Vibrations

EML4220 Class# 19197 Section# 4218
Class Periods: Section 4218, Period 9 (4:05– 4:55 PM) ***Location:*** TUN L005
Academic Term: Spring 2026

Instructor:

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Teaching Assistants:

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Office hours:

Zoom link https://ufl.zoom.us/j/98862672004?pwd=eHIwOGp0anhleW1oa0xuWTFLOC8xZz09

Course Description

Free and forced vibrations, single and multiple degrees of freedom systems, applications to mechanical systems.

Course Pre-Requisites / Co-Requisites

Prereq: EGM 3344, EGM 3401, EGM 3520 and MAP 2302 with minimum grades of C.

Course Objectives

This course stresses fundamental engineering science and mathematical principles required for understanding vibrations. There are two major goals:

a) To learn the concepts needed for understanding and analysis of the dynamic behavior of vibrating systems.
b) To develop skills for designing vibrating systems with desired properties that enhance vibration when it is wanted and reduce vibration when it is unwanted.

Materials and Supply Fees

List if applicable

Relation to Program Outcomes (ABET):

The table below is an example. Please consult with your department's ABET coordinator when filling this out.

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Medium
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

Course Schedule (Tentative, may be modified in time)

	Wk	Date	Topic
1	1	Jan 12	Introduction to the course
2		Jan 14	**Chapter 1** (8 lectures 3 reviews), Free Vibration step 1 & 2
3		Jan 16	Free Vibration step 3 & 4
4	2	Jan 21	Energy method, compound pendulum
5		Jan 23	Viscous damping
6	3	Jan 26	Viscous damping examples
7		Jan 28	Stiffness **HW1 due**
8		Jan 30	Application of vibrations to instruments and measurements
9	4	Feb 2	Stability
10		Feb 4	Career fair no class
11		Feb 6	Chapter 1 & HW 1 review **HW2 due**
12	**5**	**Feb 9**	HW 2 and Practice exam review
13		**Feb 11**	**Exam 1**
14		Feb 13	Exam1 review/**Chapter 2**, Harmonic excitation (5 lectures 3 reviews)
15	6	Feb 16	Harmonic excitation, two important phenomena
16		Feb 18	Harmonic excitation of damped system
17		Feb 20	Base excitation
18	7	Feb 23	Base excitation, rotating balance
19		Feb 25	Measurement devices/accelerometer/seismometer **HW3 due**
20		Feb 27	Review of chapter 3 and HW3
21	8	Mar 2	Practice exam review
22		**Mar 4**	**Exam 2**
23		Mar 6	Exam2 review/**Chapter 3** General forces (4 lectures 3 reviews)
24	9	Mar 9	Impulse and arbitrary Force
25		Mar 11	Step and ramp response: derivations
26		Mar 13	Ramp response: applications
27	10	Mar 23	Periodic forces and Fourier theory
28		Mar 25	Applications to Shock spectrum, Review of Chapter 3 **HW4 Due**
29		Mar 27	Reviews of HW4 and Practice exam
30	**11**	**Mar 30**	**Exam 3**
	or	**Mar 31**	**Exam 3**
31		Apr 1	Exam 3 review **/Chapter 4** MDOF systems (5 lectures 3 reviews)
32		Apr 3	2DOF Eigenvalues and natural frequencies
33	12	Apr 6	2DOF Modal analysis
34		Apr 8	More than 2DOF
35		Apr 10	Rigid body motion and modal analysis/systems with viscous damping
36	14	Apr 13	Resonance, Modal analysis of forced response **HW5 due**
37		Apr 15	Vibration Design and Review of Chapter 4
38		Apr 17	Review of HW5 and Practice Exam
39	**15**	**Apr 20**	**Exam 4**
40		Apr 22	Review of Exam 4

Important Dates (Tentative)
Feb 11 Exam 1 8:20 - 9:30 pm, Turlington Hall
Mar 4 Exam 1 8:20 -9:30 pm, Turlington Hall
Mar 31 Exam 1 8:20-9:30 pm, Turlington Hall
Apr 20 Exam 1 8:20-10:20 pm, Turlington Hall

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (5)	100 each	20%
Participation	100	5%
Exam 1	100	20%
Exam 2	100	15%
Exam 3	100	15%
Exam 4	100	25%
		100%

- Late homework will be deducted 20% per day.

Grading Policy
The following is given as an example only.

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

Academic Policies & Resources
To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment
The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:
• Your academic advisor or Undergraduate Coordinator
• HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
• Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu