Course Type	CourseCode	Nameof the Course	L	T	P	Credits
DE	NMED502	**Condition Monitoring of Machines**	3	0	0	3

CourseObjective
• The objective of the course is to study the Basics of condition monitoring and the signal processing techniques associated with the instruments used in vibration monitoring, • oil analysis etc., • its application in industries • Followed by case studies related to the condition monitoring of machines and its advantages.
LearningOutcomes
Upon successful completion of this course, • Students will be familiar to condition monitoring technique and its methods. • Be able to identify the instruments which may be employed for diagnosis of failures. • Be able to understand diagnose the failures and its consequences and therefore importance of condition monitoring techniques. • Be able to use the instruments and basic signal processing terminology used while handling the instruments. • Be able to diagnose a particular failures and will be able to reach to root cause of the failures in machines.

Unit No.	Topicsto beCovered	Lecture Hours	LearningOutcome
1	Maintenance and Condition Monitoring: Importance and necessity of maintenance, Different maintenance strategies	5	This will familiarise with condition monitoring and its importance in industries.
2	Techniques of condition monitoring: Different Nondestructive techniques – Visual, Dye Penetration, Acoustic Emission and its applications, X-ray, Radiographic, Magnetic Flux test, Temperature monitoring, Vibration analysis, Oil analysis	6	This unit will help students in understanding the basic condition monitoring techniques prevailing in the industries.
3	Oil Analysis – Oil degradation analysis, Abrasive Particle in oil, counters, Particle classification and counter, Spectrometric oil analysis, Performance trend monitoring – Primary and secondary parameters, Ferrography, Corrosion monitoring techniques	10	This will give in an insight of the oil analysis, its parameters used to observe and the instruments used in oil analysis.
4	Vibration Measurement – Different sensors for sound and vibration measurement, Data acquisition, Noise and vibration analyzers, Laser vibrometer, Vibration limits & Standards.	5	This unit will help students in understanding the basic instruments, basic characteristics and their applications in industries.
5	Basic signal processing techniques: Fourier analysis, Hilbert Transform, Cepstrum analysis, Digital filtering, Time-frequency analysis, Shock pulse method, Kurtosis.	6	This chapters will familiarise students with various signal processing terms used in the vibration analysis during data acquisition and its post

			processing techniques.
6	Condition monitoring of rotating machines: Bearing condition monitoring, gear condition monitoring, Critical speed analysis, Orbit Analysis, Wear behavior monitoring, Faults in reciprocating machines, Case studies and failure analyses	10	This chapter will help the students to understand the in-depth analysis of the failures of bearings, wear, gears, etc.
Total		42	

Text Books:

1. Robert Bond Randall, vibration based condition monitoring: Industrial aerospace and automotive applications: Willey publication 2010

References

1. Rao, B. (1996), Handbook of condition monitoring, Elsevier advanced technology, Oxford.
2. Amiya RanjanMohanty, Machinery Condition Monitoring and Principles.(1st edition) 2014 PareshGirdhar and Cornelius Scheffer, Machinery vibration analysis and predictive maintenance, Elsevier