

Structural Dynamics
CES 6018
Class Periods: MWF, Period 2, 8:30 – 9:20 am
Location: Online
Academic Term: Spring 2021

Instructor:

Dr. Jennifer Bridge
Email: jennifer.bridge@essie.ufl.edu
Office Phone Number: (352) 294-7793
Office Hours: Tuesdays, 1:00 – 2:30pm on Zoom, or by appointment
Lecture Videos: Microsoft Stream

Teaching Assistant: None

Course Description

Evaluating structural response to the effects of dynamic loads for single degree and multi degree of freedom systems. Considers seismic and wind effects, modal analysis, numerical methods, structural idealization, response spectra, and design codes (3 credits).

Course Pre-Requisites

Fundamentals of structural analysis including loads, shear and moment diagrams, and classical methods for determining displacements.

Course Objectives

To develop the students' ability to:

1. Relate real structural properties to structural idealizations used to model and analyze the effects of dynamic loads
2. Understand the response of structural systems to time-varying dynamic loads and displacements
3. Evaluate the response of single degree-of-freedom (DOF) and multi-DOF systems to harmonic and general loading conditions using analytical and numerical analysis approaches
4. Relate theoretical results to structural loading specifications, including response spectrum analysis for seismic design
5. Communicate effectively in homework, exams, and class discussions to strengthen these skills for use in engineering practice

Materials and Supply Fees: N/A

Required Software

MATLAB (<https://www.mathworks.com/products/matlab/student.html>),
Mathcad (<https://software.ufl.edu/software-listings/mathcad.html>), or similar.

Recommended Text

Tedesco, J.W., McDougal, W.G., Ross, C.A., (1999) *Structural Dynamics – Theory and Applications*, Addison-Wesley

Course Schedule (Tentative)

Week 1: Introduction
Single Degree of Freedom Systems:
Week 2: Equations of motion
Week 3: Free vibration
Week 4: Harmonic excitation
Week 5: Base excitation
Week 6: Periodic and arbitrary loading, **Exam 1**

- Week 7: Numerical analysis
Week 8: Response spectra analysis
Multi Degree of Freedom Systems:
Week 9: Analysis models
Week 10: Modal properties
Week 11: Modal equations of motion
Week 12: Modal superposition, **Exam 2**
Week 13: Damping and response spectra
Week 14: Seismic loads and design
Week 15: Additional topics
Finals Week: Final Exam (April 30, 2021, 12:30 – 2:30 pm, tentative)

Online Course Recording

Our class sessions may 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.

Attendance Policy, Class Expectations, and Make-Up Policy

This class meets three times a week for one 50-minute period. Each class will start with a brief review of previous material and/or questions on homework as needed, followed by a lecture on new material. Regular attendance is strongly recommended for success in this course. While attendance does not make up a specific component of the course grade, it will be reflected in homework and exam grades.

Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation. Make-up exams will not be given except in cases of valid medical emergencies (for which the student must provide written documentation) or certain other admissible emergencies. Students who must miss an exam due to University-approved business should notify the instructor **in advance** with a written explanation for the absence along with the appropriate documentation. Students with questions regarding this policy are urged to consult the instructor.

Evaluation of Grades

Homework: Homework assignments will make up 35% of your final grade. Problems sets will be assigned throughout the semester and will be due on the posted date. Each completed homework assignment will be submitted electronically as a single pdf file on the course website (Canvas). Assignment submissions may include any combination of hand calculations (completed neatly on engineering paper and scanned), software code/output, or spreadsheets. All work is to be neatly presented with carefully drawn sketches and clearly indicated solutions; sloppy work will receive reduced points. Assignments are due at the time stated on the assignment; technical difficulty during submission is not an excuse for missing a deadline. **Late homework will not be accepted and will receive a grade of zero.** The lowest regular homework assignment grade will be dropped. Assignments will be evaluated for overall degree of completion. A randomly selected subset of each assignment will be graded in detail. Solutions to assignments will be posted on Canvas following assignment due date. Each student is responsible for comparing their solution to that posted by the instructor, thereby determining if errors were made.

One homework assignment will be to regularly attend the Structures Graduate Seminar Series (SGSS). SGSS is part of the professional communication requirement for structural engineering graduate students and is held approximately every two weeks on Wednesdays from 12:50 – 1:40pm (Period 6) via Zoom. The schedule and

speaker information can be found on the SGSS page on the UF Structures Graduate Program Canvas site. To receive full credit for this homework, at least six seminars must be attended. If you have a conflict, please contact Dr. Bridge to discuss.

Midterm Exams: Two midterm exams will comprise 40% of your final grade (20% each).

Final Exam: A comprehensive final exam will comprise 25% of your final grade. *April 30, 2021, 12:30 – 2:30 pm (tentative)*

Assignment	Total Points	Percentage of Final Grade
Homework Sets	10 each	35%
Midterm Exams (2)	100 each	40%
Final Exam	100	25%
		100%

Grading Policy

To receive the Structures specialization, you must make a B or better in this class. The *tentative* grading scale is:

90-100%	A
80-89%	B
70-79%	C
60-69%	D
< 60%	E

The instructor reserves the right to adjust the grade distribution; grades **will not** be adjusted for individuals. More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

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/>.

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/policies/student-honor-code-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
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@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: <http://www.counseling.ufl.edu/cwc>, 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 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://www.crc.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://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.