Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2021-2022

Course Handout Part II

Date: 15-01-2022

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. : **CE F432**
Course Title : *Structural Dynamics*
Instructor-in-Charge : Chandu Parimi

Scope and Objective of the Course:

Free and forced vibrations, single and multi-degree systems, continuous systems, response of various systems to different excitations, damping; numerical evaluation of dynamic response, frequency domain analysis, mode superposition, direct integration for dynamic response.

Learning Objectives –

Students who finish this course should be

1. able to model multi-degree equations of motion
2. able to solve and plot structural behavior for arbitrary loads
3. able to code numerical analysis of structural dynamics problems

Student Learning Outcomes (SLOs) assessed in this course – **(a), (b) and (e).**

Textbooks:

1. **Dynamics of Structures, Patrick Paultre – Wiley – Reprint 2013**

Reference books

1. **Introduction to Structural Dynamics, Bruce K. Donaldson,** Cambridge University Press; 1 edition (October 23, 2006)
2. **Dynamics of Structures, Anil K. Chopra,** Pearson Education India; 3rd edition (2007)

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book	SLO*
1-7	Able to set up equations of motion using equilibrium	**Equation of Motion:** Single and Multi-degree systems	**2 TB**	**(a)**
8-14	Able to derive expressions for different forms of damping	**Free Response and Damping :** Characteristic Equation, Different forms of Damping	**3 TB**	**(a)**
15-23	Able to implement and analyze beating and resonance	**Forced Response to Harmonic Loading :** Beating, Resonance, Dynamic amplification factors,	**5 TB**	**(a)**

24-30	Able to analyze forced response using Fourier series	**Forced Response to Periodic Loading:** Fourier Series (Trigonometric form), Fourier Series decomposition (Trigonometric and Exponential)	**6 TB**	**(a)**
31-35	Able to solve and plot structural behavior for arbitrary loads	**Frequency Domain and Time Domain:** Response to arbitrary loads, Duhamel and Convolution integrals	**7,8 TB**	**(a)**
36-37	Able to derive and implement modal superposition for multi-degree problem	**Modal Superposition:** Modal Superposition, Modal Mass Participation, Spectral Superposition	**17,18 TB**	**(a),(e)**
38-42	Able to code numerical analysis of dynamics problems	**Direct Time Integration:** Direct time integration of linear and non-linear systems, Various numerical methods	**9,10 TB**	**(a),(b)**

***Student Learning Outcomes (SLOs):**

SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Assignments	-	25%		**OB**
Classroom Interaction	-	10%		**OB**
Mid-semester Test	1.5 hrs	25%	11/03 11.00am to12.30pm	**OB**
Comprehensive Exam	2 hrs	40%	09/05 AN	**OB (Computer without internet)**

Chamber Consultation Hour: Will be announced in class

Notices: Will be posted in Google Classroom

Make-up Policy: Make-up will be granted only to genuine cases with prior permission from the IC. Make ups will not be given to students who contact the IC after the evaluation component.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE