T K R COLLEGE OF ENGINEERING &TECHNOLOGY
(Autonomous)

B.TECH. MECHANICAL ENGINEERING –R17

COURSESTRUCTURE & SYLLABUS

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	**A35PC1**	Design of Machine members-1	**4**	**1**	**0**	**4**
2	**A35PC2**	Thermal Engineering-1	**4**	**1**	**0**	**4**
3	**A35PC3**	Metrology and Machine tools	**4**	**1**	**0**	**4**
4	**A35MS4**	Fundamentals of Management	**3**	**1**	**0**	**3**
5	**A35OE5**	Open Elective-1	**3**	**0**	**0**	**3**
6	**A35PE6**	**Professional Elective-1** A: Automobile Engineering B: IC Engine and Gas Turbines C: Nuclear Power generation and Supply	**3**	**1**	**0**	**3**
7	**A35PC7**	Thermal engineering Lab	**0**	**0**	**3**	**2**
8	**A35PC8**	Machine tools lab	**0**	**0**	**3**	**2**
9	**A35PC9**	Engineering Metrology Lab	**0**	**0**	**3**	**2**
		Total Credits				**27**

* MC--Mandatory course, Satisfactory/Unsatisfactory

III YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credit
1	**A36PC1**	Thermal Engineering-II	**4**	**1**	**0**	**4**
2	**A36PC2**	Design of machine members -II	**4**	**1**	**0**	**4**
3	**A36PC3**	Heat Transfer	**4**	**1**	**0**	**4**
4	**A36OE4**	Open Elective -2	**3**	**1**	**0**	**3**
5	**A36PE5**	Professional Elective-2 A: Finite Element Methods B: Refrigeration and Air Conditioning C: Machine tool Design	**3**	**1**	**0**	**3**
	A36PE6	Professional Elective-3 A Instrumentation and controlsystems B: Non Destructive Testing C : Composite Materials	**3**	**1**	**0**	**3**
6	**A36PC7**	Heat transfer Lab	**0**	**0**	**3**	**2**
7	**A36PC8**	CADD and MAT lab	**0**	**0**	**3**	**2**
8	**A36HS9**	Advanced English Communications skill lab	**0**	**0**	**3**	**2**
		Total Credits				**27**

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DESIGN OF MACHINE MEMBERS – I -A35PC1

B.Tech. III Year I Semester **L/T/P/ C**

4 /1/0/ 4

Note: Design Data books are not permitted in the Examinations. The design must not onlysatisfy 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 different materials of construction 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:

1. The student acquires the knowledge about the principles of design, material selection, component behavior subjected to loads, and criteria of failure.
2. Understands the concepts of principal stresses, stress concentration in machine members and fatigue loading.
3. Design on the basis of strength and rigidity and analyze the stresses and strains induced in a machine element.

UNIT – I:

Introduction: General considerations in the design of Engineering Materials and theirproperties – selection –Manufacturing consideration in design. Tolerances and fits –BIS codes of steels.

Design for Static Strength: Simple stresses – Combined stresses – Torsional and Bendingstresses – Impact stresses – Stress strain relation – Various theories of failure – Factor of safety – Design for

strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

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:

Riveted, Welded and Bolted Joints: Riveted joints- methods of failure of riveted joints-strength equations-efficiency of riveted joints-eccentrically loaded riveted joints.

Welded joints-Design of fillet welds-axial loads-circular fillet welds under bending, torsion. Welded joints under eccentric loading.

Bolted joints – Design of bolts with pre-stresses – Design of joints under eccentric loading – locking devices – bolts of uniform strength.

UNIT – IV:

Keys, Cotters and Knuckle Joints: Design of keys-stresses in keys-cottered joints-spigotand socket, sleeve and cotter, jib and cotter joints-Knuckle joints.

UNIT – V:

Shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts forcombined bending and axial loads – Shaft sizes – BIS code. Use of internal and external circlips, Gaskets and seals (stationary & rotary)

Shaft Couplings: Rigid couplings – Muff, Split muff and Flange couplings.Flexiblecouplings – Flange coupling (Modified).

TEXT BOOKS

1. Text book of Machine Design –by S.Md. Jalaludeen, Anuradha Publications
2. Text book of Machine design by R.S.Kurmi&J.K.Guptha, S.Chand publications
3. Design data Hand book by S.Md. Jalaludeen, Anuradha Publications

REFERENCE BOOKS

1. Design of Machine Elements / V. Bhandari / Mc Graw Hill
2. Machine Design / Jindal / Pearson

3. Design of Machine Elements / V. M. Faires / Macmillan
4 . Design of Machine Elements-I / Annaiah, M.H / New Age

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B. TECH MECHANICAL ENGINEERING-R17

THERMAL ENGINEERING – I -A35PC2

B.Tech. III Year I Semester **L/T/P/ C**
4 /1/0/ 4

PRE-REQUISITE: Thermodynamics

COURSE OBJECTIVE:

1. To apply the laws of Thermodynamics to analyze air standard cycles.
2. To understand and evaluate the performance analysis of the major components and systems of IC engines, refrigeration cycles and their applications.

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

1. To evaluate theperformance of IC engines and compressors under the given operating conditions.
2. Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles.
3. Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance

UNIT – I:

I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CIengines, 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, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

UNIT – II:

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 engine Combustion Chambers..

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

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

UNIT – IV:

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

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

UNIT – V:

Refrigeration: Mechanical Refrigeration and types – unit of refrigeration – AirRefrigeration system, details and principle of operation – applications of air refrigeration, Vapour compression refrigeration systems – calculation of COP- Use of p-h charts for calculations- effect of superheating and sub cooling, desired properties of refrigerants and common refrigerants- Vapour absorption system – mechanical details – working principle,

Air-Conditioning: Concepts of Psychrometry – Properties of moist air – Usage ofPsychrometric Chart – Calculation of moist air properties.

Types of air – conditioning systems – Requirements - schematic layout of a typical plant.

TEXT BOOKS

1. I.C. Engines / V. Ganesan / Mc Graw Hill
2. Thermal Engineering / Mahesh M Rathore / Mc Graw Hill
3 Steam tables in SI units with Mollier Chart –R.S.Khurmi ,S.Chand publications
4. Refrigeration and Airconditioning tables in SI units- by C.P.Kothandaraman

REFERENCE BOOKS

1. Applied Thermodynamics for Engineering Technologists / Eastop / Pearson
2. Fundamentals of Classical Thermodynamics / Vanwylen G.J., Sonntag R.E. / Wiley Eastern

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B. TECH MECHANICAL ENGINEERING-R17

METROLOGY AND MACHINE TOOLS -A35PC3

B.Tech. III Year I Semester **L/T/P/ C**
4 /1/0/ 4

PRE-REQUISITES: Physics

COURSE OBJECTIVES: The course content enables students to:

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

COURSE OUTCOME: At the end of the course, the student would be able to

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

UNIT – I:

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.- Metal cutting: Introduction, elements of cutting process – Geometry of single point tools. Chip formation and types of chips.

UNIT – II:

Drilling and Boring Machines – Principles of working, specifications, types, 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- 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 ofangles, Bevel protractor, and Sine bar. Measurement of flat surfaces, 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. Fundamentals of Metal Machining and Machine Tools / Geoffrey Boothroyd / McGraw Hill.

REFERENCE BOOKS

1. Principles of Machine Tools, Bhattacharyya A and Sen.G.C / New Central Book Agency.
2. Fundamentals of Dimensional Metrology / Connie Dotson / Thomson.

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B. TECH MECHANICAL ENGINEERING-R17

FUNDAMENTALS OF MANAGEMENT -A35MS4

B.Tech. III Year I Semester **L/T/P/ C**
3 /1/0/ 4

COURSE OBJECTIVE:

1. To understand the Management Concepts, applications of Concepts inPractical aspects of business and development of Managerial Skills.

COURSE OUTCOME:

1. The students understand the significance of Management in theirProfession.
2. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course.
3. The students can explore the Management Practices in their domain area.

UNIT - I:

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles,Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management-Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT - II:

Planning and Decision Making: General Framework for Planning - Planning Process,Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT - III:

Organization and HRM: Principles of Organization: Organizational Design &Organizational

Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change.

Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT - IV:

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; BehavioralLeadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Leadership.

Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT - V:

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetaryand Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

TEXT BOOKS

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES

1. Essentials of Management, Koontz Kleihrich, Tata McGraw HilL.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.

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B. TECH MECHANICAL ENGINEERING-R17

AUTOMOBILE ENGINEERING- A37PE6A

B.Tech. III Year I Semester **L/T/P/ C**
3 /1/0/ 3

PRE REQUISITES: Thermal Engineering

COURSE EDUCATIONAL OBJECTIVES: The student will be made to learn

1. The anatomy of the automobile in general
2. The location and importance of each part
3. The functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels
4. Suspension, frame, springs and other connections
5. Emissions, ignition, controls, electrical systems and ventilation

COURSE OUTCOMES: The student will be able to

1. Identify the different parts of the automobile.
2. Explain the working of various parts like engine, transmission, clutch, brakes.
3. Describe how the steering and the suspension systems operate.
4. Understand the environmental implications of automobile emissions.
5. Develop a strong base for understanding future developments in the automobile industry.

UNIT – I:

Introduction: Layout of automobile – introduction chassis and body components. Types of Automobile engines. – Power unit – Introduction to engine lubrication – engine servicing Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump – filters – carburetor – types – air filters – petrol injection. Introduction to MPFI and GDI Systems.

C.I. Engines: Requirements of diesel injection systems, types of injection systems, DI Systems IDI systems. Fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps.Introduction to CRDI and TDI Systems.

UNIT – II :

Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative cooling – pressure sealed cooling – antifreeze solutions. Ignition System: Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser, and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism. 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, constant mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter. Propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres.

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

UNIT – IV:

Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes. Steering System: Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

UNIT – V:

Emissions from Automobiles – Pollution standards National and international – Pollution Control – Techniques – Multipoint fuel injection for SI Engines. Common rail diesel injection Energy alternatives – Solar, Photo-voltaic, hydrogen, Biomass, alcohols, LPG, CNG, liquid Fuels, and gaseous fuels, Hydrogen as a fuel for IC Engines. - Their merits and demerits. Standard Vehicle maintenance practice.

TEXT BOOKS

1. Automobile Engineering / William H Crouse
2. A Text Book Automobile Engineering–Manzoor, Nawazish Mehdi &Yosuf Ali, Frontline Publications.

REFERENCES

1. A Text Book of Automobile Engineering by R K Rajput. Laxmi Publications.
2. Automotive Mechanics / Heitner
3. Automotive Engineering / Newton Steeds & Garrett.
4. Automotive Engines / Srinivasan.
5. A Text Book of Automobile Engineering By Khalil U Siddiqui New Age International.

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B. TECH MECHANICAL ENGINEERING-R17
IC ENGINES AND GAS TURBINES- A35PE6B

B.Tech. III Year I Semester **L/T/P/ C**
3 /1/0/ 3

Pre-requisites - Basic Thermodynamics

Course Objectives:

1. Acquire knowledge about the IC engine cycles, classification and working Principles.
2. Describe the testing and performance parameters along with heat balance Sheet.
3. Explain different alternate fuels, gas turbines and about jet propulsion.

Course Out Comes:

1. Explain basic concepts of actual cycles with analysis and to describe the fundamental concepts of IC engines along with its working principles.
2. Describe the combustion phenomenon in SI and CI engines.
3. Evaluate the performance of IC engines and the importance of alternate fuels.
4. Classify the essential components of gas turbine along with its performance Improving methods.
5. Illustrate the working principle of different types of Jet propulsive engines and Rockets.

UNIT - I:

Introduction: Basic Engine components and Nomenclature, Classification of Engines, Theworking principle of Engines, Comparison of 2-Stroke and 4-Stroke Engines; CI, and SIEngines, Ideal and Actual Working Cycles and their analysis, Valve timing Diagram.

Fuels: Fossil fuels, Chemical structure of Petroleum, Properties of SI and CI Engine Fuels,Fuel Ratings; Octane Number, Cetane Number.

