

Mechanics of Engineering Structures

CES 3102

Class Periods: T, R | Periods 2-3 | 8:30 AM – 10:25 AM

Location: FAB 103

Academic Term: Fall 2022

Instructor:

Arthriya Subgranon, Ph.D.

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Office Hours: T, R 2 PM - 3 PM, or by appointment, at Weil Hall room 475F

Course Description

Introduces structural load, equilibrium, shear and bending moment diagrams, structural analysis software, classical methods for displacement determination, method of consistent deformations, slope deflection method, and moment distribution method.

Course Pre-Requisites

EGM 2511 (Statics), EGM 3520 (Mechanics of Materials)

Course Objectives

To develop the student's ability to:

1. Identify, formulate and solve problems encountered in structural analysis as an integral part of the design process in engineering practice;
2. Understand the behavior of structures and components under various loading conditions;
3. Apply classical and contemporary methods of structural analysis in engineering practice;
4. Communicate effectively in homework, tests, and class discussions to strengthen these skills for use in practical engineering;
5. Introduce students to structural engineering software

Materials and Supply Fees

None.

Professional Component (ABET):

CES 3102 is a required course in the Civil Engineering BS curriculum.

Expected Program Outcomes (ABET):

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

Required Textbooks and Software

Structural Analysis
 Russel C. Hibbeler
 10th Ed., 2018
 ISBN: 0134610679

This course is included in the UF All Access (UFAA) program (<https://www.bsd.ufl.edu/allaccess>).

Course Schedule (Tentative)

| Class | Date (2022) | Hibbeler Chapter | Topic | Homework | |
|-------|-------------|------------------|--|----------|-------|
| | | | | Assigned | Due |
| 1 | 08/25 | 1 | Introduction, Materials and Structures, Idealization | 1 | |
| 2 | 08/30 | 2, 5.6 | Reactions, Determinacy, Multi-member Structures | | |
| 3 | 09/01 | 3 | Trusses - Method of Joints, Zero Force Members | | |
| 4 | 09/06 | | Test 1 - Reactions, Equilibrium, Determinacy | 2 | 1 |
| 5 | 09/08 | 3 | Trusses - Method of Sections | | |
| 6 | 09/13 | 4 | Shear and Moment Diagrams | | |
| 7 | 09/15 | 4 | Shear and Moment Diagrams | | |
| 8 | 09/20 | | Test 2 - Trusses | 3 | 2 |
| 9 | 09/22 | 6 | Influence Lines - Construction | | |
| 10 | 09/27 | 6 | Influence Lines - Application | | |
| 11 | 09/29 | 8 | Beam Deflections - Double Integration | | |
| 12 | 10/04 | | Test 3 - Shear and Moment Diagrams | 4 | 3 |
| 13 | 10/06 | 8 | Beam Deflections - Double Integration | | |
| 14 | 10/11 | 8 | Beam Deflections - Moment-Area | | |
| 15 | 10/13 | 8 | Beam Deflections - Moment-Area | | |
| 16 | 10/18 | | Test 4 - Influence Lines | 5 | 4 |
| 17 | 10/20 | 9 | Energy Methods, Virtual Work | Frame | |
| 18 | 10/25 | 9 | Virtual Work for Beams and Trusses | | |
| 19 | 10/27 | 9 | Virtual Work for Beams and Trusses | | |
| 20 | 11/01 | | Test 5 - Double Integration and Moment-Area | 6 | 5 |
| 21 | 11/03 | 10 | Indeterminate Analysis - Force Method | | |
| 22 | 11/08 | 10 | Indeterminate Analysis - Force Method | | |
| 23 | 11/10 | 15 | Indeterminate Analysis - Stiffness Method Introduction | | |
| 24 | 11/15 | | Test 6 - Virtual Work | 7 | 6 |
| 25 | 11/17 | 15 | Indeterminate Analysis - Stiff. Meth. - Beams | | |
| 26 | 11/22 | 15/16 | Indeterminate Analysis - Stiff. Meth. - Beams/Frames | | Frame |
| 27 | 11/29 | 16 | Indeterminate Analysis - Stiff. Meth. - Frames | | |
| 28 | 12/01 | 10/15/16 | Review & Applications | | 7 |
| 29 | 12/06 | | Final Test - Indeterminate Analysis | | |

Attendance Policy, Class Expectations, and Make-Up Policy

This class meets twice a week, 100 minutes per class period. Each period will start with a brief review of previous material and/or questions on homework, followed by a lecture on new material. Usually, a short break will be given part way through the lecture period. Tests will be given approximately every two weeks (see tentative course schedule). 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 test grades. Requirements for class attendance and make-up tests, 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/>

Homework: Eight homework assignments will make up 15% of your final grade. Seven problem sets will be assigned throughout the semester and will be due every two weeks (see tentative course schedule). An eighth homework assignment (the Frame assignment) will be given over the structural analysis software you will learn in class. Homework assignments will be posted on the course website. Homework must be submitted through Canvas, scanned on engineering paper with a clearly defined problem statement, given information, required information, and a clearly indicated solution(s). Homework that cannot be read will not be graded. All solutions must have correct units; solutions without correct units will be penalized. Assignments are due at the beginning of class (8:30 am) on the due date unless otherwise stated. Late homework will not be accepted and will receive a grade of zero. The lowest homework score will be dropped (excluding the Frame assignment, which will not be dropped).

Tests: Seven in-class tests will comprise 85% of your final grade. All work and solutions (with correct units and direction) are to be shown on the test in the space provided. Tests will be administered in a classroom.

The lowest of the first six test grades will be dropped. This policy generally removes the need for make-up tests caused by unplanned or conflicting events, illness, etc. Students who must miss a test due to University approved business should notify the instructor three weeks in advance with a written explanation for the absence along with the appropriate documentation. Otherwise, no make-up tests will be given.

Evaluation of Grades

| Assignment | Total Points | Percentage of Final Grade |
|-------------------|---------------------|----------------------------------|
| Homework Sets (8) | 100 each | 15% |
| Tests 1-6 (6) | 100 each | 70% |
| Final Test | 100 | 15% |
| Total | | 100% |

Grading Policy

| Percent | Grade | Grade Points |
|----------------|--------------|---------------------|
| 93.0 - 100 | A | 4.00 |
| 90.0 - 93.0 | A- | 3.67 |
| 87.0 - 90.0 | B+ | 3.33 |
| 83.0 - 87.0 | B | 3.00 |
| 80.0 - 83.0 | B- | 2.67 |
| 77.0 - 80.0 | C+ | 2.33 |
| 73.0 - 77.0 | C | 2.00 |
| 70.0 - 73.0 | C- | 1.67 |
| 67.0 - 70.0 | D+ | 1.33 |
| 63.0 - 67.0 | D | 1.00 |
| 60.0 - 63.0 | D- | 0.67 |
| 00.0 - 60.0 | 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.ua.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.ua.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
- 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 support, 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/state-authorization-status/#student-complaint>.