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 : Industrial Production** **Sem :Fourth**

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
					SESSIONAL EXAM			ESE	SUB TOTAL	
		L	T	P	TA	CT	TOT			
CH-03	Energy Ecology Environment & Society	3	1	-	10	20	30	70	100	4
ME-12A	Material Science & Metallurgy	3	1	-	10	20	30	70	100	4
IP-08	Theory of Machines & Mechanism	3	1	-	10	20	30	70	100	4
IP-10	Machine Design	3	1	-	10	20	30	70	100	4
ME-10	Fluid Mechanics-I	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
IP-09L	Theory of Machine & Mechanism Lab	-	-	2	20	-	20	30	50	2
CS-12L	Dot Net Lab	-	-	2	20	-	20	30	50	2
IP-11L	Machine Design Lab	-	-	2	20	-	20	30	50	2
ME-11L	Fluid Mechanics –I Lab	-	-	2	20	-	20	30	50	2
IP-44L	Professional Activity	-	-	2	50	-	50	-	50	2
IP-45L	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	
COMMON TO BE COURSES	ENERGY ECOLOGY ENVIRONMENT & SOCIETY	CH-03	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
			L	T	
BE IP/ME	**MATERIAL SCIENCE & METALLURGY**	ME-12A	Min "D"	Min "D"	**5.0**

MATERIAL SCIENCE & METALLURGY

Unit I

Crystal Atoms of Solid: Structure of atom binding in solids metallic, Vander walls, ionic and covalent, Space lattice and crystal system arrangement of atoms in BCC, FCC and HCP crystal. Manufacture of refractory and ferrous metals, properties uses and selection of acid, basic and natural refractory, metallurgical coke, properties, types, uses and brief description of the manufacturing processes for iron and steel making.

Unit II

Plastic Deformation of Metals: Point and line defects in crystals, their relation to mechanical properties, deformation of metal by slip and twinning stress strain curves of poly crystalline materials viz. mild steel cast iron and brass yield point phenomenon. Cold and hot working of metals and their effect on mechanical properties, annealing of cold worked metals, principles of re-crystallization and grain growth phenomenon, fracture in metal and alloys, ductile and brittle fracture, fatigue failure

Unit III

Alloy Formation and Binary Diagram: Phase in metal system solution and inter-metallic compounds. Hume-Rottery's rules, solidification of pure metals and alloy equilibrium diagrams of isomorphous, eutectic peritectic and eutectoid system, non-equilibrium cooling and coring iron, iron carbon equilibrium diagram.

Unit IV

Heat Treatment of Alloys Principles of Heat Treatment of Steel: TTT curves heat treating processes, normalizing, annealing spheroidizing, hardening, tempering, case hardening, austempering, mar-tempering, precipitation hardening process with reference to Al, Cu alloys

Unit V

Properties of Material: Creep Fatigue etc., Introduction to cast iron and steel, Non Ferrous metals base alloys, Bronze, Brasses, Duralumin, and Bearing Metals. Plastics, Composites and ceramics: Various types of plastics, their properties and selection. Plastic molding technology, FRP, GRP resins adhesive, elastomers and their application. Powder Metallurgy: Property and Applications of Powder Metallurgy, Various process and methods of making products by powder Metallurgy techniques.

References:

1. Narula GK, KS and GuptaVK; Material science; TMH
2. Raghavan V; Material Science and Engineering, PHI Publication.
3. Raghavan V; Physical Metallurgy Principles and Practice; PHI
4. Rajendran V and Marikani; Material science; TMH
5. Sriniwasan R; Engineering materials and Metallurgy; TMH
6. Navneet Gupta, Material Science & Engineering, Dhanpat Rai.
7. B. K. Agrawal, Introduction to Engineering Materials, TMH.

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
			L	T	
BE IP	**THEORY OF MACHINES AND MECHANISMS**	**IP -08**	Min "D"	Min "D"	**5.0**

THEORY OF MACHINES AND MECHANISMS

Unit I

Mechanisms and Machines: Mechanism, machine, planer mechanisms, kinematic pairs, kinematic chains and their classification, degrees of freedom, Grubler's criterion, kinematic inversions of four bar mechanism and slider crank mechanism, equivalent linkages, straight line motion mechanisms, pantograph, Davis and Ackermann's steering mechanisms, kinematic analysis of planer mechanisms using graphical techniques, relative velocity method, instantaneous center method and its application, Kennedy's theorem, coriolis component of acceleration.

