Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2019-2020

Course Handout Part II

Date: 20-07-2019

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **DE G611**
Course Title : ***DYNAMICS & VIBRATIONS***
Instructor-in-Charge : Sabareesh G R

Scope and Objective of the Course:

The course covers advanced topics in dynamics and vibrations. The emphasis is on application to common engineering situations. The main aim of the course is to prepare students to tackle complex and frontier technological problems in dynamics and vibrations. Advanced topics like Non-linear system analysis are included in **Part A** (Vibrations). The analysis of increasingly complex system has been instrumental in the development of advanced concepts like Lagrange and variation calculus, which forms the core of **Part B** (dynamics).

Textbooks:

1. "Advanced dynamics for Engineering Application", EDD Notes by N N SHARMA
2. "Elements of Vibration analysis", Leonard Meirovitch, McGraw-Hill, Singapore, 1986.

Reference books

1. "Classical Dynamics", Donald T. Greenwood, Prentice Hall Inc. Englewood Cliffs, 1977
2. "Lagrangian and Hamiltonian mechanics" M.G. Calkin, World Scientific, Singapore, 1996
3. "The Theory of classical dynamics", J.B. Griffiths, Cambridge University Press, 1985.
4. "Vibration Theory and application", William T. Thomson, CBS Publications, 3rd Ed., 1988.
5. "Mechanical Vibrations - Theory and Application" Francis S. Tse, Ivan E. Morse and Rolland T. Hinkle, Allyn and Bacon Inc. London, 1983.

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Text Book
1-3	Introduction to the concept of Vibration-Steady	Review of Basics, Equivalent spring and mass elements	TB 2, RB 4
4-6	Single DOF Vibrations	Review of Single DOF free damped and undamped Vibrations & forced Vibrations	TB 2, RB 4
7-9	Higher DOF Vibrations	Two DOF, Modal vectors Eigenvalue Problems	TB 2, RB 4
10-12	Extension to Multi DOF Vibrations	Lumped Parameter models	TB 2, RB 4
13	Structural and Coulomb damping	Different types of damping and energy dissipated in damping	TB 2, RB 4
14-16	Vibration control -	Understanding vibration control, Methods for	TB 2, RB 4

	reduction, Vibration isolation, Vibration absorbers	Isolation of Vibration, Methods for Absorbing vibration	
17-21	Transient Vibrations	Impulse Excitation, Arbitrary Excitation, Laplace Transform formulation	TB 2, RB 4
22-25	Finite Element method Equation of motion using FEM	General Discussion, Stiffness and Flexibility coefficients	TB 2, RB 4
26-27	Continuous Systems	Vibrating String, Longitudinal vibration of rods, torsional vibration of rods	TB 2, RB 4
28-29	Introduction to Nonlinear systems and Self-excited vibrations	General consideration, Perturbation Technique	TB 2, RB 4
30	Random vibrations	Bending vibration of Bars Boundary conditions	TB 2, RB 4
31-34	Vibration Analysis	Machinery Vibration Analysis, Techniques and Methods	TB 2, RB 4
35-36	Review Newtonian Mechanics	Newton's law, Principle of virtual work, D Alembert's Principle Examples	TB 1 RB : 1,2
37-40	Lagrange Mechanics Formulation and application of Lagrange Mechanics	Lagrange Mechanics Engineering Application	TB 1 RB : 1,2
41	Introduction to Hamiltonian Mechanics	Hamilton's equation, Langrage equation for impulsive forces	TB 1 RB : 1,2
42	Formulation of Hamiltonian Mechanics	Formulation for Hamiltonian Principle, Application of Hamilton's principle	TB 1 RB : 1,2

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-Semester Test	90 mts	20	5/10 , 3:30 – 05:00 PM	**CB**
Surprise Test	15 mts	5		**CB**
Term Paper + Project	--	20		**OB**
Lab work	--	20		**OB**
Comprehensive Exam	3 hrs	35	14/12 AN	**CB**

Chamber Consultation Hour: To be announced in the class.

Notices: All the notices regarding the course will be displayed on the Mechanical Notice Board/CMS.

Make-up Policy: Only for genuine cases with prior permission

INSTRUCTOR-IN-CHARGE