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)

M.E. II Sem.   **Branch : Mechanical Engg.   Specialization : Machine Design**

| Course Code | Subject | Periods | | | Evaluation Scheme | | | | | Credits |
| | | L | T | P | TA | CT | TOT | ESE | SUB TOTAL | |
					Sessional Exam					
ME-120	Advanced Machine Design	3	1	-	10	20	30	70	100	4
ME-121	Finite Element Method	3	1	-	10	20	30	70	100	4
ME-122	Mechanics of Materials Failure and Fracture	3	1	-	10	20	30	70	100	4
	Elective – I (Any One)									
ME-123A	Random Vibration									
ME-123B	Vibration and Noise Control	3	1	-	10	20	30	70	100	4
ME-123C	Applied Dynamics and Vibration Control									
ME-123D	Dynamics of Mechanical System.									
	Elective - II (Any One)									
ME-124A	Mechanical Analysis and Synthesis									
ME-124B	Advanced Topics in Mechanism	3	1	-	10	20	30	70	100	4
ME-124C	Introduction to Robotics									
ME-124D	Robotics and Robot Applications									
(PRACTICAL/DRAWING/DESIGN)										
ME-125L	Finite Element Method Practice	-	-	2	60	-	60	90	150	6
ME-126L	Robotics Lab	-	-	2	60	-	60	90	150	6
	Total	15	5	4	170	100	270	530	800	32

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 800
Total Periods : 24 Total Credits : 32

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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	
	ADVANCED MACHINE DESIGN	**ME-120**	Min "D"	Min "D"	5.0

ADVANCED MACHINE DESIGN

Gear and Gear Trains: Synthesis of tooth profile for circular spur gears, non circular spur gears with constant distance. Generation of logarithmic function, Elliptical gears, equiangular spirals teeth of non circular gears.

Gear trains : Design of gear train for a given velocity-ratio up to a desired degree of accuracy. Method of conjugate fraction, properties of conjugate fraction, Broct's table of fraction and its application. Change speed gears, preferred numbers, three shaft step change of speed, arrangemen1 of change speed gear box.

Cams: Forces in rigid system, Mathematical models, analytical methods, position error, jump, shock, unbalance, spring, surge and winding.
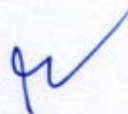
Synthesis of cams: High speed cam design, kloomoek and Muffley analytical function of cycloid harmonic and eighth power polynomial. Analytical cam design.

Analytical Cam design : Disc cam with radial flat faced follower disc cam with radial roller follower disc cam with oscillating roller follower

Linkages : Number synthesis , type synthesis, Dimensional synthesis four bar linkage Freudenstein's Equation.

REFERENCES
L Mechanism and dynamics of machinery)' By M.H. Magic and P.W. Oevirk, J.S. Beggs
2. Mechanisms - Baggs.
3. Gears - Hand book by Dudley.
4. Cams - Rothbart.
5. Mechanisms and Machines - A.Ghosh and Malik

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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	
	FINITE ELEMENT METHOD	ME-121	Min "D"	Min "D"	5.0

FINITE ELEMENT METHOD

INTRODUCTION:
Background and application of Finite Element Method, Matrix techniques solution of large system of algebraic equations, inverse of a matrix, Eigen value problem.

THEORY OF FINITE ELEMENT METHOD :
Calculus of variation, variation principles, weighted residual approach. The concept of an element, various element shapes, isoperimetric elements, Shape functions, Simple structural problems. The F.E.M. solution-procedure, plane" stress, plane strain body or structure, Mes!1 refinement, Interelement compatibility and continuity; convergence criteria. Boundary conditions, Solution of the overall problem, three dimensional stress analysis using tetrahedral and prismatic elements.

TECHNIQUES FOR NON UNEAR ANALYSIS:
Non linear analysis. Basic nonlinear solution techniques, computer aspects of nonlinear techniques, problems involving material and geometric nonlinearity.

APPLICATION OF FINITE ELEMENT METHODS:
Introduction to the solution of problems in theory of elasticity, fluid flow, heat conduction etc.

REFERENCES

1. Introduction to finite element Method By: Chandrakant S.Desai and Abel,
2. The finite element Method By : Zienkiewicz
3. Introduction to finite element Analysis (Theory and Application) By, H.C.Martin and Grahm Carey

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			T	P	
	MECHANICS OF MATERIAL FAILURE AND FRACTURE	ME-122	Min "D"	Min "D"	5.0

MECHANICS OF MATERIAL FAILURE AND FRACTURE

Unit-1
Fatique : (Normal Conditions)
Concepts of fatigue failure, statistical method. Endurance limit, S.N.diagram, stress cycling,strain cycling,Goodman and Gesber relations and their application to design problems. Review of stress concentration.

Unit-2
Controllinq Factors - Effect of Frequency of the cyclic stress, effect of-Temperature, size form, surface condition, surface protection, residua; stresses environment (corrosion fatigue) frestting of surface in contact and effect of understress and overstress.

Unit-3
Fatigue testing machines, specimen and test procedures, appearance of fatigue fractures Surface fatigue., contact stresses. Brief introduction to Random load catigue.

Unit-4
Mechanism of creep, Tramsient creep, Viscous creep, creep frnctures, Analysis of creep curves, strees relaxation, creet tests.

