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 2011)

BE (PTDC) Second Sem. Branch : Mechanical Engineering

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
		L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
					TA	CT	TOTAL			
MA-02	Mathematics - II	3	1	-	10	20	30	70	100	4
ME-16	Machine Drawing	3	1	-	10	20	30	70	100	4
ME-14	Kinematics of Machines	3	1	-	10	20	30	70	100	4
ME-12	Materials Science	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
ME-17L	CAD Oriented Machine Drawing Lab	-	-	2	20	-	20	30	50	2
ME-15L	Kinematics of Machines Lab	-	-	2	20	-	20	30	50	2
ME-56L	Professional Activity -I	-	-	2	20	-	20	30	50	2
ME-60L	Seminar/Group Discussion	-	-	2	50	-	50	-	50	2
	Total	**12**	**4**	**8**	**150**	**80**	**230**	**370**	**600**	**24**

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 600 Total Periods : 24, Total Credits : 24

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. Common	**ENGINEERING MATHEMATICS - II**	MA-02	Min "D"	Min "D"	5.0

ENGINEERING MATHEMATICS-II

UNIT-I

Second order ordinary differential equation with variable coefficients using methods, one solutionis known, Removal of First Derivative, Change of independent variable Method of Operational factor, Method of variation of parameters, solution of Second order ordinary differential equation by series method.

Unit-II

Bessel's equation, recurrence relations, Orthogonality, Generating Function of $J_n(x)$, Trigonomatric expansion involving Bessel's functions , Legendre's equation, , Legendre's Polynomial $P_n(x)$, Rodrigue's formula, Recurrence relation's, Generating functiuon of $P_n(x)$, Orthogonality, error function .

Unit-III

Partial differential equation, Formulation of PDE, solution of first order linear PDE, first order non-linear PDE, Homogenous linear PDE with constant coefficients of second and higher order, Method of separation of variable. Appluication of PDE in solution of one dimensional Heat and Wave equation

Unit-IV

Vector Calculus, Vector differentiation, Velocity and Acceleration, Gradient, Divergence and Curl, Line and Surface iIntgral, Stoke and Gauss's divergence theorem.

Unit-V

Binomial, Poisson and Gaussian (Normal) Distribution and their properties, Curv fitting bymethod of least square, Elementary concept of Reliability, Forecasting and decision theory

Reference Books:-

1. Higher Engineering Mathematics by B.V. Ramana TMH.
2. Adv.Engineering Maths by Ervin Kreszig, Wiley India IIT Student ed. 8th.
3. Higher Engineering Mathematics- By B.S. Grewal.
4. Mathematical Statistics- by Ray & Sharma.
5. Advance Engineering Mathematics-Wylie and Barrett.TMH.
6. Introduction to Theory of statistics- Mood,TMH.
7. Partial Differential Equation-Duchateau Schaum Series 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	
	MACHINE DRAWING	ME-16	Min "D"	Min "D"	5.0

Machine Drawing

Note : Paper will be FOUR Hours duration.

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	
	KINEMATICS OF MACHINES	ME-14	Min "D"	Min "D"	5.0

KINEMATICS OF MACHINES

Unit I : **Mechanisms and Machine**: Links, Kinematics pairs, Kinematics chains, Degree of freedom and constrained motion, Mechanisms, Inversions, Machines, Higher and lower pairs, Equivalent linkage. Mechanism with lower pairs pantograph, straight-line motion, Davis and Ackerman's steering mechanisms, Introduction to mechanism synthesis, types.

Unit II : **Motion Analysis** : Plane motion, absolute and relative motion Displacement, velocity and acceleration of a point, Velocity and acceleration in mechanisms - Relative velocity Method, Instantaneous center method, Centrodes, Kennedy's theorem, Klein's construction, Acceleration diagram, Acceleration center, Coriolis components, Problems of slider crank mechanism and its inversion, four bar chain etc. Analytical treatment for velocity and acceleration of piston and connecting rod of an engine. Analytical method for kinematics analysis using vector notation.

Unit III : **Friction**: Boundary and fluid film lubrication, friction in journal and thrust bearings, friction circle and axis, ball and roller bearings.**Clutches**: Single plate and multi plate clutches, Cone clutches.

Brakes: Analysis of simple brake assuming uniform pressures and uniform normal wear, band brake, band and block brakes, brakes, Internal and external shoe brakes **Dynamometer**: Different types and their applications.

Unit IV : Gears: Classification of gears, spur, helical, bevel, worm, spur gear terminology, conjugate action, law of gearing Involute and cycloidal tooth profiles, Interference and undercutting, contact ratio, Helical, spiral, Bevel and worm Gears -Equivalent spur gear concept, velocity of sliding, center distance, Efficiency.

Gear Trains: Simple, compound, epicyclic gear trains, Tabulation and formula method, tooth loads and torque calculations in gear trains.

