# Mechanical Engineering New Jersey Institute of Technology ME 615: Advanced Mechanical Vibrations Course Syllabus Spring 2025

### **1. Instructor Contact Information:**

Prof. Lin Dong Office: MEC 325 Tel: 973-596-3678 | Email: lin.dong@njit.edu

#### 2. Class Time, Office Hours and Location

Monday 6:00 pm – 8:50 pm, CKB 341. Office hours: Monday 1:00 pm – 2:00 pm, MEC 325.

#### 3. Prerequisites

Basic knowledge on dynamics, strength of materials, differential equations, matrix theory and Laplace transform.

#### 4. Course Audience

The course is for graduate students in Engineering.

#### 5. Recommended Texts

Singiresu S. Rao, *Mechanical Vibrations*, Pearson Education, Incorporated, 2016. (ISBN-13: 9780134361307)

Recommended articles and lecture handouts will be provided in classes and/or posted online via Canvas, and those materials will supplement course lectures.

#### 6. Course Description

This course covers the subject of vibration engineering, with the theory, computational aspects, and applications of mechanical vibrations. Major topics include, but are not limit to, review of free vibration of single-degree-of-freedom systems, introduction to matrix methods, harmonically excited vibration, forced vibration, Laplace transform approach for solution of vibration systems, two-degree-of-freedom systems, multidegree-of-freedom systems, principal frequencies and modes, introduction to continuous systems, vibration isolation, and applications to mechanical vibrations.

## 7. Course Objectives

Upon successful completion of this course, students are expected to gain the knowledge of mechanical vibrations and apply the knowledge of mathematics (differential equations, matrix algebra) and science (statics and dynamics) to solve engineering vibration problems. Through the lectures, team projects and laboratory demonstrations, students are expected to identify practical vibration problems, develop mathematical models, analyze, solve to find the response, and interpret the results.

## 8. Tentative Schedule

Week	Date	Торіс
1	1/27	Fundamentals of Mechanical Vibration
2	2/3	Free Vibration
3	2/10	Applications of Mechanical Vibrations
4	2/17	<ul> <li>Library Workshop</li> </ul>
		<ul> <li>Project Introduction</li> </ul>
5	2/24	Harmonically Excited Vibration
6	3/3	Exam 1
7	3/10	Exam 1 Review
8	3/17	Spring break (no class)
9	3/24	Laboratory Session
10	3/31	<b>Project Proposal Presentation</b>
11	4/7	Vibration Under General Forcing Conditions
12	4/14	Two-Degree-of-Freedom Systems
		Multidegree-of-Freedom Systems
13	4/21	Continuous System
14	4/28	Exam 2
15	5/5	Vibration Control
16	5/12	Final Project Presentation

## 9. Grading Policy

The grading will be based on four components:

- Exam 1 (25%) (March. 3, 2025)\*
- Exam 2 (25%) (Apr. 28, 2025)\*
- Project (40%)
  - Proposal presentation (10%)
  - Final presentation (15%)
  - Project report (15%)

• Homework (10%)

The letter grades will be used in determination of the final course grade along with the corresponding description as written in the university academic policy.

\*Any changes to the exam dates will be notified in advance.

## **10. Homework Assignments**

Homework will be assigned and posted on Canvas following completion of the major topics. Assignments will be collected via Canvas only. Assignments can be typed or neatly hand-written. The solution procedure must be clearly presented.

Note that Canvas will automatically apply a late penalty of 20% per day to late submissions. Consequently, a perfect homework submission will receive zero credit after 5 days. The solutions to these assignments will not be posted, they will only be discussed in the class.

## 11. Attendance

Attendance at class lectures is required for students. You will be responsible for any additional information provided during class time.

# **12. Academic Integrity**

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found below.

### https://www5.njit.edu/policies/sites/policies/files/NJIT-University- Policy-on-Academic-Integrity.pdf

Please note that it is the professional obligation and responsibility of faculty to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at <u>dos@njit.edu</u>.