

Course code	Course Name	L-T-P - Credits	Year of Introduction
ME375	MECHANICAL TECHNOLOGY	3-0-0-3	2016
<b>Prerequisite : Nil</b>			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>To develop an understanding of the basic principles of machine design and machining technology and apply those principles to engineering applications.</li> </ul>			
<b>Syllabus</b>			
<p>General principles of engineering design - Design of Machine Elements -structural machine elements subjected to various types of loads, shafts, springs, Bearings.</p> <p>Metal Cutting Technology - Types of Tools, tool geometry, tool signature - Mechanism of chip formation - Methods of machining, Heat generation in machining, Tool life and tool failure – Machinability- Basic machine tools - Lathe, Shaper, planer and slotter machines, Milling. Hobbing. Broaching, Grinding machines, Drilling and boring machines, Work holding and tool holding devices, Selection of cutting tools, Fundamentals of NC &amp; CNC machine tools</p> <p>Non-traditional Machining Technology - Abrasive jet machining, Ultrasonic machining, electro chemical machining, Electro discharge machining, Electron beam machining, Photo Chemical machining, Laser beam machining and plasma arc machining.</p> <p>Industrial Safety - General safety rules - Safety and health provisions - Fire and accident prevention - Principles of safe machine design - Safety in materials handling - Legislations on safety</p>			
<b>Course Expected Outcome.</b>			
<p>On completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>Explain the concepts and methods of designing and classification of stresses in simple machine members and design of structural machine elements subjected to various types of loading</li> <li>Define various failure modes, their endurance limit and their association with stress concentration.</li> <li>Design of Springs and Bearings with appropriate materials selection.</li> <li>Design of work holding and tool holding devices, Basic machine tools for shaper, planner, slotter milling, hobbing, broaching and grinding machines and select NC &amp; CNC machine tools,.</li> <li>Define the Non-traditional machining technology and design of various machines in this category.</li> <li>Define the non-traditional unconventional machining technology and design of various machines in this category.</li> </ol>			
<b>References/Textbooks</b>			
<ol style="list-style-type: none"> <li>Krishna Rao T., Design of machine Elements, I.K International publishing House Pvt. Ltd.</li> <li>Bhandari V.B., Design of Machine Elements, McGraw Hill Book Company</li> <li>Edward Trent and Paul Right, Metal Cutting, Butterworth- Heinemann</li> <li>Jain R.K, Production Technology, Khanna publishers</li> <li>Jain R.K., Industrial safety, Health and Environment, Khanna publishers</li> <li>Budynas and Nisbett, Shigley's Mechanical Engineering Design, , 8th Ed., McGraw-Hill</li> <li>Charles E.Wilson., Computer integrated machine design, Prentice-Hall.</li> <li>Robert L.Norton., Machine design- an integrated approach, Prentice-Hall.</li> <li>S.Md.Jalaludeen, Machine Design Volume – 1, Anuradha Publications</li> <li>Collett. C.V and Hope A.D., Engineering measurements, Pitman publishing.</li> <li>G.R.Nagpal, Machine Tool Engineering, Khanna Publishers</li> </ol>			

<b>Course Plan</b>			
<b>Module</b>	<b>Contents</b>	<b>Hours</b>	<b>Sem. Exam Marks</b>
<b>I</b>	<b>Machine Design Concepts</b> 1.1 General principles for engineering design: Factors influencing machine design, 1.2 Materials and properties, 1.3 Design considerations: Codes and standards, 1.4 Engineering stress and strain, Stress- strain diagrams, 1.5 Stresses in simple machine members: Axial, bending, torsional, bearing stress, 1.6 Principal stresses, Hoop stress, combined stresses, Simple problems, 1.7 Design considerations, Reliability based design	7	15%
<b>II</b>	<b>Design of Machine Elements</b> 2.1 Modes of failure, 2.2 Theories of failure. 2.3 Endurance limit. 2.4 Stress concentration. 2.5 Factor of safety. 2.6 Design of structural machine elements subjected to various types of loads: Static loading, Impact loading, Bending, Torsional loading, Fatigue loading; 2.7 Design of shafts - shafts subjected to pure torsion, pure bending, combined axial, bending and torsion – simple problems, 2.9 Design of springs and Material selection, 2.10 Design of Bearings and Material selection	9	15%
<b>FIRST INTERNAL EXAMINATION</b>			
<b>III</b>	<b>Metal Cutting Technology</b> 3.1 Introduction: Historical and Economic Context, 3.2 Types of Tools, tool geometry, tool signature, 3.3 Effect of tool geometry on machining, 3.4 Mechanism of chip formation, types of chips, 3.5 Methods of machining, machining tool diagram, 3.6 Heat generation in machining, 3.7 Tool life and tool failure, 3.8 Selection of cutting tools, cutting tool materials	6	15%
<b>IV</b>	<b>Machining Technology</b> 4.1 Machinability, Machinability index, 4.2 Basic machine tools, Lathe, Shaper, planer and slotter machines, 4.3 Milling. Hobbing. Broaching, Grinding machines, 4.4 Drilling and boring machines 4.5 Work holding and tool holding devices, 4.6 Selection of cutting tools, 4.7 Materials for cutting tools 4.8 Fundamentals of NC & CNC machine tools	6	15%
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	<b>Non-traditional Machining Technology</b> 5.1 Introduction to unconventional machining processes, 5.2 Abrasive jet machining: Abrasive water jet machining, abrasive flow machining, water jet machining, 5.3 Ultrasonic machining, 5.4 electro chemical machining, 5.5 Electro discharge machining, 5.6 Electron beam machining, 5.7 Photo Chemical machining, 5.8 Laser beam machining and plasma arc machining.	7	20%
<b>VI</b>	<b>Industrial Safety</b> 6.1 Introduction, general safety rules, 6.2 Safety and health provisions of the Factories Act and Rules, 6.3 Reducing industrial noise, 6.4 Fire and accident prevention, 6.5 Principles of safe machine design, 6.6 Precautions to be taken by operators: Safety in materials handling, 6.7 Legislations on safety, 6.8 Role of OSHA	7	20%
<b>END SEMESTER EXAM</b>			

## QUESTION PAPER PATTERN

Maximum Marks : 100

Exam Duration: 3 hours

**PART A:** 8 Questions from Module 1&2 (4+4). 6 questions to be answered.  $6 \times 5 = 30$  Marks

**PART B:** 8 Questions from Module 3&4 (4+4). 6 questions to be answered.  $6 \times 5 = 30$  Marks

**PART C:** 6 Questions from Module 5&6 (3+3). 4 questions to be answered.  $4 \times 10 = 40$  Marks

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