

ME 211 Introduction to Solid Mechanics – Summer 2018

Course duration: May 29th – August 3rd

Format: On-line

Instructor: Dr. Kirill Zaychik (Office: E&S Building #1327, Tel: 607-777-3982, email: kzaychik@binghamton.edu)

Office hours: On-demand (Skype: kirillzaychik)

Course description: This required course mechanical engineering undergraduate course is designed to extend the student's knowledge of mechanics to include deformable body mechanics. The main focus of this course is on the deformation of the body when subject to external loading. The concepts of stress, strain, and material constitutive laws are carefully developed in one-, two- and three-dimensions. These concepts are applied to the stress and deformation analysis of the common engineering structures such as beams, rod, shafts, pressure vessels, and two-dimensional (plane stress and plane strain) problems. Both theoretical development and applied problems solving, including analysis and design problems, are emphasized. The course material presentation takes form of instructional videos with some self-directed learning assignments. This course is the prerequisite (C- or better required) for the following ME core courses: ME 381, 392.

Required Textbook: R.C. Hibbler, Mechanics of Materials. 10th Edition, Prentice-Hall, 2016. ISBN: 9780134518121 (this book includes the online access to the Mastering Engineering¹ online resource – required for HW assignments)

ME Course ID: ME211SUMMER2018

Prerequisites by Course: ME 273 Engineering Mechanics (Statics) or equivalent course in Statics, Math 222 Calculus II or equivalent in calculus.

Prerequisites by Topic:

- Integration and derivatives
- Vector algebra
- Equivalent force systems
- Distributed force systems
- Free-body diagrams
- Static equilibrium of rigid bodies in 2D and 3D
- Trusses
- Centroid and 2nd moment of area, parallel axis theorem
- Rigid body dynamics

¹ Mastering Engineering access can be purchased separately from the book directly from Pearson: <https://www.pearsonmylabandmastering.com/northamerica/masteringengineering/>

Grading (approximate guidelines):

Homework	20%	A	95-100	C+	77-79
Term test	40%	A-	90-94	C	74-76
Final Exam	40%	B+	87-89	C-	70-73
		B	84-86	D	60-69
		B-	80-83	F	0-59

Course objectives:

Upon successful completion of this course, the student will be able to:

- Compute the stress and displacement in determinate structural systems subject to various loads (axial, bending, and torsion) using the fundamental concepts of free-body diagrams, equilibrium, compatibility, and constitutive laws.
- Select the cross-sectional geometry for the design of structural members given material and/or performance limits and requirements.
- Apply the concepts of multi-dimensional stress and strain by performing stress and strain transformations in two-dimensions.
- Analyze one-redundant indeterminate systems subjected to various combinations of axial, bending, and torsion loads using the fundamental concepts of free-body diagrams, equilibrium, compatibility, and constitutive laws.
- Select and use the proper failure criteria for multidimensional analysis of ductile and brittle materials.
- Use data from strain gage measurements to determine the stress, strain, and/or displacement in members.
- Sketch the shear and moment diagrams for beams, identifying all key points.
- Compute critical loads relating to the stability of columns.
- Interpret measurement data in the context of solving problems in solid mechanics.
- Gather, review, and demonstrate comprehension of various “short topics” in solid mechanics through self-directed learning (video notes and independent reading)