ME 309: Structural Mechanics – Spring 2019

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

Lecture - Four Credits
202 Photonics
Tuesday & Thursday
9:00a.m. – 10:45a.m.
Discussion: Wed. 9:00–10:00a.m. in ENG 410, GTF: Huate Li

Office: 730 Commonwealth Ave., EMA 213
Phone: (617) 358-1294
Office Hours: Wed. 10:00a.m.– 12:00p.m.
Wed. 1:00p.m.– 4:00p.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. 22^{nd}, 24^{th}	Course overview, stress components	1.1 – 1.7	
2	Jan. 29^{th}, 31^{st}	Equilibrium eqns., stress transformation, displacement field	1.8–1.16	HW 1
3	Feb. 5^{th}, 7^{th}	Strain, constitutive laws	2.1–2.5	
4	Feb. 12^{th}, 14^{th}	Axisymmetric problems	2.6–2.14	HW 2
5	Feb. 21^{st}	Torsion	6.1–6.4	
6	Feb. 26^{th}, 28^{th}	Strain energy, energy principles	10.1–10.3, 10.5–10.8	HW 3
7	Mar. 5^{th}, 7^{th}	Castigliano's theorem	10.4	
	Spring Break			
8	Mar. 19^{th}, $\mathbf{21}^{st}$	**Midterm Exam**		
9	Mar. 26^{th}, 28^{nd}	Rayleigh–Ritz method I	10.9–10.11	HW 4
10	Apr. 2^{nd}, 4^{th}	Rayleigh–Ritz method II		
11	Apr. 9^{th}, 11^{th}	Matrix analysis of structures I	7.8	HW 5
12	Apr. 16^{th}, 18^{th}	Matrix analysis of structures II		
13	Apr. 23^{rd}, 25^{th}	Finite element method I	7.6–7.7, 7.9–7.10	HW 6
14	Apr. 30^{th}, May 2^{nd}	Finite element method II, *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.* You will have a week upon return to complete the missed assignment. All complaints related to projects and exams must be reported to the instructor within one week after the grades are announced.

Academic Conduct & Student Performance:

1. Students must follow the COE Academic Conduct Code: www.bu.edu/academics/eng/policies/academic-conduct/. Any violation of this conduct code will be reported to the COE Academic Conduct Committee.
2. In engineering, just as in humanities, science, and social science disciplines, plagiarism is unacceptable. Original thought is highly valued in engineering and is expected from students in this course in preparing and completing all course assignments.
3. All exams are closed note and closed book. These assignments are to be completed by each student individually with no consultation with any other person other than the proctor.
4. Students are permitted to consult with each other regarding approaches to solving problems in these assignments. If you consult with another person or webpage, please write "Consulted with <person's name> in preparing this assignment."
5. Diminished mental health, including significant stress, mood changes, excessive worry, or problems with eating and/or sleeping can interfere with optimal academic performance. The source of symptoms might be strictly related to your course work; if so, please speak with me. However, problems with relationships, family worries, loss, or a personal struggle or crisis can also contribute to decreased academic performance. BU provides mental health services to support the academic success of students. Getting help is a smart and courageous thing to do – for yourself *and* for those who care about you.
6. Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. Please notify the professor if you are comfortable in doing so. This will enable me to provide any resources that I may possess.