SE 310 Syllabus – Spring 2026

Course Name: SE 310 – Design of Structures and Mechanisms

Lecture: 11:00 am to 11:50 am on Monday, Wednesday, and Friday at 114 Transportation Building

Instructor Information:

Prof. Yiwen Dong (yiwen@illinois.edu)

Office: 104A Transportation Building (subject to change)

Office hours: Monday 11:50 am- 12:50 pm or by appointment

Course Introduction: In this course, students will learn the principles of analytical modeling, i.e., how to represent real-life structural and mechanical systems schematically and analytically for the purpose of design, and apply those principles to the design of structural and mechanical systems and components.

Most engineering artifacts are either structures that bear loads or mechanisms that move. The concepts covered in this course are the underpinnings of how buildings, automobiles, robots, machines, and mechatronic devices are designed.

After completing the course, the student will be able to:

(a) determine if a structure is statically determinate or indeterminate
(b) analyze and design trusses, beams, and frames
(c) analyze statically indeterminate structures by the stiffness matrix method
(d) learn how to computationally implement truss and beam design
(e) determine the mobility in mechanisms
(f) compute velocities and acceleration in mechanisms
(g) design linkage-based mechanisms for a given kinematic application

Prerequisites: CS 101, TAM 212, and TAM 251

Required Text: Structural Analysis (5^{th}, 6^{th}, or 7^{th} Edition) by Russel C. Hibbeler.
Additional Reading: The instructor will provide additional reading material before classes.

Recommended Reading Material: Machines and Mechanisms by David H. Myszka

Course Website: Canvas will be used to post important announcements, lecture records, supplement documents, homework assignments, and Exams. It can be accessed at https://canvas.illinois.edu/ using your NetID and password. Grades will also be posted on Canvas. Please check it regularly.

Grading: The overall grade of the course will be assembled based on

5%: In-class quiz
25%: Homework
20%: Project I
10%: Project II
40%: Exams

The grading follows the +/- grade system. Borderline cases are evaluated individually, and course grades are raised solely at the instructor's discretion, using class participation and other subjective factors in that judgement.

Homework: Homework problems will be posted on Canvas at the end of each week and will be due on the due date posted. No late homework is accepted. (Special consideration may be given under emergent health-related issues.) Homework should be completed neatly and legibly on the front side (only) of white paper and scanned neatly and uploaded to Canvas. Your name, the date, and the assignment number should appear in the upper right corner of the front page. For each problem solved, present the problem statement with any associated drawings, a summary of assumptions, a solution presented in a logical and organized sequence, and the answer (s) clearly identified. **Neatness and clarity of presentation are considered in grading homework problems.** Sketches or free body diagrams must be presented when appropriate. Copying solutions from other students, solution manuals, or homework files is unauthorized and may constitute grounds for academic disciplinary procedures.

Project I: Hands-on practice on structural analysis using a real-world example. Materials will be shared later.

Project II: Hands-on practice on kinematic analysis and mechanism design using a real-world example. Materials will be shared later.

Exams: The exam will be comprehensive. Exams missed without an accepted written excuse are scored as a zero. The dates of the exams will be posted on Canvas in the first week of the semester, and please notify the instructor, Dr. Dong, via email in the second week of the semester if there is a conflict.

Academic Integrity: We will follow university regulations for academic integrity: (http://admin.illinois.edu/policy/code/). Students who violate academic integrity will receive a "0" on that exam or assignment and may receive an "F" grade in the course. Discussing a homework assignment in a group is encouraged as long as each student writes the answer in his/her own words. Plagiarism is considered a serious violation of academic integrity and will be dealt with utmost severity.

Tentative Course Timeline:

Week	
1	Introduction, Idealized model, supports
2	Method of Joints, statically determinate/indeterminate structures
3	Internal forces in Beams, Double integration of beams
4	Area moment method and Conjugate Beam method
5	Area moment method and Conjugate Beam method
6	Internal Energy definition and Virtual Work
7	Castigliano's theorem, Exam I (truss and beam, week 1-4)
8	Statically indeterminate structures
9	Matrix-based methods for trusses
10	Matrix-based methods for trusses, Project I assigned, matrix-based methods for beams
11	Matrix-based methods for beams, Exam II
12	Introduction to kinematics, Grubler's criterion and static analysis, Project I due

13	Velocity analysis, instant center approach, Project II assigned
14	Fall Break
15	Acceleration analysis
16	Acceleration analysis, Exam III