Unit II

Governors: Types, porter, proell, hartnell, wilson-hartnell, effort and power, controlling force, sensitiveness, hunting, isochronisms, and stability of governors. Fly wheel, turning moment diagram, energy stored.

Unit III

Gears: Classification of gears, nomenclature, involutes and cycloidal tooth profile properties, synthesis of tooth profile for spur gears, tooth system, conjugate action, velocity of sliding, arc of contact, path of contact, contact ratio, interference and undercutting, helical, spiral, bevel and worm gears.

Unit IV

Cams: Classification of followers and cams, radial cam nomenclature, analysis of follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), pressure angle, radius of curvature, synthesis of cam profile by graphical approach, cams with specified contours. Gear Trains: Simple, compound, epicyclic gear trains; determination of gear speeds using vector, analytical and tabular method; torque calculations in simple, compound and epicyclic gear trains.

Unit V

Gyroscopic Action in Machines: Angular velocity and acceleration, gyroscopic torque/ couple, gyroscopic effect on naval ships, stability of two and four wheel vehicles, rigid disc at an angle fixed to a rotating shaft

References:

1. Rattan SS; Theory of machines; TMH
2. Ambekar AG; Mechanism and Machine Theory; PHI.
3. Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
4. Thomas Bevan; Theory of Machines; CBS PUB Delhi.
5. Rao JS and Dukkipati; Mechanism and Machine Theory; NewAge Delhi.
6. Dr.Jagdish Lal; Theory of Machines; Metropolitan Book Co; Delhi –
7. Ghosh,A,.Mallik,AK; Theory of Mechanisms & Machines, 2e,; Affiliated East West Press, Delhi.

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
			L	T	
BE IP	**MACHINE DESIGN**	**IP -10**	Min "D"	Min "D"	**5.0**

MACHINE DESIGN

Unit I:

Stress concentration and fatigue: Causes of stress concentration, stress concentration in tension, bending and torsion, reduction of stress concentration, theoretical stress concentration factor, notch sensitivity, fatigue stress concentration factor, cyclic loading, endurance limit, S-N Curve, loading factor, size factor, surface factor. Design consideration for fatigue, Goodman and modified Goodman's diagram, soderberg equation, Gerber parabola, design for finite life, cumulative fatigue damage factor.

Unit II:

Shafts: Design of shaft under combined bending, twisting and axial loading, shock and fatigue factors, design for rigidity, design of shaft subjected to dynamic load, design of keys and shaft couplings.

Unit III:

Design of Bearings: Sliding Bearing, hydrodynamics lubrication, mechanical aspects of bearing design, lubricants, journal bearing design, rolling element bearings.

Unit IV:

Brakes & Clutches: Materials for friction surface, uniform pressure and uniform wear theories.
Design of friction clutches: Disk, plate clutches, cone & centrifugal clutches.
Design of brakes: Rope, band & block brake, Internal expending brakes, Disk brakes.

Unit V:

Design of Power screws types, screw drives, efficiency, stresses in power screws, design procedure and calculation.

References:

1. Shigley J.E; Machine Design; TMH
2. Sharma and Purohit; Design of Machine elements; PHI
3. Wentzell Timothy H; Machine Design; Cengage learning
4. Mubeen; Machine Design; Khanna Publisher
5. Ganesh Babu K and Srithar k; Design of Machine Elements; TMH
6. Sharma & Agrawal; Machine Design; Kataria & sons
7. Maleev; Machnine Design;

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
			L	T	
BE CE/IP/MECH	**FLUID MECHANICS-I**	**ME-10**	Min "D"	Min "D"	**5.0**

FLUID MECHANICS-I

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-II : 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 & method of drawing flow nets.

Unit-III : 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.

Flow Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.), flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venture-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, laminar flow through porous media, Stokes law, lubrication principles.

