling of physical systems-Mechanical, electrical, thermal and hydraulic systems, Block diagram and signal flow graph analysis, transfer function, Time response of first and second-order systems.

TEXT BOOKS:

1. Basic Electrical and Electronics Engineering –M S Sukija TK Nagasarkar OxfordUniversity.
2. Basic Electrical and Electronics Engineering-D P Kothari. I J Nagarath, McGraw HillEducation.
3. "I. J. Nagrath and M. Gopal", "Control Systems Engineering", New Age International (P) Limited, Publishers, 5th edition,2009.

REFERENCES:

1. Basic Electrical and electronics Engineering-Dr.Ramana pilla,Dr.M.Suryakalavathi & G.T. Chandrashekar-S Chand Publications.
2. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6^{th} edition.
3. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S.Publications.
4. Network Theory by Sudhakar, Shyam Mohan Palli,TMH.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press,2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson,2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India,1989.
8. "A.K Jairath" Problems and solutions of control systems with essential theory 5thEdition .

(19ME3211)DESIGN OF MACHINE MEMBERS - II

B. Tech. III Year- II Semester

L	T	P	C
3	0	0	3

NOTE: Design Data Book is permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

Pre-requisites: Engineering mechanics, Theory of machines& Design of Machine Members-I.

Course Objectives: To learn

- Knowledge about designing the commonly used important machine members such as bearings, engine parts, springs, belts, gears etc.
- Designing of various machine members under static and dynamic loads.
- Design the components using the data available in design data books.
- Design power transmission systems.
- Analyze gears and Gear systems.

Course Outcomes: At the end of the course student will be able to

- Determine the basic lubrication mode in bearings, journal bearing design using different empirical relations. Analyze the pressure distribution and design journal bearings.
- Evaluating life of rolling element bearings, design by static, dynamic loads and their selection for given service conditions, based on manufacturer‟s catalogue data.
- Demonstrate the ability to apply the fundamentals of force and stress analysis in the design of various components to successfully satisfy the function of IC engine.
- Design helical and leaf springs, design a power transmission system through belt, rope, and chain drive to meet desired needs in engineering applications.
- Analyze spur, helical, bevel and worm gears under strength and wear considerations by design. Analyze and evaluate the forces and stresses in various gear systems.

UNIT I:

Sliding contact bearings: Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design.

UNIT II:

Rolling contact bearings: Ball and roller bearings – Static load – dynamic load – equivalent radial load – design and selection of ball & roller bearings.

UNIT III:

Design of Connecting Rod: Introduction, function, Design and thrust in connecting rod – stress due to whipping action on connecting rod ends.

Design of Pistons: Forces acting on piston – Introduction, functions, Construction, Piston design and proportions of piston.

UNIT IV:

Design of Spur and Helical gears: Brief introduction involving important concepts – Design of gears using AGMA procedure involving Lewis and Buckingham equations. Check for wear.

Design of Bevel and Worm gears: Brief introduction involving important concepts – Design of gears using AGMA procedure involving Lewis and Buckingham equations. Check for wear.

UNIT V:

Mechanical Springs: Stresses and deflections of helical springs – Extension and compression springs – Design of springs for fatigue loading – natural frequency of helical springs – Energy storage capacity – Design of leaf springs**.**

Belts & Pulleys: Transmission of power by Belt and Rope ways, Transmission efficiencies, Belts– Flat and V types – Ropes - pulleys for belt and rope drives.

TEXT BOOKS:

1. V. Bhandari "Design Machine Elements" Mc GrawHill 4th Edition 2016.
2. Pandya & Shah "Machine Design" Charotar 20th Edition 2015.

REFERENCES:

1. R.S. Khurmi, J.K. Gupta "Machine Design" S Chand Publishers 25th Edition 2018
2. UC Jindal "Machine Design" Pearson.1st Edition 2010.
3. JE Shigley "Mechanical Engineering Design" Mc Graw Hill 11th Edition 2020.
4. T. Krishna Rao "Design of Machine Elements (Vol.1)" IK International Publishing House 3rdEdition Vol 1&2 2021.

(19ME3212) THERMAL ENGINEERING -II

B.Tech. III Year II Sem

L	T	P	C
3	0	0	3

Pre-requisites: Thermodynamics.

Course Objectives: To learn

1. Apply the laws of Thermodynamics to analyze Steam cycles.
2. Perform analysis of the major components of steam turbine plants and their applications.
3. Understand the working of different types of Boilers and nozzles and its applications.
4. Understand the working of steam turbines and their performance analysis.
5. Understand the working of different types of Steam condensers and jet propulsions.

