Faculty of Engineering
Scheme of Instruction and Syllabi

of

BE II - YEAR

OF
FOUR YEAR DEGREE COURSE

IN

MECHANICAL & PRODUCTION ENGINEERING

(With effect from the Academic Year 2015-2016)

July, 2015
Osmania University
Hyderabad - 500 007.

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**

WITH EFFECT FROM THE ACADEMIC YEAR 2015 - 2016

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

d Preparation of Final Accounts with simple adjustments.
l problems on preparation of final accounts, cash books,
book, bank reconciliation statement).

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l Reading:

ney R.L, K.L.Maheswari, *Managerial Economics*, Sultan
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ppas and ef Brigham, *Managerial Economics*.

al T.S., *Introduction to Accountancy*.

swari, S.N., *Introduction to Accountancy*.

y, I.M., *Financial Management*.

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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.

WITH EFFECT FROM THE ACADEMIC YEAR 2015 - 2016

SCHEME OF INSTRUCTION & EXAMINATION

B.E. II YEAR

(Mechanical Engineering & Production Engineering)

SEMESTER - II

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 251	Mathematics - IV	4	-	3	75	25
2.	ME 251	Kinematics of Machines	3	2	3	75	25
3.	EE 221	Electrical Circuits & Machines	4	-	3	75	25
4.	ME 253	Thermodynamics	4	-	3	75	25
5.	EC 222	Basic Electronics	4	-	3	75	25
6.	CE 271	Fluid Dynamics	4	-	3	75	25
		PRACTICALS					
1.	EE 291	Electrical Circuits & Machines Lab	-	3	3	50	25
2.	EC 242	Basic Electronics Lab	-	3	3	50	25
		TOTAL	**23**	**8**	**-**	**550**	**200**

WITH EFFECT FROM THE ACADEMIC YEAR 2015 - 2016

SCHEME OF INSTRUCTION & EXAMINATION

B.E. II YEAR

(SERVICE COURSES OFFERED TO OTHER DEPARTMENTS)

SEMESTER - II

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 271	Part B : Mechanical Technology (for Civil)	3	-	1.30	37	13
2.	ME 272	Thermodynamics & Fluid Mechanics (for IE)	4	-	3	75	25
		PRACTICALS					
1.	ME 291	Mechanical Technology Lab (for IE & EEE)	-	3	3	50	25

MT 251

MATHEMATICS-IV

(For CSE, Mechanical, Production and Automobile Engg.)

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

Course Objectives:

1. To impart the knowledge of essential mathematics tool like functions of complex variables and their properties
2. To introduce the concepts of Z- transforms, Fourier transforms and their properties
3. To introduce a few numerical methods to solve certain types of problems

Unit-I

Functions of Complex variables: Limits and Continuity of function, Analytic functions, Cauchy- Riemann equations , Cartesian and Polar forms, Harmonic functions, Complex integration, Cauchy's theorem, Derivative of Analytic functions, Cauchy's integral formula and its applications.

Unit-II

Residue theory and Transformations: Taylor's and Laurent's series expansions, Zeros and Singularities, Residues, Residue theorem, Evaluation of real integrals using Residue theorem, Conformal mapping, Bilinear transformation.

Unit-III

Z-Transforms: Introduction, Basic Theory of Z-transforms, Z-transform of some standard sequences, Existence of Z-transform, Linearity property, Translation theorem, Scaling property, Initial and Final value theorems, Differentiation of Z-transform, Convolution theorem, Solution of difference equations using Z-transforms.

Unit -IV

Fourier Transforms: Introduction, Fourier integrals, Fourier sine and cosine integrals, Complex form of Fourier integral, Fourier transform, Fourier sine and cosine transforms, Finite Fouriers sine and cosine transforms, Properties of Fourier transforms, Convolution theorem for Fourier transforms.

Unit -V

Numerical Methods: Solutions of Algebraic and Transcendental equations, Bisection method and Newton-Raphson's method , Interpolation, Newton's Forward and Backward difference interpolation , Lagrange's interpolation, Newton's divided difference interpolation, Numerical differentiation, Solution of differential equations by Euler's method and Runge-Kutta method of order four.

