	National Institute of Technology Meghalaya An Institute of National Importance	CURRICULUM

Programme	**Bachelor of Technology in Electronics and Communication Engineering**	Year of Regulation	**2018-19**
Department	**Electronics and Communication Engineering**	Semester	**VIII**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EC 410	**INTRODUCTION TO MEMS**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	Familiarization to the fundamentals and applications of MEMS	Course Outcomes	CO1	Ability to understand the basic operation of MEMS devices and their applications
	Understand the basic principles and operation of MEMS devices		CO2	Able to design MEMS devices based on various transduction techniques
	Understand various materials fabrication technologies used in MEMS		CO3	Able to identify materials and fabrication processes to develop MEMS devices

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1	CO1	**2**	**2**	-	-	-	-	-	-	-	-	-	-	**2**	**1**	-	-
2	CO2	**2**	**2**	-	-	-	-	-	-	-	-	-	-	**2**	**1**	-	-
3	CO3	**2**	**2**	-	-	-	-	-	-	-	-	-	**2**	**2**	**1**	-	-

SYLLABUS

No.	Content	Hours	COs
I	Overview of MEMS: Introduction to MEMS, Typical MEMS devices and products, Evolution of Microfabrication, Microelectronics and MEMS, Applications of MEMS.	**4**	**CO1**
II	Working Principles of MEMS devices: Introduction to MEMS based sensors ans actuators, Basic Mechanical Structures used in MEMS (Diaphagms, Cantilever, Bridge structures), Various Transduction Mechanisms for MEMS devices (Piezoresistive, Piezoelectric, Capacitive, Electrostatic transduction mechanisms), Basic electronic circuitry for interfacing of MEMS devices.	**12**	**CO2**
III	Materials and Fabrication Processes for MEMS: Materials - Silicon as a Substrate Material, Silicon Compounds, Gallium Arsenide, Quartz, Piezoelectric Crystals, Polymers, Packaging Materials, Fabrication processes: Photolithography, Diffusion, Ion Implantation, Oxidation, Chemical Vapor Deposition, Physical Vapor Deposition – Sputtering, Deposition by Epitaxy, Dry and Wet Etching Techniques, Micromachining processes: Bulk and Surface Micromachining, The LIGA Process.	**12**	**CO3**
IV	Study of various and recently developed MEMS based devices for various applications.	**8**	**CO1, CO2, CO3**
	Total Hours	**36**	

Essential Readings

1. T.R. Hsu, “MEMS and Microsystems: Design and Manufacture”, McGraw Hill, 1st Edition, 2002.
2. M.H. Bao, “Analysis and Design Principles of MEMS Devices”, Elsevier, 1st Edition, 2008.
3. M.J. Madou, “Fundamentals of Microfabrication: The Science of Miniaturization”, CRC Press, 2nd Edition, 2002.

Supplementary Readings

1. G.K. Ananthasuresh, K.J. Vinoy, S. Gopalakrishnan, K.N. Bhat and V.K. Aatre, “Micro and Smart Systems”, Wiley India, 1st Edition, 2010.
2. S.D. Senturia, “Microsystem Design”, Springer, 1st Edition, 2001.