

MECH 260-102

Introduction to Mechanics of Materials

3 Credits, 1st Semester 2016/17

(Tuesdays and Thursdays, 8:00-9:30 a.m.)

Room: DMP 110

Pre-requisites: All of MATH 101 and PHYS 170

Course Web Site: www.sites.mech.ubc.ca/~ial (Courses → MECH 260)

All the course material including the lecture presentations, homework assignments, and the solutions to homework problems and exams will be posted at this web site.

Instructor

Dr. Clarence de Silva, Professor

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Office Hours: Wednesdays 2:00 to 3:00 pm

Tutorials: Wednesdays, 10:00 to 11:00 a.m. in IBLC 182

Course Objectives

Mechanics of Materials deals with the internal effects (primarily stresses and strains) in a deformable solid body due to external loads acting on it. The subject is also known as “Strength of Materials” or “Solid Mechanics.” It is useful in a variety of engineering areas including mechanical, civil, mining, materials, electrical, aerospace, and biomechanical engineering. It provides theory and formulas that are directly applicable in the modeling, analysis, design, and testing of engineering devices and structures such as automobiles, airplanes, robots, machine tools, engines, bridges, elevated guideways, and buildings.

External loads (forces, moments, torques) applied on a body result in reaction loads at support locations (bearings, basement, anchors, suspension points, etc.) and internal loads throughout the body. Under static conditions these loads satisfy “equilibrium equations.” Stresses in the body are caused by the internal loading, and are a determining factor of the “strength” of the object. Strains caused by loading are directly related to the “deflection” or “deformation” or “compatibility” of the object. The stress-strains relations (or “constitutive relations”) determine the “stiffness” of an object and are governed by the physics of the object. Typically, however, stress-strain relations are determined experimentally because analytical procedures for determining them using material physics can be quite complex if not impossible. In addition to strength, deformation, and stiffness, the subject of Mechanics of Materials also concerns “stability” which studies the possibility of deformations that can grow suddenly and continuously without limit (in theory).

The course consists of lectures, tutorials, homework assignments, quizzes, an intermediate examination, and a final examination.

Suggested Textbook:

No specific textbook is assigned for this course. However, one of the following books should be used for the reading material:

1. Beer, F. and Johnston, E.R., *Mechanics of Materials*, McGraw Hill, New York, NY, 2009 (or later).
2. de Silva, C.W., *Mechanics of Materials*, CRC Press/Taylor&Francis, Boca Raton, FL, 2014.
3. Hibbeler, R.C., *Mechanics of Materials*, Pearson, New York, NY, 2011 (or later).
4. Philpot, T.A., *Mechanics of Materials*, Wiley, Hoboken, NJ, 2013.

MECH 260 -- COURSE LAYOUT

Week	Starts	Topic	Read Chapter on:
1	Sept 06	Introduction, Statics	Statics
2	Sept 13	Stress	Stress
3	Sept 20	Strain	Strain
4	Sept 27	Mechanical Properties of Materials	this topic
5	Oct 04	Design Considerations	
6	Oct 11	Axial Load and Deformation	Axial Load
7	Oct 18	Torsion	Torsion
8	Oct 25	Bending	Bending
9	Nov 01 Tuesday, Nov 01:	Bending Intermediate Exam (In Class)	Bending
10	Nov 08	Shear Stress in Bending of Beams	Transverse Shear
11	Nov 15	Deflection of Beams	this topic
12	Nov 22	Statically Indeterminate Beams	this topic
13	Nov 29	Stress/Strain Transformations	these topics

Grade Composition

Homework Assignments	10%
Main Quizzes (during tutorials)	10%
Surprise quizzes and group presentations	10%
Intermediate Examination	20%
Final Examination	<u>50%</u>
Total	<u>100%</u>

Final Exam: Typically 2.5 hrs long. The date, time, and place will be decided by the Registrar's Office.

Note: The student must pass the final examination in order to pass the course.

Teaching Assistants:

Mr. Tony Teng Li, Office: ICICS 065 (Robotics Lab)

Tel: 604-822-4850, e-mail: tengliubc@gmail.com

Office Hours: Tuesdays 1:00 p.m. to 2:00 p.m.

Mr. Hani Balkhair, Office: ICICS 079

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Office Hours: Wednesdays 1:00 to 2:00 pm