EMEC 444: Mechanical Behavior of Materials

Catalog Data
Theory, analysis, and application of mechanical behavior of materials. Constitutive behavior. Topics selected from: plasticity, fracture mechanics, viscoelasticity, high temperature behavior, and material symmetry. Engineering behavior of materials such as metals, polymers, ceramics, composites and biomaterials. Structure-function relationships such as stress-based growth, toughening mechanisms, fatigue, and damage tolerant design with modern engineering materials are emphasized.

Textbook

Instructor
Dr. Ron June, Roberts Hall 201F. F13 office hours Monday and Thursday from 10 – 11 am. Email rjune@me.montana.edu for an appointment if you are unable to make office hours or require an additional meeting.

Entrance Expectations
PREREQUISITE: EMAT251

Students are expected to be familiar with basic principles of materials science and engineering. The course will utilize mathematical and computational techniques to analyze the mechanical behavior of materials. This course requires completion of regular homework assignments, class participation, completion of project work, and sufficient performance on written quizzes examinations.

Prior to lecture, students are expected to (1) read the assigned reading (2) think critically about the reading material (3) review previous lecture material and (4) complete any required assignments.

Class participation as measured by iClickers counts for 5% of the final grade in this course. Students are expected to register iClickers with MSU and use iClickers regularly during lectures.

Course Objectives and Learning Outcomes
The objective of EMEC 444 is to provide an in-depth understanding of the relationship between material properties and mechanical function. The course will cover the mechanical behavior and structure-function relationships of a variety of materials.

Upon successful completion, students will have demonstrated an understanding of stress and strain in addition to various constitutive relationships both theoretical and empirical. The successful student is expected to be able to calculate stresses and strains for a variety of loading conditions, describe basic structure-function relationships for a range of materials, and apply these skills for material selection in engineering applications.
Schedule
CLASS Tuesday and Thursdays, 319 Roberts Hall, 12:15 – 13:30 pm.

ASSIGNMENTS Homework assigned in class. A preliminary schedule will be posted on D2L.

The schedule will be adjusted depending on course progress. Homework will be assigned in class.

Course Website
All course information will be posted on Desire2Learn (D2L). D2L announcements and MSU email accounts will serve as the official university means of communication. Per MSU policy, students are expected to check their email at least twice weekly to stay current with University-related communications. Certain communications (e.g. scheduling) may be time-sensitive. Failure to process your email effectively is not an acceptable excuse for missing official communications.

Computer Usage
Students will be expected to learn the software packages presented in lecture. Software instruction will occur both via lecture and D2L videos. The software packages utilized in this course will include MATLAB and ANSYS.

Special Needs Information
Students with special needs or requiring special accommodations should contact the instructor or the campus Disabled Student Services Office at (406) 994-2824 at their earliest opportunity.

Student Conduct
Students are expected to conduct themselves in accordance with the MSU Student Conduct Guidelines with particular attention to the areas of academic honesty, behavior, and responsibilities. As mentioned above and in conjunction with Section 310 of the Student Handbook, students are expected to be prompt and prepared for class. Late work will not be accepted. Any student using more than one iClicker will be dismissed from the course. Any student caught cheating will be dismissed from the course. Student collaboration on homework and projects is permitted as long as the final submitted work is that of the submitting student.

Assessment and Evaluation
The course outcomes will be evaluated based upon homework assignments, quizzes, projects, and exams, and the final letter grades will be weighted as follows:

- Exams (2) 35% Midterm and comprehensive final exam
- Quizzes 25% Alternate Thursdays in class
- Project 20%
- Homework 15% Due alternate Thursdays in class
- Class Participation 5% Via iClicker for each lecture
Exams missed due to unexcused absences cannot be made up. If you know in advance that you must miss any exam for a MSU-excused absence (e.g. sports travel), notice must be made PRIOR to the week of the exam and Dr. June will provide a makeup option. Two exams will be administered according to the class schedule with the final exam scheduled according to the registrar. Homework is due at the beginning of class. The lowest quiz and homework grade will be dropped. *Late work will not be accepted.* Point totals required to receive a particular letter grade will be determined by the instructor at the conclusion of the course, and the use of plus and minus grades will be at the discretion of the instructor. Inappropriate conduct, late arrival, poor group performance, and class participation will affect the final grade.