

SE556: Structural Health Monitoring

Teaching Scheme			Credits	Marks Distribution				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE	CE	ESE	CE	
3	2	0	5	70	30	30	20	150

Course Content:

Sr. No	Topics	Teaching Hrs.
1	<p><u>Introduction to SHM:</u></p> <p>An Overview of Structural Health Monitoring, Structural Health Monitoring and Smart Materials, Structural Health Monitoring versus Non Destructive Evaluation, A broad Overview of Smart Materials, Emerging SHM Technologies using Piezo Sensors, SHM using Magnetostrictive Sensors, SHM using Optical Fibres and other sensors, Overview of Application Potential of SHM, Notable Applications of SHM – Aerospace and Civil Applications, Underground Structures and Other Applications, Understanding Piezoelectric Material, Understanding Magnetostrictive Material, Optical Fibre and Lambwave method, Solution Domain for SHM, Other Damage Indices.</p>	15
2	<p><u>Vibration Control for SHM:</u></p> <p>Vibration Control using SHM – introduction to FE formulation Constitutive Relationship, Element Stiffness Matrix for High Precision Finite Element, Element Mass Matrix for High Precision Finite Element, Developing Actuator and Sensor, Influence Matrix, Estimating Sensor Voltage, Active Control of Damping, A Case study of Performance, Estimation for Different Patches, SHM of Ribbon Reinforced Composite Laminate.</p>	10
3	<p><u>SHM using Piezo and Magnteostrictive Layers:</u></p> <p>Delamination Sensing using Piezo Sensory Layer, Voltage Response from piezopatch, Electrical Impedance Method basic theory, A Case Study: Results and Discussions, SHM using Magnetostrictive, Sensory Layer, Basics of Magnetization and Hysteresis, Delamination Sensing using Magnetostrictive Sensory Layer, Constitutive relationship with composite relationship, MS Layer in symmetric Laminate, MS Layer Away from the Mid-plane in Asymmetric Laminate, Case Studies related to MS Layer based SHM.</p>	11

4 **SHM using LDV:**

06

Experimental Modal Analysis using LDV – introduction, What is LDV? Velocity and Displacement, Measurement using LDV, Case Study for Symmetric, Laminate, Case Study for Cross-ply.

Total Hrs. 42

Reference Books:

1. M. V. Gandhi and B. D. Thompson, “*Smart Materials and Structures*”, Springer Science.
2. Fu Kuo Chang, “*Structural Health Monitoring: Current Status and Perspectives*”, CRC Press.