Syllabus for ME-GY 7213
Elasticity
Spring, 2015

Course Information

Instructor:	Dr. Maurizio Porfiri Email: mporfiri@nyu.edu Office: RH507 Phone: 718-260-3681 Office Hours: Tuesday 4:00-4:55	
Lecture:	Wednesday 6:00-8:20	RH604
Webpage:	NYU Classes	

Course Goals

This course presents the fundamentals concepts of the classical theory of elasticity. The class has a strong theoretical component, grounded on continuum mechanics and applied mathematics, which is synergistically integrated with engineering design of structures. The main objectives of the class are: to understand the fundamentals of elasticity and solution techniques for elasticity problems, implement the elasticity principles to engineering problems, and understand the use of linearity, symmetry, and energy principles in elasticity problems.

Prerequisites

Introduction to Solid Mechanics (ME6213) is a pre-requisite to this class and Applied Mathematics in Mechanical Engineering (ME6003) is a highly recommended corequisite, although it is not required. Further, it is assumed that all students have a working familiarity with the basics of statics, mechanics of materials, linear algebra, and multivariable calculus.

Required Text

Hertnarski, R. B., Ignaczak, J. The Mathematical Theory of Elasticity (2nd edition), CRC Press, 2011

References

Gurtin, M. An Introduction to Continuum Mechanics, Academic Press, 1982
Timoshenko, S. P., Goodier, J. N. Theory of Elasticity, Mc Graw Hill, 1951
Soutas-Little, Elasticity, Dover, 1973

Homework

Three homework will be assigned. Each homework assignment must be typed on a word-processor. Use of LaTeX is encouraged, although other word processing platforms are certainly acceptable. Students must hand-in their own work. Students are permitted to discuss homework questions with other students, although they are not permitted to discuss solutions except in general terms. No late homework will be accepted except for exceptional and documented circumstances. Solutions for all assigned problems will be provided, although not all assigned problems will necessarily be graded. Significant weight in grading will be placed on clarity of presentation.

The three homework assignments are due at the start of class on:

1. Wednesday, 18 February
2. Wednesday, 11 March
3. Wednesday, 22 April

Exams

There will be only one mid-term. The exam will be administered in class and will test the student's comprehension and ability to apply material learned in class and through assignments. The test is open book and closed notes. Formula sheets prepared by students will not be allowed. During the exam, before beginning to solve assigned problems, students should briefly restate the problem and list the data given. Also, students should list the important concepts and formulae used to arrive at the final solution along with detailed work. Every page of every exam submission should have the student full name and section number. Illegible work and loose sheets will not be graded. Students must complete the exam on their own. If a student cannot attend an 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.

Project

One project will be assigned to every student team comprising 2-3 students in March, 2015. Each project must be typed on a word-processor. Use of LaTeX is encouraged, although other word processing platforms are certainly acceptable. Students will present their projects during the day of the finals and must turn their project to the instructor during that day.

Grading policy

Homework:	45%
Midterm Exam:	25%
Project:	30%

Extra credit

There are no opportunities for extra credit. The grading policy allows for a "bad score".

Class attendance and absences

There are no formal requirements for attendance, and there is no direct penalty for missing class. Students are strongly encouraged to attend class since some course material will only appear in lectures. Students that miss class are responsible for obtaining class notes from a classmate.

Honor system

The honor system is in strictly force for this course. It is assumed that all work submitted by a student is done so under the honor system code. **Homework questions may be discussed with students. Homework solutions may not be discussed.** The final exam must be completed individually.

ABET a-k criteria compliance

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*
ME7213	✓		✓		✓		✓		✓	✓	✓

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Tentative Lecture Schedule

Lecture	Reading	Topic of the day
Lecture 1 1/28/15	HI Ch 1 and Ch 2 pp 3–56	Course overview and mathematical preliminaries
Lecture 2 2/4/15	HI Ch 3 pp 75–97	Kinematics
Lecture 3 2/11/15	HI Ch 3 pp 98–136	Motion and equilibrium
Lecture 4 2/18/15	HI Ch 3 pp 137–168	Constitutive relations
Lecture 5 2/25/15	HI Ch 4 pp 177–211	Boundary value problems of elastostatics
Lecture 6 3/4/15	HI Ch 5 pp 255–294	Variational problems of elastostatics
Lecture 7 3/11/15	HI Ch 7 pp 337–358	Complete solutions of elasticity
Lecture 8 3/25/15		**Midterm exam**
Lecture 9 4/1/15	HI Ch 8 pp 381–390	Two-dimensional problems of elastostatics
Lecture 10 4/8/15	HI Ch 9 pp 433–485	Three-dimensional solutions of isothermal and nonisothermal elasticity
Lecture 11 4/15/15	HI Ch 9 pp 491–502	Torsion problems
Lecture 12 4/22/15	HI Ch 10 pp 507–547	Two-dimensional solutions of isothermal elasticity
Lecture 13 4/29/15	HI Ch 10 pp 547–574	Two-dimensional solutions of nonisothermal elasticity
Lecture 14 5/6/15		Discussion on open research problems