ME 309: Structural Mechanics – Spring 2018

Professor Douglas P. Holmes – *dpholmes@bu.edu*

Lecture - Four Credits
202 Photonics
Tuesday & Thursday
9:00a.m. – 10:45a.m.

Office: 730 Commonwealth Ave., EMA 213
Phone: (617) 358-1294
Office Hours: Wed. 9:00a.m.– 10:00a.m.
Thurs. 1:00p.m.– 3:00p.m.

Prerequisite: ME 305: Mechanics of Materials
Textbook: *Advanced Mechanics of Materials and Applied Elasticity,* 5^{th} *Ed.*,
A.C. Ugural, S.K. Fenster, Pearson Prentice Hall, 2012

Course Description:
Application of solid mechanics to structures and machine elements. Elementary elasticity. Energy principles. Matrix and finite element methods. Stability phenomena. Modes of structural failure. Introduction to FEM. Includes design project.

Goals:
1. Be able to apply solid mechanics and elementary elasticity to structures.
2. Formulate analytical solutions to simple structures using equilibrium methods and energy principles.
3. Use numerical methods to predict deformation, stability, and failure of complex structures.

Course Schedule (Tentative):

Wk.	Dates	Subjects	Reading	Homework
1	Jan. 18^{th}	Course overview, stress components	1.1 – 1.7	
2	Jan. 23^{rd}, 25^{th}	Equilibrium eqns., stress transformation, displacement field	1.8–1.16	HW 1
3	Jan. 30^{th}, Feb. 1^{st}	Strain, constitutive laws	2.1–2.5	
4	Feb. 6^{th}, 8^{th}	Strain energy, axisymmetric problems	2.6–2.14	HW 2
5	Feb. 13^{th}, 15^{th}	Torsion	6.1–6.4	
6	Feb. 22^{nd}	Energy principles	10.1–10.3, 10.5–10.8	HW 3
7	Feb. 27^{th}, Mar. 1^{st}	Castigliano's theorem	10.4	
	Spring Break			
8	Mar. 13^{th}, $\mathbf{15}^{th}$	**Midterm Exam**		
9	Mar. 20^{th}, 22^{nd}	Rayleigh–Ritz method I	10.9–10.11	HW 4
10	Mar. 27^{th}, 29^{th}	Rayleigh–Ritz method II		
11	Apr. 3^{rd}, 5^{th}	Matrix analysis of structures I	7.8	HW 5
12	Apr. 10^{th}, 12^{th}	Matrix analysis of structures II		
13	Apr. 17^{th}, 19^{th}	Finite element method I	7.6–7.7, 7.9–7.10	HW 6
14	Apr. 24^{th}, 26^{th}	Finite element method II		
15	May 1^{st}	*Review*		
		Final Exam – Date & Time TBD		

Grading: There will be six homework assignments (20% total), two exams (30% each), and one structural design project (20%).

Exceptions: Missed homework assignments and examinations will only be excused with *written permission from the Office of the Dean of the College of Engineering.* If an assignment is missed and properly excused, you will have a week upon return to complete the assignment. All complaints related to projects and exams must be reported to the instructor within one week after the grades are announced.

Academic Conduct:
1. Students must follow the COE Academic Conduct Code, which is found in the COE Undergraduate Student Handbook (www.bu.edu/academics/eng/policies/academic-conduct/). Any violation of this conduct code will be reported to the COE Academic Conduct Committee.
2. Plagiarism is discussed briefly in the conduct code. However, for several reasons, this subject warrants additional emphasis. In engineering, just as in humanities, science, and social science disciplines, plagiarism is unacceptable. Plagiarism is theft of another person's ideas and is a punishable offense in the same way that any form of theft is an offense. Plagiarism harms the individual whose ideas have been stolen. Original thought is highly valued in engineering and is expected from students in this course in preparing and completing all course assignments.
3. Quizzes and Exams: These assignments are to be completed by each student individually with no consultation with any other person other than the proctor. All quizzes and exams are closed note and closed book.
4. Homework and Course Project: Students are permitted to consult with each other regarding approaches to solving problems in these assignments. However, everything that is written down and turned in must be authored by the student getting credit for the assignment, and any sources that were consulted while completing the assignment must be referenced. For example, if you consult with another person in preparing one section of a laboratory report, you should write "Consulted with <person's name> in preparing this section" in that section of the report. Similarly, if you consult with a textbook other than the course text or a webpage, acknowledge this in writing in the relevant section of the report or project.