SAURASHTRA UNIVERSITY

B. E. SEMESTER- VI (MECH)

601: MACHINE DESIGN

WEF: Ay: 2006-07

Teaching Scheme			**Examination Scheme**		
Lect./week	:	4 hrs/week	Theory	:	100 Marks (4 Hrs.)
Pract.	:	4 hrs/week	Pract./Oral	:	50 Marks
			Term work	:	50 Marks
			Total	:	200 Marks

1. Principle stresses and theories of failure, stress concentration and methods of reducing it, notch sensitivity, fatigue failures, endurance limit modifying factors, Designing for alternating stresses.
   Hertz's contact stresses for spherical and cylindrical surfaces, various criteria of design.
2. Preferred numbers and their use in designs Limit fits and tolerances, Design of press & shrink fits, slip torque.
3. **DESING OF POWER SCREWS** for machine tools and presses, Forms of thread, Torque and Efficiency of power screw, Self locking screws, Collar friction, Stress analysis.
4. **DESIGN OF BELTS & CHAINS;** Mechanism of belt drive; Geometric factors, Effect of centrifugal force, Stresses in belts, Pull factor, Belt materials, Selection of pulley, Selection of flat belts and V belts from catalogue, Roller chains, Length of chain and Number of links, Power ratings of roller chain, Sprocket wheels, Failure in roller chain, Lubrication of chain drive.
5. **DESIGN OF PRESSURE VESSELS**; Thick cylinders(Lami's equations) for brittle and ductile materials, Birnie's Equation, Clavarino's equation, Barlow's equation, Design of pipes, Design of cylinder heads and cover plates.
6. **DESING OF THREADED FASTENERS** with initial tightening under fluctuating loads, Stuffing boxes, Gaskets and seals.
7. **DESIGN OF BRAKES AND CLUTCHES.**
   Classification of Brakes, Energy relations and Thermal considerations in brakes, Design consideration in Block Brake, Band Brake, Band and Block Brake, Internal Expanding shoe **BRAKE.**
   Classification of Clutches, Plate clutches, Cone clutches, Centrifugal clutches, Torque capacity of mentioned clutches and thermal considerations.

TERM WORK:

1. The candidates shall submit design report of one major problem and five minor problems from the above topics.
2. The candidates shall prepare atleast two working drawings of a1 size of details and assembly for major-design done under (1) above.
   Practical examination shall consist of drawing the sketches of machine parts and oral examination based on I & II above.

REFERENCE BOOKS:

1.	Machine Design	:	Sundera Rajmoorty And Shanmugan
2.	Machine Design	:	Shah And Pandya
3.	Machine Design (Vol. I & Ii)	:	Patel And Pandya
4.	Machine Element:	:	Dobrovosky
5.	Machine Design	:	Reshetov
6.	Machine Design	:	Pujara & Juneja
7.	Machine Design	:	Sharma and Agraval
8.	Machine Design	:	V.B.Bhandari
9.	Machine Engg. Design	:	Josheph Shigley
10.	Design of M/c Elements	:	C.S. Sharm & Kamlesh Purohit
11.	Machine Design	:	Dr. Rajendra Karwa
12.	Machine Design	:	Haidri

602: HEAT AND MASS TRANSFER

Teaching Scheme			**Examination Scheme**		
Lect./week	:	4 hrs/week	Theory	:	100 Marks (3 Hrs.)
Pract.	:	2 hrs/week	Pract./Oral	:	25 Marks
			Term work	:	25 Marks
			Total	:	150 Marks

1. CONDUCTION:

Derivation of generalized equation in the Cartesian, cylindrical and spherical co-ordinates Thermal Conductivity of gases, liquids, metals, refractory materials and building material. Effect of temperature, porosity and humidity. Determination of thermal conductivity of metals, refractories and building material steady-state heat

transfer through plane, cylindrical and spherical wall with constant and variable thermal conductivity. Composite walls. Electrical analogy.

