İzmir Institute of Technology - Department of Civil Engineering
CE 539 Advanced Mechanics of Materials - Fall 2024-2025 Course Outline

COURSE INSTRUCTOR

Dr. İzzet Özdemir
Department of Civil Engineering   *Office: C 206*
Office Hours: TBA   *E-mail:* izzetozdemir@iyte.edu.tr

COURSE SCHEDULE

Wednesday 9:45 - 12:30, Room: CZ 14

COURSE CONDUCT

The course will be taught in class at the campus. LMS page is going to be activated and used throughout the semester.

TEXTBOOK & REFERENCES

There is no particular textbook. The following books are good references covering the course content.

- Advanced Strength and Applied Elasticity, A.C. Ugural, S.K. Fenster, 4th Edition, Pearson, 2003.

- Advanced Mechanics of Materials, A. Boresi, R.J. Schmidt, 6th Edition, Wiley, 2003.

- Advanced Mechanics of Materials, R.D. Cook, W.C. Young, Colliear MacMillan, 1985.

- Inelastic Analysis of Structures, M. Jirasek, Z.P. Bazant, Wiley, 2002.

- Plastic Methods for Steel and Concrete Structures, S.S.J. Moy, John Wiley & Sons, 1981.

OBJECTIVES

The course intends to broaden the knowledge and horizons of the students in the field of mechanics of materials by teaching selected advanced topics.

COURSE CONTENT

- Analysis of Stress
  - Definition of Stress and Stress Notation
  - Equations of Equilibrium in Differential Form
  - Two-dimensional Stress at a Point
  - Mohr's Circle for 2-D Stress State
  - Three Dimensional Stresses at a Point
  - Stresses on an Oblique Plane in terms of Principle Stresses
  - Mohr's Circle for 3-D Stress

- Analysis of Strain & Stress-Strain Relations
  - Definition of Strain
  - Equations of Compatibility
  - Generalized Hooke's Law
  - Strain Energy

- Failure Criteria
  - Failure by Yielding and Fracture
    - The Maximum Principle Stress Theory
    - The Maximum Shear Stress Theory

- The Maximum Distortion Energy Theory
- The Octahedral Shearing Stress Theory
- Mohr's Theory
- The Coulomb-Mohr Theory

- Basic Rheological Models

  - Rheological devices for basic material behaviour
  - Description of elasticity, visco-elasticity and elasto-plasticity

- Introduction to Elasto-plastic Analysis

  - Elasto-plastic Bending of Beams
  - Collapse of Simple Frames
  - Introduction to Limit Analysis

- Introduction to Elastic Stability (If time permits)

  - Buckling of a Column
  - End Conditions
  - Critical Stress in a Column
  - Solution by Finite Differences

GRADING   The <u>tentative</u> overall grade constitution is as follows:

- Mid-term : 30 %

- Homework sets : 30 %

- Final : 40 %