Instructor

Lauren K. Stewart, PhD, PE
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Office Hours: Mason 3141A Tuesdays 10 - 11 am, Thursdays 3:00 - 4:00 pm, or by appointment
Coffee/Lunch Hours: Times and locations announced on Canvas

Teaching Assistant

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Office Hours: Mason 1201B, Tuesdays and Wednesdays 1:30 - 2:30 pm, or by appointment

Course Description

This course introduces key concepts in structural engineering: the science, art and skill of designing various types of structures such that their behavior is as intended in a safe manner throughout their lifetime. Through case studies of structures and failures, demonstrations and lectures, students will understand how structures of all types (i.e. buildings, bridges, domes, dams, etc.) take and transfer loads, compute the effects of the loads on the structural members, and determine the material and size of these members such that they are safe.

Course Outcomes

During this course, the student will learn by actively participating in lectures and demonstrations, by solving individual homework assignments and completing engineering projects as a member of a small team. After the student completes the course they will be able to:

- Determine the behavior of structural systems as defined by gravity, lateral, dynamic and other loads
- Represent three-dimensional structural systems as two-dimensional analysis models
- Compute the demand loads on members
- Design basic structural members made of commonly used materials
- Explain the force transfer mechanisms of the structure

Prerequisites

This course is intended for all levels of undergraduate students who have taken COE 3001: Deformable Bodies.

Course Conduct

The Georgia Tech Honor Code is the standard of conduct for this course. The Honor Code is available at http://www.honor.gatech.edu/.

Office of Disability Services

The Georgia Institute of Technology has policies regarding disability accommodation, which are administered through The Office of Disability Services. http://disabilityservices.gatech.edu/. For students with disabilities, please contact this Office to request classroom accommodations.

Website

The website for the course is https://canvas.gatech.edu. Students are expected to check regularly for announcements and are responsible for the material posted. Emails will be sent via Canvas to the email on record. It is the student's responsibility to check their email regularly.

Homework

Assignment of homework problems related to the lecture material will be posted on Canvas. Please be concise and neat in submitting solutions. All students must turn in their own homework assignments. Discussion of the homework problems with other class members is allowed. Utilizing other students or prior years' homework to directly generate your own assignment is not allowed. Homework will be checked for excessive similarities with other student's and with previous years' assignments. Assignments with excessive similarities will be given a zero for the assignment.

Assignments are due at the beginning of the class, late homework is accepted at a 25% markdown per day late up to three days. No late homework will be accepted after the solutions are posted online. Late homework due to medical reasons will be considered with a doctor's note. Extensions for religious reasons, medical issues, or any other Institute approved absence should be requested as soon as possible, prior to the homework being due.

Hands-on Projects

Three hands-on projects will be assigned and are to be completed during and outside of class in small groups throughout the semester. The groups will be assigned at the beginning of the semester. It is the student's responsibility to attend these times and should notify the instructor early in the semester if they can't attend. Each project will have report(s) and/or presentation. Each group will collect data together during class and each test report will be completed individually. Excessive similarities between reports will receive a zero grade on the assignment.

The topics for the projects are as follows:

1. Reinforced Concrete Beams
2. Trusses
3. Structural Dynamics

Make-ups for projects completed during class will only be granted in exceptional circumstances and must be requested prior to the day. Attendance may be taken during these classes to ensure fair participation of all members of the group.

Mastery Quizzes

Students must successfully master concepts in six areas, each representing ≈8% of the final grade:

1. Tributary Area and Load Paths
2. Moment and Shear Diagrams (statics review)
3. Axial Stresses, Strains, & Material Behavior
4. Flexure and Shear
5. Deflected Shapes
6. Trusses

To demonstrate mastery of each concept, students must successfully complete a 15-20 minute quiz, consisting of 1-2 problems. Quizzes will be graded using the following rubric out of a total of 4 points:

Points	**Performance**	**Examples**
4	Complete Mastery	All questions answered correctly and completely
3	Minor Errors	Numerical errors Minor units issues
2	Major Conceptual Error	Incorrect approach Incorrect equations Incorrect use of equations Major unit error
1	Two Major Conceptual Errors	
0	Many Conceptual Errors	
0	No Response	

Students must take the first offering of the quiz in class. If the student does not receive a 4 (Complete Mastery) grade, they must retake each quiz up to two additional times during the semester: once during the normal lecture (as indicated in the schedule) and once during the final exam period. Retakes should be viewed as part of the learning process. Once the student has received a 4, their grade will be recorded at 100 percent and they do not need to sit for the remaining quizzes of that subject. If the student does not receive a 4 on their third attempt, the three grades will be averaged for their final grade.

