

**STATE UNIVERSITY OF NEW YORK  
COLLEGE OF TECHNOLOGY  
CANTON, NEW YORK**



**MASTER SYLLABUS**

**COURSE NUMBER – COURSE NAME  
ENGS 203 – Engineering Strengths of Materials**

**Created by: Arthur Hurlbut, Ph.D., P.E.**

**Updated by: Dr. Lucas Craig**

**Canino School of Engineering Technology**

**Department: Engineering Science**

**Semester/Year: Spring 2023**

R. **TITLE:** Engineering Strengths of Materials

S. **COURSE NUMBER:** ENGS 203

T. **CREDIT HOURS:** (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)

# Credit Hours: 3

# Lecture Hours: 2 per week

# Lab Hours: per week

Other: 2 hours of

recitation per week

Course Length: 15 Weeks

U. **WRITING INTENSIVE COURSE:** Yes  No

V. **GER CATEGORY:** None:  Yes: GER  
*If course satisfies more than one:* GER

W. **SEMESTER(S) OFFERED:** Fall  Spring  Fall & Spring

X. **COURSE DESCRIPTION:**

This course is designed to introduce elementary analysis of deformable bodies subjected to various loading including strength, deformation, and stability analyses. Students will also be introduced to more advanced concepts to use sound judgment regarding the design of structures and components.

Y. **PRE-REQUISITES:** None  Yes  If yes, list below:

ENGS 201, or permission of instructor

**CO-REQUISITES:** None  Yes  If yes, list below:

**Z. STUDENT LEARNING OUTCOMES: (see key below)**

By the end of this course, the student will be able to:

<u>Course Student Learning Outcome</u> <i>[SLO]</i>	<u>Program Student Learning Outcome</u> <i>[PSLO]</i>	<u>GER</u> <i>[If Applicable]</i>	<u>ISLO &amp; SUBSETS</u>	
Demonstrate competence in the elementary analysis of deformable bodies subjected to various loading scenarios	a, k		2-Crit Think ISLO ISLO	CA IA PS Subsets
Determine the allowable strength, deformation, and system stability.	a, k		2-Crit Think ISLO ISLO	CA IA PS Subsets
Calculate the normal and shearing stresses in complex loading schemes	a, k		2-Crit Think 1-Comm Skills ISLO	CA IA PS W
Determine internal shear, bending moment, and deflection in loaded systems.	a, c, e, k		2-Crit Think ISLO ISLO	CA IA PS Subsets
Identify stress and deformation in torsional loading	a, c, k		2-Crit Think 1-Comm Skills ISLO	CA IA PS Subsets
Apply Euler's equations in column loading	a, c, e, k		2-Crit Think ISLO ISLO	CA IA PS Subsets
Apply Mohr's circle in 2D and 3D stress and strain scenarios	a, c, k		2-Crit Think ISLO ISLO	CA PS IA Subsets

<b>KEY</b>	<b>Institutional Student Learning Outcomes [ISLO 1 – 5]</b>
<b>ISLO #</b>	<b>ISLO &amp; Subsets</b>
<b>1</b>	<b>Communication Skills</b> Oral [O], Written [W]
<b>2</b>	<b>Critical Thinking</b> <i>Critical Analysis [CA], Inquiry &amp; Analysis [IA], Problem Solving [PS]</i>
<b>3</b>	<b>Foundational Skills</b> <i>Information Management [IM], Quantitative Lit./Reasoning [QTR]</i>
<b>4</b>	<b>Social Responsibility</b> <i>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</i>
<b>5</b>	<b>Industry, Professional, Discipline Specific Knowledge and Skills</b>

AA. **APPLIED LEARNING COMPONENT:** Yes  No

If YES, select one or more of the following categories:

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Classroom/Lab | <input type="checkbox"/> Civic Engagement              |
| <input type="checkbox"/> Internship               | <input type="checkbox"/> Creative Works/Senior Project |
| <input type="checkbox"/> Clinical Placement       | <input type="checkbox"/> Research                      |
| <input type="checkbox"/> Practicum                | <input type="checkbox"/> Entrepreneurship              |
| <input type="checkbox"/> Service Learning         | (program, class, project)                              |
| <input type="checkbox"/> Community Service        |  |

BB. **TEXTS:**

Beer, Johnston, and DeWolf. Mechanics of Materials, 8<sup>th</sup> Edition, McGraw Hill

CC. **REFERENCES:**

Beer and Johnston. Vector Mechanics for Engineers: Statics, 12<sup>th</sup> Edition, McGraw Hill

DD. **EQUIPMENT:** None  Needed:

EE. **GRADING METHOD:** A-F

FF. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

- Exams
- Quizzes
- Homework

GG. **DETAILED COURSE OUTLINE:**

IV. **Review of Statics: Equilibrium, Internal Forces**

V. **Concepts of Stress and Strain (1.1-5)**

VI. **Analysis of Elementary Loading Conditions**

- a. **Axial Loads (2.1-13)**
  - i. **Stress and Strain Distribution**
  - ii. **Deflections**
  - iii. **Statically Indeterminate Cases**
- b. **Torsional Loads (3.1-5)**
  - i. **Stress and strain Distribution**
  - ii. **Deflections**
  - iii. **Statically Indeterminate Cases**
- c. **Pure Bending and Transverse Loads (4.1-5, 7-9) (5.1-3)**
  - i. **Analysis of Loading: Shear and Moment Diagrams**
  - ii. **Stress and Strain Distribution Due to Bending**
  - iii. **Stress and Strain Distribution Due to Transvers Loads**
  - iv. **Discussion of Advanced Topics: composite beams & unsymmetric bending**
- d. **Deflections of Beams (6.1-5)**

- i. **Differential Equations of Elastic Curve**
- ii. **Relation Between Load, Shear, Moment, Slope, Deflection**
- iii. **Moment Area Method**
- iv. **Singularity Functions**
- v. **Statically Indeterminate Cases**
- e. **General State of Stress and Strain (7.1-6), (8.1-3), (9.1-2, 4)**
  - i. **Stresses on Inclined Planes**
  - ii. **Principal Stresses and Strains**
  - iii. **Mohr's Circle**
  - iv. **Analysis of Combined Loadings**
  - v. **Discussion of Advanced Topics: three dimensional state of stress f. Columns (10.1, 3, 4)**
    - v. **Stability and Buckling**
    - vi. **Support Conditions**
    - vii. **Euler's Formula**
    - viii. **Discussion of Advanced Topics: other column formula, imperfect columns.**

HH. **LABORATORY OUTLINE:** None  Yes