

**Structural Dynamics**  
EGM 6934 Section 362B  
**Class Periods:** MWF Period 5 (11:45am - 12:35pm)  
**Location:** MAE-B 229  
**Academic Term:** Spring 2023

**Instructor:**

Dr. Patrick Musgrave  
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(352) 392-6230  
Office Hours: Upon Request

**Course Description**

Special Topics in Engineering Mechanics. Vibration of continuous structural systems including coupling with smart materials and fluids. Credits: 3

**Course Pre-Requisites / Co-Requisites**

Recommended pre-requisite: EML 4220 or equivalent course covering the vibration of discrete systems

**Course Objectives**

This is a survey course that will cover the vibration of continuous systems. We will cover the theory of strings, beams, & plates using both Newtonian and Energy Methods and will find both analytical and approximate solutions (Rayleigh-Ritz, Galerkin method). Additional topics may include piezoelectric actuators, fluid loaded systems, and modal analysis. Upon completion of this course, students should have:

1. Understanding of the fundamental theory behind the dynamic modeling of continuous structural systems
2. The ability to estimate natural frequencies using numerical approximation methods
3. General understanding of how structural systems couple with smart materials (i.e. piezoelectric materials) and surrounding fluids

**Materials and Supply Fees**

None

**Reference Textbooks**

The course notes are developed by the instructor. The following textbooks can be used as reference:

- |   |   |
|---|---|
| 1. Fundamentals of Structural Dynamics<br>Roy R. Craig Jr. and Andrew J. Kurdila<br>2 <sup>nd</sup> Edition, 2006 (Wiley)<br>ISBN-10: 0471430447<br>ISBN-13: 978-0471430445 | 2. Fundamentals of Vibrations<br>Leonard Meirovitch<br>1 <sup>st</sup> Edition, 2010 (Waveland Press Inc.)<br>ISBN-10: 1577666917<br>ISBN-13: 978-1577666912            |
| 3. Engineering Vibration<br>Daniel J. Inman<br>4 <sup>th</sup> Edition, 2014 (Prentice Hall, Inc.)<br>ISBN-10: 0132871696<br>ISBN-13: 978-0132871693                        | 4. Introduction to Fluid-Structure Interactions<br>Yahya Modarres-Sadeghi<br>1 <sup>st</sup> Edition, 2021 (Springer)<br>ISBN-10: 3030858820<br>ISBN-13: 978-3030858827 |

**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](http://www.mathworks.com/academia/student_version/index.html)

### ***Attendance Policy, Class Expectations, and Make-Up Policy***

Requirements for class attendance, 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/>

#### *Attendance*

- Regular class attendance is expected.
- If the instructor is unable to hold a lecture in-person (due to travel), lectures will be pre-recorded and posted to Canvas. Students are expected to watch the recorded lectures before the following class.
- 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
  - If you are a distraction in class, you will be asked to leave.
  - Please do not bring food to class.

#### *Projects/Take-home exams*

- The primary evaluation method in this course will be projects/take-home exams.
- It is expected that there will be 3 such assessments during the semester.
- However, the exact date and number of these assignments is subject to change as the semester progresses.
- If you do not agree with the grading of a particular project/take-home exam, you will have one week from the date the assignment 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.

#### *Homework*

- HW will be posted on Canvas along with its due date
- HW will be turned in on Canvas.
- 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. Adobe Scan).
- Late HW policy:
  - HW submitted after the deadline will have a 25% deduction.
  - Late HW will not be accepted 24 hours after the due date.
  - 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.

#### *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 project due dates.

## Evaluation of Grades

Assignment	Percentage of Final Grade
<b>Projects/Take-home Exams (80% total)</b>	
Project/Take-home Exam 1	20%
Project/Take-home Exam 2	25%
Project 3	35%
<b>Homework</b>	20%
<b>Total</b>	100%

## 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/>.

## 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 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](mailto:jpennacc@ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto: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](mailto: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](mailto: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 support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto: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/state-authorization-status/#student-complaint>.