COURSE OUTLINE
CONS 272 STRENGTH OF MATERIALS FOR TECHNICIANS

Prepared By: Joseph Reilly
CONS 272 STRENGTH OF MATERIALS FOR TECHNICIANS

A. **TITLE:** STRENGTH OF MATERIALS FOR TECHNICIANS

B. **COURSE NUMBER:** CONS 272

C. **CREDIT HOURS:** 3

D. **WRITING INTENSIVE COURSE:** NO

E. **COURSE LENGTH:** 15 WEEKS

F. **semester(s) offered:** Fall

G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:**
   2 – one hour lectures and 1 – 2 hour recitation per week

H. **CATALOG DESCRIPTION:**

   The concepts of stress and strain are introduced and, in combination with statics principles, are used in the analysis of structural elements. Material properties such as ultimate strength, yield strength, elastic modulus, shear strength, torsional strength, and compressive strength are investigated using physical testing. The process of selecting structural elements such as pins, bolts, tension members, compression members, beams and shafts based on strength and factor of safety is presented and practiced.

I. **PRE-REQUISITES:** CONS172 (Technical Statics), MATH161 (Calculus 1)

J. **GOALS (STUDENT LEARNING OUTCOMES):**

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

<table>
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<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tbody>
<tr>
<td>a) Interpret the results from a tensile test.</td>
<td>3. Professional Competence</td>
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<td>2. Critical Thinking</td>
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<td>1. Communication</td>
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<td>b) Solve for the stress, strain, and deformation expected in an axially loaded</td>
<td>3. Professional Competence</td>
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<td>tension or compression member, given the load, size of material and member cross</td>
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<td>c) Determine the tensile, shear and bearing stresses present in bolted</td>
<td>3. Professional Competence</td>
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<td>connections under load.</td>
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<td>d) Determine the contact pressure and bearing stresses present in building</td>
<td>3. Professional Competence</td>
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<td>foundation elements.</td>
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e) Select members based on area required for members of trusses and frames.  
   3. Professional Competence
   2. Critical Thinking

f) Create shear and moment diagrams from loading diagrams of beams.  
   3. Professional Competence


g) Determine the bending stress, shear stress and deflection expected in structural beams.  
   3. Professional Competence

h) Select steel and timber beams to satisfy given loading specifications.  
   3. Professional Competence
   2. Critical Thinking

i) Calculate the shear stress in a shaft subjected to torsion.  
   3. Professional Competence

K. **TEXTS:** (Suggested)

Statics and Strength of Materials by Cheng, *Glencoe Publishing* ,
Statics and Strength of Materials by Onouye, *Pearson*

L. **REFERENCES:**

M. **EQUIPMENT:** No special equipment is required of the student.

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

O. **MEASUREMENT CRITERIA/METHODS:**

   - Quizzes
   - Home problems/assignments
   - Exams
   - **Final Exam**

P. **DETAILED COURSE OUTLINE:**

I. Review of statics
   a. Equilibrium formulas
   b. Solving reactions

II. Stress
   a. Tension
   b. Compression
   c. Shear
   d. Bearing

III. Strain
   a. Defined
   b. Deformation of axially loaded members
   c. Thermal stresses

IV. Mechanical properties
   a. The tensile test (of steel and aluminum)
b. Elastic modulus
c. Yield strength
d. Ultimate strength
e. Factor of safety in design
f. Compression test (of concrete)

V. Torsion in shafts
a. The torsion formula
b. Angle of twist
c. Power transmission
d. The torsion test

VI. Shear and bending in beams
a. Types of beams
b. Beam reactions
c. Shear force
d. Bending moment
e. Shear and moment diagrams

VII. Stresses in beams
a. The flexure formula
b. Allowable moment
c. Shear stress formula

VIII. Design of beams
a. