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 : Fourth**

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
					SESSIONAL EXAM			ESE	SUB TOTAL	
		L	T	P	TA	CT	TOTAL			
MA-03	Mathematics - III	3	1	-	10	20	30	70	100	4
ME-12A	Material Science & Metallurgy	3	1	-	10	20	30	70	100	4
ME-13A	Production Processes	3	1	-	10	20	30	70	100	4
ME-25A	Thermal Engg. & Gas Dynamics	3	1	-	10	20	30	70	100	4
ME-14A	Theory of Machines & Mechanism	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
CS-12L	Dot Net Lab	-	-	2	20	-	20	30	50	2
ME-27L	Production Processes Lab	-	-	2	20	-	20	30	50	2
ME-62L	Theory of Machines & Mechanism Lab	-	-	2	20	-	20	30	50	2
ME-26L	Thermal Engg. & Gas Dynamics Lab	-	-	2	20	-	20	30	50	2
ME-63L	Self Study	-	-	2	50	-	50	-	50	2
ME-61L	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	
COMMEN TO BE COURSES	MATHEMATICS- III	MA-03	Min "D"	Min "D"	5.0

MATHEMATICS – III

Unit – I : Fourier Series : Conditions for a fourier expansion, having finite number of Discontinuities, change of interval and half- rang series.

Laplace transform and inverse Laplace transform of simple functions, their elementary properties and application in solution of ordinary differential equations.

Unit – II : Analytic functions, Harmonic conjugates, Cauchy-Reimann equations, line integral, cauchy's theorem, Cauchy's integral formula, poles, residues, Residues theorem, evaluation of real integral, Bilinear transformation.

Unit – III : Difference operators, errors and approximation, interpolation (Newtons interpolation formulae, Central interpolation formulae, Lagranges interpolation, Newtons divided difference interpolation – formula inverse interpolation.

Numerical differentiation, maxima and minima.

Unit – IV : Numerical integration by using simpson's method, weddels rule, Gauss-Legendre open quadrature formula.

Solution of algebraic and transcendental equations by using Regula-Falsi, Newton-Rephson, iterative, Graffes root squaring method, Bairstow's method.

Unit – V : Solution of simultaneous algebraic equatins by using gauss elimination, Gauss-Jorden, Crout's jacobbi iterative, Gauss-siedal, Relaxation methods.

Solution of ordinary differential equations (Taylor series, Picard's Modified Euller method, Runge-kutta, predictor corrector method.)

References :

1. Laplace transform, by R.V. Churchill
2. Higher Engineering Mathematics by B.V Ramanna, TMH
3. Advanced Engineering Mathematics by Kreysizig E, willey Eastern Limited.
4. Introductory Methods of Numerical Analysis by S.S. Sastry
5. Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers.

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	**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
			T	P	
B.E. ME	**PRODUCTION PROCESSES**	ME-13A	Min "D"	Min "D"	5.0

PRODUCTION PROCESSES

Unit-I Metrology: Standards of Measurements, Linear and angular instruments; slip gauges, comparators, sine bar, angle gauges, clinometers, tape gauge, screw thread measurements, limit gauges, gauge design, fits and tolerances, **Rolling** General description of machines and process; rolling of structural sections plates and sheets; construction of hulls; hot and cold rolling techniques,

Unit-ll : Metal Cutting : Principles of metal cutting, tool geometry, Tool life plots, Mach inability, Tool wear cutting force analysis, cutting tool materials & Cutting fluids, Economics of metal machining.

Unit-III Pattern Making: Pattern and pattern making, pattern allowances; pattern design considerations, core, core boxes, types of patterns.

Foundry: Molding & core sands and their properties, molding machines, centrifugal casting, dye casting, shell molding; cupola description and operation, Lost wax molding; continuous casting;

Unit-IV Forging: Theory and application of forging processes description; principle of toleration of drop and horizontal forging machines; General principle of designs.

Press working: Description and operation of processes, process of shearing, punching, piercing, blanking, trimming, perfecting, notching, lancing, embossing, coining, bending, forging and drawing; press, tool dies, auxiliary equipment, safety devices, stock feeders, scrap cutters. forces, pressure and power requirements, requirements of stock material.

Unit-V Welding: Gas welding, Electric arc welding, AC and DC welding machines and their characteristics. Flux, electrodes, pressure welding; electric resistance welding spot, seam and butt welding; submerged arc welding, Thermit & TIG & MIG welding; brazing gas cutting

Spinning : Introduction to spinning.

Reference Books:

1. Anderson and Tetro; Shop Theory; TMH
2. Kaushish JP; Manufacturing Processes; PHI
3. Bawa; Manufacturing Processes; TMH
4. Rao PN; Manufacturing Tech- Vol 1 and 2; TMH
5. Schey JA; Introduction to manufacturing processes; McGraw Hill
6. Chapman; Workshop Technology:
7. Begeman; Manufacturing Process: John Wiley
8. Raghuvanshi; Workshop Technology:; DhanpatRai.
9. Ravi B; Metal Casting- CAD analysis; PHI.
10. Hajra Choudhary; Workshop Technology:, Vol I
11. Pandya & Singh; Production Engineering Science:
12. PC. Sharma: Production Technology, S.chand and co. New 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 MECH	**THERMAL ENGINEERING & GAS DYNAMICS**	ME-25A	Min "D"	Min "D"	**5.0**

THERMAL ENGINEERING & GAS DYNAMICS

UNIT – I : Steam generators: classification, conventional boilers, high-pressure boilers-lamont, benson, loeffler and velox steam generators, performance and rating of boilers, equivalent evaporation, boiler efficiency, heat balance sheet, combustion in boilers, super critical boilers, fuel and ash handling, boiler draught, overview of boiler codes.