UNIT - II:

Carburetors & Fuel Injection: Air Fuel Mixture Requirements, Construction and Workingof Simple Carburetor, Calculation of Air-Fuel Ratio, Parts of Carburetor. Requirement ofInjection

Systems, Classification of Injection Systems, Fuel Feed pump, Injection Pumps,Working principles of Governors, Nozzles and Fuel Injector, Injection in SI and CI Engines.

Combustion and Ignition Systems in SI and CI Engines: Normal and AbnormalCombustion in SI and CI Engines, Stages of Combustion, Detonation and Knocking.

UNIT - III:

Performance parameters for IC Engines: Engine Power, Engine Efficiencies, PerformanceCharacteristics, Variables Effecting Performance Characteristics, Methods of ImprovingEngine Performance, Heat Balance.

Modern Automotive Engines*:* Changes in Fuel injection Methods in S.I and C.I engines,Common Rail Direct Injection System, Gasoline Direct Injection, Variable ValveTechnology, A brief review of Design changes to achieve high efficiency.

UNIT - IV:

Gas Turbine: Introduction to Gas Turbines, Development, Classification and Application ofGas Turbines, Ideal and Actual Cycles; Effect of Inter cooling, Reheating, Regeneration,Combined cycle, and Cogeneration.

UNIT - V:

Gas Turbine Cycles for Aircraft Propulsion: Criteria of performance, Intake, andpropelling nozzle efficiencies, Simple Turbojet Cycle, The turboprop engine, Thrustaugmentation, Gas turbine combustion systems, Combustion chamber designs, Gas TurbineEmissions.

TEXT BOOKS

1. I.C. Engines/ Gas Turbines / V. Ganesan- Mc Graw Hill
2. Internal Combustion Engines /Colin R. Ferguson /Wiley

REFERENCE BOOKS

1. Fundamentals of Internal Combustion Engines / H.N Gupta / PHI
2. Gas Turbine Theory/ HIH Saravanamuttoo, Cohen, Rogers/ Pearson

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B. TECH MECHANICAL ENGINEERING-R17

NUCLEAR POWER GENERATION AND SUPPLY- A35PE6C

B.Tech. III Year I Semester **L/T/P/ C**
3 /1/0/ 3

COURSE OBJECTIVE:

1. To introduce the students about the knowledge of nuclear power generation and supply, reactor design and nuclear power plant.

UNIT- I:

Introduction: Systems in nuclear reactor- Reactor fuels: Natural and enriched fuels, sources, merits and demerits of different fuels for reactor use, fabrication, handling of fuels and irradiated fuels, fuel management, storage, reprocessing of irradiated fuels. Reactor shutdown systems: Materials for reactor control and choices, liquid vs. solid shut down systems, design aspect- fall safe features, loading consideration, actuation methodology. Primary heat transport (cooling) system: Heat generation and distribution, Coolant characteristics, Selection of coolants, Coolant Circuit, Core thermal hydraulics, design aspects, radioactivity generation. Decay heat removal system: Functional requirements, cooling circuits, Design aspects, Loading considerations, Passive features.

UNIT- II:

Reactor structure: Core composition, Reflector, Reactor vessel, Safety vessel, Shielding. Thermal, biological, Shield cooling system, Neutron flux monitoring and control, instrumentations. Moderator system: Materials, Selection, Design consideration, Circuit, Radioactivity aspects. Cover gas system: Purpose, Selection of material, Design considerations, Circuit. Reactor regulating system: Purpose, Methodology, Design considerations, actuating mechanism. Auxiliary cooling circuit: Functions, Design considerations, cooling circuit. Containment and ventilation system: Functions, Types, Arrangement, Design considerations, loading, Testing.

UNIT- III :

ReactorDesign: Principles, Safety classifications, Seismic quality group, Loading considerations under normal operations, anticipated operational occurrences, design basis accidents such as earthquake, loss of coolant accident (LOCA),blackout, flood, missiles, operator error, duel failures as applicable, Safety features for server accidents, standards, soft ware, verifications etc.

UNIT- IV :

Nuclear power plants: Types .Thermal reactors: BWR, PWR, PHWR, GCR, APWR, AHWR etc. Fast reactors Breeders; Fusion power; Off-land NPPs:- space power unit, nuclear ships, submarines. Economics of NPPs: Various costs, ROI, Sizing, Operational characteristics.

UNIT- V :

Radiation protection and Radioactive Waste Management: Radiation hazard, Exposures, Exposure pathways, dose unit, measurement, and radiation protection. CRP and other guidance document etc. Radioactive Waste Management: Waste categorization, Generation, Handling of wastes, Liquid, gaseous and solid, Short term / long term storage / disposed.

Reactor Stages and Safety Assurances- Nuclear safety assurance.

TEXT BOOKS

1. P.K. Nag. Nuclear Power Plant, Power Plant Engg. (Steam & Nuclear)
2. A.K. Raja, A.P. Srivastava & M. Dwivedi, An Introduction on Nuclear Engineering,

REFERENCE BOOKS

1. Glasstone&Sesons- Nuclear Engineering
2. Arora &Domkundwar, A course in Power Plant Engg-

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THERMAL ENGINEERING LAB - A36PC1

B.Tech. III Year I Semester **L/T/P/ C**
0 /0/3/ 2

PRE-REQUISITE: Thermodynamics & Thermal Engineering - I

OBJECTIVE: To understand the working principles of IC Engines, Compressors.

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

Perform any 10 out of the 12 Exercises.

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MACHINE TOOLS LAB - A35PC8

B.Tech. III Year I Semester **L/T/P/ C**
0 /0/3/ 2

OBJECTIVES:

1. To import practical exposure to the Machine tools
2. To conduct experiments and understand the working of the same.

LIST OF EXPERIMENTS:

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper,
2. Planing machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
3. Step turning and taper turning on lathe machine
4. Thread cutting and knurling on -lathe machine.
5. Drilling and Tapping
6. Shaping and Planning
7. Slotting
8. Milling
9. Cylindrical Surface Grinding
10. Grinding of Tool angles.

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B. TECH MECHANICAL ENGINEERING-R17

ENGINEERING METROLOGY LAB - A35PC9

B.Tech. III Year I Semester **L/T/P/ C**
0 /0/3/ 2

PREREQUISITES: Theoretical exposure to Metrology and machine tools.

OBJECTIVES:

1. To import practical exposure to the metrology equipment
2. To conduct experiments and understand the working of the same.

LIST OF EXPERIMENTS:

1. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear.
2. Machine tool alignment of test on the lathe.
3. Tool makers microscope and its application
4. Angle and taper measurements by bevel protractor and sine bars.
5. Use of spirit level and optical flats in finding the flatness of surface plate.
6. Thread measurement by 2-wire and 3-wire methods.
7. Load cell Calibration

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B. TECH MECHANICAL ENGINEERING-R17

THERMAL ENGINEERING-II - A36PC1

B.Tech. III Year II Semester **L/T/P/ C**
4 /1/0/ 4

Note: Steam Table book Permitted.

PRE-REQUISITE: Thermodynamics

COURSE OBJECTIVE:

1. To apply the laws of Thermodynamics to analyze steam and gas turbinecycles and to perform analysis of the major components of steam and gas turbine plants and their applications.

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

1. Develop state – space diagrams based on the schematic diagrams of process flow of steam and gas turbine plants
2. Apply the laws of Thermodynamics to analyze thermodynamic cycles Differentiate between vapour power cycles and gas power cycles
3. Infer from property charts and tables and to apply the data for the evaluation of performance parameters of the steam and gas turbine plants
4. Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components

UNIT – I:

Steam Power Plant: Rankine cycle - Schematic layout, Thermodynamic Analysis, Conceptof 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- Flowthrough 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 ofa 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.

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Parameters ofperformance – Actual cycle – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits- Combustion chambers and turbines of Gas Turbine Plant- Brief Concepts.

UNIT – V:

Jet Propulsion : Principle of Operation –Classification of jet propulsive engines – WorkingPrinciples 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. Thermal Engineering / Mahesh M Rathore/ Mc Graw Hill
2. Gas Turbines – V.Ganesan /Mc Graw Hill
3. Steam tables in SI units with Molier Chart--R.S.Khurmi ,S.Chand publications

REFERENCE BOOKS

1. Gas Turbine Theory/ Saravanamuttoo, Cohen, Rogers/ Pearson
2. Fundamentals of Engineering Thermodynamics / Rathakrishnan/ PHI

T K R COLLEGE OF ENGINEERING & TECHNOLOGY
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B. TECH MECHANICAL ENGINEERING-R17

DESIGN OF MACHINE MEMBERS - II - A36PC2

B.Tech. III Year II Semester. **L/T/P/ C**
4 /1/0/ 4

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

PRE-REQUISITES: Study of engineering mechanics, design of machine members-I and theory ofmachines.

COURSE OBJECTIVES:

1. To gain knowledge about designing the commonly used important machine members such as bearings, engine parts, springs , belts, gears etc.
2. To design the components using the data available in design data books.

COURSE OUTCOMES:

1. Knowledge about journal bearing design using different empirical relations.
2. Estimation of life of rolling element bearings and their selection for given service conditions.
3. Acquaintance with design of the components as per the standard, recommended procedures which is essential in design and development of machinery in industry.

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 – equivalentradial load – design and selection of ball & roller bearings.

UNIT – III:

Engine Parts: Connecting Rod : Thrust in connecting rod – stress due to whipping action onconnecting rod ends –Pistons, Forces acting on piston – Construction, Design and proportions of piston.

UNIT – IV:

Mechanical Springs: Stresses and deflections of helical springs – Extension andcompression springs – Design of springs for fatigue loading – natural frequency of helical springs – Energy storage capacity – helical torsion springs – Design of co-axial springs, 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.

UNIT – V:

Gears : Spur gears& Helical gears- Brief introduction involving important concepts – Designof gears using AGMA procedure involving Lewis and Buckingham equations. Check for wear.

TEXT BOOKS

1**.** Text book of Machine design by R.S. Kurmi and J.K.Guptha; S.Chand publications

2. Text book of Machine design by S.MdJalaluddin ,Anuratha publications

3. Design data Hand book by S.MdJalaluddin , Anuratha publications

REFERENCE BOOKS

1. Design of Machine Elements / Spotts/ Pearson

2. Machine tool design / V. Bhandari / Mc Graw Hill

3. Design of Machine Elements-II / Annaiah / New Age

4. Design of Machine Elements / Sharma and Purohit/PHI

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B. TECH MECHANICAL ENGINEERING-R17

DESIGN OF MACHINE MEMBERS - II - A36PC2

B.Tech. III Year II Semester. **L/T/P/ C**
4 /1/0/ 4

NOTE: Heat Transfer Data Book is permitted.

PRE-REQUISITE: Thermodynamics

COURSE OBJECTIVES:

1. To provide knowledge about application of conduction, convection andradiation heat transfer concepts to different practical applications

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

1. Understand the basic modes of heat transfer.
2. Compute one dimensional steady state heat transfer with and without heat generation Understand and analyze heat transfer through extended surfaces
3. Understand one dimensional transient conduction heat transfer
4. Understand concepts of continuity, momentum and energy equations
5. Interpret and analyze forced and free convective heat transfer
6. Understand the principles of boiling, condensation and radiation heat transfer Design of heat exchangers using LMTD and NTU methods

UNIT – I:

Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer –General discussion about applications of heat transfer.

Conduction Heat Transfer: Fourier rate equation – General heat conduction equation inCartesian, 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 Conduction Heat Transfer: Homogeneous slabs, hollowcylinders, and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation

UNIT – II:

One Dimensional Steady State Conduction Heat Transfer: Variable Thermal conductivity– systems with heat sources or Heat generation-Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internalresistance – Significance of Biot and Fourier Numbers –Infinite bodies- Chart solutions of transient conduction systems- Concept of Semi infinite body.

UNIT – III:

Convective Heat Transfer: Classification of systems based on causes of flow, conditionof flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Theorem and method, application for developing semi – empirical non-dimensional correlation for convection heat transfer –Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations – Integral Method as approximate method -Application of Von Karman Integral Momentum Equation for flat plate with different velocity profiles.