Suggested Reading:

1. R.K.Jain & S.R.K Iyengar, *Advanced Engineering Mathematics,* Narosa Publication, 4th Edition 2014.
2. B.S.Grewal, *Higher Engineering Mathematics,* Khanna Publications, 43rd Edition, 2014.
3. Erwin Kreyszig, *Advanced Engineering Mathematics,* 9th Edition, 2012.
4. James Brown and Ruel Churchill, *Complex variables and Applications,* 9th Edition,2013.
5. Vasishtha and Gupta, *Integral Transforms,* Krishnan Prakashan Publications, 2014.

ME 251

KINEMATICS OF MACHINES

(For Mechanical, Production and AE)

Instruction	
Lectures :	3 Periods per week
Drawing / Tutorials :	2 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. To make students understand the basic concepts of mechanisms , inversions and its applications, analyse velocity and acceralations in a given mechanisms
2. To understand the concept of friction and its significance in engineering applications.
3. Student could able to construct a cam profile for a given motion conditions.
4. To make the students to understand gear terminology, significance of gears and different types of gear trains.

Unit-I

Definition of link, element, pair, kinematic chain, mechanism and machine, Grubler's criterion, inversions of quadratic cycle chain, inversions of single and double slider crank chains, mechanism with lower pairs and straight line motion mechanism, Pantograph, Peaucerlier, Hart, Robert's Law Davis and Ackerman's Steering gear mechanisms. Fundamentals of coupler curves, Hooke's law.

Unit-II

Analysis of mechanisms: Graphical methods to find velocities of mechanisms, instantaneous centre, body centrode and space centrode, Kennedy's theorem, Graphical determination of acceleration of different mechanisms including Coriolis component of acceleration. Analytical method to find the velocity and acceleration, Analysis of four bar mechanism with turning pairs. Introduction to type, number and dimensional synthesis.

Unit-III

Laws of Friction: Friction in screw threads, pivots, collars and clutches, friction axis of link and friction circle

Belts and Ropes: Open and closed belt drives, length of belt, ratio of tensions, effect of centrifugal tension and initial tension over power transmission, condition for maximum power

Brakes and Dynamometers: Block or shoe, band and block, internal expanding shoe brake, Prony, Rope brake, belt transmission, Torsion dynamometers.

Unit-IV

Cams: Types of cams and followers, Displacement diagrams for followers, uniform motion, parabolic motion, simple harmonic motion, cycloidal motion drawing cam profile with knife-edge follower, translating roller follower and translating Flat follower, cams of specified contour: Eccentric circle cam with translating flat power, Eccentric circle cam with translating roller follower.

Unit-V

Gears: Classification of gears. Spur gears- Nomenclature, law of gear tooth action, involute as gear tooth profile, interference of involute gears, minimum number of teeth to avoid interference, contact ratio, Cycloidal tooth profile, comparison of involute and cycloidal tooth profile.

Helical gears: Helical gear tooth relations, contact of helical gear teeth. Gear trains- Simple and compound, Reverted, and Epicyclic gear trains.

Suggested Reading:

1. S.S. Rattan, Theory of Machines, Tata McGraw-Hill, 3rd Edition, 2009.
2. J.E.Shigley, Theories of Machines, McGraw-Hill Publications, 2005.
3. Thomas Bevan, Theory of Machines, CBS Publishers, 2005.
4. John J. Uicker. Jr, Gordon R. Pennock, Joseph E. Shigley, Theory of Machines and Mechanisms, Oxford Higher Education, 4th edition, 2015.
5. R.L .Norton, Design of machinery, An introduction to the Synthesis and Analysis, mechanisms and machines, McGraw hill higher education, 3rd edition,2012
6. Lal and Jagadish, Theory of mechanisms and machines, 2009.

EE 221

ELECTRICAL CIRCUITS AND MACHINES

(For CSE, Mechanical and Production Engg.)

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

Course Objectives :

1. To acquire knowledge in electrical circuits.
2. To be able to understand the basic principle operation and performance of electrical machines.

Unit-I

DC & AC Circuits: Analysis of circuits using loop current method, Thevenin's and Norton's theorems, Sinusoidal sources, Phasor representation of sinusoidal quantities, Average and rms values, Active power, Reactive power, Energy stored in inductance and capacitance, Mutual inductance, Dot convention, analysis of simple coupled circuits.

Unit-II

Production of 3-Phase Voltages: Analysis of 3-phase balanced circuits, 3-phase power measurement by two-wattmeter method. Transformers: Principle of transformation of voltages and currents, Equivalent circuit of transformer on no load and load, Efficiency and regulation of transformer, OC and SC tests, Auto-transformer.

