3/4 B.Tech. SIXTH SEMESTER

ME6T6C   **MECHANICAL VIBRATIONS**   **Credits: 4**

Lecture:- 4 periods/week   **Internal assessment: 30marks**
Practice: --   **Semester end examination: 70 marks**

Objectives:

1. Introduce the knowledge about vibrations and their applications
2. Propose the concept of single, double and multidegree freedom systems for undamped and damped free vibrations
3. Study different types of forced vibrations and vibration measuring instruments
4. Analyze different problems in shaft due to vibrations
5. Determine the natural frequencies in continuous system

Learning outcomes:

At the end of course the students will be able to:

1. Illustrate the causes of vibrations in industries and automobiles
2. Analyze the vibrating systems and propose methods to reduce vibrations
3. Evaluate the amount of vibrations in vibrating system
4. Determine the critical speed of shafts used in any application
5. Compute the natural frequencies in continuous systems

Pre-Requisites:
Dynamics of Machinery

UNIT-I
BASIC CONCEPTS:
Importance and scope, definition and terminology, representation of harmonic motions, introduction to various types of vibrations and causes of vibrations.

UNIT-II
SINGLE DEGREE OF FREEDOM SYSTEMS:
Undamped Free Vibrations D Alemberts Principle, Energy method, Rayleigh method, simple applications of these methods, equivalent spring stiffness.

UNIT-III
SINGLE DEGREE OF FREEDOM SYSTEMS:
Damped Free Vibrations:Introduction to different types of damping, Viscous damping, sub-critical, critical and overdamping, logarithomic decrement, frequency of damped oscillations.

UNIT-IV
FORCED VIBRATIONS:
Solution for simple harmonic excitation, steady state vibrations, base excitation, vibration isolation and transmissibility, vibration measuring instruments.

UNIT-V
TWO DEGREE OF FREEDOM SYSTEMS:
Undamped Fee Vibrations:Normal modes vibrations, natural frequencies, mode shapes, forced harmonic vibrations, torsional vibrations of two rotor systems.

UNIT-VI
WHIRLING OF SHAFTS:
Introduction, Critical speed of a light shaft with a single disc without damping, Critical speed of a light shaft with a single disc with damping, secondary critical speed, determination of stresses in shaft due to unbalance or eccentricity

UNIT-VII
MULTI-DEGREE OF FREEDOM SYSTEMS:
Undamped free vibrations: Reciprocal theorem, Rayleigh and Dunkerley method, three rotor and geared systems.

UNIT-VIII
CONTINUOUS SYSTEMS:
Free vibration of the following for various end conditionsVibration of a string, longitudinal vibrations of bar, transverse vibration of beam, torsion of vibrations of circular shaft.

Learning resources

Text Books
1. Mechanical vibrations, (7th edition) by G.K.Groover, Nemchand publications Roorke, 2003.
2. Mechanical vibrations, (4th edition) by S.S.Rao Pearson education publications, Padparganj Delhi reprint 2004.

Reference Books.
1. Mechanical vibrations, (1st edition) by J.S.Mehtha & A.S.Kailey, S.Chand & company Pvt Ltd Ramnagar New Delhi 2012.

2. Mechanical vibrations, (3rd edition) by V.P.Singh Dhanpat Rai & company Pvt Ltd Naisarak Delhi 2009.

3. Theory and problems of mechanical vibrations by S.Graham Kelley, Schaums outline series Mc Graw Hill publications New Delhi 1996.

ME6T6D   **ALTERNATIVE SOURCES OF ENERGY**   **Credits: 4**

Lecture:- 4 periods/week   **Internal assessment: 30marks**
Practice: --   **Semester end examination: 70 marks**

Objectives:

1. Explain various sources of non-conventional energy resources

Learning outcomes:

At the end of course the students will be able to:

1. Explain the fundamental principles, classification of collectors, methods of storage and application of solar Energy

2. Describe the basic concepts of Wind Energy

3. Analyze the Biomass Energy concept

4. Discuss the fundamentals of Geothermal Energy

5. Reproduce the fundamentals of Ocean Energy, tidal and wave energies

6. Identify need of conversion of energy from one form to another

Pre-Requisite

Basic Thermodynamics

UNIT – I
PRINCIPLES OF SOLAR RADIATION :
Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II
SOLAR ENERGY COLLECTION:
Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-III
SOLAR ENERGY STORAGE AND APPLICATIONS:
Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.