COURSE OUTCOMES: At the end of the course Student will be able to

1. Understand the working of vapor power cycle and various heat addition concepts for improving its vapour quality and efficiency.
2. Apply the fundamentals of thermodynamics on Nozzle performance and its analyses.
3. Estimate the various performance parameters of steam turbines in different fields of energy transfer equipments.
4. Demonstrate the concepts steam condensers with in realistic constraints and power plant measuring instruments.
5. Identify the working of various propulsive engines and its applications.

UNIT I

Steam Power Plant*:* Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating.

Boilers: Classification – Working principles with sketches including H.P.Boilers – Mountings and Accessories – Working principles- Boiler horse power, Equivalent Evaporation, Efficiency and Heat balance.

Draught- Classification – Height of chimney for given draught and discharge- Condition for Maximum discharge- Efficiency of chimney.

UNIT II

Steam Nozzles : Stagnation Properties- Function of nozzle – Applications and Types Flow through nozzles- Thermodynamic analysis – Assumptions -Velocity of nozzle at exit-Ideal and actual expansion in nozzle- Velocity coefficient- Condition for maximum discharge Critical pressure ratio-Criteria to decide nozzle shape- Super saturated flow, its effects, Degree of super saturation and Degree of under cooling - Wilson line.

UNIT III

Steam Turbines: Classification – Impulse turbine; Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency. De-Laval Turbine - its features- Methods to reduce rotor speed Velocity compounding and Pressure compounding- Velocity and Pressure variation along the flow – Combined velocity diagram for a velocity compounded impulse turbine.

Reaction Turbine: Mechanical details – Principle of operation, Thermodynamic analysis of a stage, Degree of reaction –Velocity diagram – Parson‟s reaction turbine – Condition for maximum efficiency.

UNIT IV

Steam Condensers: Requirements of steam condensing plant – Classification of condensers – Working principle of different types – Vacuum efficiency and Condenser efficiency – Air leakage, sources and its affects, Air pump- Cooling water requirement.

Power plant instrumentation and measurements: Classification of instruments in thermal power plant and working – pressure, temperature, level, flow, expansion, vibration measurements– Analysis of water, steam, flue gases.

UNIT V

Jet Propulsion : Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines – Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

Rockets: Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

TEXT BOOKS:

1. V. Ganesan “Gas Turbines” Mc Graw Hill, 2nd Edition, 2017.
2. Mahesh M Rathore “Thermal Engineering” Mc Graw Hill, 2nd Edition, 2010.

REFERENCES:

1. Saravanamuttoo, Cohen, Rogers “Gas Turbine Theory” Pearson, 5th Edition, 2001.
2. Rathakrishnan “Fundamentals of Engineering Thermodynamics” PHI, 2nd Edition, 2006.
3. R.K.Rajput “Thermal Engineering” McGraw Hill Ed.6th Edition, 2006.
4. Thermal Engineering, R.Rudramurthy, Tata McGraw-Hill Education.

(19ME3213) HEAT TRANSFER

B.Tech. III Year II Sem. **L T P C**
3 0 0 3

NOTE: Heat Transfer Data Book is permitted.

Pre-requisite: Thermodynamics.

Course Objectives: To learn

- Provide knowledge about applications of conduction, convection, and radiation.
- Discuss the fundamental principles and laws of heat transfer.
- Explore the implications of these principles for system behavior; to formulate the models necessary.
- Study, analyze and design heat transfer systems through the application of these principles.
- Develop the problem-solving skills essential to good engineering practice of heat transfer in real-world applications.

Course Outcome: At the end of this course, student will be able to

- Demonstrate the heat transfer through basic geometric elements and composite systems and able to formulate heat transfer equations.
- Demonstrate the heat transfer through unsteady state, extended surface and geometric shapes of variable thermal conductivity and able to formulate heat transfer equations equations.
- Explain about concept of continuity, momentum and energy equations and analyze natural and forced convection heat transfer and interpret forced convective heat transfer.
- Design the Heat exchangers using LMTD and NTU methods and interpret free convective heat transfer.
- Explain the principles of boiling, condensation and radiation heat transfer.

UNIT – I

Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer –Important applications of heat transfer.

Conduction Heat Transfer: Fourier`s law of heat conduction – General heat conduction equations in Cartesian, Cylindrical and Spherical coordinates – simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions

One Dimensional Steady State Heat Conduction: Plane walls, hollow cylinders, and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation, -Concept of Variable Thermal conductivity.

