

I YEAR M. TECH (MACHINE DESIGN) SECOND SEMESTER

17MEMD2T5C

CONDITION MONITORING

Credits 4

Lecture: 4 periods/week

Internal assessment: 40 marks

Tutorial: - -

Semester end examination: 60 marks

COURSE OBJECTIVE:

- Provide an overview of the fundamental principles of maintenance and condition monitoring techniques
- Acquire knowledge of data acquisition and signal processing techniques
- Explain about diagnosis of machinery faults and methods to correct faults
- Describe oil analysis and other NDT techniques

COURSE OUTCOMES:

At the end of the course student can be able to

1. Apply maintenance and condition monitoring techniques to machineries and industries
2. Implement data acquisition and signal processing techniques to all mechanical components and plants
3. Diagnose Machinery faults and apply methods to correct faults
4. Predict machinery faults and using oil analysis and other NDT techniques

UNIT-I

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 limitations of different condition monitoring techniques like wear debris monitoring, oil monitoring, performance monitoring, vibration monitoring, thermography, corrosion monitoring.

UNIT-II

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.

UNIT-III

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.

UNIT-IV

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.

Learning Resources

Text books

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