ENES 220 Mechanics of Materials

Fall 2020

Instructor: Zhen Liu, Ph.D. (Office: Compton Science Center 104; Phone: 301-687-7799)
E-mail: zliu@frostburg.edu

Class Meetings: MW 6-745PM at Room CSC 224
Office Hours: Mon 5-6pm; Tue 1-2pm, 3:15-4:30pm; Wed 5-6pm; Thurs 1-2pm

Text Book: Mechanics of Materials, by R.C. Hibberler, **9ᵗʰ edition**, 2014, Prentice Hall.

Catalog Description

Stress and deformation of solids-rods, beams, shafts, columns, tanks, and other structural, machine, and vehicle members. Topics include stress transformation using Mohr's circle, shear and moment diagrams, derivation of elastic curves, and Euler's buckling formula.

Prerequisite: **PHYS 261**, **ENES 102 (Statics),** and **MATH 237 (Calculus II).**

Designation: Required

Course Objectives

 The student will develop and/or refine their knowledge in the following areas:
• Moments of inertia for plane areas
• Stresses and deflections in shafts
• Stresses in beams – bending and shear
• Beam deflections using singularity functions and superposition
• Statically indeterminate rods, shafts, and beams
• Thermal stresses and deflections in rods
• Stress transformation and principal stresses using Mohr's circle
• Stress analysis under combined loading – 2D and 3D
• Column analysis
• Stress concentrations and fatigue strength

Course Outcomes

ENES 220 contributes directly to the following specific Mechanical Engineering Program ABET Student Outcomes **(a and e) are addressed by this course.**
(a) An ability to applying knowledge of mathematics, science and engineering
This course requires the application of calculus, vector algebra, and other elements of mathematical reasoning.

(e) An ability to identify, to formulate, and solve dynamics problems

Students will develop the ability to identify formulate, construct equations and solve stresses and strains in tension, compression, bending, deflection, buckling etc. problems

Brief list of topics:
• Moments of inertia for plane areas
• Stresses and deflections in shafts
• Stresses in beams – bending and shear
• Beam deflections using singularity functions and superposition
• Statically indeterminate rods, shafts, and beams
• Thermal stresses and deflections in rods
• Stress transformation and principal stresses using Mohr's circle
• Stress analysis under combined loading – 2D and 3D
• Column analysis
• Stress concentrations and fatigue strength

Homework Assignments
All HWs need to be typed and submitted electronically to me via Canvas with subject: Your last name_HW# Late work will not be accepted. Each homework problem should be organized into the following sections:
(a) A statement for the given information and for what is required; (b) Draw free body diagram;
(c) Basic equations; (d) Correct calculation and units; (e) Answers clearly indicated.

Attendance: Attendance and active participation are essential to learning. You are expected to attend every class. If you miss classes, you will be responsible for complying with all announcements made in the classes.

Quizzes: The quiz problems are from homework. There is no make-up quizzes, a zero grade will be signed to the missing quizzes.

Tests and Final Exam: There will be two hourly-exams during the semester. You are expected to take the tests on the scheduled dates. There will be no make-up exam unless you have an emergency and inform the instructor prior to the exam. There are no exemptions from the final exam.

Grading: The course grade will be determined in the following distributions.

Homework/Quizzes	20%
Hour Exams	50% (25% for each)
Final Exam.	30%
Total	**100**

Grading Scale

A	90 – 100%
B	80 – 89%
C	70 – 79%
D	60 – 69 %
F	0 - 59%

Any form of cheating and/or plagiarism, computer misuse and dishonesty, obstruction of rights of others and disruptive behavior will be treated according to the University Standards of Personal and Group Conduct.

The University will not tolerate disorderly or disruptive conduct which substantially threatens, harms, or interferes with University personnel or orderly University processes and functions. A faculty member may require a student to leave the classroom when his/her behavior disrupts the learning environment of the class. A student found responsible for disruptive behavior in the classroom may be administratively withdrawn from the course.

REPORTING OF CHILD ABUSE
Please be aware that according to state law in Maryland, educators are required to report current and past child abuse and neglect even when the former victim is now an adult and even when the former alleged abuser is deceased. If you disclose current or past abuse/neglect in class, in papers, or to me personally, I am required by law to report it. Please see me if you are interested in more information about this law.

COVID-19 Policy
Your health and safety are important. Therefore, during every physical in-person meeting of this course, everyone is required to follow state, local, and University public health mandates as outlined in the FSU Social Compact. Everyone must wear a face mask that covers their nose and mouth, respect posted signage, and practice good social distancing by remaining at least 6 feet away from others. The Code of Student Conduct notes that following these health and safety protocols constitute complying "with a reasonable request from authorized University personnel in the performance of their official duties," and failing to do so is a Code of Student Conduct violation.