

McEng 2122– Machine Elements

Course Number: McEng 2122

Credit: 3

Course Title: Machine Elements

Contact Hours: 2 Lecture hrs and 3 Tutorial hrs

Course Objectives:

This course enables the student to understand the design principles and procedures of joints, couplings, drives, brakes, springs, bearings etc.

Introduction: allowable stresses, engineering materials, safety factors, mechanical models and machine elements. Stress calculations for static, dynamic and varying loads. Joints, strength calculations and dimensioning. Bolted joint, riveted joints, welded and glued joints. Torque transmission joints: keys, spline joint, pin joint, interference fits. Pressure vessels, pipes, pipe connections (joints), valves. Gaskets and sealing. Springs Shafts and Rotors; Couplings and Clutches; Starting Process of Machine Plants Consisting Friction Clutches; Bearings: Rolling and Sliding; Drives: Friction, Flat and V-Belt Drives; Rope and Chain Drives; Gear drives: Spur, Helical, and Bevel Gear Drives; Geometry and Dimensioning on Strength; Worm Gear Drive.

Course outline:

1. **Introduction:** Allowable Stresses; Engineering Materials; Safety Factor; Machine Elements
2. **Strength Calculation and Dimensioning of Joints:** Bolted Joints; Riveted Joints; Welded Joints
3. **Torque Transmitting Joints:** Keys; Spline Joints; Pin Joints; Interference Fit
4. **Pressure Vessels**
5. **Springs**
6. **Shafts:** Types of shafts; Shaft design: Shaft design on the bases of strength, rigidity and vibration.
7. **Coupling and Clutches:** Coupling: Rigid couplings and flexible couplings; Clutches: Positive clutches and friction clutches.
8. **Brakes:** Materials for brake lining; Types of brakes: Single block or shoe brake, Double block or shoe brake, Band brake, internal expanding brake, Disc brake.
9. **Drives:** Friction drives; Belt drives: Flat belt drive, V-belt drive and rope drive; Chain drives; Gear drives: Introduction, Classification of gears, Gear geometry, Law of gearing, Tooth profile, Interference in involutes gears, Gear material, Design consideration for a gear derive, Types of gears, Design calculation of gears for strength and wear.
10. **Bearings:** Sliding contact bearing; Rolling contact bearing.
11. **Lubrications.**

Pre-requisites: Strength of Materials (McEng 1082)

Co-requisite:
Textbook: Shegley, J.E: <i>Mechanical Engineering Design</i> , Mc Graw Hill,
References: <ol style="list-style-type: none">1. Burr A.H.: <i>Mechanical Analysis and Design</i>, ELSEVIE,2. Hall, Holowenko and Laughlin: <i>Theory and Problem of Machine Design</i>, Schaum's Outline Series, McGraw Hill,3. Juvinal R.C.: <i>Fundamentals of Machine Components Design</i>, John Wiley & Sons
Method of Delivery: <ul style="list-style-type: none">• Lectures supported by tutorials;• Assignments; and• Demonstration of machine elements.
Attendance Requirement: <ul style="list-style-type: none">• Minimum of 75% attendance during lecture hours• 100% attendance during practical work sessions, except for some unprecedented mishaps
Evaluation: <p>Continuous Evaluation systems 50%</p> <p>Final exam 50%</p>
Hours per-semester: