DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Instruction and Syllabus of

B.E. II YEAR
MECHANICAL ENGINEERING
(With effect from 2012-2013)

UNIVERSITY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Osmania University,
Hyderabad–500 007. (A.P.)

SCHEME OF INSTRUCTION & EXAMINATION

B.E. II-YEAR (MECHANICAL ENGINEERING)

SEMESTER-I

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		SCHEME OF EXAMINATION			Credits
			Periods / week		Duration in hrs.	Max. Marks		
			L + T	D / P		Univ. Exam	Sessional Marks	
THEORY								
1.	ME 201 UE	Metallurgy & Material Science	4	-	3	75	25	4
2.	ME 202 UE	Machine Drawing	2	4	3	75	25	4
3.	ME 203 UE	Thermodynamics	4	-	3	75	25	4
4.	CE 222 UE	Mechanics of Materials	4	-	3	75	25	4
5.	EE 223 UE	Electrical Circuits and Machines	4	-	3	75	25	4
6.	MT 201 UE	Mathematics -III	4	-	3	75	25	4
PRACTICALS								
1.	ME 231 UE	Metallurgy Lab.	-	3	3	50	25	2
2.	CE 241 UE	Mechanics of Materials Lab.	-	3	3	50	25	2
		Total:	22	10		550	200	28

SCHEME OF INSTRUCTION & EXAMINATION

B.E. II- YEAR

SERVICE COURSES OFFERED TO OTHER DEPARTEMNTS

SEMESTER- I

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		SCHEME OF EXAMINATION			Credits
			Periods / week		Duration in hrs.	Max. Marks		
			L + T	D / P		Univ. Exam	Sessional Marks	
THEORY								
1.	ME 221 UE **For CE)**	Section – B Mechanical Technology	2	-	1 1/2	38	12	2

ME 201 UE

METALLURGY AND MATERIAL SCIENCE

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

Objectives:

1. To understand the basic concepts of metallurgy of metals and alloys
2. To know the fundamentals of fatigue, fracture, creep and diffusion
3. To familiarize the principles of heat treatment

UNIT -I

Dislocation in Crystals: Types of dislocations. Effect of dislocation on strength of metals. Grain boundaries, volume defects in crystalline material, Cold and Hot working. Strain Hardening, Recovery, Recrystallization. Grain growth. Grain size and their effect on mechanical properties of metals, Types of fracture in metals, modes of fracture, Griffith theory of brittle fracture, Crack propagation, Ductile fracture, fracture under combined stresses.

UNIT-II

Fatigue: S-N curve, Structure of fatigue fractured specimen, Fatigue Crack Propagation, Effect of metallurgical variables on fatigue of metal, low cycle fatigue, Cumulative fatigue, Experimental determination of fatigue strength. (R.R-Moore Test). **Creep:** Creep strength, Creep curve, Low temperature and High temperature creep, Creep Test. **Diffusion:** Fick's laws of Diffusion, Factors affecting diffusion, Applications of Diffusion theory in engineering.

UNIT-III

Extractive Metallurgy (General and Elementary Treatment Only): Methods of production of Pig Iron, Wrought iron, Cast iron, Steel, Copper and Aluminium. Types of steels- Plain Carbon Steels and their properties. Alloy Steels, Effect of alloying elements like Nickel, Chromium, Manganese, Silicon and Tungsten. Different types of Cast Irons and their properties.

UNIT -IV

Structure of Alloys: Construction and Interpretation of thermal equilibrium diagram of binary non-ferrous alloys. Study of Eutectic, Eutectoid, Peritectic, Peritectoid reactions. Iron-iron Carbide Equilibrium diagram, Construction and its interpretation.

Composites: Classification, preparation and applications

UNIT -V

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

Suggested Reading:

1. Raghavan V, "*Material Science and Engineering*", Prentice Hall of India Ltd., 4th Edition, 1994.
2. Avner S.H, "*Introduction to Physical Metallurgy*", McGraw Hill Publishing Co.Ltd., 2nd Edition, 1974.
3. Nayak S.P, "*Engineering Metallurgy And Material Science"*: Charotar Publishing House, 6th Edn., 1995.
4. Dieter G.E, "*Mechanical Metallurgy*", McGraw Hill Publishing Co., SI Metric Edn., 1988.
5. Raghavan V, "*Physical Metallurgy*", Prentice Hall of India Ltd., 13th Edn., 2002
6. Sir Alan Cottrell, *"An Introduction to Metallurgy*" Universal Press, 2nd Edn., 2009

ME 202 UE

MACHINE DRAWING

Instruction	6 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	4

Objective:

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, Machine vice, Screw jack, Non-return valves, Safety valves, Bearings, Tail stock etc.

UNIT-I

Standard Drawing Practices

Format of drawing sheet, title block, conventions of drawing lines and dimensions. First and third angle projections, convention for sectional views. Views of simple machine elements from the given pictorial and orthographic views.

UNIT II

Machine Elements: Free hand sketching of the following machine elements

Screwed Fastenings: Screw thread nomenclature, thread series, designation, thread profiles, multi start threads, coupler nut, representation of threads, bolted joints, studded joint, eye bolt, Machine Screws and cap screws, and foundation bolts.

Keys, Cotters and Pin Joints: Introduction, saddle keys, sunk keys, round keys, cotter joint with sleeve, cotter joint with socket and Spigot ends, cotter joint with a Gib and knuckle joint.

Shaft Couplings: Rigid couplings, flexible couplings, disengaging couplings and non-aligned couplings. **Riveted Joints:** Introduction, classification of riveted joints, terminology of riveted joints, rivet heads. **Welded Joints:** Introduction, types of welded joints, representation of welds on drawings.

UNIT III

Assembly Drawings

Assembly drawings from given details of component drawings and working description of the assembly. Ability to supply additional views. The exercises will be drawings of typical machine parts, assemblies e.g., Connecting rod, Eccentric, Cross head, Machine vice, Screw jack, Non-return valves, Safety valves, Bearings, Tail stock etc. These are only examples and actual exercise or examination may include any assembly.

Case studies: Study of industrial drawings pertaining to automobile industry, Aero-space and general engineering industries (Each two drawings).

Suggested Reading :

1. Siddeshwar N, Kannaiah P and Sastry VVS, "*Machine Drawing*", Tata McGraw Hill Publishing Co. Ltd., 5th Edition, 1994.
2. Bhatt N.D, "*Machine Drawing*", Charotar Publishing House, Anand, New Delhi, 28th Edition, 1993.
3. Narayan K.L, Kannaiah P, Venkat Reddy K, "*Machine Drawing*", New Age International (P) Ltd., 2nd Edition, 1999.
4. K. C. John, "*Text book of Machine Drawing*", PHI Learning, 2010.

ME 203 UE

THERMODYNAMICS

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

Objectives

1. To understand the basic concepts of thermal engineering.
2. To study the concepts of thermodynamics useful in thermal design of devices/machines employed in industries/other applications.
3. To lays the groundwork for subsequent studies in fields such as Fluid mechanics, Heat transfer, Refrigeration and Air Conditioning, Turbo machinery, Automobile Engineering and Gas Dynamics.
4. To gain the knowledge to effectively apply thermodynamics in the practice of engineering.

UNIT-I

Concepts of System, **surroundings and Universe**. Types of systems. Classification of Properties- fundamental and secondary, intensive and extensive. Temperature Scales. International Practical Temperature Scale (IPTS). Zeroth law and thermodynamic equilibrium.

Ideal Gases- Equation of State. Specific Heats, Enthalpy, Internal energy, & Entropy. Real Gases-vander Waals Equation of State, Compressibility Factor.

Types of thermodynamic processes and their representation of P-V and T-s plots. Types of cycles- Open and Closed

UNIT-II

Forms of Energy. Heat and Work Transfers. First law of thermodynamics. Energy conservation equation for a closed system. Calculation of Work Transfer, Heat Transfer, and Internal Energy changes.

First Law analysis of flow processes. Steady Flow Energy Equation and its applications. Calculation of Work Transfer, Heat Transfer, and Enthalpy changes. Thermodynamic analysis of flow through Nozzles, Diffusers, Turbines, Compressors, Throttling devices and Heat Exchangers.

First law applied to Unsteady flow Processes. Calculation of Heat transfer during charging /evacuation of a Cylinder.

UNIT-III

Carnot Cycle- Efficiency of Carnot Cycle in terms of ratio or temperatures and heat transfers. Applications of Carnot cycle -Heat Engine, Refrigerator and Heat Pump.

Second Law of Thermodynamics: Statements of Second Law of thermodynamics. Equivalence of Kelvin-Planck and Clausius Statements.

Carnot Theorems, Thermodynamic Temperature Scale, Clausius Inequality. Concept of Entropy. Reversible and Irreversible processes. Calculation of Entropy change during various thermodynamic processes.

Principle of Increase of Entropy. Second law analysis of a control Volume. Concepts of Exergy and Anergy. Loss in available energy. Second law efficiency of Turbines and

Compressors
Thermodynamic analysis of Air Standard Cycles- Otto, Diesel, Dual and Joule/ Brayton.

UNIT-IV

Pure Substances. Concept of Phase Change. Graphical representation of thermodynamic processes on P-V, P-T, T-V, T-S, H-S, P-H and P-V-T diagrams. Thermodynamic relations involving Entropy, Enthalpy and Internal Energy. Maxwell's relations. Clapeyron equation.
Properties of Steam- Use of Steam Tables and Mollier diagram.
Power Plant Cycles-Carnot and Rankine Cycles and their representation on P-V, T-S and H-S diagrams. Evaluation of performance parameters–Efficiency, Work ratio, Specific Steam Consumption and Heat Rate.

UNIT-V

Non reactive Ideal homogenous gas Mixtures: Determination of properties of Mixture in terms of properties of individual components of the mixture. Gibbs Phase Rule.
Psychrometry. Moist Air Properties. Use of Psychrometric Chart and Tables.
Concept of Air-Conditioning. Heating, Cooling, Humidification and De-humidification and other psychrometric processes. Adiabatic Mixing of two Streams of Moist Air. Sensible heat factor and Bypass factor for heaters/coolers.
Introduction to summer and winter Air-Conditioning Processes with a brief overview on devices used in Air Conditioning.

Suggested Reading:

1. Yunus A Cengel and Michael A Boles, "*Thermodynamics-An Engineering Approach*", Tata Mc Graw Hill Publishing Company Ltd. ,6th Edn., Fifth Reprint, 2009.
2. Nag P.K, "*Engineering Thermodynamics*': Tata McGraw Hill Publishing, 8th Edn, 3rd Reprint 2010.
3. Nag P.K, "*Basic & Applied Thermodynamics*': Tata McGraw Hill Publishing, 8th Reprint 2006.
4. Richard E.Sonntag, C.Borgnakke, G.J Van Wylen, "Fundamentals of Thermodynamics': John Wiley & Sons, 7th Edn., 2009.
5. Rajput R K, " *Engineering Thermodynamics*" Laxmi Publications, 4th Edition, 2010

CE 222 UE

MECHANICS OF MATERIALS

(For Mechanical Engineering)

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

Objectives:

- To understand the basic concept of stress and strains for different materials
- To know the mechanism of the development of shear force and bending moment in beams
- To know the theory of simple bending, direct & bending stress and distribution of shear stress
- To study the deflections and its applications
- To analyze and understand shear stress, torsional stress and spring applications

Unit – I

Simple stresses and strains: Types of stresses and strains. Hooks's Law, Stress- Strain curve for ductile materials, moduli of elasticity. Poisson's ratio, linear strain, volumetric strain, relations between elastic constants. Bars of varying sections, bars of uniform strength, compound bars and temperature stresses, change in length.

Unit-II

Shear Force and Bending Moment: Relation between intensity of loading. Shear force and bending moment, shear force and bending moment diagrams for cantilever and simply supported beams with and without overhanging for point loads, uniformly distributed loads, uniformly varying loads and couples.

Compound Stresses: Stresses on oblique planes, principle stresses and principle planes. Mohr circle of stress and ellipse o stress.

Unit-III

Theory of simple bending: Assumptions derivation of basic equation: $\boldsymbol{M/I = \sigma/y = E/R}$

Modulus of section, Moment of resistance, determination of flexural stresses.

Direct and Bending Stresses: Basic concepts, core of sections for rectangular, solid and hollow circular and I sections.

Distribution of shear stress: Equation of shear stress, distribution across rectangular, circular, diamond, T and I sections.

Unit-IV

Deflections: Deflections of cantilever and simply supported beams including overhanging beams for point loads and uniformly distributed loads by double integration and Maualay's method.

Strain Energy: Strain energy in bars due to gradually applied loads, sudden loads, impact loads and shock loads.

Unit-V

Torsion-Theory of pure torsion- derivation of basic equation $\mathbf{T/J = y/R = G\theta/L}$ and hollow circular shafts, strain energy- Transmission of power, combined bending and torsion.

Springs: Close and open coiled helical springs subjected to axial loads and axial couples, strain energy in springs- carriage springs.

Suggested Readings:

1. D.S. Prakash Rao, Strength of Materials – A practical Approach, Universities Press, 1999.
2. R.K. Rajput, Strenght of Materials, S. Chand & Co., 2003.
3. B.C. Punmia, Strength of Materials and Theory of Structures, Laxmi Publishers, Delhi, 2000.
4. Ferdinand P Beer et.al., Mechanics of Materials, Tata McGraw-Hill, 2004.
5. G.H. Ryder, Strength of Materials, Third Edition in SI units, Macmillan Indian Limited, Delhi, 2002.
6. S. Ramamrutham, Strength of Materials, Dhanpat Rai & Sons, 1993.
7. S.S. Bhavakatti, Strength of Materials, Vikas Publications, 2003.

EE 223 UE

ELECTRICAL CIRCUITS AND MACHINES

(For Mechanical Engineering)

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

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 Circuits: Ohm's law, Network elements, Kichhoff's laws, Power in DC circuits, Series & parallel resistances, Thevinin's and Norton's theorems.

AC Circuits: Sinusoidal sources, Phasor representation of sinusoidal quantities, Average and RMS values, Form factor, Analysis of RLC circuits to sinusoidal inputs, Power factor, Active & reactive powers, energy stored in inductance and capacitance, Mutual inductance.

UNIT II

Three-Phase Circuits: Production of 3-phase voltages, balanced star and delta connections, Measurement of power by Two-wattmeter method.

Single Phase Transformers: Principle of operation, Transformer on No-load and Load, Equivalent circuit, Efficiency & regulation, O.C and S.C tests, Principle of autotransformer.

UNIT III

DC Machines: Construction and working principle, EMF in generator, Types of excitation, Characteristics of series and shunt generators, Applications, Torque in a DC motor, Characteristics of shunt and series motors, Speed control of dc shunt motors, Losses & efficiency, Three point starter.

UNIT IV

Three-Phase Induction Motors: Production of rotating magnetic field, Construction and principle of Induction motors, Torque-slip characteristics, Star delta and Autotransformer starters, Speed control by Stator voltage and Rotor resistance methods.

UNIT V

Single-Phase Motors: Capacitor start and Capacitor run motor, Universal motors.

Three - Phase alternators: Construction, emf equation, Regulation by synchronous impedance method.

Suggested Reading:

1. Naidu M.S. & Kamakshiah S, "*Introduction to Electrical Engineering*", Tata McGraw Hill, 1995
2. Mehta V.K., "*Principles of Electrical Engineering and Electronics*", S.Chand & Co., 1995
3. A.Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "*Basic Electrical Engineering*" Tata McGraw Hill Education PVT LTD, 2009

MT 201 UE

MATHEMATICS -III

(Common to All Branches)

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

Objectives:

1. To introduce Laplace transforms, Functions of Complex Variables, the power series expansions, bilinear transformation and conformal mapping.
2. To introduce and discuss various numerical methods like solving of Algebraic and Transcendental equations , interpolation, numerical differentiation, and solutions of ordinary differential equations.
3. To Introduce Normal and χ^2 distributions, and the tests of significance, i.e t-test, F- test and χ^2 test.

UNIT- I

Laplace transformation: Introduction of Laplace transforms, sufficient condition for existence of Laplace transform, Laplace transform of Derivatives, Laplace transform of integrals, Translation theorems (I & II shifting theorems), Differentiation of Laplace transform (Multyplication by t), Integration of Laplace transform(Division by t), convolution theorem, Solving initial value problems using Laplace transform.

UNIT-II

Functions of Complex Variables: Limits and continuity of function, differentiability and analyticity, necessary & sufficient conditions for a function to be analytic,Cauchy- Reimann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiply connected regions, Cauchy's integral formula, Cauchy's formula for derivatives and their applications.

UNIT-III

Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, bilinear transformation, conformal mapping.

UNIT-IV

Numerical methods: Solution of Algebraic and Transcendental equations-Bisection method, Regula falsi method, Newton-Raphson method, Solution of linear system of equations, Gauss elimination method, Gauss-Seidel iteration method, Interpolation, Lagrange's interpolation, Newton's divided difference interpolation, Newton's Forward and Backward difference interpolations, Numerical differentiation, Interpolation approach, Numerical solutions of ordinary differential equations , Taylor's series method, Euler method, Runge-Kutta method of 4^{th} order.

UNIT-V

Probability and Statistics: Introduction to distributions, Normal and χ^2 distributions, Tests of significance, t-test, F- test, χ^2 test.

Suggested Reading:

1. R.K. Jain & S.R.K. lyengar, Advanced Engineering Mathematics, Third Edition, Narosa Publications, 2007.
2. Higher Engineering Mathematics, H.K. Dass, Er. Rajnish Verma 2011 Edition S.Chand & company Ltd.
3. Kreyszig E, Advanced Engineering Mathematics, 8 th Edition, John Wiley & Sons Ltd, 2006.
4. R.V. Churchill, "Complex Variables & its applications".Mc Graw-Hill Book Company, INC
5. Higher Engineering Mathematics , Dr.B.S Grewal 40^{th} Edition, Khanna Publishers
6. A text book of Engineering Mathematics by N.P.Bali & Manish Goyal, Laxmi Publication.

7. Probability and Statistics by Dr.M. Venkata Krishna.
8. Calculus of finite differences and Numerical Analysis by Dr. P.P Gupta and Dr.G.S. Malik, Krishna prakasham Media.

ME 231 UE

METALLURGY LABORATORY

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Objectives:

1. To familiarize the procedure for specimen preparation
2. To prepare different metal specimen for identification
3. To study the microstructure of metals and alloys
4. To understand the heat treatment procedures
5. To study the microstructure after heat treatment

List of Experiments:

1. Study of: Metallurgical Microscope
   Iron-Iron Carbide diagram
   Procedure for specimen preparation
2. Metallographic Study of Pure Iron
3. Metallographic Study of Low carbon steel
4. Metallographic Study of Medium carbon steel
5. Metallographic Study of Eutectoid steel
6. Metallographic Study of Hyper Eutectoid steel
7. Metallographic Study of Wrought iron
8. Metallographic Study of Grey cast iron
9. Metallographic Study of White cast iron
10. Metallographic Study of Black heart Malleable cast iron
11. Metallographic Study of white heart Malleable cast iron
12. Metallographic Study of Brass and Bronze
13. Study of microstructure after hardening, normalizing and annealing of steel specimen.

Note: *At least ten experiments should be conducted in the Semester*

CE 241 UE

MECHANICS OF MATERIALS LABORATORY

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Objectives:

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

Cycle – I

1. Direct tension test on metal bars
2. Young's modulus of metal specimen
3. Harness tests: Brinell and Rockwell
4. Compression test on bricks
5. Impact test
6. Shear force and bending moment tests

Cycle – II

7. Spring test
8. Torsion test
9. Bending test on simply supported beam
10. Bending test on continuous beam
11. Bending test on fixed beam
12. Curved beam

Note: *At least ten experiments should be conducted in the Semester*

ME 221 UE

SECTION - B
MECHANICAL TECHNOLOGY

Instruction	2 Periods per week
Duration of University Examination	1½ Hours
University Examination	38 Marks
Sessional	12 Marks
Credits	2

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 and Selection of the following: Earth moving and Excavation Equipment -Shovels, Dragline, Clam shell, Cable Excavator, Bucket Wheel Excavator, Tractor, Bull -dozer, Scraper, Earth compactors.

UNIT-II

Conveying Equipment: Belt Conveyor, Screw Conveyor, Bucket Conveyor, Aerial ropeway, **Hoisting Equipment:** Hoist Winch, Differential and Worm geared chain hoists. Fork lift truck, Guyed derricks, Swing and non-swing mobile crane, Whirler crane, Tower crane.

UNIT -III

Aggregate and Concrete Producing Equipment: Crushers, Jaw, Gyratory, Hammer and Roll crushers; **Screens**: Stationary, Revolving, Shaking and Vibrating screens. Concrete mixers, Concrete pump. **Pneumatic Equipment:** Reciprocating air-compressor.
Construction of pneumatic tools: Jack hammer, Paving breaker, Concrete vibrator.

Suggested Reading:

1. Peurifoy R.L, "*Construction Planning, Equipment and Methods*", McGraw Hill 6th Edn., 2008.
2. Spence G and Wood C.L, "*Building and Civil Engineering Plant'*: John-Wiley & Sons, 2nd Edn., 2004.
3. Mahesh Varma Dr, "*Construction Equipment & its Planning & Application'*: Metropolitan Book Co., 3rd Edn., 2009

SCHEME OF INSTRUCTION & EXAMINATION

B.E. II-YEAR (MECHANICAL ENGINEERING)

SEMESTER-II

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		SCHEME OF EXAMINATION			Credits
			Periods / week		Duration in hrs.	Max. Marks		
			L + T	D / P		Univ. Exam	Sessional Marks	
THEORY								
1.	ME 251 UE	Applied Thermodynamics	4	-	3	75	25	4
2.	ME 252 UE	Kinematics of Machines	4 + 1	-	3	75	25	4
3.	ME 253 UE	Manufacturing Processes	4	-	3	75	25	4
4.	CE 271 UE	Fluid Dynamics	4	-	3	75	25	4
5.	EC 273 UE	Applied Electronics	4	-	3	75	25	4
6.	MT 251 UE	Mathematics-IV	4	-	3	75	25	4
PRACTICALS								
1.	EE 241 UE	Electrical Engineering Lab.	-	3	3	50	25	2
2.	EC 292 UE	Applied Electronics Lab.	-	3	3	50	25	2
		Total:	24 + 1	6	-	550	200	28

SCHEME OF INSTRUCTION & EXAMINATION

B.E. II- YEAR

SERVICE COURSES OFFERED TO OTHER DEPARTEMNTS

SEMESTER- II

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		SCHEME OF EXAMINATION			Credits
			Periods / week		Duration in hrs.	Max. Marks		
			L + T	D / P		Univ. Exam	Sessional Marks	
THEORY								
1.	ME 271 UE **(For EEE)**	Prime Movers and Pumps	4	-	3	75	25	4
PRACTICALS								
1.	ME 291 UE **(For EEE)**	Prime Movers and Pumps Lab	-	3	3	50	25	2

ME 251 UE

APPLIED THERMODYNAMICS

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

Unit-I

Reciprocating Air Compressors: Classification and applications. Ideal and actual P-V diagrams, work input and efficiency relations for single and multi stage compressors. Effect of clearance volume on work input and efficiency. Inter cooling and after cooling concepts.

Unit-II

Internal Combustion Engines: Classification and applications. Working principles of four stroke and two stroke engines, Spark Ignition and Compression ignition engines. Deviation of actual cycles from Air Standard cycles. Performance parameters of I.C. Engines. Heat balance sheet of I. C. Engine.

Overview of Engine supporting systems- Cooling Systems, Lubrication systems- Wet sump, Dry sump and Mist Systems. Working principles of S.I. Engine fuel systems- Carburetors, Battery and Magneto Ignition systems. Working principles of C.I. Engine fuel systems- Fuel pump and Fuel injector.

Unit-III

I.C. Engine Combustion phenomena: Stages of combustion in S.I.Engines- Ignition delay, Flame front propagation and After burning. Abnormal combustion- Pre-ignition and Knocking.

Factors affecting Knocking. Stages of combustion in C.I. Engines, Delay period, Period of Uncontrolled Combustion, Period of Controlled Combustion and after burning. Abnormal Combustion-Knocking. Factors affecting Knocking. Octane and Cetane rating of fuels.Design considerations for combustion chamber and cylinder head. Type of combustion chambers of S.I. engines and C.I. engines.

Unit-IV

Steam Boilers: Classification and Working Principles. Water tube boilers- Babcok & Wilcox and Stirling boilers. Fire tube boilers- Cornish, Cochran, Locomotive and Lancashire boilers. High Pressure boilers- La mont, Benson boiler, Loeffler boiler and Velox boiler.

Boiler Mountings and Accessories: Working Principles of Water level indicator, Pressure gauge, Steam stop valve, Feed check valve, Blow-off cock, Fusible plug, Safety valves, Economizers, Superheaters and Steam separator. Steam Condensers: Jet and Surface condensers, Principle of Operation and Applications.

Unit-V

Steam power plant cycles: Carnot and Rankine cycles of operation and their efficiencies. Analysis of Rankine cycle with reheating and regeneration. Steam Nozzles: Flow of steam through convergent - divergent nozzles, velocity of steam flowing through the nozzle, mass of steam discharge through the nozzle, condition for maximum discharge, critical pressure ratio and nozzle efficiency. Super saturated expansion of steam through nozzles. General relationship between area, velocity and pressure in Nozzle flow.

Suggested Reading

1. R.K. Rajput, "Thermal Engineering, Laxmi Publications, 6th Edn., 2006
2. P.L. Ballaney, "Thermal Engineering", Khanna Publishers, 19th Edn., 1993.
3. V. Ganesan, "Internal Combustion Engines", Tata McGraw Hill Publishing, 5th Edn., 1994.
4. Richard Stone, “Introduction to I.C. Engines”, Mac Millan, 2nd Edn., 1997

ME 252 UE

KINEMATICS OF MACHINES

Instruction	4+1 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	4

Objectives

1. To understand the basic elements of machinery and their motion characteristics
2. To know the kinematic properties of mechanisms and machines
3. To understand basic machine elements
4. To know classification and applications of cams, gears and gear-trains

UNIT-I

Definitions of link, pair, chain mechanism, degrees of freedom, Kutzbach's and Grubbler's criterion. Grashof's Law, Inversions of four bar mechanisms with all revolute joints, single and double slider crank mechanisms. Instantaneous Centre, Space Centrode and Body Centrode, Kennedy Theorem. Definitions and scope of Type, Number and Dimensional Synthesis. Pantograph and Geneva mechanisms. Ackerman and Davis steering gear mechanisms and Hooke's Joint. Peaucellier, Hart, Scott-Russel, Watt and Tchebicheff mechanisms.

UNIT-II

Analytical method to find velocities and accelerations in mechanisms. Velocities in mechanisms by instantaneous centre method, velocity and acceleration of mechanisms by using relative velocity method including Coriolis component of acceleration.

UNIT- III

Law of friction. Screw threads, Pivots, Collars. Clutches -Single and Multi plate, Cone and centrifugal clutches. Friction circle and friction axis of a link. Belt, Rope, Chain and drives.

UNIT-IV

Brakes and Dynamometers: Block or shoe, band, band and block, internal expanding shoe brakes. Rope brake and Belt transmission, Dynamometers. Types of Cams and followers, motion of the follower, follower displacement diagram, Cam profile for specified follower motion and Cams with specified contours.

UNIT-V

Theory of Gearing, Terminology and Definitions, Law of Gearing, Tooth profiles, Path of contact and Arc of contact. Interference, methods of avoiding interference. Contact Ratio. Introduction to Helical, Bevel and worm gears.

Gear Trains: Simple, Compound, Reverted and Epicyclic gear trains. Differential of an Automobile.

Suggested Reading:

1. J. E. Shigley and John J. Uicker "Theory of Machines and Mechanisms", Tata McGraw Hill, 2nd Edn., 1995.
2. Thomas Bevan, "Theory of Machines", College Book Store (CBS) Publishers Ltd., 3rd Edn., 1985.
3. S.S. Rattan, "Theory of Machines", Tata McGraw Hill, 3rd Edn., 1995.
4. J.S. Rao and R.V. Dukkipati, "Mechanisms and Machine Theory", Wiley Eastern Limited, 1992.
5. Amitabha Ghosh and Ashok Kumar Mallik, Theory of Mechanisms and Machines, East West Press Pvt. Ltd, 2008

ME 253 UE

MANUFACTURING PROCESSES

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

Objectives

1. To know the various manufacturing processes
2. To understand the basic concepts of casting and welding
3. To understand the manufacturing of plastics and composites
4. To familiarize the forming processes and forming load estimation.
5. To understand the principle of high energy rate forming processes

UNIT-I

Moulding Sands, Properties of sands, Testing of Sand properties and their improvements. Types of patterns and pattern materials, Pattern allowances. Core sands, core sand properties and core making processes. Machine Moulding techniques. Riser and Riser size estimation-Chvorinov and Caine's rules. Types gates and components of gating system. Directional solidification.

UNIT-II

Introduction to Furnaces: Cupola, Arc and Induction. **Special Casting Processes:** Shell Mould Casting, Co_2 Casting, Investment Casting, Gravity and Pressure Die Casting, Centrifugal Casting and Continuous Casting. Cleaning of Castings, Casting defects and their Causes.

Processing of Plastics: Blow molding, Injection molding, Reaction injection molding, Rotational molding and Extrusion. **Processing of Composites:** Hand lay-up, Filament winding, Compression moulding. Introduction to MEMS.

UNIT-III

Welding Classification, Oxy-Acetylene Welding-Basic set up, Welding and Cutting Torches, Types of Flames. Arc Welding - Energy sources, Polarity effect, starting of Arc. Flux and Gas Shielding, Arc Blow, Electrode Coating types, Electrode Specifications. **Arc Welding Processes:** Schematics of SMAW, GTAW, GMAW, PAW, SAW, LBW and EBW.

UNIT - IV

Resistance Welding: Spot, Seam, Projection and butt welding, Flash welding. **Solid State Welding:** Pressure Welding, Ultrasonic Welding, Friction welding and Explosive welding. Basics of soldering, brazing and adhesive bonding.

Powder Metallurgy: Powder production methods, steps in powder metallurgy processes, cold and hot isostatic pressing, typical industrial applications.

UNIT-V

Mechanism of Plastic Deformation, Definitions of Cold, Hot and Warm Working, Yield Criteria, Metal Working Presses. Sheet Metal Working: Geometry of Punch and Die for Blanking/Piercing operations, Cup Drawing, Strip Layout, Force Calculations. Metal spinning. **Bulk Deformation Processes:** Simple Estimation of Forces in Forging, Rolling, Rod Drawing and Extrusion. Hydrostatic Extrusion. High Energy Rate Forming-Explosive forming, Magnetic forming, Electro-hydraulic forming and Rubber pad forming.

Suggested Reading:

1. P.N.Rao, "*Manufacturing Technology*," Vol. 1, Tata McGraw Hill Publ., 3nd Ed., 2011.
2. Amitabh Ghosh & Mallick, "*Manufacturing Science"*, Assoc. East west Press Pvt. Ltd. 4th Ed., 2011.
3. Serope Kalpakjian, "*Manufacturing Engineering and Technology"*, Addison, Wesley Publishing Company, 2006
4. George.E. Dieter, *Mechanical Metallurgy*, SI Metric Edition McGraw-Hill Book Company,
5. Kaushish J.P, "*Manufacturing Processes"*, PHI Learning Pvt. Ltd., 2nd, 2010

CE 271 UE

FLUID DYNAMICS

(For Mechanical Engineering)

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

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 gases for different conditions of expansion

UNIT-I

Properties of Fluids: Introduction, definition of luid, Units of measurement, Fluid Properties- mass density, specific weight, specific gravity, Viscosity, Newton's law of viscosity – Newtonian and non Newtonian fluids. Classification of fluids- Ideal and real.

Fluid Kinematics: Fundamentals of fluid flow –types of fluid flow, description of flow pattern, basic principles of fluid flow, continuity equation, acceleration of a fluid particles.

UNIT-II

Fluid Statics: Fluid pressure at a point, variation of Pressure in a fluid, measurement of Pressure-simple manometers, differential manometers.

Fluid dynamics: Introduction, forces acting on a fluid in motion, Euler's equation of motion, Bernoulli's equation, application of Bernoulli's equation – venturimeter, pilot tube. Impulse momentum equation, application of impulse momentum equation – Forces on a pipe bend.

UNIT-III

Flow through pipes: Introduction, two types of flow – laminar and turbulent – Reynold's experiment. Laws of fluid friction, Darcy- Weisbach equation. Steady laminar flow- circular pipes – Hagen-Poiscuille's law. Hydrodynamically smooth and rough boundaries and it's criteria and resistance to flow of fluid in smooth and rough boundaries – variation of friction factor.

UNIT-IV

Boundary layer theory: Introduction, thickness of boundary layer, boundary layer along a flat thin plate and its characteristics. Laminar and turbulent boundary layer, laminar sub layer, separation of boundary layer and its control.

Fluid flow around submerged objects: Drag and lift – Introduction, types of drag, drag on a flat plate. Development of lift on immersed bodies – lift of an airfoil.

UNIT-V

Flow of compressible fluids: Introduction, concepts of compressible flow, continuity and energy equation, propagation of elastic waves due to compression of fluid, velocity of sound, Mach number and its significance, propagation of elastic waves due to disturbance of fluid stagnation properties, area velocity relationship for compressible flows.

Suggested Reading:

1. K.Subramanya,Theory and Applications of fluid Mechanics, Tata McGraw-Hill Publishing Company Ltd., New Delhi,1993.
2. Vijay Gupta and Santhosh K. Gupta, Fluid Mechanics and its applications, wiley Eastern Ltd.,New Delhi,1984.
3. K.L.Kumar, Engineering Fluid Mechanics, Eurasia Publishing House PVT Ltd, New delhi,2009.
4. P.N.MOdi,and S.M.Seth., Hydralics and Fluid Mechanics, Standard Book House, 1995.
5. Fluid Mechanics & Hydraulic Machines, S.C. Gupta, Pearson Publishers.

EC 273 UE

APPLIED ELECTRONICS

(For Mechanical Engineering)

Instruction	4 periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	4

Objectives:

1. To understand the characteristics of diodes and transistor configurations
2. To understand the design concepts of biasing of BJT and FET
3. To understand the design concepts of feedback amplifiers and oscillators
4. To study the design concepts of OP Amp and data converters

Unit I

Characteristics of PN Junction: Half wave rectifier, Full wave rectifier, filters, ripple, regulation, TIF and efficiency, Zener diode and Zener diode regulators. CRT construction and CRO applications

Unit II

Bipolar and Field Effect Transistors : Biasing FET , small signal model, h-parameter equivalent circuits, basic amplifier circuits-CB,CE,CC configurations of BJT and CG,CS and CD configurations of FETs, RC-coupled amplifier and its frequency response.

Unit III

Feedback Concepts: Types of negative feedback-modification of gain, bandwidth, input and output impedances-applications; Oscillators: RC phase shift, Wienbridge, LC and Crystal Oscillators.

Unit IV

Operational Amplifier: Characteristics, applications, Differential amplifiers, logic gate circuits-Introduction to Digital Systems-AND,NAND,NOR,XOR gates, Binary half wave adder, full adder, Multi-vibrators-Bi-stable, Mono-stable and Astable Multi-vibrators (Qualitative treatment only)-Schmitt trigger.

Unit V

Data Acquisition Systems: Construction and Operation of transducers-Strain gauge LVDT, Thermocouple, Instrumentation Systems, Magnetic tape recorders, FM recording, Digital recording, Digital to Analog and Analog to Digital conversions.

Suggested Reading:

1 Robert Boylestad L. and Louis Nashelsky, *Electronic Devices and Circuit Theory*, Prentice Hall of India , 2007

2 Helfrick D and David Cooper, *Modern Electronic Instrumentation and Measurements Techniques,* 1st edition, Prentice Hall of India, 2006.

3 Salivahanan, Suresh Kumar and Vallavaraj, *Electronic Devices and Circuits,* 2nd edition, Tata McGraw-Hill, 2010.

MT 251 UE

MATHEMATICS-IV

(ECE, CSE and ME)

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

Objectives:

1. To introduce the student, the expansion of periodic functions, and their applications.
2. To introduce the methods of forming and solving Partial differential equations, Also Z- Transforms
3. To introduce basic statistical methods like curve fitting, correlation and regression.

UNIT –I

Fourier series and Fourier transforms: Fourier series, Fourier series expansions of even and odd functions, convergence of Fourier series, Fourier half range series, Fourier transforms, inverse Fourier transforms, Fourier cosine & sine transforms.

UNIT –II

Partial differential equations: Formation of first and second order partial differential equations, solution of first order equations, Lagrange's equation, Nonlinear first order equations, Charpit's method, higher order linear equations with constant coefficients.

UNIT-III

Application of Fourier series to linear partial differential equations: Classification of linear second order partial differential equations, separation of variables method (Fourier method), Fourier series solution of one dimensional heat equation, one dimensional wave equation, Laplace's equation.

UNIT –IV

Z-Transforms: Introduction, basic theory of Z-transforms, Z-transforms of 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-V

Curve fitting by method of least squares**,** correlation and regression, types of correlations, scatter diagram, Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, equal ranks, correlation factor, equations to the lines of regression.

Suggested Reading:

1. Advanced Engineering Mathematics - R.K.Jain & S.R.K. Iyengar
   3rd Edition, Narosa Publications for I, II, III, IV units.
2. Higher Engineering Mathematics-H.K. Dass, Er.Rajnish verma for unit V.
3. Kreyszig E, Advanced Engineering Mathematics, 8 th Edition, John Wiley & Sons Ltd, 2006.
4. Gupta & Kapoor: Fundamentals of Mathematical statistics, Sultan chand

& sons, New Delhi.
5. Probability and Statistics by Dr. M. Venkata Krishna
6. A text book of Engineering Mathematics by N.P.Bali & Manish Goyal , Laxmi Publication.

EE 241 UE

ELECTRICAL ENGINEERING LAB

(For Mechanical Engineering)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Objectives:

1. To learn practical electric AC & DC circuits.
2. To learn operation and performance characteristics of electrical machines by conducting various tests

List of Experiments:

1. Verification of Kirchhoff's Laws.
2. Verification of Thevinin's and Norton's Theorems.
3. Study of Three-Phase Balanced Circuits.
4. Measurement of Power by Two-Wattmeter Method.
5. Study of Single-Phase RLC Series Circuits.
6. Magnetization Curve of a Separately Excited DC Generator.
7. Load Characteristics of Shunt Generator.
8. Performance Characteristics of Shunt Motor.
9. Speed Control of DC Shunt Motor.
10. O.C and S.C Tests on Single-Phase Transformer.
11. Load Test on Single-Phase Transformer.
12. Load Test on Three-Phase Induction Motor.

Note: At least ten experiments should be conducted in the Semester.

EC 292 UE

APPLIED ELECTRONICS LAB

(For Mechanical Engineering)

Instruction	3 periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credit	2

Objectives:

1. To understand the characteristics of diodes and transistor configurations
2. To understand the design concepts of biasing of BJT and FET
3. To understand the design concepts of feedback amplifiers and oscillators
4. To study the design concepts of OP Amp and data converters

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 Colpitts Oscillators
8. Common Emitter Amplifier
9. Astable Multivibrator
10. Full-wave rectifier with and without filters using BJT
11. Operational Amplifier Applications
12. Strain Guage Measurement
13. Analog-to-Digital and Digital to Analog Converters

Suggested Reading:

1. Maheshwari and Anand, *Laboratory Experiments and PSPICE Simulations in Analog Electronics*, 1st edition, Prentice Hall of India, 2006.

2. David Bell A., *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall of India, 2001.

ME 271 UE

PRIME MOVERS AND PUMPS
(For Electrical Engineering)

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

Objectives

1. To know basics of fluid mechanics and governing equations
2. To understand the working principle of hydraulic turbines and pumps
3. To understand the working principle of steam and gas power plants

UNIT-I

Fluid Mechanics: Viscosity, Newtonian and Non-Newtonian fluids, Continuity, Momentum and Energy equations. Bernoulli's equation and its applications. Laminar and Turbulent flows. Basic concepts of Boundary layer theory and boundary layer thickness.

UNIT-II

Hydraulic Turbines: Dynamic action of water on flat and curved surfaces. Parts and working of Pelton, Francis and Kaplan turbines Draft tube in Reaction turbine, working and different types in use. Velocity diagrams for impulse and Reaction turbines. Number and dimensions of buckets for Pelton wheel. Blade angles and dimensions for Reaction turbines. Work done, power output and efficiencies. Simple problems for Pelton, Francis and Kaplan turbines. Selection of turbines for electric power generation. Principles of Similarity .Specific speed and its ranges for Pelton, Francis and Kaplan turbines. Unit quantities. Performance and characteristic curves. Cavitation and its effects.

UNIT-III

Pumps: Reciprocating Pumps-Working of single and double acting types. Effect of acceleration head and friction. Functions and use of Air vessels. Problems on pressure head, work done, power required without and with air vessels. **Centrifugal pumps**: Parts and working of CF pumps. Need for priming, pump installation. Velocity diagrams and vane angles. Types of Impellers. Work and power required. Manometric and other efficiencies. Simple problems for single stage pumps; Principles of similarity, specific speed and unit quantities. Performance and characteristic curves.

UNIT-IV

Basic Steam Engineering: Generation, properties and dryness fraction of steam. Functions of a boiler. Working of a simple vertical type and Babcock and Wilcox type boilers with simple sketches. Boiler Mountings and Accessories and their functions. Rankine and modified Rankine cycles, Re-heat and Re-generation cycles. Evaluation of Mean Effective Pressure.

UNIT -V

Steam and Gas Power Plants: Layout of simple steam power plant and working of its individual units. Classification and compounding of steam turbines. Velocity diagrams for single stage impulse and reaction turbines. Simple problems on work done, blade angles, power output and thermal efficiencies of turbines. Working of reheat and bleeding cycles. Gas Turbine Power Plant: Bray ton cycle for gas turbines. Simple closed cycle and open cycle gas turbine plants. Layout and efficiency of gas turbine plants. Intercooling and Reheating cycles. Evaluation of power output, cycle temperatures and thermal efficiencies for simple gas turbine plants.

Suggested Reading:

1. Ballaney P. L, "*Thennal Engineering*", Khanna Publishers, 19th Edn., 1993.
2. Yadav R, "*Steam and Gas turbines*", Galgotia Publishers, 6th Edn., 1992.
3. Kumar D.S, "*Fluid Mechanics and Fluid Power Engineering*", S.K. Kataria & Sons, 6th Edn., 2003.

ME 291 UE

PRIME MOVERS AND PUMPS LABORATORY
(For Electrical Engineering)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Objectives

1. To gain knowledge on working principle of petrol and diesel engines
2. To understand the working principle of hydraulic turbines and pumps
3. To study performance and characteristic curves of turbines and pumps
4. To gain the knowledge of various flow meters and the concept of fluid mechanics

a) Thermal Engineering Laboratory:

1. Determination of flash point.
2. Determination of fire point.
3. To conduct performance test on diesel engine
4. To determine the valve timing diagram of a I.C (gas) engine
5. To conduct performance test on multi-cylinder petrol engine.
6. To conduct heat balance test on diesel engine.

b) Hydraulic Machinery Laboratory:

7. Performance & characteristics curves of Pelton wheel.
8. Performance & characteristics curves of Francis turbine.
9. Performance curves of Centrifugal pump.
10. Performance & characteristics curves of Turbo wheel.
11. Performance curves of Kaplan turbine.

Note: *At least ten experiments should be conducted in the Semester*