CES 4702 – ANALYSIS AND DESIGN OF REINFORCED CONCRETE

INSTRUCTOR	DR. GABY OU, ASSISTANT PROFESSOR IN CIVIL AND COASTAL ENGINEERING WEIL 475, *GOU@UFL.EDU*
Lecture Times	3rd and 4th period (9:35 – 11:30), Tuesday and Thursday FLG 0280
Office Hours	12:00 PM – 2:00 PM Tuesday and Thursday. Other times by appointment
Grader/T.A.	A grader will help score homework but will not interface with students Dr. Ou will score quizzes and hold office hours
Course Description	The purpose of this course is to establish a firm understanding of the behavior of reinforced concrete structures, then to develop methods used in current practice and to achieve familiarity with codes and specifications governing practical design. In this course, we will learn to understand the basic performance of concrete and steel as structural materials, and the behavior of reinforced concrete members and structures. If we understand the basic concepts behind code provisions for design, we will be able to 1) Approach the design in a more knowledgeable fashion, not like following a black box; 2) Understand and adapt the changes in code provisions better and faster.
Course Objectives	Develop the ability of the student to determine the flexural and shear strength of existing reinforced concrete beams and columns, and to design reinforced concrete beams and columns for given design loads. Develop the ability to compute deflections for reinforced concrete beams. Develop the ability to design reinforcement details for reinforced concrete structures.
Learning Outcomes	To teach the student to identify, formulate, and solve open-ended structural engineering problems. The course will also enhance the student's ability to use techniques, skills, and modern engineering tools necessary for the practicing structural engineer.
ABET-Related Objectives and Outcomes	This course achieves the following ABET-related objectives and outcomes: Outcome (a): Apply knowledge of mathematics, science and engineering Outcome (c): Design systems and components to meet desired needs
Prerequisites	CGN 3501 – Civil Engineering Materials, CES 3102 – Mechanics of Structures
Required Text	McCormac and Brown, *Design of Reinforced Concrete*, 10th edition ISBN: 9781118879108 Wiley
Student Attendance	Students are expected to show up on time and attend every class.
Homework Policy	Late homework will not be accepted. The layout and appearance of your work must be of professional quality. Please underline or box the answers and provide your name, the course number, the assignment number at the top of the first page.
Exam Policy	Make-up quizzes are not allowed. One of the quizzes will be dropped (see below).
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.
Academic Honesty	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 in this class.
Grading	**Five** in-class, closed-book **In-Class** quizzes will comprise 90% of the final grade. Five homework assignments submitted through Canvas will account for the remaining 10% of the final grade. Each quiz will be preceded by a homework assignment. The lowest scoring homework and quiz will be dropped. The purpose of this drop is to remove the need for make-up quizzes caused by unplanned or conflicting events, illness, etc. Quizzes are given during scheduled class time only. It is your responsibility to take the quiz. No make-up quizzes will be given. Quiz #5 drop exception: In order for quiz #5 to qualify as the dropped quiz, you must score at least 50% on quiz #5. For example, say your lowest score among the first four quizzes is 70%, and your score on quiz #5 is 45%. In this case the 70% would be dropped and the 45% retained. However, if your score on quiz #5 is 50%, the 50% will be dropped and the 70% retained. The final grade will be determined based a straight scale (A ≥ 93, A- ≥ 90, B+ ≥ 87, B ≥ 83, B- ≥ 80, C+ ≥ 77, C ≥ 73, C- ≥ 70, D+ ≥ 67, D ≥ 63, D- ≥ 60). Grade thresholds may be adjusted downward based on class performance, but not upward. Thus, the straight scale above is the most severe scenario (an A might move down to 92 but cannot move up above 93). After a quiz or homework is posted, you have ten (10) business days to discuss the grading with the instructor. For more information on grades and grading policies, please visit: 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.
Software Use	All faculty, staff and student 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.
Calculator Policy	To prevent students from programming equations and problem solutions into their

