

# Engineering Program

<b>Specialization</b>	<b>Technology of remote industrial sensing and controlling</b>
<b>Course Number</b>	20413255
<b>Course Title</b>	<b>Machine Condition Monitoring, Machine Health</b>
<b>Credit Hours</b>	<b>3</b>
<b>Theoretical Hours</b>	<b>3</b>
<b>Practical Hours</b>	<b>0</b>

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**Brief Course Description:**

This course covers the principle of Machinery Condition Monitoring, Principles of Maintenance, Fundamentals of Machinery Vibration, Rotordynamics, Digital Signal Processing, instrumentation, Noise Monitoring, Electrical Machinery Faults, Machine Tool Condition Monitoring.

**Course Objectives:**

Upon the completion of the course, the student will be able to:

- Introduce student to machine monitoring and conditioning
- Understand various types faults
- Give the necessary background about digital processing and vibration
- Introduce the basic instrumentation used for machine monitoring and noise analyses

**Detailed Course Description:**

Chapter No.	Content	Textbook	Time Needed
1	<b>Introduction</b> <ul style="list-style-type: none"> <li>• Machinery Condition Monitoring</li> <li>• Present Status</li> <li>• Fault Prognosis</li> </ul>		2
2	Principles of Maintenance <ul style="list-style-type: none"> <li>• Reactive Maintenance</li> <li>• Preventive Maintenance</li> <li>• Predictive Maintenance</li> <li>• Enterprise Resource Planning</li> <li>• Bath Tub Curve</li> </ul>		3
3	<b>Fundamentals of Machinery Vibration Servo Drives.</b> <ul style="list-style-type: none"> <li>• Single Degree-of-Freedom Motion</li> <li>• Forced Vibration Response</li> <li>• Base Excitation</li> <li>• Force Transmissibility and Vibration Isolation</li> <li>• Tuned Vibration Absorber</li> <li>• Unbalanced Response</li> <li>• Characteristics of Vibrating Systems</li> <li>• Vibration of Continuous Systems</li> <li>• Mode Shapes and Operational Deflection Shapes</li> <li>• Experimental Modal Analysis</li> </ul>		3
4	<b>Rotordynamics</b> <ul style="list-style-type: none"> <li>• Simple Rigid Rotor-Disc System</li> <li>• Unbalance Response and Critical Speed</li> <li>• Journal Bearings</li> <li>• Oil Whirl and Oil Whip</li> <li>• Squeeze Film Dampers</li> <li>• Condition Monitoring in Large Rotor Systems</li> </ul>		3
5	<b>Digital Signal Processing</b> <ul style="list-style-type: none"> <li>• Classification of Signals</li> <li>• Signal Analysis</li> </ul>		3

	<ul style="list-style-type: none"><li>• Frequency Domain Signal Analysis</li><li>• Fundamentals of Fast Fourier Transform</li><li>• Examples</li></ul>		
6	<b>Instrumentation</b> <ul style="list-style-type: none"><li>• Measurement Standards and errors</li><li>• Calibration Principles</li><li>• Basic Measuring Equipment</li><li>• Vibration</li><li>• Laser-Based Measurements</li><li>• Current Measurements</li><li>• Noise Measurements</li></ul>		2
7	<b>Vibration Monitoring</b> <ul style="list-style-type: none"><li>• Acoustical Terminology</li><li>• Noise Sources</li><li>• Sound Fields</li><li>• Noise Source Identification</li></ul>		
8	<b>Electrical Machinery Faults</b> <ul style="list-style-type: none"><li>• Faults in Electric Motor</li><li>• Fault Detection in Electric Motors</li><li>• MCSA for Fault Detection in Electrical Motors</li><li>• Instrumentation for Motor Current Signature Analysis</li><li>• MCSA for Fault Detection in Any Rotating Machine</li><li>• Fault Detection in Power Supply Transformers</li><li>• Fault Detection in Switchgear Devices</li></ul>		

### Evaluation Strategies:

		Percentage	Date
<b>1. Exams</b>	<b>First Exam</b>	20%	/ /20__
	<b>Second Exam</b>	20%	/ /20__
	<b>Final Exam</b>	50%	/ /20__
<b>2. Homework and Projects</b>		10%	/ /20__
<b>Total</b>		100%	

### Teaching Methodology:

- Lectures
- PowerPoint slides
- Term projects

### Text Books & References:

#### Textbooks

Machinery condition Monitoring principles And Practices, AMIYA R. MOHANTY , Taylor & Francis Group , 2015

### References