References:

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechnics and machinery; TMH
3. Cengal; Fluid Mechanics; TMH
4. White ; Fluid Mechanics ; TMH
5. JNIK DAKE; Essential of Engg Hyd; Afrikan Network & Sc Instt. (ANSTI)
6. Franiss JRD; A Text Book of fluid Mech. for Engg. Student
7. R Mohanty; Fluid Mechanics; PHI
8. Gupta; Fluid Mechanics; Pearson.

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
			L	T	
BE IP/MECH	**THEORY OF MACHINES AND MECHANISMS LAB**	**IP -09L**	Min "D"	Min "D"	**5.0**

THEORY OF MACHINES AND MECHANISMS LAB
(Suggested Exercise)

List of experiments (expandable)

1. To study all inversions of four-bar mechanisms using models
2. Draw velocity and acceleration polygons of all moving link joints in slider crank mechanism
3. Determination of velocity and acceleration in above using method of graphical differentiation
4. To study working of differential gear mechanism.
5. To study working of sun and planet epicycle gear train mechanism using models
6. To plot fall and rise of the follower versus angular displacement of cam and vice versa.
7. Study of universal gyroscope
8. Analytical determination of velocity and acceleration in simple mechanism using Roven's M.

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
			L	T	
BE ME/IP/CS/IT	**DOTNET LAB**	**CS-12L**	Min "D"	Min "D"	**5.0**

DOTNET LAB

1. Overview of Web-Server, Web-Browser, Websites, Webpages, Html, DHTML
2. Net framework
3. Visual Studio IDE
4. Standard Controls
5. Data Control
6. ADO NET
7. Database Connectivity : Access/SqlServer/Oracle
8. Validation Controls
9. Navigation Controls
10. Login Controls
11. Crystal Report Controls
12. ASP.NET State Management
    (a) Session Object
    (b) Application Object
13. Working with Master Page
14. Working with CSS
15. AJAX Extensions
    (a) Update Panel
    (b) Update Progress
    (c) Timer

(Suggested Exercise)

1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#
10. Reading and Writing XML Documents with the XML Text-Reader/-Writer Class and C#
11. Working with Page and form s using ASP .Net
12. Data Sources access through ADO.Net,
13. Working with Data readers , Transactions
14. Creating Web Application

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
			L	T	
BE	**MACHINE DESIGN LAB**	**IP -11L**	Min "D"	Min "D"	**5.0**

MACHINE DESIGN LAB
(Suggested Exercise)

List of Experiment (Expandable):

Designing and sketching of components contained in the syllabus (Suggested List)

1. To Study S-N Curve for various Elements.
2. Design of Machine Elements for cyclic Loading.
3. Design of Bearings.
4. Design of Friction Clutch.
5. Design of a Shaft Subjected to Combined Loadings.
6. Design of Simple Band Brake.

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
			L	T	
BE/PTDC IP/ME/CE	**FLUID MECHANICS -1 LAB**	**ME-11L**	Min "D"	Min "D"	**5.0**

FLUID MECHANICS-1 LAB
(Suggested Exercise)

List of Experiment (Expandable):

1. To determine the local point pressure 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, Cv, Cd 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	
B.E IP	**PROFESSIONAL ACTIVITY**	**IP-44L**	Min "D"	Min "D"	5.0

PROFESSIONAL ACTIVITY
(Suggested Exercise)

- Student shall visit a nearby Industry and shall prepare a technical report suggesting some improvement in operation.
- Student shall Design and fabricate a new laboratory equipment. He shall prepare a design report.
- Student shall improve an existing lab equipment and prepare chart or lab manual .
- Student shall publish a review paper in some Indian Journal.
- Student shall make a report on an Industry employing latest technology/ Innovation.
- Student shall prepare a working model of a machine part.
- Student shall make a software/ comp. program for the Institute to enhance efficiency in its working.
- Student shall prepare a detailed project report to start a small-medium enterprise.
- A group of student shall register with the Industry cell and submit a report on work done there about Institute-Industry linkage.
- Experimental work on a new set of equipments.
- Seminar Presentation with a report submitted to the supervisor.

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	
B.E IP	**SEMINAR/GROUP DISCUSSION**	**IP-45L**	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.