Unit-III

DC Machines: Construction and working principle of a DC machine, Production of emf in a generator, Types of excitation, Characteristics of series, shunt and compound motors, Speed control and application of DC motors, Losses and efficiency, three point starter.

Unit-IV

Induction Motors: Production of rotating magnetic field, Construction and principle of operation of induction motors, Speed-torque characteristics, Methods of starting and Speed control of 3-phase induction motors,

Unit -V

Single-Phase & Special Motors: Various types of single phase motors, Spilt phase, Capacitor start and Capacitor run, Basic features of Stepper motor and Brushless DC motor.

Suggested Reading:

1. Naidu M.S. & Kamakshiah S, *Introduction to Electical Engineering,* Tata McGraw Hill, 1995.
2. Jhon Bird, *Electrical Circuit theory and Technology,* Routledge Taylor & Francis Group, Fourth Edition, 2012.
3. Mehtu V.K., *Principles of Electrical Engineering and Electronics,* S.Chand & Co., 1999.
4. A. Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, *"Basic Electrical Engineering"* Tata McGraw Hill Education PVT. LTD., 2009.

ME 253

THERMODYNAMICS

(For Mechanical and Production)

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

Course Objectives:

1. To make students to understand the basic concepts of thermodynamics as an energy approach to a system with their applications.
2. Analyse Laws of conservation of energy as applied to thermodynamic systems.
3. To make students to understand properties of pure substance and their representation and interpretation by graphical representation of pressure, volume, temperature, and enthalpy and entropy.
4. To understand the principles of air standard cycles and their applications.

Unit-I

Introduction: Microscopic and Macroscopic approach of thermodynamics system. surroundings and property, intensive and extensive properties, Measurement of temperature, Zeroth law of thermodynamics, Temperature Scales, ideal gas and ideal gas thermometer, Reversibility and irreversibility quasi– static process, Specific heats for ideal gases, Thermodynamics Equilibrium.

Unit-II

First Law of Thermodynamics: Statement of First Law, Heat and work interactions, Thermodynamics work and Internal energy, Energy as property of system, First Law applicable to Closed system, Thermodynamic processes and calculation of work, Heat transfer, and internal energy, Heat as Path Function, First law analysis of flow processes and limitation, Calculation of work done during flow processes.

Unit-III

Second Law of Thermodynamics: Physical description of second law, Kelvin– Planck and Clausius statement of Second Law of thermodynamics, Equivalence of Kelvin– Planck and Clausius statements, Reversible and irreversible processes, Carnot Theorems, Clausius Inequality, Calculation of entropy change during various thermodynamic processes principle of Entropy increase, T– S diagrams, Available and Unavailable energies in steady flow, Second Law Analysis of Control Volume, Helmholtz and Gibb's functions.

Unit-IV

Thermodynamic properties of Fluids: Properties of pure substances, Concept of phase change, Graphical representation of pressure, Volume and Temperature, (PVT), H-S and T-S diagrams, Properties of steam, Use of steam Tables and Mollier diagram, Thermodynamic relations involving entropy, Enthalpy, Internal Energy, Maxwell relations and Clapeyron equation.

Unit-V

Air standard cycles: Air standard cycles– Otto, Diesel, Dual Combustion Cycle, **Sterling and Rankine cycle.**

Mixture of Gases: Mole fraction and mass fraction, Partial pressure and Dalton's Law, Amagat-Leduc Law of Partial volumes, Relation between partial pressure, mole fraction and volume fraction; Gas Constant, molecular mass and specific heats of the gas mixtures; relation between volumetric and gravimetric analysis.

Suggested Reading:

1. P.K. Nag, *Basic & Applied Thermodynamics,* Tata McGraw Hill, 2nd Edn., 2008..
2. Y.V.C.Rao, *An Introduction to Thermodynamics,* Universities Press, 2nd Edn., 2010.
3. P.L Ballaney, *Thermal Engineering,* Khanna Publishers 2004.
4. E. Radha Krishnan, *Engineering Thermodynamics,* 2002.
5. D. S. Kumar, *Thermal science and Engineering,* 2006.

EC 222

BASIC ELECTRONICS

(For CSE, Mechanical and Production)

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

Course Objectives:

1. Analyze the behavior of Semiconductor diodes in Forward and Reverse bias
2. Design of Half wave and Full wave rectifiers with L,C,LC & CLC Filters
3. Explore V-I characteristics of Bipolar Junction Transistor in CB,CE & CC configurations
4. Explain feedback concept and different oscillators.
5. Analyze Digital logic basics and Photo Electric devices.

Unit-I

Semi Conductor Theory: Energy levels, Intrinsic and Extrinsic Semiconductor, Mobility, Diffusion and Drift current. Hall Effect, Characteristics of P-N Junction diode, Parameters and Applications.

Rectifiers: Half wave and Full wave Rectifiers (Bridge, center tapped) with and without filters, ripple, regulation and efficiency. Zener diode regulator

Unit-II

Bipolar Junction Transistor: BJT, Current components, CE, CB, CC configurations, characteristics, Transistor as amplifier. Analysis of CE, CB, CC Amplifiers (qualitative treatment only).

JFET: Construction and working, parameters, CS, CG, CD Characteristics, CS amplifier.

Unit-III

Feedback concepts: Properties of negative feedback amplifiers, Classification, Parameters.

Oscillators: Barkhausen Criterion, LC Type and RC type oscillators and crystal oscillator. (Qualitative treatment only)

Unit-IV

Operational Amplifiers: Introduction to OP Amp, characteristics and applications - Inverting and Non-inverting Amplifiers, Summer, Integrator, Differentiator, Instrumentation Amplifier.

Digital System : Basic Logic Gates, Half, Full Adder and Subtractors.

Unit-V

Data Acquisition systems: Study of transducer (LVDT, Strain gauge, Temperature, Force).

Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics only.

Display Systems: Constructional details of C.R.O and Applications.

Suggested Reading:

1. Jacob Millman, Christos Halkias, Satyabrata jit, *Electronics Devices and Circuits , McGraw Hill,* 3rd edition, 2010
2. Ramakanth A. Gayakwad, *Op-AMPS and Linear Integrated Circuits,* 4th edition, Prentice Hall of India, 2000.
3. M. Morris Mano, Digital Design, 3rd edition, Prentice Hall of India, 2002
4. William D Cooper, aand A.D. Helfrick, *Electronic Instrumentations and Measurement Techniques,* Pearson/PHI 2007.
5. S. Shalivahan, N. Suresh Kumar, A. Vallava Raj, *Electronic Devices and Circuits,* Tata McGraw Hill, 2003.

CE 271

FLUID DYNAMICS

(For Mechanical and Production)

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

Course Objectives:

1. To know various fluid properties, concept and method of fluid pressure measurement.
2. To understand the basic concepts of fluid motion.
3. To study different equations of fluid motion and fluid dynamics.
4. To analyze different flow characteristics of laminar and turbulent flows.
5. To study the motion of gasses for different conditions of expansion.

Unit-I

Properties of fluids: Definition of fluid and concept of continuum. Fluid properties; pressure, density, specific weight, specific volume, dynamic and kinematic viscosity. Classification of fluids; ideal and real fluids.

Fluid Kinematics: General concepts of path lines, stream lines, streak lines and stream tubes. Classification of fluid flow; steady and unsteady, uniform and non-uniform, laminar and turbulent, rotational and irrotational, one, two and three-dimensional flows. Definition and properties of stream function and velocity potential function.

Unit-II

Fluid Dynamics: Energy of a fluid body, potential energy and potential head, pressure energy and pressure head, kinetic energy and kinetic head, energy equation. Derivation of Euler's and Bernoullis' equations, and their applications. Impulse momentum equation and its applications.

Unit-III

Measurement of Fluid Flows: Measurement of pressure, and use of pressure measuring devices such as manometers, Bourdon's

pressure gauge and transducers. Measurement of velocity, and use of velocity measuring devices such as pitot tube and hot wire anemometer. Measurement of discharge, and use of discharge measuring devices such as venturimeter, orifice meter and rotameter; derivation of relevant formulae. Discharge formulae for weirs and notches.

Unit-IV

Laminar and Turbulent Flow through Pipes: Distinction between laminar and turbulent flows; Reynold's number and its significance. Upper and lower critical values of Reynold's numbers for flow in pipes. Development of laminar and turbulent flow in circular pipes. Hagen-Poisciille equation; frictional losses m pipes. Darcy's equation. Estimation ofDarcy's friction factor. Empirical formulae and Moody's chart.

Boundary Layer Theory: Development of laminar and turbulent boundary layers on a flat plate, pressure gradient, and phenomenon of separation. Fluid flow over an aerofoil, flow around a cylinder at rest, rotational flow around a cylinder at rest, lift and drag forces, and coefficients; circulation and Maimus effect.

Unit-V

Compressible fluid flow: Concepts of compressible flow, continuity, momentum and energy equation of compressible flow. Velocity of sound in compressible and incompressible fluids. Mach Number. Classification of compressible flow; adiabatic flow in perfect gas, stagnation pressure and temperature. Temperature, pressure, density ratios as functions of Mach number.

Suggested Reading:

1. K. L. Kumar, *Engineering Fluid Mechanics.* Eurasia Publishing House 1997.
2. R. K. Rajput, *Fluid. Mechanics and Hydraulic Machines,* S Chand & Co., 2003.
3. P. N. Modi and S. M. Seth, *Hydraulic and Fluid Mechanics,* Standard Book House, Delhi, 1995.
4. V L. Streeter, *Fluid Mechanics.* McGraw-Hill Co. Ltd., 2002.

EE 291

ELECTRICAL CIRCUITS & MACHINES LAB

(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 understand the verification of Thevenin's and Norton's Theorems.
2. To acquire knowledge in electrical circuits.
3. To understand the basic principle operation and performance of electrical machines.

List of Experiments:

1. Verification of Thevenin's and Norton's Theorems.
2. Measurement of Power by Two-Wattmeter Method.
3. Study of Single-Phase R, L & C Series & Parallel Circuits.
4. Study of Self and Mutual Inductance of Coils and their interconnections.
5. Magnetization Curve of a Separately Excited DC Generator.
6. Load Characteristics of a Shunt Generator.
7. Performance Characteristics of a Shunt Motor.
8. Performance Characteristics of a Compound Motor.
9. Performance Characteristics of a Series Motor.
10. Speed Control of DC Shunt Motor.
11. O.C. and S.C. Tests on Single-Phase Transformer.
12. Performance Characteristics of 3-Phase Induction Motor.
13. Speed Control Methods of Induction Motors.

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

EC 242

BASIC ELECTRONICS LAB

(For CSE, Mechanical and Production)

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

Course Objectives:

1. Demonstrate the characteristics of Semiconductor diodes
2. Realize the filters and rectifiers.
3. Verify the characteristics of different transistor Configurations
4. Design of Biasing Circuits for BJT and FET Amplifiers
5. Design different circuits using Operational Amplifiers.

List of Experiments:

1. CRO-Applications, Measurements of R, L and C using LCR meter, Color code method and soldering practice.
2. Characteristics of Semiconductors diode (Ge, Si and Zener)
3. Static Characteristics of BJT-Common Emitter
4. Static Characteristics of BJT-Common Base
5. Static Characteristics of FET
6. RC-Phase Shift Oscillator
7. Hartley and Colpitt's Oscillators
8. Common Emitter Amplifier
9. Astable Multivibrator
10. Full-wave rectifier with and without filters using BJT
11. Operational Amplifier Applications
12. Strain Gauge Measurement
13. Analog-to-Digital and Digital to Analog Converters

Suggested Reading:

1. David Bell A., *Operational Amplifiers and Linear ICS*, PHI, 2005
2. David Bell A., *Laboratory Manual for Electronic Devices and Circuits*, PHI, 2007
3. Boylestad R.L and Nashelsky, *Electronics Devices and Circuit Theory*, PHI, 2006

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

ME 271

PART - B
MECHANICAL TECHNOLOGY
(For Civil Engineering)

Instruction	3 Periods per week
Duration of University Examination	1 & 1/2 Hours
University Examination	37 Marks
Sessional	13 Marks

Course Objectives:

1. To know the working principle of earth moving equipment
2. To study types and working principle of conveying and hoisting equipment
3. To understand the working principle of concrete producing, concrete screening and concrete mixing equipment
4. To know the principle of pneumatic equipment and tools

Unit-I

General description, operation, maintenance and selection of the following: Earth moving and Excavating Equipment: Shovels, Dragline, Clamshell, Cable excavator, Bucket wheel excavator, Tractor, Bulldozer, Scraper, Trenchers, Grader, Earth compactors.

Unit-II

Conveying Equipment: Belt conveyor, Screw Conveyor, Bucket Conveyor, Apron Conveyer, Aerial ropeway

Hoisting Equipment: Hoist winch, Differential and Worm geared chain hoists, Fork lift trucks, Guyed and stiffly derricks, swing and non-swing mobile crane, Whirler, crane, Construction elevator, Passenger lift. Bucket elevators.