UNIT – II

Systems with internal heat generation: Extended surface – Long Fin, Short Fin with Insulated tip and Short Fin with free end, Application to error measurement of Temperature.

One Dimensional Transient Heat Conduction: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers –Infinite Systems, Concept of Semi-infinite System , General Unsteady systems- Chart solutions.

UNIT – III

Convective Heat Transfer: Classification of systems based on type of flow, condition of flow, Configuration of flow and medium of flow – Concept of Boundary layers, -Dimensional analysis as a tool for experimental investigation – Buckingham π Theorem,– Significance of non- dimensional numbers – Concepts of Continuity, Momentum and Energy Equations, – Important correlations of forced conventions.

Internal Flows: Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this –Use of empirical relations for Horizontal Pipe Flow and annulus flow.

UNIT – IV

Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.

Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient and Fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods, Concept of Compact heat exchanger.

UNIT - V

Boiling, Condensation and Radiation Heat Transfer:

Boiling: – Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux and Film boiling.

Condensation: Film wise and drop wise condensation –Nusselt‟s Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

Radiation Heat Transfer: Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities –Radiation laws- Planck distribution law, Stefan- Boltzman law, Wien`s distribution law , Kirchoff`s law, Lamberts cosine law,– Heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

TEXT BOOKS:

1. Heat and Mass Transfer / J.P.Hollman & S Bhattacharya/ Mc Graw Hill/ Eight Edition.
2. Heat and Mass Transfer / D.S.Kumar/ S. K. Kataria & Sons/2009.

REFERENCE BOOKS:

1. Essential Heat Transfer - Christopher A Long / Pearson.
2. Heat Transfer –Ghoshdastidar / Oxford/ Second Edition.
3. Heat and mass Transfer Fundamentals and Applications/ A J Ghajar & Y A. Cengel/ Mc Graw Hill/4th Edition.
4. A Text book on Heat transfer/S.P.Sukhatme/Universities Press(India) Pvt lid/2005 4th Edition.

(19ME3271)ALTERNATIVE FUELS FOR IC ENGINES
(PROFESSIONAL ELECTIVE-II)

B.Tech. III Year II Sem

L	T	P	C
3	0	0	3

Pre-requisites: Applied Thermodynamics-I.

Course Objectives: To leran

1. Different types of alternative fuels.
2. Study the types of liquid fuels used in SI engines and their Performance and Emission Characteristics.
3. Study the different types of liquid fuels used in CI engines and Performance and Emission Characteristics.
4. Study the different types of gaseous fuels used in SI engines and Performance and Emission Characteristics.
5. Study the different types of gaseous fuels used in CI engines and Performance and Emission Characteristics.

Course Outcomes: At the end of the course Student will be able to

1. Classify various Potential Alternative Fuels available for internal combustion engines.
2. Evaluate the various techniques used in SI Engines.
3. Importance of fuel blends in IC engines.
4. Identifying the performance and emissions, characteristics of SI and CI engines.
5. Discuss the concept of Dual Fuelling Engines.

UNIT I

Introduction: Availability and Suitability and properties of Potential Alternative Fuels – Ethanol, Methanol, DEE, DME, Hydrogen, LPG, Natural Gas, Producer Gas, Bio gas and Bio-diesel, Properties, Merits and Demerits.

UNIT II

Liquid fuels for SI Engines: Requirements of fuels for SI Engines-Different Techniques of utilizing alternative liquid fuels– Blends, Neat form, Reformed Fuels - Manufacturing, Storage and Safety-Performance and Emission Characteristics of alternative liquid fuels.

UNIT III

Liquid fuels in CI Engines: Requirements of fuels for CI engines- Different Techniques for their Utilization-Blends, Fuel modifications to suit CI engines, Neat fuels, Reformed fuels, Emulsions, Dual fuelling, Ignition accelerators and other additives– Performance and emission characteristics.

UNIT IV

Gaseous Fuels in SI Engines: Use of Hydrogen, CNG, LPG, Natural Gas, Producer gas and Bio gas in SI engines– Safety Precautions – Engine performance and emissions.

UNIT V

Gaseous Fuels in CI Engines: Use of Hydrogen, Producer Gas, Biogas, LPG, Natural gas, CNG in CI engines. Dual fuelling, Performance and Emission characteristics.