There will be many versions of each exam and students should expect that the exam will consist of different questions each time. Additionally, students will not all receive the exam during the same sitting.

Cheating off of another student's exam is unethical and unacceptable. Other examples of cheating include, but are not limited to, bringing unauthorized material to exam, collaborating or sharing notes, talking during exam and using cellphones. Prior to the exam, all personal belongings will be placed in the front of the classroom. Please do not bring anything into the exam room which you are not comfortable leaving at the front. Cheating off of anyone else's work is a direct violation of the GT Academic Honor Code, and will be dealt with accordingly per Georgia Tech policy.

Textbook

There is no official textbook for the course. Course notes, homework solutions and additional course material will be available to print on T-square.

References for the course include:

- C. Dym and P. Little (1998) Engineering Design: A Project-based introduction. New York: John Wiley and Sons.
- J. Gordon (2009). Structures: Or why things don't fall down. Da Capo Press.
- T.Y. Lin and S. Stotesbury (1988). Structural Concepts and Systems for Architects and Engineers. New York: John Wiley and Sons.
- M. Salvadori (2002). Why buildings stand up. New York: W.W. Norton and Company.
- D. Schodek and M. Bechthold (2013). Structures (7th Edition). Columbus, Ohio: Prentice Hall.
- N. Delatte (2009). Beyond Failure: Forensic Case Studies for Civil Engineers. ASCE Publications.

Grading

The final grade will be determined from the following grading scheme:

- Homeworks (25%)
- Hands-on Laboratories (25%)
- Mastery Quizzes (50%)

Tentative Schedule

Date	Topic	Quiz Topic	Due
1/8	Course Introduction Types of Structures & Structural Elements *Case-Study: One World Trade Center* Review: Reactions		
1/10	Loads Load Combinations		
1/15	Structural Systems Load Paths *Case-Study: Beijing National Stadium*		
1/17	Internal Forces Review: Moment and Shear Diagrams		
1/22	Material Behavior General Structural Behavior & Redundancy *Case-Study: Alfred P. Murrah Building*		
1/24	Quiz Axial Loads and Buckling	Load Paths	
1/29	Project 1 Reinforced Concrete Beam Construction		
1/31	Flexure		
2/5	Group A: Quiz & Reinforced Concrete Construction Group B: Project 1 Reinforced Concrete Beam Testing	Internal Forces	
2/7	Group B: Quiz & Reinforced Concrete Construction Group A: Project 1 Reinforced Concrete Beam Testing	Internal Forces	
2/12	Shear		
2/14	Quiz Steel Construction *Failure Case Study: Pittsburgh Convention Center*	Axially Loaded Members	
2/19	Precast, Prestressed, and Post-tensioned Construction *Failure Case Study: L'Ambiance Plaza*		
2/21	Deflected Shape		
2/26	Intro to Structural Analysis Software Quiz	Flexure and Shear	
2/28	Trusses		
3/5	Group A - Project 2: Trusses Group B - Space Trusses, *Case Study: Emirates Stadium* Group B - Quiz	Deflected Shapes	Project 1
3/7	Group A - Space Trusses, *Case Study: Emirates Stadium* Group A - Quiz Group B - Project 2: Trusses	Deflected Shapes	
3/12	Influence Lines		
3/14	Cables *Case Study: Dallas Airport Terminal* Quiz	Trusses	
3/19	Spring Break		
3/21	Spring Break		
3/26	Quiz Retake (Optional)	Load Paths Internal Forces Axially Loaded Members	
3/28	Cable Bridges *Case Study: Scripps Crossing* *Case Study: George Washington Bridge* *Failure Case Study: Point Pleasant Bridge*		

Tentative Schedule (cont.)

Date	Topic	Quiz Topic	Due
4/2	Quiz Retake (Optional)	Flexure and Shear Deflected Shapes Trusses	
4/4	Arches & Domes *Case Study: Il Palazetto Dello Sporto*		Project 2
4/10	Structural Dynamics		
4/12	Group A: Project 3 Structural Dynamics & Earthquakes Group B: Earthquake Engineering		
4/16	Group B: Project 3 Structural Dynamics & Earthquakes Group A: Earthquake Engineering		
4/18	Extreme Loads		
4/23	Final Review		Project 3
5/2	**Final Exam** Quiz Retake Quiz Retake Quiz Retake Quiz Retake Quiz Retake Quiz Retake	 Moment & Shear Load Paths Axial Stress & Strain Flexure & Shear Deflected Shapes Trusses	