



SECOND SEMESTER 2019-2020

Course Handout Part II

Date: 06-01-2020

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.

This subject deals vibration of structures and their behavior due to it. At the end of the course the student will be in a position to analyze simple structural elements, which involve calculation of stress, strain and deformation. This is an essential feature in any design process.

Learning Objectives –

Students who finish this course should be

1. Able to set up equations of motion using equilibrium
2. Able to derive expressions for different forms of damping
3. Able to solve and plot structural behavior for arbitrary loads (time domain and frequency domain)
4. Able to derive and implement modal superposition for multi-degree problem
5. Able to code numerical analysis of dynamics problems

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

Textbook:

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

Reference Books:

1. Introduction to Structural Dynamics, Bruce K. Donaldson
2. Structural Dynamics, Anil K. Chopra

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book	SLO*
1-6	Able to set up equations of motion using equilibrium	<u>Equation of Motion:</u> 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)
15-21	Able to implement and analyze beating and resonance	Forced Response to Harmonic Loading : Beating, Resonance, Dynamic amplification factors,	5 TB	(a)
22-28	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)
29-35	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)
35-40	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)
41-42	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	-	30%		OB
Classroom Interaction	-	10%		OB
Mid-semester Test	1hr	20%	5/3 9.00 - 10.30AM	CB
Comprehensive Exam	3hrs	40%	9/5 AN	OB (Open 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