TEXT BOOKS*:*

1. Osamu Hi rao and Richard K.Pefley, John Wileyand Sons. "Present and Future Automotive Fuels"
2. Keith Owen and Trevor Eoley "Automotive Fuels Handbook" SAE Publications, 1990. DomaKundawar, Dhanpatrai& Co. Ltd "IC Engines".

REFERENCES:

1. S.S. Thipse, Jaico "Alternative Fuels", Publishing House.
2. V.Ganeshan, "IC Engines", Tata McGraw-Hill Education.
3. Richard L.Bechtold, "Alternative Fuels Guide Book", SAE Electronic Publications.
4. NirajTopare, SatishKhedkar, Vilasrenge "Algae Biodiesel an Alternate Fuel for Diesel Engine", Lamberd Academic Publishing.

(19ME3272) UNCONVENTIONAL MACHINING PROCESSES
(PROFESSIONAL ELECTIVE-II)

B.Tech. III Year II Sem **L T P C**
3 0 0 3

Pre-requisites: Machine Tools.

Course Objectives: To learn
1. Modeling technique for machining processes.
2. Interpretation of data for process selection.
3. Mechanics and thermal issues associated with chip formation.
4. Effects of tool geometry on machining force components and surface finish.
5. Machining surface finish and material removal rate.

Course Outcomes: At the end of the course Student will be able to
1. Understand the basic techniques of Unconventional Machining processes modeling.
2. Understand the Abrasive, water jet machining and electro chemical processes.
3. Analyze the EDM process and its input and response parameters.
4. Understand the importance of non thermal processes.
5. Understand the applications of various unconventional machining processes.

UNIT – I

Introduction: Need for non-traditional machining Methods-Classification of modern machining Processes – considerations in process selection. Materials. Applications. Ultrasonic machining – Elements of the process, mechanics of metal removal process, parameters, economic considerations, applications and limitations, recent development.

UNIT - II

Abrasive Jet Machining, Water Jet Machining and Abrasive Water Jet Machining: Basic principles, equipment, process variable, and mechanics of metal removal, MRR, application and limitations.

Electro – Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring processes, metal removal rate in ECM, Tool design, Surface finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate.

UNIT – III

Thermal Metal Removal Processes: General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

UNIT – IV

Generation and control of electron beam for machining: theory of electron beam machining, comparison of thermal and non-thermal processes.

Laser beam machining: General Principle and applications, thermal features, cutting speed and accuracy of cut.

UNIT - V

Application of plasma for machining: metal removing mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. **Chemical machining:** principle - applications.

Finishing processes: Magnetic abrasive finishing, Abrasive flow finishing, Electro stream drilling and shaped tube electrolyte machining.

TEXT BOOKS:

1. V.K. Jain "Advanced Machining Processes" Allied publishers Ltd, 2nd Edition,2002
2. P. C. Pandey, H. S. Shan "Modern Machining Processes" Tata Mc Graw Hill Education,1st Edition,1980.

REFERENCES:

1. M.K Singh "Unconventional Manufacturing Process" New Age Publishers, 2nd Edition,.2008.
2. J.A. Mc Geough "Advanced Methods of Machining" Publisher, Springer International, 3rd Edition, 1988.
3. Gary.F Benedict "Non-Traditional Manufacturing Processes" Publisher, CRC Press, 1st Edition, 1987.
4. Mishra P.K. "Non-Conventional Machining Process" Narosa Publishing House, 2nd Edition, 2006.

(19ME3273)FINITE ELEMENT METHODS
(PROFESSIONAL ELECTIVE-II)

B.Tech. III Year - II Sem

L	T	P	C
3	0	0	3

Pre-requisites: Mechanics of Solids, Empirical Mathematics of Matrices, Heat Transfer, Mechanical Vibrations.

Course Objectives: To learn

- Basic principles of finite element analysis procedure.
- Concepts of Mathematical Modelling of Engineering Problems.
- Applying finite element solutions to structural, thermal& dynamic analysis problems.
- Knowledge and skills needed to effectively evaluate finite element analysis.
- Appreciate the use of FEM to a range of Engineering Problems.

Course Outcomes: At the end of the course Student will be able to

- Summarize the basics of finite element formulation.
- Apply finite element formulations to solve one dimensional Problems.
- Apply finite element formulations to solve two dimensional scalar Problems.
- Apply finite element method to solve Heat Transfer problems.
- Apply finite element method to solve problems dynamic analysis Problems.

