

MEGR 2144 INTRODUCTION TO SOLID MECHANICS

Catalog Data	Introduction to Solid Mechanics. (3) Prerequisite: MEGR2141 and MATH 2241. An introduction to the theory of deformable bodies and its applications. Stress and deformation resulting from axial, torsion and bending loads. Shear and moment diagrams. Mohr's circle for stress and strain and buckling of columns. (Fall, Spring)
Textbooks	Mechanics of Materials, James M. Gere, Seventh Edition, Cengage Learning, ISBN: 0534553974.
Goals	This course is designed to provide an introduction to the mechanics of deformable bodies.
Prerequisites	MEGR 2141 and MATH 2241.
Class Topics	Review of Basic Statics Axial Loading of Bars (statically determinate and indeterminate problems, thermal effects) Torsion of Shafts Shear Force and Bending Moment Diagrams Pure Bending Transverse Loading of Beams Deflections of Beams Pressure Vessels Stress Transformations Combined Loading Problems Buckling
Outcomes	At the completion of this course, the student should be able to: <ol style="list-style-type: none">1. apply the principles of equilibrium to the problems of deformable body mechanics, distinguish between statically determinate and indeterminate systems.2. explain the concepts of stress, strain, material behavior and distinguish between linear and nonlinear material behavior.3. describe fundamental principles used in developing equations for stresses in axial loading, pure bending, transverse shear, torsion and thin-walled pressure problems.4. formulate and solve mechanical and structural problems involving tension, torsion and bending.5. formulate and solve for the deflection of a beam subjected to a variety of loading and boundary conditions.6. determine various modes of buckling and determine the critical loads of buckling for various boundary conditions.

7. develop a thorough understanding of the stress-state at a point and determine principal stresses and maximum shear-stress at any point in a simple structural problem.
8. select, design and analyze a mechanical part based on stress-based and maximum deflection-based design criteria.

Computer Usage	Some of the homework may require the use of Matlab, Maple and/or Mathcad. Students are encouraged to solve some problems using at least one of these packages.
Laboratory	There is no laboratory content associated with this course.
Design Content	Some of the homework problems and example problems may involve design of beams, pressure vessels, shafts in torsion, etc.
Grading	Grading policies are determined by the instructor.
Follow-up Courses	MEGR 2144 is a prerequisite to MEGR 3152: Mechanics and Materials Lab, MEGR 3156: Design Projects Lab II, MEGR 3161: Introduction to Engineering Materials, and to MEGR 3221: Machine Analysis and Design.
Notes	Students have the responsibility to know and observe the requirements of the UNCC Code of Student Academic Integrity (http://legal.uncc.edu/policies/ps-105.html).
Program Outcomes	This course contributes to the fulfillment of program outcomes ME1 and ME 5 (ABET criteria a and e). Student attainment of outcome ME5 is assessed in this course.
Coordinator	Kevin Lawton, Department of Mechanical Engineering and Engineering Science, UNC-Charlotte.
Prepared by	Kevin Lawton, November 11, 2009