

## **17MD020 CONDITION MONITORING AND FAULT DIAGNOSIS OF MACHINES**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
17MD020	CONDITION MONITORING AND FAULT DIAGNOSIS OF MACHINES				

### **Course Description and Objectives:**

To provide a basic understanding with case studies on different surface NDE techniques and apply them for inspecting materials in accordance with industry specifications and standards.

1. To provide knowledge and enrich ideas about the conventional NDT techniques
2. develop a strong hands on experience for inspecting and evaluating components in accordance with industry specifications
3. To develop a fundamental knowledge about the advanced techniques and the recent developments in non-destructive testing so as to control the quality in manufacturing engineering components.

### **Course Outcomes:**

After successful completion of this course the student will be able:

1. To have a basic knowledge of surface NDE techniques which enables to carry out various inspection in accordance with the established procedures.
2. To calibrate the instrument and inspect for in-service damage in the components.
3. Differentiate various defect types and select the appropriate NDT methods for better evaluation.
4. Ability to communicate their conclusions clearly to specialist and non-specialist audiences.
5. Documentation of the testing and evaluation of the results for further analysis.

### **SKILLS ACQUIRED:**

1. Analyzing engineering problems, selecting and using mathematical and theoretical data to provide suitable NDT solutions with consideration of the entire inspection cycle
2. Apply their engineering knowledge to the development, operation, maintenance and progression of technologies used for NDT
3. Observe, record and draw conclusions from data and experimental evidence, recognizing inherent uncertainties and limitations
4. Applying design processes, including materials selection that meet NDT standards

### **UNIT - I**

Introduction: System failure, component failure, failure decisions, failure classifications, types of failure, failure investigations, causes of failure, Methods of maintenance – condition based maintenance, preventive maintenance, proactive maintenance, time based maintenance, predictive maintenance.

### **UNIT - II**

Condition Monitoring: Need and importance of condition monitoring, the decision to monitor, common monitoring techniques, online/off-line monitoring, commonly measured operating characteristics, condition monitoring - predictive maintenance - preventive Maintenance.

### **UNIT - III**

Transducers and Instrumentation for Recording and Analysis: Vibration transducers Displacement transducers, velocity pickups, accelerometers, Temperature transducers Vibrationmeters, FFT analyzers. Time domain instruments, Tracking analyzers.

### **UNIT - IV**

Analyzing Machine Condition: General characteristics-Process measurements, vibration , Typical vibration sources, symptoms of other common machinery problems. Development and use of acceptance limits-guide line and limits based on physical constraints. Vibration severity criteria, changing machinery condition-time trends statistical limits, detailed diagnostic monitoring.

### **UNIT - V**

Data Processing & Vibration Analysis: Fourier analysis, frequency analysis techniques, vibration signature, vibration monitoring equipment, system monitors and vibration limit detectors.

Performance Trend Monitoring : Primary and secondary performance parameters, performance monitoring systems.

### **Activities:**

Inspection of welds using solvent removable visible dye penetrant.

Inspection of welds using solvent removable fluorescent dye penetrant.

Inspection of welds by Magnetic Particle Testing - Dry method.

Inspection of welds by Magnetic Particle Testing- Wet method.

Inspection of a welded plate by radiographic single wall single image technique- X rays.

Inspection of a welded pipe by Panoramic Technique- Gamma rays.

Inspection of a welded pipe by double wall single image technique - Gamma rays.

Familiarization of ultrasonic flaw detectors

### **TEXT BOOKS:**

1. Williams J.A, "Engineering Tribology" 2<sup>nd</sup> Edition, Cambridge University Press, 2005.

2. Bernard J. Hamrock, "Fundamentals of Fluid Film Lubricant", 2<sup>nd</sup> Edition, Marcel Dekker Publishers, 2004.

**REFERENCEBOOKS:**

1. Shigley J, E Charles, "Mechanical Engineering Design", 9<sup>th</sup> Edition, McGraw Hill Co., 2010.
2. Rowe W W & O' Dionoghue, "Hydrostatic and Hybrid Bearing Design" 2<sup>nd</sup> Edition, Butterworths & Co. Publishers Ltd., 2007.
3. Collacott R. A. "Mechanical Fault Diagnosis and Condition Monitoring", 2<sup>nd</sup> Edition, Chapman and Hall, London, 2007.