UNIT I

Introduction to Finite Element Methods: General Procedure – Engineering Applications – Types of Analysis Performed - Stress and Equilibrium, Strain – Displacement relations. Stress – strain relations: Finite Elements: 1- Dimensional, 2 – Dimensional, 3-Dimensional & Interpolation Elements

One Dimensional Problems: 1-D Linear and 1-D Quadratic Elements - Finite element modeling, Coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT II

Analysis of Trusses: Derivation of Stiffness Matrix for Plane Truss, Displacement of Stress Calculations.

Analysis of Beams: Stiffness matrix for two noded elements, two degrees of freedom per node beam element, Load Vector, Deflection.

UNIT III

Finite element modeling of two-dimensional stress analysis with constant strain triangles and treatment of boundary conditions, Estimation of Load Vector, Stresses

Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements. Two dimensional four noded isoperimetric elements and numerical integration.

UNIT IV

Steady State Heat Transfer Analysis: One dimensional analysis of Slab, fin and two- dimensional analysis of thin plate.

UNIT V

Dynamic Analysis: Formulation of finite element model, element - Mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar, truss and beam.

TEXT BOOKS:

1.Tirupathi R. Chandrupatla, Ashok D.Belegundu "Introduction to Finite Elements in Engineering", 4th Edition, Pearson Publications, 2015.

2. J. N. Reddy"An Introduction to the Finite Element Method",4th Edition,Mc GrawHill, 2020.

REFERENCES:

1. G. Ramamurty "Applied Finite Element Analysis",2nd Edition,Ik International Publications,2010.

2. Chennakesava R. Alavala,"Finite Element Methods: Basic Concepts and applications", 1stEdition, PHI publications, 2012.

3.U.S.Dixit"Finite Element ethod for Engineers"1st Edition,Cengage Publications,Edition,2009.

4. S.S. Bhavikatti"Finite Element Analysis" 3rd Edition, New Age International Publishers,2015.

(19ME3274) LEAN MANUFACTURING
(PROFESSIONAL ELECTIVE – II)

B.Tech. III Year - II Sem

L	T	P	C
3	0	0	3

Pre-requisites: Nil.

Course Objectives: To learn

- Concepts of Lean Manufacturing.
- Different layouts and JIT,TPM concepts etc 3 To get an idea about 5S & TQM
- Concepts of Six sigma.
- Details about manufacturing companies where lean manufacturing concepts are implemented.

Course Outcomes: At the end of the course the student should be able to

- Understand the difference between conventional manufacturing versus lean manufacturing & apply the principles of lean manufacturing.
- Explain Lean Manufacturing Tools.
- Classify the of layouts and apply JIT, TPM Principles.
- Understand and Practice TQM, 5S principles.
- Explain the concept of six sigma and Practice.

UNIT I

INTRODUCTION TO LEAN MANUFACTURING: Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools.

UNIT II

CELLULAR MANUFACTURING, JIT, TPM: Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. Jidoka concept – Poka-Yoke (mistake proofing) - Worker Involvement– Quality circle activity – Kaizen training - TPM – Pillars of TPM, Principles and implementation of TPM.

UNIT III

SET UP TIME REDUCTION, TQM, 5S, VSM: Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

UNIT IV

SIX SIGMA: Six Sigma – Definition, statistical considerations, variability reduction, design of experiments – Six Sigma implementation.

UNIT V

CASE STUDIES: Various case studies of implementation of lean manufacturing at industries.

TEXT BOOKS:

1. Design and Analysis of Lean Production Systems, Ronald G. Askin& Jeffrey B. Goldberg, John Wiley & Sons, 2003.
2. Mikell P. Groover (2002) _Automation, Production Systems and CIM.

REFERENCES:

1. Rother M. and Shook J, 1999 _Learning to See: Value Stream Mapping to Add Value and Eliminate Muda,, , Lean Enterprise Institute, Brookline, MA.
2. Lean and Agile Manufacturing: Theoretical, Practical and Research Futurities By S.R. Devadasan,V. Mohan Sivakumar, R. Murugesh& P.R. ShalijDevadasan S.R PHI Learning Pvt. Ltd., 12-Jun-2012.
3. The Toyota Way: 14 Management Principles from the World's Greatest **M**anufacturer Hardcover – January 7, 2004**,**by Jeffrey Liker.
4. Kaizen Express: Fundamentals for Your Lean Journey , 2009,by Toshiko Narusawa.

(19ME3251) HEAT TRANSFER LAB

B.Tech. III Year-II Sem

L	T	P	C
0	0	3	1.5

Pre-requisite: Thermodynamics.

