

Samrat Ashok Technological Institute, Vidisha

Department of Mechanical Engineering

Lecture Plan

Course Code:	ME-1875 B	Year/Semester :	BE 4 th Year/ 7 th Semester
Course Name:	Smart and Nano Materials	Academic Year :	July-2023 / ODD
L – P:	3 – 0	Credit :	4
Course Detail :	Theory	Term Start Date :	24-07-2023
Course Coordinator:	Dr. Gaurav Bajpai	Term End Date :	

Academic Year: 2023					
Name of Teacher: Dr. Gaurav Bajpai					
Subject: Smart and Nano Materials					
Theory/Tutorial: Theory					
Sr. No.	Name Of Unit/Topics	Hrs. Allotted	Actual Date	Teaching Aid Code	Remarks
01	Unit: 1- Introduction	10			
	Overview of Smart Materials: Introduction to Smart Materials	02			
	Classification of smart materials, Components of a smart System	02			
	Applications of smart material,	01			
	Primitive functions of intelligent materials; Intelligence inherent in materials	02			
	Materials intelligently harmonizing with humanity	02			
	Intelligent biological materials	01			
02	Unit: 2- Smart Materials and Structural Systems:	08			
	Smart materials; Sensing technologies	01			
	Micro-sensors; Intelligent systems;	01			
	Hybrid smart materials;	02			
	Passive sensory smart structures	01			
	Reactive actuator-based smart structures	02			
	Active sensing and reactive smart structures; Smart skins	01			
03	Unit: 3- Piezoelectric Materials	08			
	Overview, Piezoelectricity; Industrial, piezoelectric materials; Smart materials featuring piezoelectric elements,	02			
	Electrostrictive Materials,	02			
	Magnetostrictive materials, Magnetoelectric materials, Magnetorheological fluids,	02			
	Electrorheological fluids,	01			
	Electro-Rheological (ER) Fluids	01			
04	Unit: 4- Shape Memory Materials	08			
	Shape Memory Materials (SMM): Background on shape-	02			

	memory alloys				
	Applications of shape-memory-alloys	02			
	Continuum applications: structures and machine systems; Discrete applications	02			
	Impediments to applications of shape-memory-alloys	01			
	Shape-memory-plastics	01			
	Unit: 5 - Synthesis of Nano-materials	06			
05	Introduction, Bottom-up approach: Sol-gel method, emulsion and Top-down	02			
	ball milling approach with examples, Physical methods	01			
	Inert gas condensation, Arc discharge,	01			
	Physical Vapour Deposition, Chemical Vapour Deposition	02			
Teaching Aid Code:		Sign of Teacher: Dr. Gaurav Bajpai			
1	White board				
2	L.C.D/overhead PROJECTOR				
3	MODEL & CHART				
4	PPT & VIDEO				
LESSON PLANNING, Rev. no. :00					

Reference Books:

1. Brian Culshaw, Smart Structures and Materials, Artech House, 2000
2. Smart Structures: Analysis and Design, A. V. Srinivasan, Cambridge University Press, Cambridge, New York, 2001.
3. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors, Materials and Amplifiers, G. Gautschi, Springer, Berlin, New York, 2002.
4. M.V. Gandhi, and B.S. Thompson, Smart Materials and structures (2nd edition), Chapman & Hall, 1992.
5. Guran, H.S. Tzou, G.L. Anderson, and M. Natori, Structure Systems: Smart Structures, Devices and System (Part 1), and Materials and Structures (Part 2), World Scientific Publications, 1998.
6. Nanostructures and Nanomaterials by Guozhong Cao