

**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: J. Miles Canino, Ph.D.

Canino School of Engineering Technology

Department: Engineering Science

Semester/Year: Fall/2018

- A. **TITLE:** Engineering Strengths of Materials
- B. **COURSE NUMBER:** ENGS 203
- C. **CREDIT HOURS:** (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)

Credit Hours: 3
Lecture Hours: 3 per week
Lab Hours: per week
 Other: per week

Course Length: 15 Weeks

- D. **WRITING INTENSIVE COURSE:** Yes No

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

- F. **SEMESTER(S) OFFERED:** Fall Spring Fall & Spring

- G. **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 in order to use sound judgment regarding the design of structures and components.

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

ENGS 205, ENGS 201, or permission of instructor

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

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

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

<u>Course Student Learning Outcome</u> <u>[SLO]</u>	<u>Program Student Learning Outcome</u> <u>[PSLO]</u>	<u>GER</u> <i>[If Applicable]</i>	<u>ISLO & 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

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

J. **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 | |

K. **TEXTS:**

Beer, Johnston, and DeWolf. Mechanics of Materials, 8th Edition, McGraw Hill

L. **REFERENCES:**

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

M. **EQUIPMENT:** None Needed:

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

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

- Exams
- Quizzes
- Homework

P. **DETAILED COURSE OUTLINE:**

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

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

III. **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)**
 - i. **Stability and Buckling**
 - ii. **Support Conditions**
 - iii. **Euler's Formula**
 - iv. **Discussion of Advanced Topics: other column formula, imperfect columns.**

Q. **LABORATORY OUTLINE:** None Yes