

| 4045 - MACHINE DESIGN PRACTICE | | | | | | | | | | |
|--------------------------------|-----------|--------|------------------------|----------|------------------------------|------|---------------|-------|-----|----------|
| Teaching Schedule Per Week | | | Progressive Assessment | | Examination Schedule (Marks) | | | | | |
| Lectures | Practical | Credit | | | Theory | | Practical Ex. | Total | | |
| 4 | 2 | 6 | 25 | 25 | 3 hrs. | 100 | 25 oral | | 175 | |
| Pre-requisite | | Source | | Semester | Theory | Test | Total | TW | PR | Gr Total |
| 4032 | | MEC | | | 75 | 25 | 100 | 25 | 50 | 175 |

RATIONALE: - The failures of machine components may be due to many reasons but mainly it is attributed to various types of loading. Many of the parts of a machine are subjected to combined type of loading and hence it is necessary to analyse the stresses, which develop on the components and take corrective measures to prevent failures of the components. The selection of materials for a particular application, the shape of the parts and manufacturing procedures are equally important aspects which need to be considered. All the above mentioned points are essential to get the end product. Hence, it is necessary to develop the ability to take an overall view of various associated problems rather to visualise it in a particular angle only. The students should also be conversant with the use of Handbook / Data book to locate a particular data as and when required by him/her. In this course the students shall be given an idea of the process of designing.

OBJECTIVES:- a) To develop the ability to analyse the problem.

b) To develop the habit of referring to design data book for finding standard information.

c) To develop ability to design any machine part consisting of maximum of four components.

| COURSE CONTENTS | | Hrs | Mks |
|-------------------------------|---|-----|-----|
| 1. FUNDAMENTALS | Stress, Strain, Elastic limit, Yield strength, Ultimate strength, with the help of stress – strain diagram, proof stress, and creep. Stress – Time curve for completely bending cycle, endurance limit. Stress concentration – causes and remedies. Working stresses, factor of safety, general consideration in selecting factor of safety. General consideration for selections of materials and manufacturing processes. Use of design data book, standardisation General design – Consideration & Procedure | 6 | 8 |
| 2. LOAD CONSIDERATION | 1 Types of external loads 2 Types of induced stress, tensile, compressive, shear, crushing and bearing. 3 Design of machine parts subjected to direct tension, compression, shearing, bending, twisting, Cotter joint, Knuckle joint, Turn buckle, Suspension link. Levers, Rocker arm, Bell crank lever, Safety valve lever, Arms of pulleys, Bearing Cap. | 13 | 20 |
| 3. COMBINED LOADING | 1 Design of machine parts subjected to – Combined direct and bending. Combined bending and twisting. Combined direct and twisting. Introduction to elastic theories of failures and application of maximum principal stress theory and maximum shear stress theory 2 Design of the following machine parts. Clamp frame, Offset link. Line shaft with two bearings and one or two pulleys mounted in between the bearings. | 10 | 16 |
| 4. DESIGN OF FASTENERS | 1. Stresses in screw fastening 2 Design of bolts of uniform strength. 3 Design of bolted joint subjected to direct and eccentric loading. 4 Design of welded joints (symmetrical and asymmetrical weld) axially loaded. 5 Design of welded joint subjected to eccentric loading | 8 | 12 |

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|---|----|-----|
| 5. DESIGN OF KEYS AND COUPLING | 7 | 12 |
| 1 Design analysis of sunk key | | |
| 2 Design of following couplings, solid muff coupling, flange coupling, bushed pin type flexible coupling. | | |
| 6. POWER SCREW | 6 | 8 |
| 1 Thread profiles used for power screws | | |
| 2 Design of power screws (screw jack, screw press, screw clamp) with consideration of maximum principal and shear stress theory, buckling. | | |
| 3 Efficiency of screw, Self locking of screw. | | |
| 7. SPRING | 10 | 16 |
| 1 Classification, applications and functions of springs, 2 Materials used for springs. | | |
| 3 Spring index, 4. Spring rate, 5. Wahl's correction factor, 6 Stresses and deflection in compression helical spring, 7. Energy stored in spring. 8 Helical spring in series and parallel and concentric, 9 Leaf spring . | | |
| 8. BEARING | 4 | 8 |
| 1 Types of bearings. 2 Sliding and rolling contact bearing and their comparison | | |
| 3. Types of ball and roller bearing. Selection of bearing from the hand book, | | |
| 4. Mountings of bearing. | | |
| Total | 64 | 100 |

TERM WORK

The term work shall consist of a report involving design and preparation of working drawings on A-3 or half imperial size sheets on the following topics.
One problem each on topics No. 2, 3, 5, 6.

REFERENCE BOOKS

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|-------------------|--------------------------------|
| 1. Machine Design | R. S. Khurmi and J.K. Gupta |
| 2. Machine Design | Pandya and Shah. |
| 3. Machine Design | D.C. Sharma and D. K. Agarwal. |

