| Course code | Course Name | L-T-P - Credits | Year of Introduction |
|---|---|---|---|
| ME218 | ELEMENTS OF MACHINE DESIGN | 3-1-0-4 | 2016 |

**Prerequisite :** ME213 Theory of machines

**Course Objectives:**

- To develop an ability to design a system to meet the desired needs by choosing proper machine elements and mechanisms within the realistic constraints

**Syllabus:**

Introduction to design – design process – material behaviour – stress and strain – stress concentration - theories of failure - Welded joints – Design of keys and cotters-Design of Shaft couplings–Design of Bearing- Design of Gears-Design of Shafts

**Expected outcome** .

- After completion of this course, students are expected to have an understanding of the design of various machine elements. They will be able to select appropriate mechanisms.

**Data Book ( Approved for use in the examination):**

1. P.S.G., Tech., Machine Design Data Handbook
2. K. Mahadevan , Design data Book -– C.B.S Pub.

**References:**


1. Shigley J.E., Mechanical Engineering Design, McGraw Hill Book Company
2. Siegel, Maleev& Hartman, Mechanical Design of Machines, International Book Company
3. Phelan R.M., Fundamentals of Mechanical Design, TMH, Ltd.
4. Doughtie V.L & Vallance A.V., Design of Machine Elements, McGraw Hill Book Company
5. Juvinall R.C. &Marshek K.M., Fundamentals of Machine Component Design, John Wiley
6. Machine Design Robert L Norton , Prentice Hall India
7. Design of machine elements M.F.Spotts, Prentice Hall India
8. Machine Design – Wentzell, Thomson Learning
9. Kulkarni S.G, Machine Design, THM


**Course Plan**

| Module | Contents | Hours | Sem. Exam Marks |
|---|---|---|---|
| I | Introduction to design - steps in design process - design factors - tolerances and fits - principles of standardisation. Materials and their properties - Elastic and plastic behaviour of metals - ductile and brittle behaviour. True stress and true strain - stress - strain curves - Selection of materials - stresses in machine parts - tension, compression, shear, bending and torsional stresses, combined stress. Stress concentration, stress intensity factor - Fracture toughness -factor of safety, margin of safety - variable stress - endurance limit - Theories of failure | 9 | 15% |
| II | Combined steady and variable stress - Gerber, Goodman, Soderberg method - impact load - fatigue loading | 9 | 15% |
| **FIRST INTERNAL EXAMINATION** | | | |

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|---|---|---|---|
| **III** | Welded joints - types of joints, strength of welds, fillet welds- eccentric loading.<br>Design of keys and cotters.<br>Shaft couplings, - stresses in couplings -design of couplings- Muff and flanged coupling | 9 | 15% |
| **IV** | Gears - spur and helical gears - Design for static and dynamic loading and wear - Lewis and Buckingham equations for design. | 10 | 15% |
| **SECOND INTERNAL EXAMINATION** | | | |
| **V** | Bearing- Journal bearing -Introduction to lubrication - Hydrodynamic bearings - Sommerfield Number, Petroff's number, L/D ratio, Clearance ratio - minimum film thickness - bearing materials. Rolling contact bearings - bearing types - Ball & roller bearings - Static and dynamic load capacity - Equivalent dynamic load - Bearing life - Selection of bearing. | 10 | 20% |
| **VI** | Shaft - stresses in shafts - design for static loads - reversed bending and steady torsion -- design for fatigue loading | 9 | 20% |
| **END SEMESTER EXAM** | | | |

**Question Paper Pattern**

Max. marks: 100, Time: 3 hrs
The question paper should consist of three parts

**Part A**

4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part B**

4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part C**

6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

**Note**: In all parts, each question can have a maximum of four sub questions, if needed.