

Course Code	Course Name	Credits
MEC601	Machine Design	04

Objectives:

1. To study basic principles of machine design
2. To familiarize with use of design data books & various codes of practice
3. To acquaint with functional and strength design principles of important machine elements
4. To familiarize selection of standard elements such as rolling element bearings, belts etc.
5. To make conversant with preparation of working drawings based on designs

Outcomes: Upon successful completion of this course, the learner will be able to

1. Use design data book/standard codes to standardise the designed dimensions
2. Design Knuckle Joint, cotter joint and Screw Jack
3. Design shaft under various conditions and couplings
4. Select bearings for a given applications from the manufacturers catalogue.
5. Select and/or design belts and flywheel for given applications
6. Design springs, clutches and brakes

Module	Details	Hrs
1	Mechanical Engineering Design, Design methods, Aesthetic and Ergonomics consideration in design, Material properties and their uses in design, Manufacturing consideration in design, Design consideration of casting and forging, Basic principle of Machine Design, Modes of failures, Factor of safety, Design stresses, Theories of failures (Selection in the process of designing), Standards, I.S. Codes, Preferred Series and Numbers Thick Cylinders: Design of thick cylinders subjected to an internal pressure using Lamé's equation	08
2	Design against static loads: Socket and Spigot Cotter joint, Knuckle joint, Bolted and welded joints under eccentric loading; Power Screw- Screw Jack.	08
3	3.1 Design against fluctuating loads: variables stresses, reversed, repeated, fluctuating stresses. Fatigue failure: static and fatigue stress concentration factors, Endurance limit-estimation of endurance limit, Design for finite and infinite life, Soderberg and Goodman design criteria, 3.2 Design of Shaft: power transmitting, power distribution shafts, Module (excluding crank shaft) under static and fatigue criteria. Keys: Types of Keys and their selection based on shafting condition. Couplings: Classification of coupling, Design of Flange couplings, Bush pin type flexible couplings	12
4	4.1 Rolling Contact Bearings: Types of bearing and designation, selection of rolling contact bearings based on constant / variable load & speed conditions (includes deep groove ball bearing, cylindrical roller, spherical roller, taper roller, self-aligning bearing and thrust bearing) 4.2 Sliding Contact Bearings: Design of hydro dynamically lubricated bearings (self-contained), Introduction to hydro static bearings,	08
5	5.1 Design and selection of Belts: Flat and V-belts with pulley construction. 5.2 Design and selection of standard roller chains. 5.3 Design of Flywheel – Introduction, Fluctuation of energy and speed, turning moment	08

	diagram, estimating inertia of flywheel for reciprocating prime movers and machines, Weight of the flywheel, flywheel for punches, rim constructions, stresses in rims and arms, Construction of flywheel.	
6	6.1 Design of Springs: Helical compression, Tension Springs under Static and Variable loads, Leaf springs. 6.2 Design of Clutches: Introduction, types, Basic theory of plate and cone type clutches, Design of single plate, multi-plate and with spring, lever design and thermal, wear considerations. 6.2 Design of Brakes: Design of single shoe brake.	08

Assessment:

Internal Assessment for 20 marks:

Consisting Two Compulsory Class Tests

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total six questions, each carrying 20 marks
2. Question 1 will be compulsory and should cover maximum contents of the curriculum
3. Remaining questions will be mixed in nature (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four questions need to be solved

Text/Reference Books:

1. Design of Machine Elements - V.B. Banadari, Tata McGraw Hill Publication
2. Design of Machine Elements - Sharma, Purohil. Prentice Hall India Publication
3. Machine Design -An Integrated Approach - Robert L. Norton, Pearson Education
4. Machine Design by Pandya & Shah, Charotar Publishing
5. Mechanical Engineering Design by J.E. Shigley, McGraw Hill
6. Machine Design by Reshetov, Mir Publication
7. Machine Design by Black Adams, McGraw Hill
8. Fundamentals of Machine Elements by Hawrock, Jacobson McGraw Hill
9. Machine Design by R.C. Patel, Pandya, Sikh, Vol-I & II C. Jamnadas & Co
10. Design of Machine Elements by V.M. Faires
11. Design of Machine Elements by Spotts
12. Recommended Data Books – Design Data: Data Book of Engineers by PSG College, Kalaikathir Achchagam

Links for online NPTEL/SWAYAM courses:

<https://nptel.ac.in/courses/112/105/112105124/> - Design of Machine Elements, IIT Kharagpur

<https://nptel.ac.in/courses/112/106/112106137/> - Machine Design-II, IIT Madras