INSTRUCTOR: E. R. Evans, Jr., P.E.  
13 Prischak Building  
898-6138  
ere100@psu.edu  
http://engr.bd.psu.edu/edevans/  

OFFICE HOURS:  
Monday 10 - 10:50 AM  
Tuesday 10 - 10:50 AM  
Thursday 3 - 3:50 PM  
Others hours by appointment  

PREREQUISITES: E MCH 011  


COURSE GRADE DISTRIBUTION:  
- Exams (3 x 15%) 45%  
- Homework & Computer Assignments 15%  
- Quizzes 10%  
- Design Project 5%  
- Comprehensive Final Exam 25%  

GRADE SCALE:  
- A 93-100%  
- A- 90-92%  
- B+ 87-89%  
- B 83-86%  
- B- 80-82%  
- C+ 77-79%  
- C 70-76%  
- D 65-69%  
- F Below 65%  

ACADEMIC INTEGRITY:  
Penn State Erie puts a very high value on academic integrity, and violations are not tolerated. Academic integrity is one of Penn State’s four principles to which all students must abide. Any violation of academic integrity will receive academic and possibly disciplinary sanctions, including the possible awarding of an XF grade which is recorded on the transcript and states that failure of the course was due to an act of academic dishonesty. All acts of academic dishonesty are recorded so repeat offenders can be sanctioned accordingly.  (See http://www.pserie.psu.edu/faculty/academics/integrity.htm)  

NOTE TO STUDENTS WITH DISABILITIES:  
Penn State welcomes students with disabilities into the University’s educational programs. If you have a disability-related need for modifications or reasonable accommodations in this course, contact the Disability Specialist in the Office of Student Affairs, Room 115 Reed Union Building, 898-6111.  

COURSE POLICIES AND PROCEDURES:  
- Attendance is required although role will not be regularly taken. You are responsible for all material covered in class, in handouts, sent by email or posted to the course website.  
- Exams and quizzes may be made-up at the discretion of the instructor upon presentation of a valid doctor’s excuse or University authorized justification for the absence. You must notify (call or email) the instructor prior to the absence. Students will not be permitted to share anything during the exams and quizzes.  
- Quizzes and exams are usually taken without the use of reference materials. An equation sheet is provided with the exams. Partial credit is usually given as appropriate.  
- Six to nine hours of out-of-class work is expected from you each week. You should regularly review material from class and the relevant sections of the text. Ask questions and seek help as soon as possible. The worst thing that you can do in this class is fall behind.  
- I will be communicating with you between class via email and updates on the web pages. You are expected to regularly check for these communications.
HOMEWORK:

- Homework assignments will be made during each class to help you learn the material covered. You are required to complete each assignment even though they will not all be collected for evaluation.
- Problems are to be neatly done on engineering calculation paper.
- Homework problems are generally worth 5 points each. Partial credit is assigned for work performed. If a problem isn’t attempted, no credit is given.
- You may discuss homework activities with other students, but you may not copy one another’s work. Additionally, you may not look at another person’s work to “see how they did it” - that’s really copying.
- Homework is due two class periods after the assignment is made. This allows the student at least one class period to ask questions about the homework before it is due.
- Late homework is not accepted.
- Steps for solving homework problems:
  - State the given information – what do you know about the problem?
  - State the objectives – what are you solving for?
  - State any assumptions and references – which methods and equations are you going to use?
  - Draw any necessary diagrams including a free-body diagram (FBD)
  - Solve the problem step by step in a clear logical and systematic manner.
  - Write the equation then substitute any known values into the equation. Include units.
  - Give the final answer – underline or draw a box around the final answer. Your final answer must always include proper units.

COURSE OUTCOMES AND OBJECTIVES:

The objective of this course is to introduce students to and ensure that students obtain a solid foundation in the mechanical behavior of materials. The primary types of mechanical behavior we are interested in are strength and stiffness of engineering materials. This includes the stress, strain, deformation forces/moments, displacements and deflections of these materials due to various types of loading.

The stress and/or stiffness of a material is important if it has to carry a load of any kind. This load could be its own weight. The design of machinery, equipment, buildings, bridges, aircraft, vehicles, supports, roads, boats, etc. are all dependent on the mechanical properties of the materials used to build them.

Students in Mechanical Engineering will use these concepts in several other classes including machine design, fluids, materials, manufacturing, vibrations, and finite element analysis. Students also going into Aerospace Engineering, Civil Engineering, Material Science/Engineering, Automotive Engineering, Nuclear Engineering and Engineering Mechanics will also depend on these concepts.

After completing this course, students should be able to explain and/or describe:
- elastic and plastic material behavior;
- linear and non-linear material behavior;
- compression, tension and shear;
- ductile and brittle materials;
- material strength, stiffness, resilience and toughness;
- stress-strain curve;
- identify and measure Young’s modulus;
- physical meaning of Poisson’s ratio;
- identify ultimate stress;
- true stress and true strain;
- stress concentrations;
- shear stress and strain;
- safety factors and allowable stress.
COURSE OUTCOMES AND OBJECTIVES CONTINUED:

After completing this course, students should be able to solve/calculate the following types of problems

- **Axial – Chapter 1 and 2**
  - Normal stress and deformation in axial members;
  - Lateral strain;
  - Thermal expansion;
  - Statically indeterminate problems.

- **Torsion – Chapter 3**
  - Shear stress, shear strain and angle of twist – non-uniform distribution;
  - Statically indeterminate problems.

- **Beams – Chapter 4, 5, 6, and 9**
  - Shear force and bending moment diagrams – develop diagrams and equations;
  - Normal bending stress in a beam;
  - Shear stresses and their distribution;
  - Slopes and deflections curves/equations using singularity functions.

- **Stress Transformations – Chapter 7**
  - Principal stresses and maximum shear stress in 2D;
  - Mohr’s circle problems for plane stress.

- **Combined Loading – Chapter 8**
  - Stresses under combined loading – bending/axial and shear/torsion.

- **Columns/Buckling – Chapter 10**
  - Structural stability and buckling concept;
  - Buckling and design;
  - Euler’s formula for pinned-pinned columns;
  - Euler’s formula for other boundary conditions.