Department of Civil and Construction Engineering and Management

CENG4412 – Reinforced Concrete and Steel Design

CATALOG DESCRIPTION

Design of reinforced concrete members: beams, one-way slabs, and columns using the ACI 318 design code. Design of steel members: tension members, beams, columns, and connections using the AISC LRFD code.
(4 Credit hours)
Prerequisite: CENG 3325
Corequisite: CENG 3434

INSTRUCTOR

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COURSE WEBSITE

All course materials will be managed through **Canvas**. Homework assignments, solutions, handouts, and other class-related resources will be posted there. Please make sure to check Canvas regularly for updates.

SCHEDULE

The course will be offered online including all lectures and office hours.
Lectures: Tuesdays and Thursdays 11:00am – 12:20pm
Exams: In-person
Instructor office hours: Tuesdays and Thursdays 12:30pm-1:30pm

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LEARNING OBJECTIVES

By the end of this course, you will be able to:

1. **Design real buildings** – Take functional requirements and an architectural concept, then create the structural design for a low-rise steel or concrete building.
2. **Understand materials** – Explain how structural steel behaves and what makes it strong, versatile, and unique.
3. **Weigh design choices** – Compare the pros and cons of using steel versus reinforced concrete in building design.
4. **Master the design process** – Apply the full engineering design cycle, from problem definition to solution.
5. **Perform realistic load analysis** – Use ASCE 7 to calculate dead, live, snow, roof, and wind loads.
6. **Apply load combinations** – Use LRFD equations to combine loads and check structural safety.
7. **Simplify complex structures** – Reduce a 3D frame to a 2D model while accounting for loads, connections, and out-of-plane behavior.
8. **Use modern tools** – Employ engineering software to analyze and design structural systems efficiently.

REQUIRED TEXTS

AISC Manual of Steel Construction (15th Edition)
ACI 318-19 Building Code Requirements for Structural Concrete
Lectures and other handouts will be made available via Canvas.

GRADING POLICY

Practice Questions	25%
Class Tests	45%
Final Exam	30%

ATTENDANCE POLICY

Students are responsible for all information covered in class, regardless of whether it appears in the lecture notes or other handouts.
Attendance and participation in sessions is mandatory.

University Policies and Information for Students

Attendance, academic honesty, calculator policy, accessibility services, campus carry, tobacco-free campus, and other policies are as per UT Tyler guidelines. Please refer to the official UT Tyler resources.
The final day to **withdraw** from the course without penalty is **November 4th, 2024**.

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TENTATIVE COURSE SCHEDULE

Date	Topic
28-Aug	Introduction
2, 4 Sep.	Structural Analysis Review Load Cases Simplified Probabilistic Model LRFD Philosophy
9, 11 Sep.	Concrete: Materials, composite action, compression/tension members, plain beams. Concrete: Flexure of beams.
16, 18 Sep.	Concrete: Development length, cut-off lengths. Concrete: Shear of beams.
23, 25 Sep.	Concrete: Shear and Deflection of beams. Concrete: Short columns.
30 Sep., 2 Oct.	Concrete: Long Columns
7 Oct.	Concrete Review
9 Oct.	Exam 1: Concrete Design
14, 16 Oct.	Steel: Material properties, tension members.
21, 23 Oct.	Steel: Tension members. Steel: Axial compression
28, 30 Oct.	Steel: Axial compression. Steel: Flexure and shear of beams.
4, 6 Nov.	Steel: Flexure and shear of beams. Steel: Combined axial compression and bending (beam columns).
11, 13 Nov.	Steel: Connections.
18 Nov.	Steel Review
20 Nov.	Exam 2: Steel Design
2, 4 Dec.	Durability & Fire Resistance. Review Session.
9 Dec.	Final Exam (see UT Tyler academic calendar)

ASSIGNMENTS/Practice Questions

Practice Questions will be assigned regularly as per the course schedule. Due dates will be indicated on each assignment.

You must **submit your assignment as a single PDF file** via Canvas by **11:59 PM on the due date**.

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EXAMS

There will be **two midterm exams** all held **in person from 5:00–7:00 PM**. Please plan accordingly, as attendance at these scheduled times is required.

Guidelines:

- Exams are **closed notes**.
- The **only allowed references** are your **personal** copies of the *AISC Steel Construction Manual* and *ACI 318 Building Code Requirements*, along with an approved calculator.
- Manuals must be your own—borrowing or sharing is not permitted.
- Handwritten notes and tabbing within your own manual are encouraged, but no loose sheets or pasted materials may be added.
- Approved calculators: TI-30 (or FE-equivalent).
- Solutions will **not** be posted on Canvas.

