Rensselaer

MANE 6962 Experimental Mechanics

Syllabus

Course Information

Course Title: Experimental Mechanics
Course Number: 6962
Credit Hours: 3
Semester / Year: Fall 2018
Meeting Days and Time: Mondays and Thursdays, 10:00 – 11:20 a.m.
Room Location: Carnegie Building, 210
Prerequisites or Other Requirements: Graduate standing or permission of instructor

Instructor

Name / Title: K. L. Mills, Assistant Professor
Office location: 2044 JEC
Office Telephone Number: (518) 276-8390
Office Hours: Thursdays, 12:30-13:30 pm
Email Address: millsk2@rpi.edu

Course Description

In this course we will study the design and analysis of experiments in solid mechanics including some applications in biomechanics. Methods for experimental stress analysis and the mechanical testing of materials will be discussed. Measurement techniques including instrumentation and data acquisition for key mechanical parameters such as displacements and forces (point and full-field measurements). Mechanical behaviors include creep and relaxation, high strain rate, fracture, fatigue, and aspects of biological soft tissues.

Course Text(s)

No texts are required for this course. Any additional readings beyond course notes and reference information for journal articles will be provided.

Student Learning Outcomes

After successfully completing this course, the students will be able to:

- recognize and describe different types of stress-, fracture-, or deformation-based experiments;
- determine the best experiment or set of experiments to assess the desired material behavior; and
- identify the design criteria for developing new experiments.

Course Assessment Measures and Grading Criteria

- Homework (30%) assignments will include problem sets (approximately 3) and short reports on original research papers (approximately 2).

- Mid-term report (20%) will be based on research that you currently perform, have performed, or would like to perform. Format and rubric will be discussed prior to beginning the report.
- Lab report (20%) will be based on a set of experiments that we will demonstrate in order to compare different methods of measuring material behavior. Format and rubric will be discussed prior to beginning the report.
- Final report (30%) will be for the students to design a set of experiments and analysis procedures in order to address a particular unknown material (or cell or tissue) mechanical behavior. The topics will be decided together with the instructor prior to beginning the project. Literature research is expected. Format and rubric will be discussed prior to beginning the report.
- Please bring any concerns regarding grading to the instructor's attention within one week of the return date of the assignment.

Course Calendar

This is a tentative schedule and subject to change depending upon the progress of the class.

Week/Class		Topic	Assignments
Week 1	R 8/30	Review Stress, Stress transformations	
	M 9/3	Labor Day – No Class	
	R 9/6	Review Strain, Stress-Strain relations	
Week 2	M 9/10	Strain measurements	Homework 1
	R 9/13	Strain measurements	
Week 3	M 9/17	Strain measurements (*Constitution Day*)	
	R 9/20	Optics	Homework 2
Week 4	M 9/24	Optics	
	R 9/27	Moiré and photoelasticity	
Week 5	M 10/1	Experimental Session 1	
	R 10/4	Moiré and photoelasticity	Homework 3
Week 6	***T 10/9***	— / TBD	Midterm Reports Due
	R 10/11	Student Midterm Presentations	Student Presentations
Week 7	M 10/15	Experimental Session 2	
	R 10/18	— / TBD	Homework 4
Week 8	M 10/22	Digital Image Correlation	
	R 10/25	Micromechanical measurements, AFM	
Week 9	M 10/29	Experimental Session 3	
	R 11/1*	— / TBD	Homework 5
Week 10	M 11/5*	AFM	
	R 11/8	Cell Biomechanics	
Week 11	M 11/12	Cell Biomechanics	Lab Report Due
	R 11/15	Review Fracture Mechanics	
Week 12	M 11/19	Fracture experiments	
	R 11/22	Thanksgiving – No Class	Final Reports Due
	M 11/26	Fracture experiments	
Week 13	R 11/29	Fracture experiments	
	M 12/3	Student Final Presentations	Student Presentations
Week 14	R 12/6	Student Final Presentations	Student Presentations
	M 12/10	Student Final Presentations	Student Presentations

*Prof. Mills may be away on travel.

Other Course Policies

- Penalties will be assessed for late assignments (-25% per day) except in the case of officially documented reasons.
- Presentation times, when set, may not be reassigned except for officially documented reasons.
- Please follow all instructions regarding lab safety

Academic Integrity

Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses they teach, and teachers must trust that the assignments that students turn in are their own. Acts that violate this trust undermine the educational process. The Rensselaer Handbook of Student Rights and Responsibilities and The Graduate Student Supplement define various forms of Academic Dishonesty and you should make yourself familiar with these. In this class, students are encouraged to collaborate and seek help and feedback on all assignments. In cases where help was received, or teamwork was performed, credit should be clearly indicated on the documentation/assignment submitted or presented.

Plagiarism is strictly forbidden and will not be tolerated. The first violation will result in a warning. If there is a subsequent infraction there will be no credit earned for the assignment, and a third violation will result in a report of violation of academic integrity (see below) and an F in the course.

Submission of any assignment that is in violation of this policy may result in a penalty of no credit for that assignment.

Violations of academic integrity may also be reported to the appropriate Dean of Graduate Education.

If you have any question concerning this policy before submitting an assignment, please ask for clarification.