



## Machine Element Design I

<b>Course Code:</b>	28651
<b>Credits:</b>	3
<b>Course Type:</b>	Theoretical
<b>Prerequisites:</b>	Materials Science, Engineering Graphics 2
<b>Co-Requisite:</b>	Strength of Materials 2
<b>Course Length:</b>	51 hours

### Outline:

#### 1. Fundamentals of Engineering Design:

Design in Mechanical Engineering, flowchart of design process, critical factors in design, design parameters, steps in the design of a part, standards

#### 2. Material Selection:

Review of the engineering materials, review of the stress-strain relations, types of stress and loading, failure criteria, factor of safety, reliability, statistical data, Tolerances, stress concentration and related tables/figures

#### 3. Fatigue theories:

Cyclic loading, endurance strength, correction factors of endurance strength, fatigue loading with fixed and cyclic components, fatigue failure theories

#### 4. Shaft design:

Basic concepts, general design considerations, steps and corners, applications of static/fatigue failure theories, deflections, fabrication considerations, critical frequencies, keys and keyways, retaining rings, pins, splines, and their calculations

#### 5. Bolts and Screws:

Definitions, types of screws, power screws and their mathematical models, friction and efficiency in power screws, fastener screws and their types, washers and nuts, stiffness models for screw fasteners, types of loading, static/fatigue strength of screw fasteners, preloading of screws, fasteners in pressurized vessels, compound loading of fasteners

#### 6. Weld and joints:

Types of welding and their applications, geometrical relations in welds, strength calculations, compound loading, statics and fatigue strength of welds



## **7. Springs:**

Definitions, types of springs and their applications, coil springs and their mathematical models, fundamental relations, stress concentration, correction factors, stiffness of springs, natural frequency, buckling, materials of spring, torsional springs, helical springs, leaf spring, constant force springs.

## **Reference:**

1. Mechanical Engineering Design, Shigley & Mischke, Mc Grawhill Book Co. New York
2. Machinery Handbook, 25<sup>th</sup> Edition, Industrial Press Inc.
3. Fundamental of Machine Design , P.Orlov 1980 (5 vols)
4. Design of Machine Elements R.L. Norton 2001
5. An Intrd. to Eng. Des. A. SAMUEL. J. WEIR 1999