



**National Institute of Technology Meghalaya**  
An Institute of National Importance

**CURRICULUM**

Programme		<b>Bachelor of Technology</b>										Year of Regulation			<b>2019-20</b>	
Department		<b>Physics</b>										Semester			<b>IV</b>	
Course Code	Course Name	Credit Structure				Marks Distribution										
		L	T	P	C	INT	MID	END	Total							
<b>PH 274</b>	<b>Smart Materials</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>200</b>							
Course Objectives	To introduce the smart materials.	Course Outcomes	CO1	Able to acquire knowledge about smart materials and its various types												
	To introduce types of smart materials such as Shape Memory Alloys, Auxetic Materials, Smart Fluids and Nanomaterials		CO2	Able to acquire knowledge about smart solids for material processing												
	To develop an ability and skill to apply smart materials for commercial implications		CO3	Able to apply smart fluids in core engineering												
			CO4	Able to acquire knowledge of nanomaterials and its applications												
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
1	CO1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
2	CO2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	CO3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
4	CO4	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>SYLLABUS</b>																
No.	Content													Hours	COs	
I	<b>Overview of Smart Materials:</b> Smart systems, Smart or intelligent materials, classification of smart materials, smart structure and their applications.													2	CO1	
II	<b>Shape Memory Alloys :</b> Shape memory alloys and their types, shape memory and phase transformation, pseudoelastic effect, super-elasticity, magnetic shape memory alloys, shape-memory polymers.													5	CO2	
III	<b>Smart Fluids &amp; Chromic Materials:</b> Electrostrictive and magnetostrictive materials, chromic materials – thermochromic, photochromic, piezochromic materials and their applications.													5	CO2 CO3	
IV	<b>Auxetic Materials :</b> Definition of auxetic materials, micromechanical models for auxetic materials, elasticity of auxetic solids, stress concentration, fracture and damage in auxetic materials, auxetic beams.													6	CO2	
V	<b>Nanomaterials:</b> Introduction to nanomaterials, exciton confinement, types of nanomaterials, physical properties of nanomaterials, nanostructures; graphene, carbon nanotubes, fullerenes, surfaces and interfaces in nanostructures, magnetic nanostructures, thermodynamics of nanomaterials, nanomaterials: risks and benefits.													8	CO4	
<b>Total Hours</b>													<b>26</b>			
<b>Essential Readings</b>																
1. M. V. Gandhi and B. D. Thompson, "Smart Materials and Structures", Chapman & Hall, 1 <sup>st</sup> Edition, 1992.																
2. Teik-Cheng Lim, "Auxetic Materials and Structures", Springer, 1 <sup>st</sup> Edition, 2015.																
3. T W Duerig, "Engineering Aspects of Shape Memory Alloys", Butterworth-Heinemann, 1 <sup>st</sup> Edition, 2013.																
4. Dieter Vollath, "Nanomaterials: An Introduction to Synthesis, Properties and Applications", 2 <sup>nd</sup> Edition Wiley-VCH, 2013.																
<b>Supplementary Readings</b>																
1. M. S. Vijaya, "Piezoelectric Materials and Devices Applications in Engineering and Medical Sciences", CRC Press, 2013.																
2. K. T. Ramesh, "Nanomaterials Mechanics and Mechanisms", 1 <sup>st</sup> Edition, Springer, 2009.																
3. B Culshaw, "Smart Structures and Materials", Artech House, 3 <sup>rd</sup> Edition, Boston, 1996.																
4. Y. Gogotsi, "Nanomaterials Handbook", Taylor & Francis Group, 2 <sup>nd</sup> Edition, 2006.																