WITH EFFECT FROM THE ACADEMIC YEAR 2015 - 2016

SCHEME OF INSTRUCTION & EXAMINATION

B.E. II YEAR

(Mechanical Engineering & Production Engineering)

SEMESTER - I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	MT 201	Mathematics - III	4	-	3	75	25
2.	ME 201	Metallurgy and Material Science	4	-	3	75	25
3.	ME 202	Machine Drawing	-	6	3	75	25
4.	CE 221	Mechanics of Materials	4	-	3	75	25
5.	CE 222	Environmental Studies	4	-	3	75	25
6.	CM 221	Managerial Economics & Accountancy	4	-	3	75	25
		PRACTICALS					
1.	ME 231	Metallurgy Lab	-	3	3	50	25
2.	ME 232	Computer Drafting Lab	-	2	-	-	25
3.	CE 241	Mechanics of Materials Laboratory	-	3	3	50	25
		TOTAL	**20**	**14**	-	**550**	**225**

SCHEME OF INSTRUCTION & EXAMINATION

B.E. II YEAR

(SERVICE COURSES OFFERED TO OTHER DEPARTMENTS)

SEMESTER - I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	ME 221	Elements of Mechanical Engineering (for ECE)	4	-	3	75	25
2.	ME 222	Elements of Production Technieques (for IE)	4	-	3	75	25
3.	ME 223	Principles of Mechanical Engineering (for EEE)	-	6	3	75	25

MT 201

MATHEMATICS - III

(Common to all Branches except ECE)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To introduce the concepts of Fourier series, partial diferential equations and their applications
2. To provide the knowledge of some probability distributions , tests of significance, curve fitting, correlation and regression

Unit-I

Partial differential equations: Formation of Partial differential equations, Linear first order equations, Lagrange's equation, Non linear first order equations, Charpit's method, Standard forms.

Unit-II

Fourier series and its applications to partial differential equations: Expansion of a function in Fourier series for a given range, Fourier series for odd and even functions, Change of interval, Half range sine and cosine series , Solution of wave equation, Heat equation and Laplace's equation by the method of separation of variables and their use in problems of vibrating string, One dimensional unsteady state heat flow and two dimensional steady state heat flow.

Unit -III

Statistics: Introduction to Probality, Baye's theorem, Random variables, Density functions, Mathematical expectation, Expected values, Moments and Moment generating functions, Characteristic functions.

Unit-IV

Distributions: Poisson, Normal, Gamma and Chi-Square distributions, Tests of significance, Chi-Square, F and t-tests.

Unit-V

Curve fitting: Fitting of curves by the method of least squares (straight line, parabola, exponential curves), Correlation and Regression, Lines of regression.

Suggested Reading:

1. R.K. Jain & S.R.K. lyengar, *Advanced Engineering Mathematics,* Narosa Publications, 4th Edition, 2014.
2. Dr.B.S.Grewal, *Higher Engineering Mathematics,* Khanna Publications, 43rd Edition, 2014.
3. Dr.M.D.Raisinghania, *Ordinary and Partial differential equations,* S.Chand, 17th Edition 2014.
4. Erwin Kreyszig, *Advanced Engineering Mathematics,* 9th Edition, 2012.
5. S.C Gupta, V.K.Kapoor, *Fundamentals of Mathematical Statistics,* S.Chand & Sons.

ME 201

METALLURGY AND MATERIAL SCIENCE

(For Mechanical, Production and AE)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To provide knowledge about material properties, crystal structures and imperfections in materials.
2. To know about fatigue and creep properties and their significance.
3. To provide knowledge about heat treatment and its importance on material properties.
4. To provide the knowledge of extractive metallurgy.

Unit-I

Introduction: Materials and properties, structure of metals-crystal structures and crystal planes, imperfection in crystals, Dislocation in crystals, Types of dislocations, Critical resolved shear stress, Effect of slip and twinning on the plastic deformation, Jogs and its effect on yield phenomenon, Hall-Petch equation, Orange peel effect, cold and hot working, strain hardening and Bauchinger effect, Recovery, Recrystallisation, Grain growth and its effect on mechanical properties of metals. Types of fracture in metals, modes of fracture, Griffith theory of brittle fracture, crack propagation.