2. CONVECTION:

Force convection, Dimensionless number and their interpretations, continuity equation, concept of hydrodynamics and thermal boundary layers, Momentum equation and energy equation; Use of approximate internal methods in their derivations. Derivation of generalized equation in dimensionless groups by dimensional analysis and principle of similarity.

Natural convection: use of experimental correlation by determine heat transfer coefficient and heat loss.

Force convection : Determination of the heat transfer coefficient from experimental co-relation for parallel counter and cross flow arrangements.

4. Combined modes of heat transfer :

Convection and conduction. Heat transfer from fins. Effectiveness of fins.

Types of Heat Exchangers: parallel, counter and cross flow and multiple pass, The logarithmic mean temperature difference, the overall heat transfer coefficient. Effect of fouling on the performance of heat exchangers. Determination of the number of passes, number of tubes per pass and the length of transfer unit. Heat losses from pipe lines, furnaces, air spaces, critical thickness of insulation.

5. RADIATION:

Nature of radiator, its intensity, concept of black and gray surfaces. Laws of radiation: Kirchhoff's, Steffen-Boltzmann's, Planck's & wein displacement. Emissivity, Electrical analogy, Heat-Exchanges between black and gray surfaces with and without re-radiating surfaces. Heat exchange between the enclosed body the enclosure, effect of radiation shields.

6. Combined modes of heat transfer :

Convection, conduction and radiation, overall heat transfer coefficient, Heat losses from pipe lines, furnaces, air spaces, critical thickness of insulation.

7. Elementary Mass Transfer:

Fick's law, Eqimolal diffusion , diffusion of vapours through a stagnant medium. Similarity between heat and Mass transfer. Heat mass transfer in humidification and dehumidification. Application to engineering problems.

REFERENCE BOOKS:

Principles of Heat Transfer	:	Kreith
Heat Transfer	:	Macadams
Heat Transfer	:	Domkundwar
Heat Transfer	:	Sukhatme
Heat and Mass transfer	:	R. K. Rajput
Heat and Mass transfer	:	D. S. Kumar
Heat transfer	:	J. P. Holman

603: COMPUTER PROGRAMMING

Teaching Scheme			**Examination Scheme**		
Lect./week	:	4 hrs/week	Theory	:	100 Marks (3 Hrs.)
Pract.	:	2 hrs/week	Pract./Oral	:	25 Marks
			Term work	:	25 Marks
			Total	:	150 Marks

(1) Computer Introduction in Mechanical Engineering :

Introduction to computers, organization of computes (Block Diagram), methods of operation, flow charts and Algorithms, application of computer in manufacturing and design, software introduction used for the manufacturing and design in mech. engineering.

(2) C++ Programming Basics:

Program Structure, Content, Variables, date types, key words, declaration of variable, operations and expression, Type conversion, library function

(3) Data input and output :

Reading & writing a character. Formatted input and out

(4) Control and looping :

Branching statements, nesting & looping statements.

(5) Object and classes :

A simple class C++ objects as physical object, create and used it for the machine component design.

(6) File management :
Defining, opening and closing file input/output operation on files, error handling during I/O random access file, command line arrangement.

(7) Graphics Programming :
Line and other shape functions, Drawing and filling images. Filling regular and non regular shapes, patterns, & colors output putting and justifying, text, create standard machine component

(8) Computer aided Part designing and programming :
Design the m/c parts subjected pure twisting moment, bending moment and combining twisting and bending moment by using above mentioned concepts.

Note : Student must have to design project for at least 3 different m/c component using above concepts for the Term Work.

REFERENCE BOOKS :

(1) Design of MACHINE ELEMENTS - V.B.Bhandari
(2) Machine Design - R.S.KHURMI
(3) Mastering C++ - Venugopal
(4) Object oriented programming with C++ Balaguruswamy
(5) Thinking in C++ - P.B. Mahapatre.
(6) Machine Design - R.K.Jain
(7) CAD/CAM - Haidry

604: DYNAMICS OF MACHINE – II

Teaching Scheme			**Examination Scheme**		
Lect./week	:	4 hrs/week	Theory	:	100 Marks (3 Hrs.)
Pract.	:	2 hrs/week	Pract./Oral	:	25 Marks
			Term work	:	25 Marks
			Total	:	150 Marks

1 **MECHANICAL VIBRATION**:
Types of vibration, Degrees of freedom, Natural frequency of systems, undamped and damped vibration, viscous damping logarithmic decrement, Forced vibration, Resonance, Dynamic magnifier, phase-lag,, vibration isolation and transmissibility, vibration absorbers. Two degree of freedom system, critical speed of the shafts, Torsional vibration, geared systems, Equivalent torsional systems, Holzer's method, Longitudinal and Transverse vibration of the beams, Dunkerley's equation, Influence Co-efficient Method, Stadola Method, Dunkerley's & Rayleigh's Method, Matrix Method

2 **BALANCING:**
Static and dynamic balance: Balance of revolving masses in the same plane and in different planes; partial balance of reciprocating parts, primary and secondary balance of multicylinder in-line engines, direct and reverse cranks and its application to radial and V- engines. Field balancing by graphical and analytical. Balancing machines, Automobile wheel balancing machine.

3 **CAM DYNAMICS**:
Dynamics of high speed cam system, polydyn. cams, force analysis of cams, vibrations, jump, shock, spring surge criteria in high speed cams.

REFERENCE BOOKS:

Theory Of Machines	:	J. M. Sheth & M. M. Jadvani
Mechanical Vibration	:	Grover
Theory Of Machines	:	P.I. Ballaney
Mechanical Vibration	:	G.K. Grover
Mechanical Vibration	:	Sharma
Theory of Machines	:	Jagdishlal
Mechanical Vibration	:	Thomson
Theory of M/Cs	:	J.M. Shah & Jadwani
Theory of M/Cs	:	S.S. Ratan
Mechanism and Machine Theory	:	Rao and Duhkipati
Mechanical Vibrations	:	Seto (Schaum Series)
Theory & Practice of Mechanical Vibration	:	Rao & Gupta

605: PRODUCTION TECHNOLOGY

Teaching Scheme			**Examination Scheme**		
Lect./week	:	4 hrs/week	Theory	:	100 Marks (3 Hrs.)
Pract.	:	2 hrs/week	Pract./Oral	:	25 Marks
			Term work	:	25 Marks
			Total	:	150 Marks

1. METAL CUTTING:
Tool materials, their types, characteristics, and selection orthogonal and oblique cutting, cutting parameters, cutting forces and power, tool wear, economics of cutting machineability ratings.

2. CUTTING TOOL DESIGN:
Criteria of design for single point, multi point and formed tools, throw away *pipe, chip breakers, coolants, types and application, safety considerations in tool design.

3. TOOL LAYOUTS:
Capstan and turret standard tooling and tool holder, bar feeding and indexing mechanism. Tool layouts for simple parts. Automates single spindle and multi spindle constructional details and working principles, tooling and cam design.

4. PRESS TOOLS:
Design of press tools, die and punch design, effect of Clearance, simple, compound and progressive dies, strip layout, methods of mounting punches and dies, and drawing dies.

5. JIGS AND FIXTURES:
Economics of Jigs and fixtures, principles of locating and clamping. Locating and clamping devices, design of jigs and fixtures. Standardization in jigs and fixtures.

6. SELECTION OF PROCESS:
Analysis of alternative process, planning on sequence, machine tools & tooling required, estimation of production time.

TERM WORK / PRACTICALS: Term work/ Practical will be based on followings:

1. Experiments on metal cutting.
2. Exercises on selection of process and tooling.
3. Design and drawing of press tool.
4. Design and drawing of jig and fixture.

REFERENCE BOOKS:

1.	Principles of Engg. Production	:	by Lisseman & Martin
2.	Theory of Metal Cutting	:	by Paut H. Black
3.	Fundamental of T - design	:	by Astme
4.	Production Engineering Science	:	by P.O. Pandey & C. K. Singh
5.	Production technology	:	by R. K. Jain
6.	Production Engg.	:	by P.C. Sharma
7.	Production Technology	:	by H.M.T.