CEE 3051 - Introduction to Structural Engineering

Instructor

Lauren K. Stewart, PhD, PE
School of Civil & Environmental Engineering
lauren.stewart@ce.gatech.edu
Office Hours: Mason 3141A, Mon and Wed 12:30-1:30pm, or by appointment

Teaching Assistant

George P. Burdell, george.burdell@gatech.edu
Office Hours: Mason 3141A, Tues and Thurs TBD, 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 Objectives

During this course, the student will learn by actively participating in lectures and demonstrations, by solving individual homework assignments and completing an engineering project 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 as a technical elective for all levels of undergraduate students who have taken Statics: COE 2001.

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://t-square.gatech.edu. Students are expected to check regularly for announcements and are responsible for the material posted. Emails will be sent via T-square 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 T-square. 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, copying is not. Homework will be checked for excessive similarities and 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, with the exception of Institute approved absences, will be accepted after the solutions are posted online.

Participation

Participation is based on the following criteria: arriving to class on time; paying attention during lectures; attentive watching and listening to screenings of documentaries (in class or online); respectful listening when the instructor or your peers are speaking; your ability to be fully engaged in your learning without texting, checking your phone or email, or participating in other digital distractions; your ability to stay awake, etc. If you are unable to meet the above criteria, the instructor or teaching assistant will take away participation points throughout the semester. Keep in mind you start the semester with ALL your points, so don't lose them! If you are distracting others in your lack of participation, you will hear from the instructor via email or in a short face-to-face conference before or after class.

Hands-on Projects

Five hands-on projects will be assigned that are to be completed during class in small groups throughout the semester. The groups will be assigned at the beginning of the semester. It is the students responsibility to attend these class 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 or as a group outside of class, as specified in the assignment.

Make-ups for projects completed during class will only be granted in exceptional circumstances for Institute approved absences. Attendance may be taken during these classes to ensure fair participation of all members of the group.

Exams

There will be a one-hour exam on November 20, 2015 covering all of the course material. The exam is focused on concepts and general understanding of course material. A review will be conducted the class period immediately before the exam.

Cheating off of another student's exam is unethical and unacceptable. 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 grade will be determined from the following grading scheme:

- Homeworks (25%)
- Hands-on Projects (25%)
  - Flexure and RC Beams
  - Truss Design
  - Arches & Cables
  - Prestressed Beams
  - Structural Dynamics
- Exam (25%)
- Final Bridge Project (20%)
- Participation (5%)

Tentative Schedule

Date	Topic	Due
8/17	Course Introduction Types of Structures & Structural Elements *Case-Study: One World Trade Center*	
8/19	Structural Systems: Members and Connections	
8/21	Loads and Load Combinations	
8/24	Load Paths *Case-Study: Beijing National Stadium*	Participation #1
8/26	General Structural Behavior & Redundancy *Case-Study: Alfred P. Murrah Building*	
8/28	Material Behavior	
8/31	Steel Construction *Failure Case Study: Pittsburgh Convention Center*	
9/2	Reinforced Concrete Construction Explanation of RC Beam Lab	HW#1
9/4	Axial Loads & Buckling	
9/7	**Labor Day**	
9/9	Flexure	
9/11	Project #1: RC Beam Making	Participation #2
9/14	Project #1: RC Beam Testing	
9/16	Shear	
9/18	Deflection	
9/21	Intro to Structural Analysis Software	
9/23	Introduction to Design	Project#1
9/25	Truss Design	
9/28	Space Trusses *Case Study: Emirates Stadium* *Failure Case Study: Kemper Arena*	HW#2
9/30	Project #2: Trusses	
10/2	Towers *Case Study: Eiffel Tower*	
10/5	Cable-stayed Bridge *Case Study: Scripps Crossing*	
10/7	Cables *Case Study: Dallas Airport Terminal*	
10/9	Suspension Bridges Systems *Case Study: George Washington Bridge* *Failure Case Study: Point Pleasant Bridge*	Project#2

Tentative Schedule (cont.)

Date	Topic	Assignment Due
10/12	**Fall Break**	
10/14	Arches *Case Study: Salginatobel Bridge*	HW#3
10/16	Project #3: Cables & Arches	
10/19	Domes *Case Study: Hagia Sophia*	
10/21	Domes *Case Study: Parthenon*	
10/23	Dams *Failure Case Study: Austin Dam*	Participation #3
10/26	Prestressed, Precast & Post-tensioned Concrete	Project#3
10/28	Project #4: Prestressed Concrete Beam Making	
10/30	Project #4: Prestressed Concrete Beam Testing	HW#4
11/2	Structural Dynamics *Case Study: Water Tower*	
11/4	Earthquakes I	
11/6	Earthquakes II and Base Isolation *Failure Case Study: Cypress Street Viaduct*	Participation #4
11/9	Approximate Methods for Lateral Loads	Project#4
11/11	Project #5: Structural Dynamics	
11/13	Project #5: Structural Dynamics	
11/16	Blast, Wind and Fire Loads *Failure Case Study: Tacoma Narrows*	
11/18	Review for Exam	HW#5
11/20	**Exam**	
11/23	*Failure Case Study: Hyatt Regency Walkway*	Project #5
11/25	**Thanksgiving**	
11/27	**Thanksgiving**	
11/30	*Failure Case Study: L'Ambiance Plaza*	
12/2	Balsa Bridge Testing	Bridge
12/4	Balsa Bridge Testing	
12/9	**Final Project Presentations**	Final Report