Forced convection: External Flows: Concepts about hydrodynamic and thermal boundarylayer and use of empirical correlations for convective heat transfer -Flat plates and Cylinders.

UNIT – IV:

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

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

Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient andfouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

UNIT - V:

Heat Transfer with Phase Change:Boiling: – Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux andFilm 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 – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– 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 – Dixit /Mc Graw Hill
2. Heat and Mass Transfer / Altamush Siddiqui/ Cengage
3. Heat transfer Data Book- C,P,Kothandaraman and S,Subramanyan, New Age International

REFERENCE BOOKS

1. Heat and Mass Transfer by D.S.Kumar

2.Essential Heat Transfer - Christopher A Long / Pearson

3. Heat Transfer –Ghoshdastida / Oxford

4. Heat and Mass transfer Domakundwar

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B. TECH MECHANICAL ENGINEERING-R17

FINITE ELEMENT METHODS -A36PE5A

B.Tech. III Year II Semester. **L/T/P/ C**
3 /1/0/ 3

Pre-requisites: Mechanics of Solids

Course Objective: The aim of the course is to provide the participants an overview on FiniteElement Method, Material models, and Applications in Civil Engineering.

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

1. Apply finite elementmethod to solve problems in solid mechanics, fluid mechanics and heat transfer.
2. Formulate and solve problems in one dimensional structures including trusses, beams and frames.
3. Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axi-symmetric and plate bending problems.
4. Modeling of engineering systems and Soil–Structure Interaction (SSI).
5. Importance of interfaces and joints on the behavior of engineering systems.
6. Implementation of material model in finite element method and applications

UNIT – I:

Introduction to Finite Element Method for solving field problems.Stress and Equilibrium.Boundary conditions. Strain – Displacement relations. Stress – strain relations.

One Dimensional Problems : 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: Stiffness Matrix for Plane Truss and Space Truss Elements, StressCalculations.

Analysis of Beams: Element stiffness matrix for two node, two degrees of freedom per nodebeam

element, Load Vector, Deflection, Stresses

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 nodedIsoparametric elements and numerical integration.

UNIT – IV:

Steady State Heat Transfer Analysis: one dimensional analysis of Slab, fin and two dimensional analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

UNIT – V:

Dynamic Analysis: Formulation of finite element model, element - Mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar, trussand beam. Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation.techniques such as semi automatic and fully Automatic use of softwares such as ANSYS, NISA, NASTRAN,etc.

TEXT BOOKS

1. Finite Element Methods: Basic Concepts andapplications/Alavala/PHI
2. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu/Pearson

REFERENCE BOOKS

1. An Introduction to the Finite Element Method / J.N.Reddy/ Mc GrawHill
2. Finite Element Analysis / SS Bhavikatti / NewAge
3. Finite Element Method/Dixit/Cengage

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B. TECH MECHANICAL ENGINEERING-R17
REFRIGERATION AND AIR CONDITIONING - A36PE5B

B.Tech. III Year II Semester. **L/T/P/ C**
3 /1/0/ 3

UNIT – I:

Introduction to Refrigeration: -Basic concepts – Unit of refrigeration and C.O.P-refrigerators-heat pump- carnot refrigerator-applications of refrigerator – Vapour compression refrigeration- Ideal cycle -effect of sub cooling of liquid- super heating of vapour-deviations of practical (actual cycle) from ideal cycle- construction and use of P-H chart- problems.

UNIT – II:

Components: Compressors -classification – Working – Advantages and Disadvantages. Condensers – classification – Working Principles Evaporators – classification – Working Principles Expansion devices – Types – Working Principles.

UNIT - III:

Vapor Absorption refrigeration – Description and working of ammonia – water, Li Br – water system – Calculation of HCOP, Principle and operation of three fluid vapour absorption refrigeration system.Air refrigeration- Bell Coleman cycle – open and dente air system – ideal and actual refrigeration – applications – steam jet refrigeration system -working principle – basic operation

UNIT – IV:

Introduction to Air Conditioning:Psychometric Properties & Processes – Sensible and latent heat loads Characterisation – Need for Ventilation, Consideration of Infiltration – Load concepts of RSHF, ASHF, ESHF and ADP.Concept of human comfort and effective temperature -Comfort Air conditioning – Industrial air conditioning and Requirements – Air conditioning Load Calculations.

UNIT – V:

Air Conditioning systems: Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers. Heat Pump – Heat sources – different heat pump circuits Applications

TEXT BOOKS

1. Refrigeration and Air Conditioning / CP Arora / TMH.
2. A Course in Refrigeration and Air Conditioning I SC Arora &Domkundwar / Dhanpatrai.

REFERENCE BOOKS

1. Principles of Refrigeration /Dossat / Pearson Education.
2. Basic Refrigeration and Air-Conditioning/ Ananthanarayanan / TMH.
3. Refrigeration and Air Conditioning/ Manohar Prasadl New Age.
4. Refrigeration and Air Conditioning/Ahmadul Ameen/PHI.

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B. TECH MECHANICAL ENGINEERING-R17
MACHINE TOOL DESIGN- A36PE5C

B.Tech. III Year II Semester. **L/T/P/ C**
3 /1/0/ 3

PRE REQUISITES: Manufacturing process, Tool Materials, Drive units& mechanisms.

COURSE OBJECTIVE:

1. To develop a solution oriented approach by in depth knowledge of Machine Tool Design.
2. To address the underlying concepts, methods and application of Machine Tool Design.
3. To know various interdisciplinary materials machining and Designing

COURSE OUTCOMES:

1. The student can identify different areas of Machine Tool Design.
2. Can find the applications of all the areas in day to day life.
3. Student's gets and basic conceptual knowledge on automation

Unit- I:

Introduction-Calculation Data (Forces, Velocities and Power Requirements during metal cutting): Turning: Cutting force, Cutting Speed and Feed Rate. Drilling: Cutting forces, Cutting Speed and Feed Rate. Milling: Chip Section, Cutting force, Milling with Cutter Heads. Grinding: Grinding Forces, Cutting Speed, Feed Rate, and Depth Setting. Planning, Shaping and Broaching. General Requirements of the Machine Tool: Accuracy of Shape, Dimensional accuracy and surface finish of the components produced. High Productivity.High Technical and Economic Efficiency.

