

**Micro Electro Mechanical Systems**  
**B.E., VIII Semester, Electronics & Communication Engineering/**  
**Telecommunication Engineering**  
 [As per Choice Based Credit System (CBCS) scheme]

Subject Code	15EC831	IA Marks	20
Number of Lecture Hours/Week	03	Exam marks	80
Total Number of Lecture Hours	40 (8 Hours per Module)	Exam Hours	03
CREDITS – 03			
<b>Course Objectives:</b> This course will enable students to: <ul style="list-style-type: none"><li>• Understand overview of microsystems, their fabrication and application areas.</li><li>• Working principles of several MEMS devices.</li><li>• Develop mathematical and analytical models of MEMS devices.</li><li>• Know methods to fabricate MEMS devices.</li><li>• Various application areas where MEMS devices can be used.</li></ul>			
<b>Module 1</b>			<b>RBT Level</b>
<b>Overview of MEMS and Microsystems:</b> MEMS and Microsystem, Typical MEMS and Microsystems Products, Evolution of Microfabrication, Microsystems and Microelectronics, Multidisciplinary Nature of Microsystems, Miniaturization. Applications and Markets.			L1, L2
<b>Module 2</b>			
<b>Working Principles of Microsystems:</b> Introduction, Microsensors, Microactuation, MEMS with Microactuators, Microaccelerometers, Microfluidics.			L1, L2
<b>Engineering Science for Microsystems Design and Fabrication:</b> Introduction, Molecular Theory of Matter and Inter-molecular Forces, Plasma Physics, Electrochemistry.			
<b>Module 3</b>			
<b>Engineering Mechanics for Microsystems Design:</b> Introduction, Static Bending of Thin Plates, Mechanical Vibration, Thermomechanics, Fracture Mechanics, Thin Film Mechanics, Overview on Finite Element Stress Analysis.			L1,L2,L3
<b>Module 4</b>			

<b>Scaling Laws in Miniaturization:</b> Introduction, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Fluid Mechanics, Scaling in Heat Transfer.	L1,L2,L3
<b>Module 5</b>	
<b>Overview of Micromanufacturing:</b> Introduction, Bulk Micromanufacturing, Surface Micromachining, The LIGA Process, Summary on Micromanufacturing.	L1,L2
<b>Course Outcomes:</b> After studying this course, students will be able to: <ul style="list-style-type: none"> <li>• Appreciate the technologies related to Micro Electro Mechanical Systems.</li> <li>• Understand design and fabrication processes involved with MEMS devices.</li> <li>• Analyse the MEMS devices and develop suitable mathematical models</li> <li>• Know various application areas for MEMS device</li> </ul>	
<b>Question paper pattern:</b> <ul style="list-style-type: none"> <li>• The question paper will have 10 full questions carrying equal marks.</li> <li>• Each full question consists of 16 marks with a maximum of Three sub questions.</li> <li>• There will be 2 full questions from each module covering all the topics of the module</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<b>Text Book:</b>  Tai-Ran Hsu, MEMS and Micro systems: Design, Manufacture and Nanoscale Engineering, 2 <sup>nd</sup> Ed, Wiley.	
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Hans H. Gatzert, Volker Saile, JurgLeuthold, Micro and Nano Fabrication: Tools and Processes, Springer, 2015.</li> <li>2. Dilip Kumar Bhattacharya, Brajesh Kumar Kaushik, Microelectromechanical Systems (MEMS), Cenage Learning.</li> </ol>	

D.V. 

H.O.D.

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