JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
(An Autonomous Institute of Govt. of M.P.)
Affiliated to Rajiv Gandhi Technological University, Bhopal (MP)
Scheme of Study and Examination (w.e.f. July 2010)

B.E. Second Year **Branch : Mechanical** **Sem :Third**

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
					SESSIONAL EXAM			ESE	SUB TOTAL	
		L	T	P	TA	CT	TOTAL			
ME-10	Fluid Mechanics	3	1	-	10	20	30	70	100	4
CH-03	Energy Ecology Environment & Society	3	1	-	10	20	30	70	100	4
ME-06	Solid Mechanics - I	3	1	-	10	20	30	70	100	4
ME-08	Thermodynamics	3	1	-	10	20	30	70	100	4
ME-16	Machine Drawing	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
ME-07L	Solid Mechanics Lab - I	-	-	2	20	-	20	30	50	2
ME-09L	Thermodynamics Lab	-	-	2	20	-	20	30	50	2
ME-17L	CAD Oriented Machines Drawing Lab	-	-	2	20	-	20	30	50	2
ME-11L	Fluid Mechanics Lab	-	-	2	20	-	20	30	50	2
ME-59L	Self Study/ Professional Activity	-	-	2	50	-	50	-	50	2
ME-60L	Seminar/Group Discussion	-	-	2	50	-	50	-	50	2
	Total	**15**	**5**	**12**	**230**	**100**	**330**	**470**	**800**	**32**

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 800
Total Periods : 32, Total Credits : 32

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	FLUID MECHANICS	ME10	Min "D"	Min "D"	5.0

FLUID MECHANICS

Unit-I : Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, volume- and gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. Fluid Static's : Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and Tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Unit-ll : Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & non uniform, one, two and three dimensional flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets their utility

Unit-lll Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications. **Fluid Measurements**: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.); flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturi-meter, weirs and notches).

Unit-IV Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.)

Unit-V Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates

References: -

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Streeter VL, Wylie EB, Bedford KW; Fluid Mechanics; TMH
3. Som and Biswas; Fluid Mechnics and machinery; TMH
4. Cengal; Fluid Mechanics; TMH
5. White ; Fluid Mechanics ; TMH
6. Gupta; Fluid Mechanics; Pearson
7. JNIK DAKE; Essential of Engg Hyd; Afrikan Network & Sc Instt.-(ANSTI)
8. R Mohanty; Fluid Mechanics; PHI

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	ENERGY ECOLOGY ENVIRONMENT & SOCIETY	CH03	Min "D"	Min "D"	5.0

ENERGY ECOLOGY ENVIRONMENT & SOCIETY

Unit I : **Energy sources and energy storing devices**

World and Indian energy scenario, types of energy sources – renewable and non-renewable energy sources. Solar energy storage ,application & maintenance of solar cell panel, introduction & applications of hydro, wind, biomass, ocean, tidal, wave and geothermal. Synergy between energy and environment. Global environment issues, greenhouse gas emission, global warming, green energy solution.

Batteries – Primary and Secondary batteries- Alkaline battery – Lead (Pb) acid storage battery , Ni-cadmium battery ,Lithium battery ,Fuel cell , Hydrogen Oxygen fuel cell ,Photo galvanic cell.

Unit II : Ecosystem Structure & scope of ecology, Natural cycles of the environment, Hydrogen cycle, Oxygen Cycle, Carbon cycle, Nitrogen cycle, Phosphate cycle, Sulphur cycle, Biodiversity.

Society:- Environmental problems and impact of P.A.T(Population, Affluence and Technology). Environmentally beneficial and harmful technologies, environment impact assessment policies (EIA).Ethics and regulatory act of environment.

Soil Pollution Sources & control measures. MSW, HWM.

Unit III :**Air pollution-** Chemical composition of atmosphere, -primary, Secondary; pollutants, Chemical and photochemical reaction, effects of CO, SOx, NOx, HC and particulates. Causes & effects of acid rain, ozone depletion: Monitoring and control of air pollutants.

Noise pollution- introduction physiological effect, measurement and control of noise pollutants.

Unit IV : Water pollution- sources causes of water pollution , types and nature of water pollutant. Pollution load determination i.e. particulates ,suspended matter, total dissolved solids ,dissolved gases DO, BOD & COD. EL NINO phenomenon. Waste water treatment Domestic – Aerobic & anaerobic treatment. Industrial waste water treatment (ETP plant.) Electro dialysis membrane technique and filtration by activated charcoal and synthetic resins.

Unite V : Corrosion & its prevention- Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic & Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing & control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodes protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

TEXT BOOKS

1. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
4. Energy,Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi .
5 Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	SOLID MECHANICS-I	ME06	Min "D"	Min "D"	5.0

SOLID MECHANICS-I

UNIT – I :

Tension and Compression within Elastic Limit, The Tensile Test Diagram, Working Stress. Stress and strain Produced in a Bar by its own weight, statically Indeterminate problems in Tension and Compression, Assembly and Thermal Stresses, Extension of a Circular Ring.

Analysis of Stress and strain, stress on inclined planes for simple tension and compression Mohr' Circle, Tension or compression in two perpendicular directions. Mohr's circle for combined stresses, principal stresses, lateral contraction, strain in the case of tension or compression in two perpendicular directions. Pure shear, modulus shear, working stresses in shear.

UNIT – II :

Stresses in laterally loaded symmetrical beams. Pure bending various shapes of cross sections of beams. Laterally loaded symmetrical beams. Shearing stresses in bending. Distribution of shearing stresses in circular cross section shearing stresses in I beams principal, stresses in bending, stresses in built up beams. Pure bending of beams in a plane which is not a plane of symmetry, bending of beams having two planes of symmetry, Bending of beam in a principal plane which is not a plane of symmetry.

UNIT – III :

Defection of laterally loaded symmetrical beams, Differential equation of the deflection curve. Deflection of simply supported beams. Cantilever beams, overhanging beams, Determination of deflections by Area-moment method. Method of superposition, Macaulay method, conjugate beam method, effect of shearing force on the defection of beams.

Strain energy in tension, compression, shear and impact, strain energy due to principal stresses strain energy due to principal stresses. Strain energy in bending, Castiglino's theorem, Maxwell's reciprocal theorem.

UNIT – IV :

Shaft, Torsion of circular solid and hollow shafts. Combined bending and Torsion of solid and hollow circular shafts,

Theory of columns and struts, Bending by tension or compression, eccentric loading, eccentric compression of slender symmetrical column, critical load, limitation of Euler's method, Rankine-Gordon Formula Johnson's parabolic formula, Perry-Robertson formula straight line formula.

UNIT – V :

Thin pressure vessels, thin cylinder under internal pressure, thin spherical shell under internal pressure, cylindrical shell with hemispherical ends, Volumetric Strain, Tube under combined loading wire, winding of thin cylinders, Rotational stresses in thin cylinders.

Rotating Disc of uniform thickness, solid disc, disc with central hole, disc of uniform strength, Temperature stresses in uniform disc.

References :

1. Mechanics of Materials – James M. Gere
2. Introduction to Solid Mechanics – Irving H. Shames
3. Engineering Mechanics of Solids – Egor P. Popov
4. Strength of Materials – G.H. Ryder
5. Mechanics of Material Vol I & II – E.J Hearn
6. Strength of Materials Vol I & II – S. Timoshenko

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	THERMODYNAMICS	ME08	Min "D"	Min "D"	5.0

THERMODYNAMICS

UNIT – I : Basic concepts : Concept of an ideal gas, Gas laws, Avogadro's hypothesis, Heat and work transfer . First law of thermodynamics. First law applied to a closed system undergoing a cycle, processes analysis of closed system. Flow process, flow energy, steady flow process, Relations for flow processes, limitations of first law of thermodynamics.

UNIT – II : Second law of thermodynamics. heat engine, heat reservoir, Refrigerator, heat pump, COP, EPR, Available energy, Carnot's theorem, Carnot's cycle, efficiency of Carnot's cycle, statement of second law. Reversible and irreversible processes, consequence of second law,

Entropy, Entropy change for ideal gas, T-S diagrams, Availability and Irreversibility. Gibons and Helmholtz functions.

UNIT – III : Real gas, Deviation with ideal gas, Vander-wall's equation, evaluation of its constants limitations of the equation. The law of corresponding states Compressibility factor, Generalized compressibility chart, P-V.T surface of a Real gas, Thermodynamics relations, Maxwell relations and their applications.

UNIT – IV : Pure substance, phase, phase-transformations, formation of steam, properties of steam, PVT surface, HS, TS,PV,PH,TV diagram, processes of vapor measurement of dryness fraction, use of steam table and mollier chart.

UNIT – V : Air standard cycles, Carnot, Otto, Diesel, Dual cycles and there comparison, two stroke and four stroke engines, Brayton cycle, non reactive gas mixture, PVT relationship, mixture of ideal gases, properties of mixture of ideal gases. Internal energy, Enthalpy and specific heat of gas mixtures, Enthalpy of gas-mixtures.

