

Vibrations

EML 4220 Section 2703

Class Periods: MWF 5 (11:45am – 12:35pm)

Location: MAE-B 238 and Zoom

Academic Term: Fall 2021

Instructor:

Patrick Musgrave, Mechanical and Aerospace Engineering Dept.

pmusgrave@ufl.edu

(352) 392-6230

Office Hours: MW 3:00 – 4:00pm, via Zoom (link available on Canvas)

Teaching Assistant:

Please contact through the Canvas website

- Michelle Lorini, michelle584@ufl.edu

Office Hours: Th 2:00 – 3:00pm, via Zoom (link available on Canvas)

Course Description

Single and multiple degree of freedom systems, including application to mechanical systems with problems employing computer techniques. Credits: 3

Course Pre-Requisites / Co-Requisites

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

Course Objectives

This course presents the fundamental engineering science and mathematical principles required for the understanding of vibrations. Students will (a) learn the concepts needed to understand and analyze the dynamic behavior of vibrating systems and (b) will develop the skills necessary to design mechanical systems that suppress or enhance vibrations. Upon completion of this course, each student should have:

1. General understanding of vibration analysis and the ability to apply this understanding towards solving a given problem.
2. Basic understanding of free, damped, and forced vibrations in single and multiple degree of freedom systems
3. The ability to apply advanced science and engineering principles in the design and analysis of structures to suppress or enhance vibrations.

Materials and Supply Fees

None

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, 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	

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	
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 Textbook

- Engineering Vibration
Daniel J. Inman
4th Edition, 2014 (Prentice Hall, Inc.)
ISBN-10: 0132871696
ISBN-13: 978-0132871693

This course is participating in UF All Access program. Login at the following website and Opt-In to gain access to your required eBook. <https://www.bsd.ufl.edu/G1CO/1Pay1f/start.aspx?TASK=INCLUDED> – UF All Access will provide you with your required materials digitally at a reduced price and the ability to pay using your student account. This option will be available starting 1 week prior to the semester starting and ending 3 weeks after the first day of class. For print purchasing options or study guides and additional course materials please visit <https://www.bkstr.com/floridastore/home> or the UF Bookstore located in the Reitz Union.

Recommended Reading

We will largely follow the layout of the Inman book. It is extremely useful. I suggest you read the relevant chapters, especially if you are having issues with the homework. Any edition of the book is fine for content, but homework problems will be assigned from the 4th edition of the book.

Required Software

- MATLAB Student Version
 - This will be used throughout the class and on some homework assignments.
 - You may consider using UFApps to access a number of popular software applications for “free” including Matlab at: <http://info.apps.ufl.edu/>
 - Not all toolboxes are included in this version.
 - Matlab is also available for purchase and download at: http://www.mathworks.com/academia/student_version/index.html

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance

- Regular class attendance (In-person or Zoom) is expected although not explicitly included in the grade evaluation.
- This course will be conducted in a hybrid fashion. Students can attend the lecture either in-person or via Zoom. Both will take place during the scheduled class time.
- The link for the Zoom recording can be found on the Canvas page: <https://elearning.ufl.edu>

- Lectures will also be recorded and uploaded online for later viewing and reviewing (See the statement about consent for recording below.)
- You are expected to take a sincere interest in learning the classroom material.
 - You are expected to show up on time for class.
 - Please silence/turn-off all cell phones prior to the start of class (including on Zoom)
 - Please be sure to remain on mute when not speaking
 - If you are a distraction in class, you will be asked to leave.
 - Please do not bring food to class.

Homework

- HW will be posted on Canvas along with its due date.
- HW will be turned in on Canvas.
- All assigned problems will be graded for completion, some or all will be graded for accuracy.
- Homework will be submitted online and must be in .pdf format. If submitting handwritten assignments, **the submission should be a scanned version**. Do not take a picture of your homework, as this results in unnecessarily large files. Scanner apps are available for free for mobile devices (e.g. CamScanner).
- Late HW will be accepted up to 24 hours after the due date with a maximum-grade penalty of 20 points. If you have an absolute doomsday of a week, this is your safety valve. Hardship cases will be considered on an individual basis and only if the instructor has been contacted before the due date of the assignment. Students with hardship cases (e.g., due to medical problems) will be referred to the Dean of Students office, which will perform a background investigation to determine if the hardship is legitimate.
- If you do not agree with the grading of a HW problem, you will have one week from the date the HW is returned to submit a written argument of why you think the grade should be higher. However, the final decision will remain the instructor's.

Exams

- **All exams will be conducted via Honorlock**
 - Mid-term exams will be scheduled during the evening of a class day (8:20-10:10pm, E2-E3).
 - You must have a webcam and be able to rotate the webcam for Honorlock's "Room Scan" to take the exam. Google Chrome and the Honorlock extension for Chrome are also needed.
- Exam dates
 - Mid-Terms:
 - Exam 1 – 9/22
 - 8:20 – 10:10pm (E2-E3)
 - Contents: Free Vibrations (Inman – Ch 1)
 - Exam 2 – 10/20
 - 8:20 – 10:10pm (E2-E3)
 - Contents: Forced Vibrations/Response to Harmonic Excitation (Inman – Ch 2)
 - Exam 3 – 11/10
 - 8:20 – 10:10pm (E2-E3)
 - Contents: General Forced Response (Inman – Ch 3)
 - Final Exam:
 - 12/15 from 3:00-5:00pm (<https://registrar.ufl.edu/courses/final-exam.html>)
 - Contents: Multi Degree of Freedom Systems, Vibration Suppression (Inman – Ch 4 & portions of 5).

- A formula sheet will be allowed during exams (one page, two sided). Otherwise, exams will be closed-book and closed-notes.
- Cell phones and physical calculators are NOT allowed during exams. Honorlock's built-in scientific calculator is permitted.
- Exam problems may be taken directly from the homework problems or from lecture discussions with some modifications. Thus, in addition to the weight placed on homework in the final grade, it is to your advantage to understand as many of the homework problems as possible. The emphasis of the exams will be to test your understanding, not on formulaic repetition, so expect the exam problems to be challenging and to test your grasp of the methods taught in the class.
- It is the students' responsibility to communicate their knowledge on the exams. In order to be able to grade your work, it must be neat, legible, and follow in logical steps with all work shown. Partial credit may be given for work which can be followed and the nature and magnitude of the mistake identified. No credit will be given for incorrect answers with insufficient indication of how they were obtained.
- Make-up exams will not be given since a student's lowest exam grade will be dropped. A missed exam will count as your dropped exam.
 - Make-up exams are only allowed for students with extreme, documented circumstances. Students must contact the instructor as soon as possible to provide documentation and request a make-up exam. Excused absences must be consistent with university policies in the undergraduate catalog and require appropriate documentation (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>).
- If you do not agree with the grading of a particular exam problem, you will have one week from the date the exam is returned to submit a written argument of why you think the grade should be higher. However, the final decision will remain the instructor's.

E-learning course web site (Canvas)

- E-Learning/Canvas system (<https://elearning.ufl.edu>) – all documents, homework, grades, etc. will be posted on this system.
 - Students are expected to check Canvas on a regular basis for up-to-date course information. This may include changes to the syllabus, homework assignment due dates, and exam schedules.
- Slack will be used as a discussion forum for this course.
 - [Click here to join](#). Link is valid until 9/18/2021. Email the instructor or TA after this date to join
 - This channel is a good way for students to discuss topics amongst each other, and it is a good way to ask the Instructor and/or TA questions outside of office hours.
 - Any information about HW assignments, due dates, etc. will be posted to Canvas

Evaluation of Grades

Students will be evaluated from their grades on the following, which are weighted as follows

- 75% Exam 1, Exam 2, Exam 3 and Final Exam
*Based on TOP 3 Exam Scores out of the 4 Exams: i.e. lowest exam grade is dropped
Each of the 3 counted exams is worth 25% of final grade*
- 25% Homework Assignments

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
63.3 – 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/>.

Consent for Audio/Video Recording for Online Lectures

Our class sessions will be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

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 Conduct 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. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Cheating at the University of Florida is unacceptable and will not be tolerated. While learning together and collaboration in the interest of learning are welcome, cheating and plagiarism are not. You are welcome to work with others to learn, but your work must be your own. If you need help with a problem, do not search for someone else’s solution on Chegg. Using solutions such as those on Chegg is an Honor Code violation. Instead, **come to office hours to get help from the TAs or myself!** We are the most direct and Honor Code-approved method of getting help in the class. *Use us!*

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@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/>

COVID-19

- **You are expected to wear approved face coverings at all times** during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus.
- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

Academic Resources

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

Career Resource 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: <http://www.distance.ufl.edu/student-complaint-process>.