Course Syllabus

Department: Science & Technology

Date: 01-15-2013

I. Course Prefix and Number: ESC 213

Course Name: Strength of Materials

Credit Hours and Contact Hours: 3 credit hrs (3 lec hrs, 0 lab hr)
Catalog Description including pre- and co-requisites: *supporting data required for grade prerequisite of 'C' or higher.* A study of the basic concepts of strength of materials; stress and strain in external loading, shear and torsion; centroids and moments of inertia; shear, moment, and stress in beams; load, shear, and moment diagrams; design and deflection of beams (statically determinate and indeterminate); combined stresses; welded, bolted and riveted joints; columns.
Pre-requisite: ESC 211.

Relationship to Academic Programs and Curriculum including SUNY Gen Ed designation if applicable:
This course is primarily a technical elective course for the A.S. in Engineering Science program. It is designed for the students who wish to pursue a baccalaureate degree in Aerospace, Mechanical, or Civil Engineering. Other students from other programs may also take the course if they have the appropriate background.

II. Course Student Learning Outcomes: *State the student learning outcome(s) for the course (e.g. Student will be able to identify…)*
Upon completion of the course the student will be able to:

1. Determine the stresses and strains caused in a structural member by thermal or mechanical loads such as axial, transverse, torsional, and bending.
2. Conduct a tensile testing of a specimen and determine its stress strain characteristics as well as its modulus of elasticity.
3. Solve the reactions in a statically indeterminate structure.
4. Determine the stresses in a beam under unsymmetric bending.
5. Determine the principal stresses at any point in a generally loaded structure by applying the Mohr's circle method.
6. Calculate the deflections in a beam under transverse loading.

College Learning Outcomes Addressed by the Course: *(check each College Learning Outcome addressed by the Student Learning Outcomes)*

☐ writing	☐ computer literacy
☐ oral communications	☐ ethics/values
☐ reading	☐ citizenship
☒ mathematics	☐ global concerns
☒ critical thinking	☐ information resources

III. Assessment Measures (Summarize how the college and student learning outcomes will be assessed):

For each identified outcome checked, please provide the specific assessment measure.

List identified College Learning Outcomes(s)	Specific assessment measure(s)
eg: writing	*eg: student will complete a research paper*
Mathematics	Student will answer specific test questions correctly
Critical Thinking	Student will answer specific test questions correctly

IV. Instructional Materials and Methods

Types of Course Materials:

Current edition of Beer and Johnston, "Mechanics of Materials" is used as the textbook.
Instructor notes are used as the supplemental source of information for the course content.
Each student is required to have a scientific calculator (a minimum of TI-83 or equivalent).
A course website is maintained on the internet for lecture schedule, test solutions, and other supplemental learning material.

Methods of Instruction (e.g. Lecture, Lab, Seminar …):

Main avenue used to convey knowledge to the student are lectures. They are presented in the traditional way, using either whiteboard or smartboard, supplemented with models, material samples, or power point presentations.
Plenty of example problems are solved in class and the students are allowed to practice the problem solutions through various homework assignments.

V. General Outline of Topics Covered:

Introduction, forces and stresses, axial loading, normal stress
Shearing stress, application to the analysis of simple structures
Stress on an oblique plane under axial loading, components of stress
Ultimate and allowable stress, factor of safety

Normal strain under axial loading, stress-strain diagram
Hooke's law, modulus of elasticity, elastic vs plastic deformation, fatigue
Deformations of members under axial loading
"Tensile testing" experiment
Statically indeterminate problems
Problems involving temperature changes
Poisson's ratio
Generalized Hooke's law for multi-axial loading, dilatation, bulk modulus
Shearing strain, shear modulus
Saint-Venant's principle, stress concentrations
Plastic deformations
Stresses and deformations in a circular shaft
Statically indeterminate shafts
Stresses and deformations in a symmetric member in pure bending
Bending of members made of several materials
Eccentric axial loading in a plane of symmetry
Unsymmetric bending
General case of eccentric loading
Transverse loading of prismatic members, shear on a horizontal plane
Stresses under combined loadings
Transformation of plane stress, principal stresses, maximum shearing stress
Determination of principal stresses and Mohr's circle
Design of prismatic beams, shear and bending moment diagrams
Relations among load, shear, and bending moment
Deformation of a beam under transverse loading
Equation of the elastic curve
Statically indeterminate beams

7/12