Unit-II

Fatigue: S-N curve, Structure of fatigue fracture specimen, Fatigue crack propagation, Effect of metallurgical variables on fatigue of metal, Low cycle fatigue, Cumulative fatigue and fatigue damage, Experimental determination of fatigue strength (RR-Moore Test), Factors to be considered for improvement of the fatigue life.

Creep: Creep Strength, Creep curve, Creep deformation mechanisms, creep test, Difference between creep curve and stress rupture curve. Diffusion: Fick's law of diffusion, Applications of diffusion theory in Mechanical engineering.

Unit-III

Structure of Alloys: Construction and interpretation of Thermal equilibrium diagram of binary nonferrous alloys, study of Eutectic, Eutectoid, Peritectic, Peritectoid reactions, Iron-Iron Carbide.

Equilibrium diagram, Construction and interpretation. Types of Plain Carbon Steels, Cast Iron and their properties and Characteristics.

Alloy Steels: Effects of alloying elements like Nickel, Chromium, Manganese, Silicon, Tungsten, and Titanium.

Unit-IV

Heat Treatment: Annealing, Normalising, Hardening, Tempering, Construction and interpretation of T.T.T Curve. Austempering and Martempering, Case Hardening, Carburising, Nitriding, Carbo-nitriding, Flame Hardening, Induction Hardening, Brief introduction of Age Hardening.

Unit-V

Introduction to Extractive Metallurgy: Method of production of pig iron by blast furnace, Cast iron by Cupola furnace, Method of production of copper and Aluminum, Method of production of steel by Bessemer Converter, L.D. process, Electric Arc process. Modern steel making process by Electric slag refining. **Introduction to powder metallurgy and composite materials.**

Suggested Reading:

1. V. Raghavan, *Material Science and Engineering,* Prentice Hall of india Ltd., 4th Edition. 1994.
2. S.H. Avner, *Introduction to physical metallurgy,* Tata McGraw Hill, 2nd Edn, 1997.
3. S.P. Nayak, Engineering *Metallurgy and Material Science,* Charoter Publishing House, 6th edition 1995.
4. E. Dieter, *Mechanical Metallurgy, Metric Edition,* Tata McGraw Hill, 3rd edn., 1997.
5. Serope Kalpakjian and Steven R-Schmid, *Manufacturing Engineering & Technology,* Pearson, 4th edition, 2006.
6. Sir Alan Cottrell, *An Introduction to Metallurgy,* Universities Press, 2nd edition, 2013.

ME 202

MACHINE DRAWING

(For Mechanical and Production)

Instruction	6 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To understand format of drawing sheet, angle of projections and practice of simple machine elements
2. To practice free hand sketching of machine elements
3. To understand assembly drawings of typical machine parts such as Connecting rod, Eccentric, Cross head, Pipe vice, Screw jack, Swivel bearing, Tail stock etc.

1. **Introduction:**
Format of drawing sheet, title block, conventions of drawing lines and dimensions, First and third angles projections, convention for sectional views. Orthographic projections including sectional views of simple machine elements.

2. **Drawing of Fastners, Joints and Couplings:**
Practice of sketching work: Free hand sketches of typical machine elements for simple cases for riveted and screwed fastenings, joints and coupling. The sketches should be proportionate; Dimensions should be in terms of proportions to the basic size and dia.

3. **Assembly Drawing:**
Preparation of assembly drawings from given details, Ability to supply additional views, the exercises will be drawings of typical machine parts viz., Connecting rod, Eccentric, Cross head, Stuffing box, Pipe vice, Screw jack, Ram's bottom safety valve, Lathe Tool Post, Tail stock, Revolving centre, Pedestal bearing (Plummer block), Swivel bearing .

Note: The test is for the ability of the student to read and interpret drawing.

The drawing should include part list in standard format.

Suggested Reading:

1. N.D. Bhatt, *Machine Drawing,* Charotar Publishing house, Anand, New Delhi, 28th edition, 1994.
2. N. Siddeshwar, *Machine Drawing,* Tata McGraw Hill Publishing Co. Ltd., 5th edition, 1994.
3. Basudeb Battacharayya, *Machine Drawing,* oxford higher education, 1st edition, 2011.
4. K.L. Narayana, P.Kannaiah, K.Venkat Reddy, *Machine Drawing,* New Age International (P) Ltd., 2nd edition 1999.
5. K. C. John, *Text book of Machine Drawing,* PHI Learning, 2010.