Unit-5
FRACTURE:- Historical background, Modes of crack displacement opening mode, sliding mode, tearing mode, stress intensity factor of a crack stress intensity factor in finite bodies, Fracture criterion- Griffiths fracture stress, Fatigue toughness (critical stress intensity factor) Fracture crack propogation, plastic deformation around crack tip, crack opening displacement. Allication to design of steam turbine rotor discs, and thin walled pressure vessels and thin walled pressure pipings.

REFERENCE BOOKS:
1. Strength and Resistance of Metals- Lessels - J & M
2. Engineering Material Science - Rechards - Prentice Hall
3. Elementory Engineering Fracture Mechanics - David Brock- Nordhoff
4. Advanced Machine Design - A.Mubeen - Khanna

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Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	VIBRATION & NOISE CONTROL	ME-123B	Min "D"	Min "D"	5.0

VIBRATION AND NOISE CONTROL

Unit-1
Single degree of freedom system:- Undamped and Damped free vibrations of single Degree of freedom system and forced vibration of single degree of freedom system. Torsional vibration stiffness of spring energy method, viscous damping. Coulomb and structural damping non-harmonic excitation.

Unit-2
Two degree of freedom system: Principal mode of vibration, vibration various cases such as double pendulum, two rotor system torsional, oscillation, undamped forced vibration with harmonic excitation, principle of vibration asorbers.

Unit-3
Multi deqreed of freedom system: exact analysis undemped free vibration influence numbers and Maxwells reciprocal theorem, torsional vibration of multi rotor system, natural frequencies and mode shape, model analysis, vibration of grade system, Numerical methods Rayleighs method, Dunker leys method, stodolas method, Rayleigh Ritz method, Holzer's method, method of matrix itration, finite element based dynamic analysis of simple systems, Equation of motion of an element. Incorporation of boundary conditions. Consistent and lumped mass matrices.

Unit-4
Vibration Measurement and Control :- Vibration Nomograph ,Reduction of vibration at the source, Control of vibration ,control of natural frequencies Introduction to damping,vibration ,Isolation,vibration absorber, Transducers, vibration pickups, vibration measuring instrurnents, vibration exciters, frequency-measuring, instruments. signal analysis, Dynamic testing of machine and structure, Experimental modal analysis. Machine condition monitoring and diagnosis.
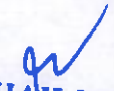
Unit-5
Noise Control. : Nature of air borne and Structure, Mechanism of generation of radiation of sound, Frequency and sound dependent human response, decibel scale, relationship between sound pressure

level, sound power level and sound intensity scale, sound spectra and octave band analysis, loudness, weighting network,auditory effect of noise, Hazardous noise exposure due to machines and equipments,

industrial noise control strategies, noise control at source, noise control along the path, Noise control at the receiver ear defenders ear plug.

Refference Books:
1. Mechanical Vibration - G.K.grover -Nemchand and Bross.
2. Mechanical Vibration - Singiresu S.Rao -Pearson
3. Theory of Vibration - with application William T.Thomson -pearson
4. Mechanical Vibration and Noise Engineering -Ambekar A.G.PHI

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			T	P	
	ROBOTICS & ROBOT APPLICATIONS	ME-124D	Min "D"	Min "D"	5.0

ROBOTICS AND ROBOT APPLICATIONS

UNIT-1
Fundamentals of Robot Technology :- Robot Anatomy. Robot drive system .Control systems and Dynamic, performance. Robotic sensors.

UNIT-2
Control systems and Components :- concepts and models. Controllers. Robot activation and feedback. Position sensors. Velocity ,sensors. Actuators. Power Transmission Systems. Robot Joint control design.

UN I T-3
Robot motion Analysis and Control :- Manipulator Kinematics Transformations. Robot Kinematics . Manipulator Path Control . Robot dynamics.

UNIT-4
Sensors in Robotics:- Transducers and Sensors. Tactile sensors. Proximity and Range sensors. Miscellaneous sensors. Sensor- based systems. Uses of sensors in Robotics.
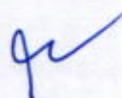
UNIT-5
Robot Applications:-   (i) Robot cell Design and Control- Robots and Machine Interference .work cell Control. Error detection and Recovery.

(ii) Robot Applications in manufacturing: - material Transfer and machine Loading/Unloading. Process Operations. Assembly and Inspection Application.

Reference Book:

(1) Industrial Robotics - M.P.Groover, M.Weiss,R.N.Nagel, N.G.Odrey- Tata McGraw Hill
(2) Introduction to Robotics. - John J.Graig -Pearson Education
(3)Robotics and Control - R.K.Mittal and I.J.Nagrath Tata McGraw Hill
(4) Robot Dynamics and Control - Spong- Wiley India
(5) Robot Modeling and Control - Spong- Wiley India

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			T	P	
	FINITE ELEMENT METHOD PRACTICE	CE-125L	Min "D"	Min "D"	5.0

FINITE ELEMENT METHOD PRACTICE

The exercises in this component shall be designed to demonstrate the basic principles outlined in different units of the theory paper. After completing the exercises the student should have developed a good grasp of the practical utilities of the theory content.

(Suggested Exercise)

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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	
	ROBOTICS LAB	ME-126L	Min "D"	Min "D"	5.0

ROBOTICS LAB

The exercises in this component shall be designed to demonstrate the basic principles outlined in different units of the theory paper. After completing the exercises the student should have developed a good grasp of the practical utilities of the theory content.

(Suggested Exercise)