

MCG 3145: Advanced Strength of Materials

Summer 2013 (2X)

Instructor: Dr. Davide Spinello
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Lectures: CBY B012
Monday 11:30 - 14:30
Wednesday 12:00 - 15:00

Tutorial:
Thursday 8:30 - 11:30, CBY B012

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 than complete and sufficient material.

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

TA: Elisa Cantergiani
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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 thorough 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 Wed, July 16 - 12:00 - 14:00 in CBY B012

Final exam July 31 - 18:00 - 21:00 in STE B0138

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 16	<i>No class</i>
2: We Jun 18	Uniaxial tension tests; Stress and strain; Hooke's laws; Stress-strain diagrams; Thermal strain.
3: Mo Jun 23	Stress and strain tensors; Principal orientations; Basic principles; Superimposition principle.
4: We Jun 24	Stress and strain transformations.
5: Mo Jun 30	Failure criteria.
6: We Jul 2	Axial stress in bars: Differential and integrated forms; Statically determinate and indeterminate cases; Stress concentration factors.
7: Mo Jul 7	Beam bending: Equilibrium; Internal loads and moments.
8: We Jul 9	Boundary values problem for beam bending; Boundary conditions.
9: Mo Jul 14	Euler buckling.
10: We Jul 16	Thin pressure vessels.
11: Mo Jul 21	Principle of virtual work.
12: We Jul 23	Energy principles. Castiglianos theorems.