CE 221

MECHANICS OF MATERIALS

(For Mechanical, Production and AE)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To understand the basic concept of stresses and strains for different materials
2. To know the mechanism of the development of shear force and bending moment in beams.
3. To know theory of simple bending, direct and bending stresses and distribution of shear stresses.
4. To study the deflections and its applications.
5. To analyze and understand shear stress, torsional stress and spring applications.

Unit-I

Stresses and Strains: Definitions, types of stresses and strains. Elasticity and plasticity. Hooke's law. Stress-strain diagrams for engineering materials. Modulus of elasticity. Poisson's ratio. Relationship between elastic constants. Linear and volumetric strains, Bars of uniform strength. Temperature stresses. Compound bars.

Unit-II

Shear Force and Bending Moment: Bending moment and shear force diagrams for cantilever, simply supported beams and beams with overhangs for point loads and UDL. Relationship between intensity of loading, shear force and bending moment Simple theory of bending. Moment of resistance. Modulus of section.

Unit-III

Deflections: Slope and deflections by the method of double integration in cantilever, simply supported beams and beams with overhangs subjected to point loads and uniformly distributed loads.

Torsion: Derivation of torsion formula for circular sections. Torsion a stresses, angle of twist, power transmission, effect of combined bending and torsion. Close coiled and laminated springs.

Unit-IV

Shear Stresses in Beams: Distribution of shear stresses in rectangular, I-and T-, standard steel and hollow sections. Compound stresses, principal stresses and strains. Mohr's circle of stress.

Unit-V

Cylinders: Stresses in thin and thick cylinders with internal and external pressures. Hoop and longitudinal stresses. Stresses in compound cylinders.

Direct and bending stresses: Core of rectangular, circular, I- and T- sections.

Columns and Struts: Euler and Rankin formulae for axial load applications. Secant and Perry formulae for eccentrically loaded columns.

Suggested Reading:

1. D. S. Prakash Rao, *Strength of Materials,* A Practical Approach, Universities Press, Hyderabad, 1999.
2. G H. Ryder, *Strength of Materials,* Third Edition in SI units, Macmillan India Limited, Delhi, 2002,
3. S. Ramamrutham, *Strength of Materials,* Dhanpat Rai & Sons, 1993.
4. S. S. Bhavakatti, *Strength of Materials,* Vikas Publications, 2003.
5. B. C, Punmia, *Strength of Materials and Theory of Structures,* Laxmi Publications, 1992.

CE 222

ENVIRONMENTAL STUDIES

(Common to all Branches)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To study the sources of water, floods and its impact on environment.
2. To know about the ecosystem and energy resource system.
3. To understand the biodiversity concepts and its advantages.
4. To study different types of pollution and its impact on environment.
5. To know the social and environment related issues and their preventive measures.

Unit-I

Environmental studies: Definition, scope and importance, need for public awareness. Natural resources: Water resources; use and over utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. Effects of modern agriculture, fertilizer-pesticide problems, water logging salinity. Energy resources, growing energy needs, renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

Unit-II

Ecosystems: Concepts of an ecosystem, structure and functions of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

Unit-III

Biodiversity: Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to

biodiversity, endangered and endemic species of India, conservation of biodiversity.

Unit-IV

Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid waste management, Environment Protection Act; Air, water, forest and wild life acts, issues involved in enforcement of environmental legislation.

Unit-V

Social Aspects and the Environment: Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion. Environmental protection act, population explosion.

Disaster Management: Types of disasters, impact of disasters on environment, infrastructure and development. Basic principles of disaster mitigation, disaster management, and methodology, disaster management cycle, and disaster management in India.

Suggested Reading:

1. K. De, *Environmental Chemistry,* New Age Publications, 2002.
2. E. P. Odum, *Fundamentals of Ecology,* W.B. Sunders Co., USA.
3. GL. Karia and R.A. Christian, *Waste Water Treatment, Concepts and Design Approach,* Prentice Hall of India, 2005.
4. Benny Joseph, *Environmental Studies,* TataMcGraw-Hill, 2005
5. V. K. Sharma, *Disaster Management,* National Centre for Disaster Management, IIPE, Delhi, 1999.

CM 221

MANAGERIAL ECONOMICS AND ACCOUNTANCY

(For Mechanical, Production and AE)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To study the basic concepts of economics
2. To know about demand forecasting, markets, competitive structures.
3. To understand the cost analysis cost output relationship -Break even analysis.
4. To study capital budgeting, methods, sources of capital
5. To know the final Accounts with simple adjustments

Unit-I

Evolution of economics- Managerial Economics- nature, scope, importance relation to other sciences, usefulness to engineers and basic concepts.

