22ME302 DESIGN OF MACHINE COMPONENTS

Hours Per Week :

L	T	P	C
2	2	2	4
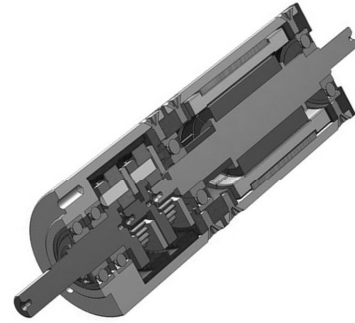
PREREQUISITE KNOWLEDGE: Fundamental physics, Mathematics, Engineering mechanics..

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to enrich fundamental concepts required for the design of machine components when subjected to various types of loading and operating conditions .

Source: http://www. pmdengineer.com/

MODULE-1

UNIT-1   **6L+6T+6P=18 Hours**

Design For Static & Fatigue Strength: Selection of Materials, Phases of design, Theories of failure and its applications in static design, Stress concentration, Fluctuating stresses, design for low cycle and high cycle fatigue, Design for finite and infinite life, Strength of transverse and parallel fillet welds; Design of bolted joints, Design of helical springs.

UNIT-2   **10L+10T+10P=30 Hours**

Design Tasks: Selection of materials using Ashby charts, Modeling of knuckle joint, cotter joint, Experimental determination of endurance limit, Measurement and assembly of machine parts, estimation stress concentration and factor of safety, solving numerical problems using design data book.

PRACTICES:

- To create wire frame and surface models using Creo/CATIA.
- To model machine components using Creo/CATIA.
- To design the shafts based on various theories of failure using C/MATLAB.
- To determine the finite or infinite life of shafts subjected to fatigue load using MATLAB.
- Modeling and assembly of Cotter/Knuckle Joints.

MODULE–2

UNIT-1   **6L+6T+6P=18 Hours**

Design of Transmission Elements: Shafts and keys, flat belt drives, spur gears, journal bearings, antifriction bearings.

UNIT-2   **10L+10T+10P=30 Hours**

Design Tasks: Selection of v- belt drives, estimation of module, Computer aided design of shafts and keys, Selection of antifriction bearings from catalogue, Fitment and alignment of Bearing, Modeling of gear drive.

PRACTICES:

- To design and modeling of spur gear using MATLAB/Creo.
- To design and modeling of helical gear using MATLAB/Creo.
- Modeling and assembly of Plummer block.
- To estimate the rating life of ball bearing using MATLAB.
- To estimate the rating life of taper roller bearing using MATLAB.

SKILLS:
- ✓ *Problem solving skills.*
- ✓ *Programming/ Modeling/ Analysis skills.*
- ✓ *Creative skills.*
- ✓ *Teamwork.*
- ✓ *Communication skills.*

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply suitable failure theory for design of various machine elements subjected to static loading or cyclic loading.	Apply	1	1, 2
2	Evaluate the strength and the rating life of mechanical elements.	Evaluate	1	1, 2, 3
3	Construct machine components using modeling software.	Apply	2	1, 2, 3
4	Conceptualize a machine in terms of geometrical requirements and synthesize an Assembly of machine components.	Create	2	1, 2, 9

TEXT BOOKS:
1. Robert L. Norton, "Machine Design: An Integrated Approach", Pearson, 6th Edition, 2020.
2. Keith J Nisbett and Richard G Budynas, "Mechanical Engineering Design", McGraw-Hill Education, 10th Edition, 2014.

REFERENCE BOOKS:
1. George Dieter and Linda Schmidt, "Engineering Design", 6th Edition, 2021.
2. Ashby M F, "Material Selection in Mechanical Design", Elsevier, 5th Edition, 2016.