VIBRATIONS

EML4220 Class# 12930 Section# 2592
Class Periods: Period 5 (11:45 AM - 12:35 AM)
Location: FLG 270
Academic Term: Fall 2023

This syllabus may be modified during the semester. If this happens, students will be notified, and the revised syllabus will be posted on the course web site.

Instructor:
Name: Youping Chen
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Office Phone Number: (352)3928494
Office Hours: Monday and Friday, 4:05-4.55pm via zoom
https://ufl.zoom.us/j/98862672004?pwd=eHIwOGp0anhleW1oa0xuWTFLOC8xZz09

Teaching Assistants:

- "Bilgili, Emir" emir.bilgili@ufl.edu
  Office Hours: 12:50-1:40pm Thursdays via zoom

- "Faiella,John Andrew" faiellaj@ufl.edu
  Office Hours: 12:50 -1:40pm Tuesdays via zoom

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 of vibrations. The major two goals are:

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.

Upon completion of this course, students will be able to
1) Generate simplified models for vibrating systems,
2) Derive the equations of motion of single- and multiple-degree-of-freedom systems using fundamental physical laws,
3) Solve the equations using mathematical methods of ordinary differential equations and linear algebra,
4) Analysis of the mathematical solutions to find natural frequencies of the systems and to predict the dynamic responses of the systems to external excitations,
5) Design mechanical systems with desired vibratory performance

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of mechanics and mathematics	High
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	Low
3. An ability to communicate effectively with a range of audiences	Low
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	Low
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Low
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Low

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- Title: Engineering Vibration
- Author: Daniel J. Inman
- Publication date and edition: 3rd or 4th Edition

Recommended Materials

- Recommended materials will be posted on the course website.
- Formulas will be posted on the course website.
- HW solutions will be posted on the course website.

Materials and Supply Fees

None

Tentative Course Schedule (this may be modified in time)

	Week	Date	Topic
1	1	Aug. 23	Introduction to the course
2		Aug. 25	**Chapter 1**, Free Vibration (**8 lectures + 2 reviews**) step 1 & 2
3	2	Aug. 28	Free Vibration step 3 & 4
4		Aug. 30	Energy method, compound pendulum
5		Sep. 1	Free Vibration, Viscous damping
6	3	Sep. 6	Free Vibration, Viscous damping examples
7		Sep. 8	Free Vibration, Stiffness **HW1 due**
8	4	Sep. 11	Free Vibration, Application of vibrations to instruments and measurements
9		Sep. 13	Free Vibration, Stability
10		Sep. 15	Chapter 1 & HW 1 review **HW2 due**
11	5	Sep. 18	HW 2 and Practice exam review
		Sep. 20	Carrer Fair
12		**Sep. 22**	**Exam 1**
13		Sep. 25	Exam1 review/**Chapter 2**, Harmonic excitation (**5-6 lectures 2 reviews**)
14	6	Sep. 27	Harmonic excitation, two important phenomena
15		Sep. 29	Harmonic excitation of damped system
16	7	Oct. 2	Base excitation
17		Oct. 4	Base excitation, rotating balance
		Oct. 6	Homecoming
18	8	Oct. 9	Measurement devices/accelerometer/seismometer **HW3 due**
19		Oct. 11	Review of chapter 3 and HW3
20		Oct. 13	Practice exam review
21	**9**	**Oct. 16**	**Exam 2**
22		Oct. 18	Exam2 review/**Chapter 3**, General force response, impulse (**5 lectures 2 reviews**)
23		Oct. 20	Impulse and step response
24	10	Oct. 23	Step and ramp response
25		Oct. 25	Periodic forces and Fourier theory
26		Oct. 28	Introduction to Laplace transform, shock spectrum **HW4 Due**
27		Oct. 30	Review of HW4
28		Nov. 1	Review of Chapter 3, Practice exam review
29		**Nov. 3**	**Exam 3**
30	12	Nov. 6	Exam 3 review **/Chapter 4** MDOF systems (**6 lectures 2 reviews**)
31		Nov. 8	2DOF Eigenvalues and natural frequencies
32	13	Nov. 13	2DOF Modal analysis
33		Nov. 15	More than 2DOF
34		Nov. 17	Rigid body motion and modal analysis/systems with viscous damping
35	14	Nov. 20	Resonance, Modal analysis of forced response
36	15	Nov. 27	Vibration design **HW5 due**
37		Nov. 29	Review of Chapter 4 and HW 5
38		Dec. 1	Review of Practice Exam
39	**16**	**Dec. 4**	**Exam 4**
40		Dec. 6	Review of exam 4

Attendance Policy, Class Expectations, and Make-Up Policy

Class attendance is required and will be monitored. Students will be held responsible for knowledge of all scheduling and policy announcements made in class or on the course website. Make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

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

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

More information on UF grading policy may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive 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, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: https://counseling.ufl.edu, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.ufl.edu.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall*,* 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints*:* https://distance.ufl.edu/getting-help/; *https://distance.ufl.edu/state-authorization-status/#student-complaint*.