Université d'Ottawa
Faculté de génie

Département de
génie mécanique

uOttawa

University of Ottawa
Faculty of Engineering

Department of
Mechanical Engineering

MCG 3145: Advanced Strength of Materials

Summer 2013 (2X)

Instructor: Dr. Davide Spinello
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office: CBY A612
phone: 613.562.5800 ext. 2460
office hours: Take an appointment by email

Lectures: CBY D207
Monday 11:30 - 14:30
Wednesday 12:00 - 15:00

Tutorial:
Thursday 8:30 - 11:30, LPR 155

Textbook: Popov, Egor P.: *Engineering Mechanics of Solids.* Prentice Hall (any edition).
The material developed in class is based on the textbook. No additional material will be provided. Class notes should be considered as reference for the appropriate sections of the textbook, rather that complete and sufficient material.

Web page: `http://by.genie.uottawa.ca/~spinello/webpage/teaching.html`

TA: Yue Yang
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office hours: Take an appointment by email

Description and Objectives

This course is dedicated to the review and further development of notions of mechanics of materials addressed in the courses CVG2140/2540, including stress, strain, and constitutive laws for linear elastic materials; tension and bending of symmetric beams; torsion of circular bars; statically determinate and indeterminate systems; thin-walled pressure vessels; stress concentration factors. This course aims at providing through understanding of these notions.

The notions above will be generalized by addressing non-symmetric beams and prismatic bars; thick-walled pressure vessels; buckling; material response beyond the elastic regime; residual stresses; failure criteria in static loading fatigue; impact stresses; energy methods and Castigliano's theorems. A brief introduction to the finite element method will be also provided.

Exams and Assignments

Exams: All exams will be open book - open notes.

Illegible work and loose sheets will not be graded. If a student cannot attend a test/exam due to a medical condition, certified by a doctor, he/she must notify the instructor in advance. Unexcused absence from an exam will result in a grade of 0 for that exam.

Mid-term exam Thursday, July 18 - 9AM to 11AM in LPR 155

Final exam July 30 - 9AM to 12PM in MCD 146

Assignments: Four homeworks will be assigned during the term. Assignments will be individual. There will be tutorial sessions dedicated to problems solving based on the material presented during the lectures.

Grades

Grades from assignments and mid-term exam determine the semester grade S, computed as follows:

Mid-term exam	60%
Homework assignments	40%
Total of semester (S)	100%

This mark will be combined with the final exam grade F in the following way:

$$0.6F + 0.4S$$

If $F < 55\%$, regardless of the mark of the semester S the overall course grade will be F.

Regulations on Academic Fraud

The following link provides information regarding academic fraud, including the Regulation on Academic Fraud which provides information on the definition of fraud, the disciplinary process and the consequences of dishonest behaviour: `http://web5.uottawa.ca/mcs-smc/academicintegrity/regulation.php`

Tentative lecture schedule

Lecture	Topics
1: Mo Jun 17	Stress and strain tensors; Thermal strain; Principal orientations; Basic principles; Superimposition principle.
2: We Jun 19	Hooke's laws; Stress and strain transforms, Mohr's circle; Failure criteria.
3: Mo Jun 24	Tension in beams: Differential and integrated forms; Statically determinate and indeterminate cases; Thin-walled pressure vessels; Stress concentration factors; Buckling.
4: We Jun 26	Beam bending: Equilibrium; Internal loads and moments; Axial stress; Stress concentration factors.
Mon Jul 1	**Canada day**
5: We Jul 3	Beam bending: Shear stress; Strains; Displacements; Rotations.
6: Mo Jul 8	Elastic torsion of circular bars and thin-walled tubes.
7: We Jul 10	Impact stresses.
8: Mo Jul 15	Behaviour beyond elasticity, residual stresses.
9: We Jul 17	Energy methods and virtual work.
10: Sa Jul 20	Castiglianos theorem.
11: Mo Jul 22	Skew bending.
12: We Jul 24	Advanced torsion.