

## CONDITION MONITORING

<b>Course Code</b>	22MEMD2T5C	<b>Year</b>	I	<b>Semester</b>	II
<b>Course Category</b>	Programme Elective	<b>Branch</b>	ME	<b>Course Type</b>	Theory
<b>Credits</b>	4	<b>L-T-P</b>	4-0-0	<b>Prerequisites</b>	Material Science and Metallurgy
<b>Continuous Internal Evaluation:</b>	40	<b>Semester End Evaluation:</b>	60	<b>Total Marks:</b>	100

**Course outcomes:** At the end of the course, the student will be able to:

CO	Statement	BTL	Units
CO1	Apply maintenance and condition monitoring techniques to machineries and industries	L2	1
CO2	Implement data acquisition and signal processing techniques to all mechanical components and plants	L3	2
CO3	Diagnose Machinery faults and apply methods to correct faults	L3	3
CO4	Predict machinery faults and using oil analysis and other NDT techniques	L3	4

**Contribution of Course outcomes towards achievement of programme outcomes & Strength of correlations (High:3, Medium: 2, Low:1)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2	2	1	1						2	3	1
CO 2	3	2	2	2	1	1						2	3	1
CO 3	3	2	2	2	1	1						2	3	1
CO 4	3	2	2	2	1	1						2	3	1

Syllabus		
Unit	Contents	Mapped CO
1	PREDICTIVE MAINTENANCE TECHNIQUES: Basics, maintenance philosophies, Bath tub curve, Classification of maintenance, advantages and disadvantages of maintenance, plant machinery classifications and recommendations. CONDITION MONITORING TECHNIQUES: Introduction to Condition monitoring, definition, Types of condition monitoring, advantages and	CO1

	limitations of different condition monitoring techniques like wear derbies monitoring, oil monitoring, performance monitoring, vibration monitoring, thermography, corrosion monitoring.	
2	DATA ACQUISITION: Introduction, collection of vibration signal, vibration transducers, characteristics and mountings, conversion of vibrations to electrical signal. SIGNAL PROCESSING, APPLICATIONS AND REPRESENTATIONS: The Fast Fourier Transform (FFT) analysis, Time waveform analysis, Phase signal analysis, special signal processes	CO2
3	MACHINERY FAULT DIAGNOSIS USING VIBRATION ANALYSIS: Unbalance, bent shaft, Eccentricity, Misalignment, looseness, Belt drive problems, gear defects, bearing defects, Electrical faults, Cavitation Shaft cracks, Rotor rubs, Resonance, Hydraulic and aerodynamic forces. CORRECTING FAULTS THAT CAUSE VIBRATION: Introduction, Balancing Alignment, Resonance vibration control with dynamic absorbers.	CO3
4	OIL AND PRACTICAL ANALYSIS: Introduction, oil fundamentals, oil analysis sampling methods, lubricant properties, contaminants in lubricants, practical analysis techniques. OTHER PREDICTIVE MAINTENANCE TECHNIQUES: Ultrasound, Infrared thermography applications of IR thermography, ISO 2372 standards for vibrations.	CO4

#### Learning Resources

**Text Book(s):**

1. Machinery vibration Analysis & Predictive Maintenance by Paresh Girdhar, Elsevier publishers.
2. Mechanical Fault diagnosis and condition monitoring by R. A .Collacott.

**References:**

1. Vibration monitoring and diagnosis by R. A. Collacott.
2. First course on condition monitoring in the process industries, by M.J.Neale, Nov 1979, Manchester.
3. Management of Industrial Maintenance by Newman-Butterworth, March 1978.
4. Condition Monitoring Manual by National Productivity council, New Delhi

Course coordinator:

HOD