MEC E 380 Advanced Strength of Materials I  
September - December, 2011

Lectures:    TR    9:30 – 10:50    Mec 2-1  
Seminars:   F    11:00 – 11:50    Mec-2-3  

Instructor:  Professor Zihui Xia  
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Office Hours: Tuesday and Thursday 11:00-12:00 or by appointment  

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Office hours: Monday & Friday, 12:00-2:00pm at Help Desk. 3rd floor of Mec Building  

Textbook:   Advanced Strength and Applied Elasticity(Fourth Edition), by A.C. Ugural and  

Homepage:   e-class: https://eclass.srv.ualberta.ca/portal/  
            (use your GPU login and password) where lecture notes, assignment and seminar problems are posted.  

Pre-requisite: MEC E 260, CIV E 270. It is up to you to check if you have the prerequisite. If you do not, withdraw from the course.  

Examinations: Examinations are 'open book'.  
Final: 9:00 – 12:00, Dec 14, Wednesday, 2011, location: MEC 2-1  

Mark Distribution:  Seminar Quizzes (2)  10%  
                    Assignments (best 10 of 12)  10%  
                    Midterm exam  30%  
                    Final exam  50%  
                    The final mark will be assessed based on a combination of University grade distribution curve and absolute mark measurement.  
(Note: if you miss the midterm examination, for a valid reason, your final examination will have a weight of 80 percent.)  

Assignments: See attached sheet.  

Seminars: Problem solving sessions/worked examples/Quizzes  
See attached sheet for suggested questions. Bring Textbook to seminars.  

Course Objective: Learn advanced stress/strain analysis methods to examine load-carrying capacity of various structures/structural components in terms of strength/stiffness criteria.  

Course Outline: Introduction and review: stress and strain of simple structural components; application of  
                Free Body Diagram method
Ch. 1 Analysis of stress: general multiaxial stress state at a point in a body; stress tensor; transformation of stress components with rotating coordinate system; principal stresses; maximum shear stress; failure (yielding) criteria.

Ch. 2 strain and stress-strain relation: multiaxial strain state at a point in a body; strain tensor; transformation of strain components with rotating coordinate system; principal strains; maximum shear strain; Generalized Hookes’ Law; strain energy.

Ch. 3 Two-dimensional problems in elasticity: general formulation of elasticity problems; traction boundary conditions; Airy stress function method; thermal stresses; stress concentration factors and Neuber’s diagram.

Ch. 4 Energy method: strain energy and complementary strain energy; Castigliano’s first and second theorems; determination of deformation by using Castigliano’s theorem; statically indeterminate system.

Ch. 5 Bending of beams: bending of beams with asymmetric cross section; composite beams; shear center of beams with thin-walled cross section; curved beams.

Ch. 6 Torsion of prismatic bars: torsion of noncircular bars; Prandtl’s stress function method.

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behavior (available on the University Governance website at: http://www.uofaweb.ualberta.ca/governance/studentappeals.cfm) and avoid any behavior which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.