Unit- II:

Design Principles: Stiffness and Rigidity of the Separate Constructional Elements and their Combined behavior Under Load, Static Rigidity, Dynamic Rigidity, Natural frequencies, Damping, Mode of Vibration.. Standardization of Spindle Speeds and Feed Rates: Layout of Speed Change Gears. Saw Diagrams for Arithmetic Progression, Geometric Progression, Harmonic Progression and Logarithmic Progression of spindle speeds for Mechanical Stepped Drives for Machine Tools. Establishment of Gear Ratios, Layout of the Intermediate Reduction Gears, Calculation of Transmission Ratios, Pulley Diameter, Gear Wheel Diameters and Number of Teeth. Ray Diagram. Speed Diagram.

Unit- III:

Electrical, Mechanical and Hydraulic Drives for the Operational Movements: Electric Drive and Control Equipment. Mechanical and Hydraulic Drives. Drives for Producing Rotational Movements, Stepped Drives, Step less Drives. Drives for Producing Rectilinear Movements. Backlash Eliminator in the Feed Drive Nut. Automatic Control: Principles and Constructional Elements. Automatic Driving of the Cutting Movements, Feed Movements, and Return Movements.Automatic control of movements for Starting, Stopping and Reversing. Automatic Clamping and Unclamping the work piece.

Unit- IV:

Automatic Selection of Required Speeds, Automatic Setting of Tools.Automatic Measurement of Machined Shape and Surfaces.Transport of Components from One Machine to the Next.Applications (Examples of Automatic Machines). Control for Moving Slides into Defined, Fixed Positions. Control of Feed Movements in Producing Profiles or Surface by Continuous Path Control. 7. Design of Constructional Elements: Machine Tool Structures, Structural Elements Design for Centre Lathe, Drilling Machine, Knee Type Milling Machine, Planning Machine, Boring Machine, and Grinding Machines.

Unit- V:

Design of Slide Ways: Design of Slide ways for Tables, Saddles and Cross-slides. Antifriction Bearings for slide ways.Hydrostatically Lubricated Slide ways. 9. Design of Spindles and Spindle Bearings: Design of Spindles for Strength and Stiffness. Design of Spindles for Balancing.General Layout and Design of the Driving Elements and the Spindle Bearings.Selection and General Layout of Ball and Roller Bearings for Supporting Spindles. 10. Design of Secondary Drives for Machine Tools: Design of Cutting Drives, Feed Drives and Setting Drives.

TEXT BOOKS

1. Design Principles of Metal-Cutting Machine Tools by F. Koenigsberger
2. Machine Tool Design by N. K. Mehta. McGraw Hill Publishing.
3. Machine tool design by Sen and Bhattacharya, CBS Publications

REFERENCES

1. Machine Tool Design by Acherkan, Mir publishing.
2. Machine Tool Design by S.K, Basu, Oxford and IBH Publishing

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B. TECH MECHANICAL ENGINEERING-R17
INSTRUMENTATION AND CONTROL SYSTEMS -A36PE6A

B.Tech. III Year II Semester. **L/T/P/ C**
3 /1/0/ 3

PRE-REQUISITES: Engineering Physics, Metrology& Surface Engineering

COURSE OBJECTIVES:

1. Identify the various methods of signal transmission and calibration process.
2. understand the equipment used in Temperature measurement (thermocouples), Pressure measurement (bourdon gauges, Dead weight pressure gauge, Bellows gauge, etc.) Level measurement (bubblers, pressure cells, ultrasonic, load cells) Flow measurement (orifice plates, magnitude-flow meters, mass-flow meters, weirs, flumes, etc.)
3. correctly use a range of industrial calibration equipment (current sources, thermocouple and, digital pressure indicator/calibrators)
4. Correctly connect commission and calibrate current loop devices, temperature transmitters, pressure cells, pressure sensors, ultrasonic level meters, load cells.
5. understand the health and safety implications of working with process control systems

COURSE OUTCOMES: Upon completion of the subject, students will be able to

1. Apply acquired engineering knowledge to analyze, assess and solve common process controland instrumentation problems.
2. Use technical literature and other information sources to treat with industrial control and instrumentation engineering problems.
3. Utilize appropriate control engineering and instrumentation documentation and standards.
4. Apply instrumentation principles to specify industrial instruments, for practical engineering processes, situations and problems.
5. Install, configure and operate control and instrumentation equipment.
6. Discuss historical, current, and future technological trends in industrial engineering and Install, configure and operate control and instrumentation equipment.

UNIT—I:

Definition — Basic principles of measurement — Measurement systems, generalized configuration and functional descriptions of measuring instruments — examples.Dynamic performance

characteristics — sources of error, Classification and elimination of error.

UNIT—II:

Measurement of Displacement: Theory and construction of various transducers to measure displacement — Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

Measurement of Temperature: Classification — Ranges — Various Principles of measurement — Expansion, Electrical Resistance — Thermistor — Thermocouple — Pyrometers — Temperature Indicators..

Measurement of Pressure: Units — classification — different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows — Diaphragm gauges. Low pressure measurement — Thermal conductivity gauges — ionization pressure gauges, Mcleod pressure gauge.

UNIT—III:

Measurement of Level: Direct method — Indirect methods — capacitative, ultrasonic, magnetic, cryogenic fuel level indicators — Bubbler level indicators.

Flow Measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot — wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical Tachometers — Electrical tachometers — Stroboscope, Non-contact type of tachometer.

Measurement of Acceleration and Vibration: Different simple instruments — Principles of Seismic instruments — Vibro meter and accelerator meter using this principle.

UNIT— IV:

Stress Strain Measurements: Various types of stress and strain measurements — electrical strain gauge — gauge factor — method of usage of resistance strain gauge for bending compressive and tensile strains — usage for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

Measurement Of Force, Torque And Power: Elastic force meters, load cells, Torsion meters, Dynamometers.

UNIT—V:

Elements of Control Systems: Introduction, Importance — Classification — Open and closed

systems Servomechanisms — Examples with block diagrams — Temperature, speed and position control systems.

TEXT BOOKS

1. Measurement Systems: Applications & Design I D.S Kumar/Anuradha Agencies.
2. Instrumentation, measurement & analysis IB.C.Nakra&K.K.Choudhary/ TMH.

REFERENCE BOOKS

1. Principles of Industrial Instrumentation and Control Systems Chennakesava R Alavala/ Cengage Learning.
2. Instrumentation and Control systems! S.Bhaskar/Anuradha Agencies.
3. Experimental Methods for Engineers / Holman/McGraw Hill.
4. Mechanical and Industrial Measurements I R.K. Jain/ Khanna Publishers.
5. Mechanical Measurements / Sirohi and Radhakrishna / New Age.
6. Instrumentation & Mech. Measurements /A.K. Tayal /Galgotia Publications.

T K R COLLEGE OF ENGINEERING & TECHNOLOGY
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B. TECH MECHANICAL ENGINEERING-R17
NON DESTRUCTIVE TESTING - A36PE7B

B.Tech. III Year II Semester. **L/T/P/ C**
3 /1/0/ 3

PRE-REQUISITE: Destructive Testing, Mechanics of Solids.

COURSE OBJECTIVE: The course should enable the students to:

1. Apply the techniques of surface non destructive techniques testing methods.
2. Apply of ultrasonic, radiographic techniques.
3. Understand advanced NDT technique.
4. Understand the relevant non-destructive testing methods for various engineering practice.

COURSE OUTCOMES:

1. Understand the visual examination techniques in direct and indirect methods for NDT.
2. Remember the various equipment available for the visual inspection and the codes and standards for non-destructive testing.
3. Apply the liquid penetrant test that can be used for effective identification of surface cracks in metals.
4. Apply the codes and standards applicable for the liquid penetrant testing in the classification of NDT.
5. Understand the principle of magnetic particle testing and the advantages and limitations of the magnetic particle testing equipment and process.
6. Understand the principle of ultrasonic testing and identify the suitable methods for conducting nondestructive testing using the ultrasonic testing equipment.
7. Evaluate the interpretation procedures for NDT by ultrasonic testing along with its applications.
8. Understand transmission and pulse-echo methods of ultrasonic testing.

UNIT-I :

SURFACE NDE METHODS: Visual examination, direct and indirect methods, equipment, codes and standards, liquid penetrant testing, variables, interpretation and evaluation of test results, applicable codes and standards, magnetic particle testing, principle, equipment, advantages and limitations.

UNIT -II :

ULTRASONIC TESTING: Principle of ultrasonic testing, methods, equipment, evaluation, interpretation, applications.

UNIT -III :

RADIOGRAPHIC TESTING: Principles, films, radiography equipment, variables, radiographic image quality, techniques, safety.

UNIT -IV :

ADVANCED NDE TECHNIQUES-I: Principle of phase array, technique, equipment, verification of flow existence and position, reporting, application, special radiographic techniques and interpretation of radiography, advantages and limitations.

UNIT –V:

ADVANCED NDE TECHNIQUES-II: Acoustic, emission inspection, principles and applications, leak testing, principles and applications, industrial computed tomography principles and applications.

TEXT BOOKS

1. J. Prasad, C.G.K Nair, ―Non-destructive Test and Evaluation of materials‖, Tata McGraw-Hill, 2nd Edition, 2011. 2.
2. J. Krautkramer, H. Krautkramer, ―Ultrasonic Testing of material‖, Springer, 4th Edition, 1990.

REFERENCE BOOKS

1. B. Raj, T. Jayakumar, M. Thavasinumuthu, ―Practical Non-destructive Testing‖, Alpha science International Limited, 3rd Edition, 2002.

2. R. Halshaw, ―Industrial Radigraphy: Theory and Practice‖, Springer, 2nd Edition, 1995.

3. ASM, ―Non–destructive examination and quality control‖, ASM International, volume17, 9th Edition, 1989.

T K R COLLEGE OF ENGINEERING & TECHNOLOGY
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B. TECH MECHANICAL ENGINEERING-R17
COMPOSITE MATERIALS - A36PE8C

B.Tech. III Year II Semester. **L/T/P/ C**
3 /1/0/ 3

COURSE OBJECTIVE: The prime objective of this course is to introduce, classify, and process composite materials which are novel and widely applied materials. The applications of composite materials that would suit the requirements are also dealt in detail as an integral part.

COURSE OUTCOME: The student will apply the concepts learnt during the course to design, andapply a composite material for a specific application.

UNIT - I:

Introduction: Definition – Classification of Composite materials based on structure andmatrix. Advantages and disadvantages application of composites based on structure –Functional requirements of reinforcement and matrix.Effect of reinforcement (size, shape,distribution, volume fraction) on overall composite performance.

UNIT - II:

Reinforcements: Preparation, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements.Mechanical behavior of composites; Rule of mixtures, Inverse rule of mixtures.Loadingunder Isostrain and Isostress conditions.

UNIT - III:

Manufacturing of Polymer matrix composites; Preparation of Moulding compounds andprepregs – hand lay-up method – Autoclave method – Filament winding method –Compression moulding – Reaction injection moulding. Properties and applications

UNIT - IV:

Manufacturing of Metal Matrix Composites; Casting – Solid State diffusion technique,Cladding – Hot isostatic pressing. Properties and applications polymer composites

UNIT - V:

Manufacturing of Ceramic Matrix Composites; Liquid Metal Infiltration – Liquid phasesintering. Manufacturing of Carbon – Carbon composites; Knitting, Braiding, Weaving.

