[CEE 6533-ZNCM*] Syllabus

Polymer Composite Structures, 3 Credits

(Design of Pultruded Polymer Composite Structures)

* ZNCM: No-cost: $0 required costs,

The No-cost designator is for use with courses that exclusively use course materials that are free of charge to students. These materials may include open educational resources (OER), institutionally licensed campus library materials that all students enrolled in the course have access to use, and other materials that require no additional cost to students.

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OER include, but are not limited to: full courses, course materials, modules, textbooks, faculty-created content, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge.

Instructor Information

Instructor	Email	Office Hours
Professor Abdul-Hamid Zureick	azureick@ce.gatech.edu	Office hours will be announced and shared with students.
Teaching Assistant(s)	**Email**	
None	-	-

General Information

Description

A course that addresses principles of the behavior and design of pultruded fiber-reinforced polymer structures. Specific topics addressed in this course include, but are not limited to:

1) **Historical Perspective:** Historical development of polymer composite materials, Polymer composite materials in infrastructure applications, Pultrusion process, Product availability, Design standards and specifications, Professional Responsibilities, Code of Ethics, and Design philosophies.

2) **Pultruded Material Properties:** Constituent Materials, Physical and mechanical properties of pultruded structural members, Test methods, Durability and environmental effects, Statistically-based design properties.

3) **Design Basis:** Limit states design, General analysis requirements, Design for strength and serviceability.

4) **Tension Members:** Introduction; failure modes of bolted members subjected to tension, and design criteria.

5) **Buckling Analysis of Orthotropic Plates:** Governing differential equation for plate buckling, derivation of stability design criteria for elements with various boundary conditions. Development and basis of local buckling design criteria.

6) **Members subjected to compression:** Theoretical background, local and global buckling of axially loaded members, Behavior and design criteria for doubly, singly, and non-symmetric sections; built-up members.

7) **Doubly-Symmetric Members Subjected to Flexure and Shear:** Theoretical background; flexural design provisions -- Lateral-Torsional Buckling; element stability under flexure and shear, serviceability limit states.

8) **Bolted and Riveted Connections:** Introduction; stress concentration in orthotropic plates subjected to various loading conditions, failure modes and limit states, design provisions for simple connections, and detailing.

Course Goals and Learning Outcomes

Upon successful completion of this course, students should develop a clear understanding of the:

1) current state-of-the-art knowledge involving those fundamental principles, theory, assumptions, limitations, and investigative procedures that are essential for the understanding of the behavior and design of elementary pultruded fiber-reinforced polymer structural members and systems.

2) underlying basis for, and the details of, relevant provisions of the ASCE Pre-Standard for the Load and Resistance Factor Design of Pultruded Fiber Reinforced Polymer Structures.

Course Requirements & Grading Distribution

Homework Assignments	50%
Midterm 1	20%
Project	30%

Grading Scale

Your final grade will be assigned as a letter grade according to the following scale:
A (90-100%), B (80-89%), C (70-79%), D (60-69%), F (0-59%)

Course Materials

1) ASCE74-23 Standard: Load Resistance Factor Design (LRFD) of Pultruded Fiber Reinforced Polymer (FRP) Structures (Available from Georgia Tech Library)
2) ANSI/AWWA D121-24 Bolted Aboveground Thermosetting Fiberglass-Reinforced Plastic Panel-Type Tanks for Water Storage (Available from Georgia Tech Library)
3) Class notes and publicly available documents-Check Canvas (available at no cost)
4) Code of Ethics for Engineers, Free download from the National Society of Professional Engineers or the American Society of Civil Engineers (ASCE)-Free download https://www.nspe.org/sites/default/files/resources/pdfs/Ethics/CodeofEthics/NSPECodeofEthicsforEngineers.pdf
5) Lekhnitskii, S. G. (1968). Anisotropic Plates, Translated to English from the second edition by S.W. Tsai and T. Cheron, Gordon and Breach Science Publishers. Can be downloaded from the official site of the Defense Technical Information Center. This is a zero-cost text.

Additional Materials/Resources Available from the Georgia Tech Library

- ASCE 7- Minimum Design Loads for Buildings and Other Structures
- The International Building Code (IBC)
- Timoshenko, Stephen P. and Gere, James M.(1961). Theory of Elastic Stability. This text is republished by Dover Publications Inc.

Course Website

Course announcements and additional handouts can be accessed via canvas.gatech.edu

Course Expectations & Guidelines

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

Any student with learning needs, requiring special accommodation shall contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss the special needs and to obtain an accommodations letter.

Attendance and/or Participation

Students are expected to attend classes and participate in class discussion on a regular basis. Students who are absent from class are responsible for any missed work.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

1) Homework and project assignments must be turned in by the end of the lecture on the due date. Late homework assignments will be corrected but will receive zero grade credit.
2) Students are expected to take tests and the final examination at the assigned time. Make –up tests and final examination(s) can only be arranged when accompanied by persuasive and valid reasons or when are in accordance with the "approved Institute activities" (http://www.catalog.gatech.edu/rules/4/

Student Use of Mobile Devices in the Classroom

No cell phone use for making/receiving calls, text messaging, or checking emails is allowed.

Notebook, laptop, or tablet computer usage is permitted only if these devices are used to take notes or to perform specific tasks during the lecture.