

İzmir Institute of Technology - Department of Civil Engineering
CE 539 Advanced Mechanics of Materials - Fall 2025-2026 Course Outline

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| COURSE INSTRUCTOR | Dr. İzzet Özdemir Department of Civil Engineering Office Hours: TBA | <i>Office: C 206</i> <i>E-mail: izzetozdemir@iyte.edu.tr</i> |
| COURSE SCHEDULE | Thursday 9:45 - 12:30, Room: CZ 14 | |
| COURSE CONDUCT | Teams 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. | <ul style="list-style-type: none">• 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 of the students in the field of mechanics of materials by teaching selected topics. | |
| COURSE CONTENT | | <ul style="list-style-type: none">• Analysis of Stress<ul style="list-style-type: none">• 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<ul style="list-style-type: none">• Definition of Strain• Equations of Compatibility• Generalized Hooke's Law• Strain Energy• Failure Criteria<ul style="list-style-type: none">• Failure by Yielding and Fracture<ul style="list-style-type: none">• 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 tentative overall grade constitution is as follows:

- Mid-term : 30 %
- Homework sets : 30 %
- Final : 40 %