Unit-II

Demand -concept, determinants, law of demand, elasticity of demand and types, demand forecasting, markets, competitive structures, price – output determination under perfect competition and monopoly (Simple numerical problems can be asked from elasticity of demand)

Unit-III

Firm and Industry, Production function-input put relations-laws of returns internal and external economics of scale, cost analysis, cost concepts, cost output relationship -Break even analysis, (numerical problems can be asked on calculation of P/V ratio, break-even point, margin of safety and their applications, but excluding decision making problems)

Unit-IV

Capital, significance, types, determinants and estimation of fixed and working capital requirements, capital budgeting, methods, sources of capital (numerical problems on evaluation of capital budgeting opportunities with traditional and discounted cash flow methods and on estimating working capital requirements can be asked).

Unit-V

Accounting, principles, Journal, Subsidiary Books, Ledger, Trial balance and Preparation of Final Accounts with simple adjustments. (Numerical problems on preparation of final accounts, cash books, petty cash book, bank reconciliation statement).

Suggested Reading:

1. Varshney R.L, K.L.Maheswari, *Managerial Economics*, Sultan Chand
2. JC Pappas and ef Brigham, *Managerial Economics*.
3. Grawal T.S., *Introduction to Accountancy*.
4. Maheswari, S.N., *Introduction to Accountancy*.
5. Pandey, I.M., *Financial Management*.

ME 231

METALLURGY LAB

(For Mechanical & Production)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

Course Objective:

1. To understand and demonstrate the working principle of the optical microscope.
2. To Know the polishing techniques for the specimen preparation.
3. To know the ferrous and non-ferrous material structure, properties and practical applications.
4. To understand the Heat treatment process of steels.
5. To know the heat treatment methods, TTT curve, its advantages & disadvantages.

1. **Study of:** Metallurgical Microscope, Allotropes of Iron, Iron-Iron Carbide diagram, Procedure of Specimen preparation.
2. **Metallographic study and analysis of:** Steels-Low, Medium, Eutectoid and High Carbon, Stainless, Case carburized and HSS, Cast Irons – White, Gray, Malleable and Spheroidal. Non-Ferrous Alloys-(-Brass, Alloys-α-Brass, α -β Brass, Bronze,
3. **Study of TTT Curve**
   Study of microstructure and measurement of hardness before and after the following processes: Annealing, Normalizing, Hardening, Hardening and Tempering.
4. **Study of Microstructure Characteristics by Image Analyzer.**
5. **Creep Test.**
6. **Fatigue Test.**

Note: Experiments to be carried out in ten sessions.

ME 232

COMPUTER DRAFTING LAB

(For Mechanical, Production and AE)

Instruction	2 Periods per week
Sessional	25 Marks

Course Objectives:

1. To present fundamentals of graphics and drafting appropriate for developing functional skill in computer-aided drafting.
2. To present fundamentals of AutoCAD; drafting and modeling.
3. To introduce mechanical engineering applications of AutoCAD.
4. To teach the basic drawing technique of the components of a mechanical engineering.
5. To teach students the basic building blocks in drafting and designing.

List of Experiments:

1. Introduction to AutoCAD, Setting up drawing environment, navigate the interface, Coordinate system.
2. Use of function keys, object snaps and modify the properties of entities.
3. Exposure to graphic primitives like line, types of lines, polygon, point, plane, circle, arc etc.
4. Experiments with inserting reusable symbols (blocks), adding text, hatching, and dimensions.
5. Preparing a layout to be plotted and use of advanced editing and construction techniques.
6. Setting up layers, styles, templates and using export and import of cad file formats.
7. Use of Draw, modify, dimension and view commands and toolbars.
8. Development of 2D drawings of Automobile engineering components using commands/tool bars.
9. Introduction to wireframe and surface modeling.
10. Introduction to solid modeling. Creating solid primitives, use of Boolean operations for creation of simple auto parts.
11. User coordinate system (UCS)
    Model coordinate system (MCS)

Note: Minimum ten experiments should be conducted in the semester

CE 241

MECHANICS OF MATERIALS LABORATORY

(For Mechanical and Production)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

Course Objectives:

1. To know and understand the experiments on various materials to assess their behavior/ limitations.
2. To know the brittle and ductile material failure patterns etc, by conducting experiments.
3. To understand shear force bending moment and deflections for different types of beams .
4. To know the rigidity modulus by conducting spring and torsion test.

List of Experiments:

Cycle -1

1. Direct tension test on metal rods
2. Young's modulus of metal specimen by direct tension test
3. Brinnel's and Rockwell's hardness tests
4. Compression test
5. Impact test

Cycle - II

1. Test on a helical spring to determine the rigidity modulus.
2. Torsion test to determine the rigidity modulus of a shaft.
3. Deflection test on a cantilever beam to determine the Young's modulus
4. Deflection test on a simple beam to determine the Young's modulus
5. Deflection test on a fixed beam to determine the Young's modulus
6. Fatigue test.

Note: Minimum ten experiments should be conducted in the semester.

ME 221

ELEMENTS OF MECHANICAL ENGINEERING

(For ECE)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To understand the basic concepts of thermodynamics
2. To understand the working principles of Heat exchangers, I.C engines and compressors.
3. To understand the various manufacturing processes
4. To understand the various Refrigeration systems and refrigerants.
5. To familiarize the design and working principles of drives and transmission systems

Unit-I

Thermodynamics: Concept of system, process and properties, laws of thermodynamics, concept of entropy and Clausius inequality, steady flow energy equation for an open system.

IC Engines: Working of four stroke and two stroke petrol and diesel engine with p-V diagrams, valve timing diagram, calculation of indicated power, brake power, specific fuel consumption, mechanical and thermal efficiencies.

Reciprocating Air compressors: work done, efficiency of multistage compressors, effect of clearance volume.

Unit-II

Heat transfer: Basic modes of heat transfer, Fourier's law of conduction, Newton's law of cooling, Stefan-Boltzmann law of radiation and one dimensional steady state conduction heat transfer through plane walls without heat generation.

Heat exchangers: Classification and application of heat exchangers in industry, derivation of LMTD in parallel and counter-flow heat exchangers and problems.

Unit-III

Refrigeration: Types of refrigeration systems- Air refrigeration system, vapor compression system, ammonia-water absorption refrigeration system, thermoelectric refrigeration system, COP and representation of cycle on T-S and H-S diagrams, Types and properties of refrigerants, eco-friendly refrigerants. Introduction to psychrometry and psychrometry processes.

Unit-IV

Basic Manufacturing Processes: Welding, brazing, soldering, brief description of process and parameters, associated principles of gas welding, arc welding.

Casting: Sand casting, die casting, and principles and application.
Forming: Basic concepts of forming processes: Extrusion, rod/wire drawing, Forging and Rolling.

Principles and Applications of basic Machining Processes: Turning, milling and grinding.

Unit-V

Definition of kinematic link and pair, mechanism and machine, **Gears**: Classifications of gears, nomenclature **Gear Trains**: Simple, compound, inverted and epi-cyclc gear trains.

Belt and Rope drives: Open and cross belt drives, length of belt, ratio of tensions of flat belt, condition for maximum power transmission for flat belt.

Suggested Reading:

1. P.N. Rao, *Manufacturing Technology*, Vol. 1 & 2, Tata McGraw Hill publishing co, 2010.
2. Thomas Bevan *Theory of Machines*, CBS Publishers, 1995.
3. R.K. Rajput, *Thermal Engineering*, Laxmi Publications, 2005
4. C. Sachdeva. *Fundamentals of Engineering Heat and Mass transfer*, Wiley Eastern Ltd, 2004
5. Serope Kalpakjain and Steven R. Schmid, *Manufacturing Engineering and Technology,* 4th Edition, Pearson Education, 2013, Noida, India.

ME 222

ELEMENTS OF PRODUCTION TECHNIQUES

(For Instrumentation Engineering)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To know the various manufacturing processes and concepts of casting and joining processes.
2. To understand the various advanced machining methods with applications of numerical controls.
3. To study the need of unconventional machining methods and their application in the manufacturing processes.
4. To understand the basic concepts and classification of metal forming and drawing applications.