for Quizzes	calculators for quizzes, or having their calculators communicate with other calculators or computers during quizzes, only certain models of calculators are permitted to be used during quizzes. These are the same calculators permitted for use in the Fundamentals of Engineering Examination (FE), which all Civil Engineering students will eventually need to take. There are **no exceptions**. No other models of calculators will be allowed in quizzes. The only acceptable models are those listed as follows: **Casio:** All fx-115 models. **Hewlett Packard:** The HP 33s and HP 35s models, but no others. **Texas Instruments:** All TI-30X and TI-36X models.
Cell phones	Cellular telephones are unacceptable during quiz time. Students **must** turn off their cell phones at the beginning of a quiz, and not turn it on again until they have submitted their quiz to the instructor and left the room. Any student doing anything with a phone during a test will be assumed to be communicating with another person and fail the quiz.
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/.
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** 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/state-authorization-status/#student-complaint.

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

Disclaimer	The syllabus and course material is subject to change. All changes will be announced in class and distributed. Students are responsible for all announced changes. **Course Schedule on the next page**

Notes: The topics and order are unlikely to change. However, the specific calendar days in the schedule are subject to change as the pace dictates. The quiz dates may change (with advance notice), but this is unlikely.

Class	Date	Topic	HW due date
1	Th, 8/24	Course introduction, syllabus, analysis vs design, factors	
2	Tu, 8/29	Factored moment, materials review	
3	Th, 8/31	Materials, section properties	
4	Tu, 9/5	Flexure theory: Three phases of RC beam behavior	
5	Th, 9/7	Strength analysis – singly reinforced beams (SRB)	
6	Tu, 9/12	Strength analysis – singly reinforced beams	
7	Th, 9/14	**Quiz 1** (topic ➔ Review, SRB flexure theory)	HW#1 DUE
8	Tu, 9/19	Strength analysis – singly reinforced beams – non-rect sections	**(Traveling, Pre-recorded Class)**
9	Th, 9/21	T-Beam analysis DRB, design tools for SRB	
10	Tu, 9/26	Doubly reinforced beam (DRB) analysis	
11	Th, 9/28	SRB vs DRB example	
12	Tu, 10/3	Design tools	
13	Th, 10/5	**Quiz 2** (topic ➔ Flexure & Strength – SRB, DRB, T-beams)	HW#2 DUE
14	Tu, 10/10	Design – SRB	
15	Th, 10/12	Design – T-beams	
16	Tu, 10/17	Design - DRB	
17	Th, 10/19	Shear analysis and stirrups	
18	Tu, 10/24	**Quiz 3** (topic ➔ Design of single, double and T beams)	HW#3 DUE
19	Th, 10/26	Shear design of stirrups	
20	Tu, 10/31	Shear design, Bond and development concepts	
21	Th, 11/2	Bond and development	
22	Tu, 11/7	Bond and development, Deflections in SRB	
23	Th, 11/9	Deflections in SRB	
24	Tu, 11/14	**Quiz 4** (topic ➔Shear, Bond and Development)	HW #4 DUE
25	Th, 11/16	Deflections, Introduction to Columns	
26	Tu, 11/21	Column design – small moments	
27	Tu, 11/28	Columns design - large moments	
28	Th, 11/30	Columns design - large moments	
29	Tu, 12/5	**Quiz 5** (topic ➔ Deflections and Columns)	HW#5 DUE

Topic	Book Chapter
Introduction, material properties and behavior, design process, loads	1, 4.1
Flexure theory	2
Strength analysis – singly reinforced beams	3
Strength analysis – T beams and doubly reinforced beams	5
Design of singly reinforced sections	4
Design of T beams and doubly reinforced beams	5
Shear stress and stirrups	8
Bond and development	7
Deflections	6
Columns – introduction	9
Columns – design of short columns with bending	10