Unit-III

Aggregate and Concrete Producing Equipment: Crusher's jaw, Gyratory, Hammer and Roll crusher. Screens-stationary, shaking and vibrating screens, concrete mixers, concrete pumps.

Pneumatic Equipment: Reciprocating air compressor, Construction pneumatic jack hammer, paving breaker, Rock drill, concreter vibrator.

Suggested Reading:

1. R.L. Peurifoy, *Construction Planning Equipment and Methods*, McGraw Hill Publishers, 1956.
2. Mahesh Varma, *Construction Equipment and its Planning and Applications*. Metropolitan Books Co, Delhi, 2004.
3. Goodes Spence, *Building and Civil Engineering Plant,* Crossby Lock Wood, 1995.

ME 272

THERMO DYNAMICS AND FLUID MECHANICS

(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 understand the basic concepts of thermal Engineering
2. To understand design of reciprocating machinery such as IC Engines and Reciprocating air compressors etc.
3. To study the working principles of thermal experiments used in thermal power plants
4. To analyze different flow characteristics of laminar and turbulent flows

Unit-I

Thermodynamics: Zeroth law, First law of thermodynamics, Concept of internal energy and enthalpy, Application to closed and open loop systems, Second law of thermodynamics, Concept of entropy, Clausius inequality and principles of increase in entropy in irreversible process.

IC Engines: Concept of Air standard cycles, Otto, Diesel and Dual combustion cycles. 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.

Unit-II

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

Steam turbines: Classification of steam turbines, velocity diagrams for simple impulse and reaction turbines, problems on work done, blade angles, power and thermal efficiency of the turbine.

Gas turbine: Classification of gas turbine-constant pressure combustion cycle, open cycle, closed cycle and constant volume

combustion gas turbine plants, use of gas turbines, Fuels used and calculation of efficiencies.

Unit-III

Properties of Fluids: Definition of fluid and concept of continuum, fluid properties- density, pressure, specific weight, specific volume, dynamic and kinematic viscosities.

Fluid Kinematics: General concepts of path lines, streak lines, stream lines, stream tubes, classification of fluid flow- steady and unsteady flow, uniform and non-uniform flow, one-two and three dimensional flows.

Definition and properties of stream function and velocity potential function, concept of continuity.

Unit-IV

Measurement of Fluid Flows: Devices used for measurement of pressure, velocity and discharge and derivation of relevant formulae.

Fluid Dynamics: Derivation of Euler's and Bernoulli's equations, and their applications, impulse moment equation and its applications.

Unit-V

Laminar and Turbulent flows through pipes: Distinction between laminar and turbulent flows, Reynolds number and its significance, Critical Reynold's number, laminar and turbulent flow in circular pipes, Hagen Poiseullc equation, frictional losses in pipes, Darcy's equation, estimation of Darcy's friction factor, empirical formulae and Moody chart, Development of laminar and turbulent boundary layer on a flat plate, Dimensional analysis and dynamic similarity.

Suggested Reading:

1. R.K.Rajput, Thermal Engineering, Laxmi Publications, 2005.
2. Modi, P.N. and Seth, S.M., Fluid Mechanics, Standard Book House New Delhi-2004.
3. Streeter, Fluid Mechanics Victor L&Wylie, E.Benjamin 7th Edition.
4. V.Ganesan, Internal Combustion Engines, Tata McGraw Hill Publishing, 5th Edn., 1994.

ME 291

MECHANICAL TECHNOLOGY LAB

(For Instrumentation Engineering & EEE

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

Course Objectives:

1. To gain knowledge on working principle of petrol and diesel engines
2. To understand the working of pressure gauges and other measuring equipment

List of Experiments:

1. Determination of absolute and kinematic viscosity of lubricants
2. Determination of Flash and Fire points of lubricants
3. Valve timing diagram of 1C engine
4. Performance test on multi-cylinder petrol/diesel engine
5. Heat Balance Sheet on IC-engine
6. Performance test on reciprocating air compressor
7. Study and Calibration of pressure gauges
8. Measurement of velocity by pilot tube
9. Measurement of velocity by hot-wire anemometer
10. Measurement of discharge by venture meter
11. Measurement of discharge by orifice meter/rotameter
12. Determination of Reynolds's Number.

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