

Course Number	IEng2070			
Course Title	Design of Machine Element			
Degree Program	B.Sc. in Industrial Engineering			
Module	<b>Mechanical Design</b>			
Module Coordinator				
Lecturer				
ECTS Credits	<b>5 Credit Points</b>			
Time Distribution (in Hr.)	Lecture	Tutorial	Practice or Laboratory	Home study
	54	81	0	54
Course Objectives & Competences to be Acquired	<p>This course enables the student to understand:</p> <ul style="list-style-type: none"> <li>• Identification or selection of proper safety factor to avoid failure before the expected life of the component;</li> <li>• Fatigue life and fatigue strength of machine elements;</li> <li>• Causes of stress concentration in machine elements;</li> <li>• Analysis of the strength of bolted, welded, riveted and interference fitted joints;</li> <li>• Analysis of keys, splines and pins;</li> <li>• Analysis of pressure vessels, valves and sealing mechanisms;</li> <li>• Analysis of springs.</li> </ul>			
Course Description/Course Contents	<p><b>Course Description:</b> Introduction to mechanism of parts, static and fatigue strength design, forces on bearings, shafts, clutches and helical springs. Types of such machine elements and selection criteria are going to be dealt.</p> <p><b>Course Outline:</b></p> <ol style="list-style-type: none"> <li>1. Introduction to Mechanisms of Machines <ul style="list-style-type: none"> <li>- Four bar linkages</li> <li>- Dynamics of linkages</li> <li>- Cam follower mechanism</li> <li>- Gears and gear trains</li> <li>- Flywheels</li> </ul> </li> <li>2. Design for static strength <ul style="list-style-type: none"> <li>- Static loads</li> <li>- Failure theories</li> <li>- Stress concentration</li> <li>- Failure of ductile and brittle materials</li> </ul> </li> <li>3. Design of fatigue strength <ul style="list-style-type: none"> <li>- Cyclic loads</li> <li>- S N diagram</li> <li>- Endurance limit</li> <li>- Endurance limit modifying factors</li> <li>- Fluctuating Stresses</li> <li>- Stress due to combined loading</li> <li>- Cumulative fatigue damage</li> </ul> </li> <li>4. Bearings <ul style="list-style-type: none"> <li>- Bearing types</li> <li>- Selection of rolling contact bearings</li> </ul> </li> </ol>			

	<ul style="list-style-type: none"> <li>- Lubrication Journal bearings</li> </ul> <p>5. Shafts</p> <ul style="list-style-type: none"> <li>- Design for static loads</li> <li>- Bending and torsion</li> <li>- Soderberg approach</li> <li>- Goodman approach</li> </ul> <p>6. Clutches and Brakes</p> <ul style="list-style-type: none"> <li>- Internal expanding rim clutches and brakes</li> <li>- Externally contracting rim clutches and brakes</li> <li>- Band type clutches and brakes Axial (Disk) type clutches and brakes</li> </ul> <p>7. Helical Springs</p> <ul style="list-style-type: none"> <li>- Stress in Helical springs</li> <li>- Deflection in Helical springs</li> <li>- Design of Helical springs</li> <li>- Fatigue loading</li> </ul>
Pre-requisites	Strength of material, Machine drawing
Semester	Year 2, Semester II
Status of Course	Compulsory
Teaching & Learning Methods	Lectures supported by tutorials; Assignments; and Demonstration of machine elements.
Assessment/Evaluation & Grading System	Assignment: 15 % Quiz:15% Tests:30 %, and Final Examination: 40%
Attendance Requirements	Minimum of 85% attendance during lecture hours and 100% during tutorials
Literature	<ol style="list-style-type: none"> <li>1. Joseph Edwar&amp; Charles R. Mischke. Mechanical Engineering Design, 6th Edition, McGraw-Hill International Edition.</li> <li>2. John J., Gordon R. &amp; Joseph E. Theory of Machines and Mechanism, 3rd Edition, Indian Edition.</li> <li>3. Robert L. Norton. Design of Machinery: An Introduction to the synthesis &amp; analysis of Mechanism and Machines, 3rd Edition, International Edition.</li> <li>4. J. Hannah &amp; RC Stephens. Mechanics of Machines: Elementary Theory &amp; Examples, 4th Edition.</li> <li>5. Charles E.W &amp; J.P Sadler.Kinematics and Dynamics of machinery, 3rd Edition, International Edition.</li> </ol>