Make-up exams:

- Make-up exams will only be granted for documented medical emergencies or serious hardships with prior approval from the instructor.
- Missing an exam without proper documentation will result in a **zero**.

RECORDINGS

Class sessions **may be recorded** by the instructor for the use of students enrolled in this course. Recordings that include personally identifiable information or other sensitive content protected under FERPA **will not be shared** with anyone outside the course without the consent of all relevant students. Recordings are intended **only for educational use** by enrolled students and **must not be distributed** or shared outside the course without explicit permission.

Academic Misconduct

Plagiarism on homework and cheating on exams are considered **academic misconduct** and will not be tolerated. Please refer to the **University of Texas at Tyler Undergraduate Catalog** and the **Manual of Policies and Procedures for Student Affairs (MOPPS, Chapter 8)** for university policies on academic integrity, cheating, and plagiarism. Ignorance of these policies does **not** excuse violations. All incidents of academic dishonesty will be addressed according to university rules.

Collection of Student Work

During the semester, selected student work (best, average, and below-average examples) **may be collected** for inclusion in ABET outcomes notebooks. This process will involve making a copy of your work while returning the original graded assignment to you. Your individual performance level will **not be disclosed** when samples are used.

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CALCULATOR POLICY

Only **NCEES-approved calculators** are permitted during examinations. Use of a non-approved calculator will result in your exam being collected immediately and a grade of **zero** assigned.

Approved calculators include the following (see the official NCEES website for the complete list: www.ncees.org/exams/calculator-policy/):

- **Hewlett Packard**: HP 33s, HP 35s (no others permitted)
- **Casio**: All FX-115 models
- **Texas Instruments**: All TI-30X and TI-36X models

It is the **student's responsibility** to confirm that their calculator is approved. If you are unsure, check with the instructor prior to the exam.

At the discretion of the instructor, a non-approved calculator (e.g., a graphing calculator) may be permitted **only if it is inspected and all memory is cleared** immediately prior to the exam. During the exam, calculators are subject to random inspection. Failure or refusal to clear memory, or to surrender a calculator for inspection, will result in **immediate disqualification from the exam** unless you can provide an approved calculator as listed above.

AI POLICY

The use of **artificial intelligence (AI) tools** is **not permitted** in this course under any circumstances. All submitted work must represent your own original effort. Assignments and class activities have been carefully designed to support your learning and completing them independently is essential to mastering the course objectives.

The use of ChatGPT or any other AI-based tools—at any stage of the work process, including idea generation, drafting, or revisions strictly prohibited. Any deviation from this policy will be treated as a violation of the **UT Tyler Honor Code** and the university's standards of academic integrity.

SYLLABUS DISCLAIMER

This syllabus serves as a formal statement of intent regarding how the course will be conducted during the semester. It provides an outline of the topics to be covered, the requirements you are expected to fulfill, and the timeline necessary for successful completion of the course. The syllabus is designed to ensure fairness and to prevent arbitrary or untimely changes to course expectations.

However, the instructor reserves the right to make modifications to the syllabus when necessary. Any such changes will be communicated in advance and reflected in the updated syllabus posted on Canvas. As demonstrated during the disruptions of 2020, unforeseen circumstances beyond our control may require adjustments to course content, requirements, or scheduling. In such cases, every effort will be made to provide timely updates and clear guidance.

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PURCHASING INSTRUCTIONS FOR DESIGN MANUALS

(A) ACI 318-19 Manual

1. Register for a **free student membership** with ACI using your **UT Tyler email address**:
   ACI Student Membership Link
2. Once you receive your membership number (this may take a few days), purchase the *ACI 318-19(22)* manual at the discounted member price:
   ACI Manual Purchase Link
3. Be sure to select:
   - **Inch-Pound (IN-LB) Units**
   - **Printed Document** (required for exam-electronic versions are not permitted).

(B) AISC Steel Construction Manual, 16th Edition

1. Log in or create a **student account** at: AISC Student Portal.
2. Complete the **demographics survey** and proceed to the next page.
3. Use the **grey "+" sign** to generate a student discount code.
   - You must have access to your **.edu email address** to receive the code.
   - Enter the **class key: H1085006-97245.**
4. Retrieve your discount code and purchase link from your **.edu email** inbox.
5. Note: The coupon code is valid from **August 11, 2025, to October 11, 2025.**
   If you experience difficulties with the purchase process, please consult the troubleshooting instructions provided on the program page.

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