Unit-1

Classification and comparison, merits and limitations of manufacturing processes, Criteria for selection of process for manufacturing a product, Casting-sand casting types, procedures to make sand moulds, cores, concept of die casting

Unit-II

Welding: Introduction and classification of welding process, gas welding, arc wielding flux and gas welding, consumable and non-consumable electrodes, resistant, spot and butt welding, Brazing and soldering, brief description of process, parameters, and associated principles

Unit-III

Conventional Machining: General principles, operations (with schematic diagrams) and working of machine tools viz., Lathe, Shaper, Milling, Drilling and drilling machines. Concepts of NC, CNC, DNC and FMS.

Unit-IV

Unconventional Machining Processes: Need for unconventional machining processes, classification, principles, (with schematic diagram) and application of Abrasive Jet Machining, Ultrasonic Machining, Electrical Discharge Machining, Laser Beam Machining and Electron Beam Machining.

Unit-V

Metal Forming: Basic concepts and classification of forming processes, principles, equipment used, application of Forging, Extrusion, Wire drawing, Deep drawing, Rolling and Powder metallurgy.

Suggested Reading:

1. P.N Rao. *Manufacturing Technology*, Vol 1and 2, Tata McGraw Hill Publishing, 2000, New Delhi.
2. Hajra Chowdary, *Elements of Workshop Technology*, Volume-1 and II, Khanna Publishers, 6th Edition, 2004.
3. P.C.Panday and H.S Shart *Modern Machining Processes,* Tata McGraw Hill Pub, 3rd Edition, 2000.
4. V.K. Jain, *Unconventional Machining*, Allied Publishers, 2004.
5. Serope Kalpakjain and Steven R. Schmid, *Manufacturing Engineering and Technology*, 4th Edition, Pearson Education, 2013, Noida, India.

ME 223

PRINCIPLES OF MECHANICAL ENGINEERING

(For EEE)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To understand the applications of Heat transfer in practical situations related to conduction, convection and radiation.
2. To understand the basic principles of refrigeration & Air conditioning and learn their applications.
3. To understand the principles of energy conversion through IC engines, thermal power plants etc with focus on working of individual components of the system.
4. To learn the principles of power transmission through gears with focus on the elements of transmission.
5. To understand the working principles of Hydraulic machinery like turbines & pumps with focus on fluid flow parameters & characteristics.

Unit -I

Laws of Thermodynamics : Steady flow energy equation-conditions of reversible and irreversible process-Modes of Heat transfer conduction and convection, radiation - concept of black body radiation - steady state conduction - Heat transfer through plane walls, cylinders, critical radius of insulation for cylinders.

Heat Exchanger: Classification, Industry applications, LMTD calculations, parallel and counter flows.

Refrigeration System: Types, co-efficient of performance and ton, SVC & air refrigeration and properties of refrigerants, eco friendly refrigerants, Psychrometric Processes for summer and winter A/c only.

Unit -II

Principles of IC Engines: Petrol and Diesel, 2 stroke / 4 stroke and Performance curves, Reciprocating Compressors - concept of multi stage compression, Types, Calculation of mechanical and thermal efficiencies.

Generation of steam: Boilers – Babcock, Sterling, Locomotive, Lancashire, Gas Turbines -classification, constant pressure.

Unit -III

Gears : Classification, Gear trains, types - Single, compound, Inverted & Epicyclic gear trains, Belt & rope drives, open and cross belt, length of belt, ratio of tension flat belts, condition for maximum power.

Unit - IV

Introduction to Bernoulli's equation, applications - Venturi meter, Orifice meter, Flow through pipes - Hagen's formula, Friction loss in pipes, Darcy's formula, Reynolds number and its significance.

Hydraulic Turbines : Classification - working principle - Francis, Kaplan, Pelton Wheels, Work done, power output, efficiency, specific speed, Unit quantities, Draft Tube, Performance characteristic curves.

Unit-V

Pumps: Working principles and construction details of Centrifugal and reciprocating pumps, Effect of friction, acceleration head, work done, power required with and without air vessels, Problems faced in pumps, precaution, cavitation.

Suggested Reading:

1. R.K. Rajput, *Thermal Engineering*, Laxmi Publications, 2005.
2. Thomas Bevan *Theory of Machines*, CBS Publishers, 1995.
3. Yadav, *Steam and Gas Turbines*, Central Publishing House Ltd., 2004.
4. S. Ramamrutham, *Hydraulic Machines*, Dhanpat Rai and Sons, 2004.
5. John J. Uicker. Jr, Gordon R. Pennock, Joseph E. Shigley, *Theory of Machines and Mechanisms,* Oxford Higher Education, 4th edition, 2015.