

CIVE 310 Mechanics of Materials

Curricular Area	Civil Engineering Fundamentals
Type of Course	Required
Catalogue Description	Stresses, strains, and stress-strain relationships. Temperature. Axial bars in tension and compression. Torsion of circular bars. Bending and shear stresses in beams. Combined stresses. Stress transformation and Mohr's circle. Computer spreadsheet applications and project.
Prerequisites	CIVE 210
Load	2 sessions (50 min per session) + 1 problem solving session (1.5 hours) per week; 3 credits
Textbook	Beer, Johnston and DeWolf, <i>Mechanics of Materials</i> , McGraw-Hill, 4th Edition
Topics	<ol style="list-style-type: none">1. Introduction to the mechanics of solids2. Review of principles of statics<ol style="list-style-type: none">a. Equilibrium principlesb. Analysis of plane trusses and beams3. Concepts of stress and strain<ol style="list-style-type: none">a. Axial and shear stresses/strainsb. Stress-strain relationshipsc. Generalized Hooke's Lawd. Temperaturee. Design criteria and safety factors4. Axial members<ol style="list-style-type: none">a. Axial stress, strain/deformation, and displacementb. Lateral strain: Poisson's ratioc. Introduction to designd. Applicationse. Statically indeterminate systems5. Torsion of circular members<ol style="list-style-type: none">a. Limitations to circular/tubular barsb. Shear stress, strain/deformation, and rotationc. Analogy with axial systemsd. Applications6. Bending problems<ol style="list-style-type: none">a. Pure bendingb. Axial stress, strain/deformation, and curvaturec. Composite beams: transformed sectiond. Bending with axial load (load combination)e. Biaxial bending w/o axial loadf. Applications7. Shear stresses in beams<ol style="list-style-type: none">a. Shear flowb. Shear stress and strainc. Combined torsion and shear (load combination)d. Applications8. Stress transformation<ol style="list-style-type: none">a. Stress transformation equationsb. Mohr's circle graphical representation9. Project: computer/spreadsheet or other<ol style="list-style-type: none">a. Special/additional topicsb. Solution for practical problems

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Learning Outcomes	Correlation with	Program Outcomes	Program Objectives
Students will understand the fundamental laws of mechanics of materials using stress analysis.		a	1
Students will be able to analyze and solve problems to predict the stress and strain behavior of systems.		b	2
Students will be able to use the strength and safety approach.		a	3

Learning Outcomes Assessment Tools	Exam Pbs	HW Pbs	Lab Reports	Project Report	Course Survey
Students will understand the fundamental laws of mechanics of materials using stress analysis.					✓
Students will be able to analyze and solve problems to predict the stress and strain behavior of systems.	✓	✓	✓		✓
Students will be able to use the strength and safety approach.	✓	✓	✓		✓

Prepared by Mounir Mabsout

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