CEE 381
Structures I

Catalog data:	20-CEE-381. Structures I. 3 ug. cr. Applied theory of beams, columns, and other structural elements.
Prerequisites:	Basic Strength of Materials (20-ENFD-375), Structural Mechanics Laboratory (20-CEE-383) (co-requisite)
Textbook:	Beer, Johnston & DeWolf, *Mechanics of Materials*, 3rd Ed., McGraw-Hill
References:	Gere & Timoshenko, *Mechanics of Materials*, 4th Ed., Brooks/Cole
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Goals:	This course represents the ideal continuation of the Basic Strength of Materials course, with a more focused attention on typical Civil Engineering topics. The goal is to enable the students to solve elastic problems involving beam subjected to the most general loading conditions and restraints, and therefore to have a complete knowledge of the behavior of single members. The students will thus be ready to take the following step, consisting in the elastic calculations of assemblies of members, such as structural frames.
Lecture or lab topics:	1. Review of Basic Strength of Materials topics (7 classes) 2. Torque on members with rectangular and thin-walled cross-section (1 class) 3. Simplified 3D case of stress transformation (rotation about principal axes)(1 class) 4. Plane strain transformation. Analytical and graphical approach (Mohr's circle)(1 class) 5. Strain rosettes (1 class) 6. Thin-walled pressure vessels (2 classes) 7. Analysis of structures with combined loads. Kern of a cross-section (2 classes) 8. Shear stresses due to shear in thin-walled members (2 classes) 9. Principal stresses on transversally-loaded beams (2 classes) 10. Deflection of beams. Integration methods and moment-area method (8 classes) 11. Instability of axially loaded members. Analysis and design. (3 classes) 12. Midterm and final exams (2 classes)
Computer usage:	Due to the mostly theoretical content of the course, and to the relatively simple problems, which the students learn to solve, the usage of computer programs is limited. General mathematic programs can be used to solve simple differential equations or to calculate solutions to

	elementary integrals or linear systems of equations. Due to the relative simplicity of the calculations involved, the use of computer programs is therefore not expressly required for a successful outcome in this course. Also, usage of programs like STATICS V.6 to draw internal forces diagram, in order to reinforce the theoretical approach of free-body diagrams is facultative.
ABET criterion 3:	a, c, e
ABET criterion 8:	a, d
Date prepared:	March 5, 2003, Last Update April 25, 2007

Specific Examples of ABET Criterion 3

a: The assigned homework covers a wide range of problems associated with the theoretical topics analyzed in class, and include problems for the solution of which a significant level of engineering judgment is required. The solution of the proposed problems requires extensive use of the mathematics and calculus background of the students, as well as ingenuity and intuition.

c: The covered topics and the assigned homework explicitly involve the design and/or the verification of a simple structural system or of an assembly of simple structural systems, including the design process necessary in order to obtain a structure compatible with given deformability or stress constraints.

e: The very nature of the topics covered by the course requires the students to become able to identify, formulate and solve the given structural problems.

Specific Examples of ABET Criterion 8

a: Basic knowledge of trigonometry, analytic geometry, linear algebra and calculus are necessary for the solution of the vast majority of the problems assigned during the course, and the students need to apply all these theoretical topics on practical problems.

d: The topics taught in this course will allow the students to be able to actively participate in the design process possibly involved in the professional component of the curriculum.