Properties and applications

TEXT BOOKS

1. Composite Materials – K. K. Chawla
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.
3. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007

REFERENCE

1. Composite Materials Science and Applications – Deborah D.L. Chung
2. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, andStephen W. Tasi

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B. TECH MECHANICAL ENGINEERING-R17

HEAT TRANSFER LAB -A36PC7

B.Tech. III Year II Semester. **L/T/P/ C**
0 /0/3/ 2

PRE-REQUISITE: Thermodynamics

COURSE OBJECTIVES: To enable the student to apply conduction, convection and radiation heat transfer concepts to practical applications

COURSE OUTCOME: At the end of the lab sessions, the student will be able to

1. Perform steady state conduction experiments to estimate thermal conductivity of differentmaterials
2. Perform transient heat conductionexperiment
3. Estimate heat transfer coefficients in forced convection, free convection , condensation and correlate with theoreticalvalues
4. Obtain variation of temperature along the length of the pin fin under forced and free convection
5. Perform radiation experiments: Determine surface emissivity of a test plate and Stefan- Boltzmann's constant and compare with theoreticalvalue

Minimum twelve experiments from the following:

1. Composite Slab Apparatus – Overall heat transferco-efficient.
2. Heat transfer through laggedpipe.
3. Heat Transfer through a ConcentricSphere
4. Thermal Conductivity of given metalrod.
5. Heat transfer inpin-fin
6. Experiment on Transient HeatConduction
7. Heat transfer in forced convectionapparatus.
8. Heat transfer in naturalconvection
9. Parallel and counter flow heatexchanger.

10. Emissivityapparatus.
11. Stefan BoltzmanApparatus.
12. Critical Heatfluxapparatus.
13. Study of heat pipe and itsdemonstration.
14. Film and Drop wise condensationapparatus

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B. TECH MECHANICAL ENGINEERING-R17
CADD and MAT LAB -A36PC8

B.Tech. III Year II Semester. **L/T/P/ C**
0 /0/3/ 2

PRE-REQUISITES:

1. Familiarity with a programming language (Matlab or BASIC).
2. Elementary ordinary differential equations.
3. Elementary linear algebra.
4. Basic principles of descriptive geometry.

COURSE OBJECTIVES: The objectives are:

1. To acquaint the student with some of the terminology in this very new field and relateit to the basic engineering process of design,
2. To provide an introduction to the basic analytical fundamentals that are used to createand manipulate geometric models in a computer program,
3. To introduce the student to full-scale CAD software systems designed for geometricmodeling of engineering components and systems (attention will be directed at bothdrafting and full 3-D modeling systems),
4. To provide experience in using the CAD tools to develop a simple project ofreasonable complexity, and
5. To provide a brief survey of methods for integrating these tools into a comprehensivedesign system that incorporates advanced database management concepts.

COURSE OUTCOMES:

1. Students should be able to apply computer methods for solving a wide range ofengineering problems.
2. Students should be able to use computer engineering software to solve and presentproblem solutions in a technical format.
3. Students should be able to utilize computer skills to enhance learning andperformance in other engineering and science courses.
4. And finally, students should be able to demonstrate professionalism in interactionswith Colleagues, faculty, and staff.

CADD LAB

(Perform Any Six Exercises from Each Laboratory)

List of exercises Using Software Capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems(absolute, relative, polar, etc.) – Creation of simple figures like polygon and generalmulti-line figures.
2. Study of script, DXE & IGES Files.
3. Drawing of a Title Block with necessary text and projection symbol.
4. Drawing of curves like parabola, spiral, involute using B spline or cubic spline.
5. Creations of Shafts, rounds, Chamfers and slots
6. Representation of dimensioning and tolerances scanning and plotting.
7. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone,etc, and dimensioning.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing of front view and top view and side view of objects for the given pictorialviews (eg. V-block, Simple stool, Objects with hole and curves).
10. Drawing isometric projection of simple objects.
11. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from3-D model.
12. Assembling of part models using constraints

MATLAB

1. Write MATLAB commands to analyze arithmetic, logical and Boolean operations.
2. Write MATLAB commands to analyze vector operations and magic matrix's.
3. Write a MATLAB program to demonstrate if and else if statement for comparing Twonumbers.
4. Analyze the following operations in MATLAB.

a) Colon operator b) Line Plotting c) 2D plotting

5. Write MATLAB code to observe Regression and Polynomial functions.
6. Generate an array of random numbers between 1 to 100. Arrange them in

(a) Ascending and descending order

(b) Pick the numbers divisible by 2 using suitable commands.

7. Write a program to multiply 3X3 matrix and obtain inverse of the resultant matrix.
8. Generate an array of random numbers between 1 to 50 and

(a) Convert them into binary numbers

(b) Normalize the numbers between 0 and 1 using suitable formula

9. Write a MATLAB program to generate second order system.

10. 3D surface map for the following function ( ) $g\ Xe\ x2\ y2$ □ □ □
11. Write a MATLAB program to obtain smallest and largest values of integers.
12. Write a MATLAB program to obtain smallest and largest of floating point numbers.

T K R COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

B. TECH MECHANICAL ENGINEERING-R17
ADVANCED COMMUNICATIONS SKILLS LAB-A36HS9

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

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

1. To improve students' fluency in spokenEnglish
2. To enable them to listen to English spoken at normal conversationalspeed
3. To help students develop theirvocabulary
4. To read and comprehend texts in differentcontexts
5. To communicate their ideas relevantly and coherently inwriting
6. To make studentsindustry-ready
7. To help students acquire behavioral skills for their personal and professionallife
8. To respond appropriately in different socio-cultural and professionalcontexts

COURSE OUTCOMES: Students will be able to:

1. Acquire vocabulary and use itcontextually
2. Listen and speakeffectively
3. Develop proficiency in academic reading andwriting
4. Increase possibilities of jobprospects
5. Communicate confidently in formal and informalcontexts

SYLLABUS

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

1. **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 andCollocations.
2. **Reading Comprehension** –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, , Skimming, Scanning,Inferring Meaning.
3. **Writing Skills** – Structure and Presentation of Different Types of Writing – Letter

Writing/Resume Writing/ e-correspondence/ Technical ReportWriting.

4. **Presentation Skills** – Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ e-mails/Assignments…etc.,
5. **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 andProcess,
6. Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

Minimum Hardware Requirement

Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriateacoustics**
- **Eight round tables with five movable chairs for eachtable.**
- **Audio-visualaids**
- **LCDProjector**
- **Public Addresssystem**
- **Computer with suitableconfiguration**

Suggested Software: The software consisting of the prescribed topics elaborated above should be procured andused.

- **Oxford Advanced Learner's Compass**, 8th Edition
- **DELTA's key to the Next Generation TOEFL Test: AdvancedSkill Practice.**

REFERENCES

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