Unit V : **Cams**: Classification of cams and followers, Type of follower motion, uniform, simple harmonic, parabolic, cycloidal, cam profile by graphical method, cams with specified contours.

Belts, Ropes and Chains: Introduction, Belt and Rope Drives, Open and Crossed belt drives, Velocity ratio, Slip, Types of pulleys, Crowning of pulleys, Law of belting,-Length of belt, Cone Pulleys, Ratio of friction tensions, Power Transmitted, Centrifugal effects of the belt, Maximum power transmitted by a belt, Initial Tension, Chains, Chain Length, Angular Speed Ratio, Classification of chains

References:

1. 1. Theory of Machines and Mechanisms by A. Ghosh and A.K. Mallik, Affiliated East wast press.
   2. Theory of Machine and Mechanism by J.E.Shigley and J.J.Uicker Addrson wesley.
   3. Fundamentals of Applied Kinematics by D.C.Tao Addison wesley.
   4. Theory of Machines by Beven.
   5. Theory of Machines by Green.
   6. Theory of Machines by A.C.Rao.
   7. Mechanism & Machine Theory by Dr. A.G. Ambedkar
   8. Theory of Machines by S.S. Ratan

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	
	MATERIAL SCIENCE	ME-12	Min "D"	Min "D"	5.0

MATERIAL SCIENCE

Unit I

Mechanical Behavior of Materials: The behavior of metals subjected to tension, compression, bending, shear, variable loads and temperature, Wear, Creep.

Crystal Structure of Solids: Atomic Structure, Crystal structure, Bonds in solids, Allotropy, Crystallographic notations of atomic planes, Structure of atom binding in solids metallic

Deformation of Metals: Elastic and Plastic Deformation, Dislocations, Imperfections, Mechanism of Slip and Slip Planes, Twinning, Season Cracking, Bauschinger's effect, Work hardening, Cold and hot working of metals and their effect on mechanical properties, Principles of recovery, recrystalisation, Dendrite structure.

Unit II

Phase rule and Theory of Alloys: Phase, Phase changes, Phase Rule, Solid Solutions, Equilibrium Diagrams, Eutectic and Eutectoid type phase diagrams, Lever's rule

The Iron-Carbon Diagram: Allotropy of Iron, Phase transformation during heating and Cooling, TTT diagrams, Effect of cooling rate on phase changes and structure, the composition and uses of carbon and alloy steels, effect of alloying elements on properties of steels, Tool and Die Steels, Stainless Steel, Hadfield Steel

Unit III

Heat Treatment of Steel: Grain growth and Grain Size, Annealing, Normalizing, Spherodizing, Hardening, Tempering, Case Hardening, Quenching, Nitriding, Cynaiding, Effect of alloying elements on transformation temperature, Austempering and Martempering, precipitation hardening process with reference to Al, Cu alloys

Unit IV

Cast Iron: Composition, Types of cast iron, Grey cast iron, White cast iron, ;Melleable Cast iron, chilled cast iron - structure and general characteristics, Factors affecting structure of cast iron, effect of alloying elements on properties of cast iron, Cooling rate and graphite flake size, Heat treatment of cast iron

Unit V

Powder Metallurgy: Production of Powder, molding, sintering, advantages, disadvantages and limitations of Powder Metallurgy, Principles of precipitation hardening and heat treatment of non ferrous metals.

Non Ferrous Alloys: Compositions, advantages, limitations of uses of alloys of Copper, Aluminium, Magnesium, Tin, Nickel, Lead, Zinc, Titanium etc.

Ceramics and Polymers: Classifications, properties and their selections, Clay, Glasses and Refractories, Plastics, Rubbers Adhesives

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
8. Engineering Physical Metallurgy By Y. Lekhtin, MIR Publication

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	
B.E.	**KINEMATICS OF MACHINE LAB**	ME-15L			

KINEMATICS OF MACHINE LABORATORY

LIST OF EXPERIMENTS / STUDIES

1. To Study different types of Kinematics Pairs.

2. To Study Slider Crank Mechanisms and its Inversion.

3. To Study Mechanisms with Lower Pairs. (Straight Line Motion Mechanism, Gross Hoper Mechanisms, Pantographs etc.)

4. To Study different types of Cams, Followers and to plot n - 0 curve (follower displacement Vs Angle of Cam Rotation) for different Cam Follower pairs.

5. To Study different types of Friction Clutches.

6. To Study different types of Brakes.

7. To Study Gears and Gears Trains.

8. To Study working of Differential Gear Mechanism.

9. To Study of Cam Follower Mechanism.

10. Study of Ackermann Steering Mechanism.

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	
	PROFESSIONAL ACTIVITY- I	ME-56L	Min "D"	Min "D"	5.0

PROFESSIONAL ACTIVITY- I
(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.

Note : The list of activities can be modified as per requirements of the department.

A hand written report of about 30 pages duly signed by the student and the concerned teacher should be submitted.

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	ME-60L			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.