Syllabus

ESC 213 Strength of Materials

General Information

Date

March 7th, 2018

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Department

Science and Technology

Course Prefix

ESC

Course Number

213

Course Title

Strength of Materials

Course Information

Credit Hours

3

Lecture Contact Hours

3

Lab Contact Hours

0

Catalog Description

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.

Key Assessment

This course does not contain a Key Assessment for any programs

Prerequisites

ESC 211

Co-requisites

None

Grading Scheme

Letter

First Year Experience/Capstone Designation

This course DOES NOT satisfy the outcomes applicable for status as a FYE or Capstone.

SUNY General Education

This course is designated as satisfying a requirement in the following SUNY Gen Ed category

None

FLCC Values

Institutional Learning Outcomes Addressed by the Course

Vitality
Inquiry
Perseverance
Interconnectedness

Course Learning Outcomes

Course Learning Outcomes

1. Identify the fundamental modes of deformation: axial, torsional, bending.
2. Calculate stresses and strains caused by fundamental modes of deformation.
3. Apply methods of stress and strain analysis to solve the reaction forces in a statically indeterminate structure.

Outline of Topics Covered

I. Introduction, forces and stresses, axial loading, normal stress
II. Shearing stress, application to the analysis of simple structures
III. Stress on an oblique plane under axial loading, components of stress
IV. Ultimate and allowable stress, factor of safety
V. Normal strain under axial loading, stress-strain diagram
VI. Hooke's law, modulus of elasticity, elastic vs plastic deformation, fatigue
VII. Deformations of members under axial loading

VIII. "Tensile testing" experiment

IX. Statically indeterminate problems

X. Problems involving temperature changes

XI. Poisson's ratio

XII. Generalized Hooke's law for multi-axial loading, dilatation, bulk modulus

XIII. Shearing strain, shear modulus

XIV. Saint-Venant's principle, stress concentrations

XV. Plastic deformations

XVI. Stresses and deformations in a circular shaft

XVII. Statically indeterminate shafts

XVIII. Stresses and deformations in a symmetric member in pure bending

XIX. Bending of members made of several materials

XX. Eccentric axial loading in a plane of symmetry

XXI. Unsymmetric bending

XXII. General case of eccentric loading

XXIII. Transverse loading of prismatic members, shear on a horizontal plane

XXIV. Stresses under combined loadings

XXV. Transformation of plane stress, principal stresses, maximum shearing stress

XXVI. Determination of principal stresses and Mohr's circle

XXVII. Design of prismatic beams, shear and bending moment diagrams

XXVIII. Relations among load, shear, and bending moment

XXIX. Deformation of a beam under transverse loading

XXX. Equation of the elastic curve

XXXI. Statically indeterminate beams