Course Objectives:

- To enable the student to apply conduction, convection and radiation heat transfer concepts to practical applications.

Course Outcomes:

- At the end of the lab sessions, the student will be able to
- Perform steady state conduction experiments to estimate thermal conductivity of different materials.
- Perform transient heat conduction experiment.
- Estimate heat transfer coefficients in forced convection, free convection, Condensation and correlate with theoretical values.
- Obtain variation of temperature along the length of the pin fin under forced and free Convection.
- Perform radiation experiments: Determine surface emissivity of a test plate and Stefan-Boltzmann‟s constant and compare with theoretical value.

List of Experiments

1. Heat Transfer Through composite Materials.
2. Thermal Conductivity of a Metal Rod.
3. Parallel and Counter Flow Heat Exchanger.
4. Stefan Boltzmann‟s Constant Apparatus.
5. Transient Heat Conduction.
6. Heat Pipe Demonstration Apparatus.
7. Thermal Conductivity of Insulating Material.
8. Heat Transfer Through Lagged Pipe.
9. Heat Transfer in Forced Convection.
10. Heat Transfer Through Natural Convection.
11. Measurement of Surface Emissivity.
12. Heat Transfer Through Pin-Fin.
13. Critical Heat Flux Apparatus.
14. Boiling & condensation Apparatus.

Note: Perform any 10 out of the 12 Exercises.

(19EE3258)BASIC ELECTRICAL ENGINEERING LAB

B.Tech.III Year II Sem **L T P C**
0 0 3 1.5

Pre- Requisites: Basic Electrical and Electronics Engineering

Course Objectives:

- To introduce the concepts of electrical circuits and itscomponents
- To understand magnetic circuits, DC circuits and AC single phase & three phasecircuits
- To study and understand the different types of DC/AC machines andTransformers.

Course Outcomes:

- To analyze and solve electrical circuits using network laws andtheorems.
- To understand and analyze basic Electric and Magneticcircuits
- To study the working principles of ElectricalMachines

The following experiments are required to be conducted as compulsory experiments

Part - A

1. Verification of ohm's law
2. Verification of KVL andKCL
3. Measurement of Active and Reactive Power in a balanced Three-phasecircuit
4. Performance Characteristics of a DC Shunt Motor
5. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-PhaseTransformer
6. OC and SC Test on Single Phase Transformer.
7. Performance Characteristics of a Three-phase InductionMotor
8. No-Load Characteristics of a Three-phaseAlternator

In addition to the above eight experiments, at least any two of the experiments from the following

Part – B

1. Swinburne's Test on d c shunt machine
2. To determine the transfer function of DC motor
3. To determine the transfer function of DC generator
4. Time response of Second order system

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar OxfordUniversity
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw HillEducation
3. "I. J. Nagrath and M. Gopal", "Control Systems Engineering", New Age International (P) Limited, Publishers, 5th edition,2009

REFERENCES:

1. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6^{th} edition.
2. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S.Publications.
3. Network Theory by Sudhakar, Shyam Mohan Palli,TMH.
4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press,2011.
5. E. Hughes, "Electrical and Electronics Technology", Pearson,2010.
6. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

19ME3291: TECHNICAL PAPER PRESENTATION

B.Tech. III Year II Sem. **L T P C**

0 0 2 1

GENERAL INSTRUCTIONS

1. **Pick The Right Topic**: Make sure that you find this topic genuinely interesting, or find some aspect of it that is especially cool.

2. **Skim Your Textbook:** Look over the syllabus, read the newspapers regularly, look through recent issues of relevant journals and magazines, surf the net, watch the Technical news, talk to your classmates and friends to get innovative Ideas.

3. **Narrow down Your Topic**: Many good ideas are wasted because students have a hard time focusing on a narrow enough topics. If your topic is way too broad, try homing in on some part of that topic, and exploring that area in more depth.

4. **My Topic is Too Narrow**: Generalize to similar or related topics (cloning of humans vs. cloning of animals, unexpected social problems that might result from cloning, technical aspects of cloning, moral or religious issues related to cloning, etc.). But keep your focus clear throughout

5. **Organize Your Thoughts In A Good Outline**: Outlining is a genuine pain, especially in the early stages of your paper, by forcing you to come in terms of writing the topic. Try to reveal major deficiencies in your approach. Use it on your first draft to get your bearings, or on your final draft to check the way you've organized your paragraphs.