References :

1. Engineering Thermodynamics by P.K.Nag; TMH Pub
2. Thermodynamics by Van GJ; John Wylie Pub.
3. Thermodynamics by Cengel Y; TMH Pub.
4. Thermodynamics by Arora CP; TMH Pub.
5. Thermal Engineering by R.Yadav
6. Engineering Thermodynamics by Omkar Singh New Age International.
7. Engineering Thermodynamics by Ratha Krishanan PHI India Pvt. Ltd.
8. Engineering Thermodynamics by M.Archuthan, PHI India

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	MACHINE DRAWING	ME16	Min "D"	Min "D"	5.0

MACHINE DRAWING

Note : Paper will be FOUR Hours duration. Unit I and Unit II have weightage of 14 marks and unit III have 42 marks.

UNIT I

Principles of Drawing, Classification of Drawings, Drawing Sheets, Scales, Lines, Sections .Theory of drawing and dimensioning as per IS codes, sectional views and sectioning conventions, Conventional Representation of Materials, Machine Components, surface finish and tolerances, types of welded joints and representation.

UNIT II

Drawing of Machine Elements and simple parts

Keys, cottered joints and knuckle joint, Rivet heads and Riveted joints, Screw Thread Nomenclature, Forms of Threads, Thread Series, Thread Designation, Multi-start Threads, Right Hand and Left Hand Threads, Representation of Threads

UNIT III

Assembly Machine Drawing

Pedestal bearings, Footstep bearings, Plummer Block, Blow of Cock, Lever Safety Valve. Tail Stock, Tool Post, Tool Head for Shaping Machine, IC engines parts - Piston and Connecting rods, Stuffing box, Crosshead, Eccentric

References:

1. Bhat, ND; Machine Drawing; Charotar
2. Singh A; Machine Drawing; TMH
3. Narayana and Reddy; Machine Drawing; New age, Delhi.
4. Agarwal and agrawal; Engineering Drawing; TMH
5. Shigley JE et al; Mechanical Engineering Design, TMH
6. John KC; Text Book Of Machine Drawing; PHI Learning
7. Luzzader WJ, Duff JM; Fundamental of Engg Drawing Interactive Graphics; PHI.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	SOLID MECHANICS LAB - I	ME07L	Min "D"	Min "D"	5.0

SOLID MECHANICS LAB
(Suggested Exercise)

1. Study of UTM machine.
2. Estimation of proof stress for ductile and wood by four point method
3. Tensile Test on Brittle and ductile material.
4. Shear Test
5. Torsion Test
6. Impact Test
   (a) Charpy Test
   (b) Izod Test
7. Hardness Test
   (a) Brinell Hardness
   (b) Vickers Hardness
   (c) Rockwell Hardness
8. Study of failures in ductile material and brittle materials.
9. Study of cement testing machine
10. Compression test on cement stock
11. Compression test on wood (Along the grain & across the grain)

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	THERMODYNAMICS LAB	ME09L	Min "D"	Min "D"	5.0

THERMODYNAMICS LAB
(Suggested Exercise)

1. To find mechanical equivalent of heat using joules apparatus.
2. To study working of impulse and reaction steam turbine by models.
3. To study working of Gas turbines by models and to identify various processes of Brayton cycle.
4. To calculate COP of vapor compression refrigeration system and to plot on T-s, p-H diagrams
5. To plot specific fuel consumption versus RPRR diagrams for diesel and petrol engines

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	CAD ORIENTED MACHINES DRAWING LAB	ME17L	Min "D"	Min "D"	5.0

List of Experiments:

1. Introduction to Compute Aided Drafting software for 2D and 3D Modeling

2. Computer Aided Drafting of simple machine parts

3. 3D Modeling of simple solid shapes

4. Design and drawing of parts contained in the syllabus

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	FLUID MECHANICS LAB	ME11L	Min "D"	Min "D"	5.0

List of Experiment (Expandable)

1. To determine the local point velocity with the help of pitot tube.

2. To find out the terminal velocity of **a** spherical body in water.

3. Calibration of Orifice meter and Venturi meter

4. Determination of Cc, C_v, C_d of Orifices

5. Calibration of Nozzle meter and Mouth Piece

6. Reynolds experiment for demonstration of stream lines & turbulent flow

7. Determination of meta-centric height

8. Determination of Friction Factor of a pipe

9. To study the characteristics of a centrifugal pump.

10. Verification of Impulse momentum principle.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	SELF STUDY/ PROFESSIONAL ACTIVITY	ME59L	Min "D"	Min "D"	5.0

Objective of Self Study : is to induce the student to explore and read technical aspects of his area of interest/ hobby or new topics suggested by faculty.

Evaluation will be done by assigned faculty based on report/seminar presentation and viva.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	SEMINAR/GROUP DISCUSSION	ME60L	Min "D"	Min "D"	5.0

Objectives of Group Discussion & Seminar is to improve the Mass Communication and Convincing/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.