Unit II : Phase Change Cycles: Vapor Carnot cycle and its limitation, Rankin cycle, effect of boiler and Condenser pressure and superheat on end moisture and efficiency of ranking cycle, modified Rankin cycle, reheat cycle, perfect regenerative cycle, Ideal and actual regenerative cycle with single and multiple heaters, open and closed type of feed water heaters, regenerative-reheat cycle, supercritical pressure and binary-vapor cycle, work done and efficiency calculations.

Unit III

(A) Gas dynamics: speed of sound, in a fluid mach number, mach cone, stagnation properties, one-dimensional isentropic flow of ideal gases through variable area duct-mach number variation, area ratio as a function of mach number, mass flow rate and critical pressure ratio, effect of friction, velocity coefficient, coefficient of discharge, diffusers, normal shock.

(B) Steam nozzles: isentropic flow of vapors, flow of steam through nozzles, condition for maximum discharge, effect of friction, super-saturated flow.

Unit IV : Air compressors: working of reciprocating compressor, work input for single stage compression different, compression processes, effect of clearance, volumetric efficiency real indicator diagram, isentropic & isothermal and mechanical efficiency, multi stage compression, inter - cooling, condition for minimum work done, classification and working of rotary compressors

Unit V : Steam condensers, cooling towers and heat exchangers: introduction, types of condensers, back pressure and its effect on plant performance air leakage and its effect on performance of condensers, various types of cooling towers, design of cooling towers, classification of heat exchangers, recuperates and regenerators .parallel flow, counter flow and cross flow exchangers, fouling factor, introduction to LMTD approach to design a heat exchanger.

References :

1. Nag PK; Power plant Engineering; TMH
2. Thermodynamics by Gordon J. Van Wylen
3. P.K.Nag; Basic and applied Thermodynamics; TMH
4. G anesan; Gas turbines; TMH
5. Heat Engines by V.P. Vasandani & D. S. Kumar
6. R. Yadav Steam and Gas Turbines
7. R.Yadav Thermal Engg.
8. Kadambi & Manohar; An Introduction to Energy Conversion – Vol II. Energy conversion cycles

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**	ME -14A	Min "D"	Min "D"	**5.0**

THEORY OF MACHINES AND MECHANISMS

Unit I :

Mechanisms and Machines: Mechanism, machine, plane and space 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, pantograph, straight line motion mechanisms, Davis and Ackermann's steering mechanisms, Hooke's joint

Unit II

Kinematic analysis of plane mechanisms using graphical and Cartesian vector notations: Planar kinematics of a rigid body, rigid body motion, translation, rotation about a fixed axis, absolute general plane motion. General case of plane motion, relative velocity method, velocity and acceleration analysis, instantaneous center and its application, Kennedy's theorem, relative motion, Coriolis component of acceleration; velocity and acceleration analysis using complex algebra (Raven's) method.

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 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 MECH	**PRODUCTION PROCESSES LAB**	ME – 27L	Min "D"	Min "D"	**5.0**

PRODUCTION PROCESSES LAB
(Suggested Exercise)

1. Study of slip gauges and sine bar to measure the angle of a component.
2. Study of various types of gauges for mass production checking
3. To prepare various types of patterns in Pattern shop
4. To prepare a sand mould for a given pattern
5. To prepare any job using forging operations
6 To prepare a job in metal cutting shop using lathe machine
7 To prepare a job in welding shop

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 & MECHANISM LAB**	ME - 62L	Min "D"	Min "D"	**5.0**

THEORY OF MACHINES & MECHANISM 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 MECH	**THERMAL ENGINEERING & GAS DYNAMICS LAB**	ME -26L	Min "D"	Min "D"	**5.0**

THERMAL ENGINEERING & GAS DYNAMICS LAB
(Suggested Exercise)

1. Study of working of some of the high pressure boilers like Lamont or Benson
2. Study of Induced draft/forced and balanced draft by chimney
3. Determination of Calorific value of a fuel
4. Study of different types of steam turbines
5. Determination of efficiencies of condenser
6. Boiler trail to chalk out heat balance sheet
7. Determination of thermal efficiency of steam power plant
8. Determination of Airflow in ducts and pipes.
9. To find out efficiencies of a reciprocating air compressor and study of multistage Compressors .
10. Find Out heat transfer area of a parallel flow/counter flow heat exchanger

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 MECH	**SELF STUDY**	ME-63L	Min "D"	Min "D"	5.0

SELF STUDY

(Suggested Exercise)

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 ME	**SEMINAR/GROUP DISCUSSION**	ME-61L	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.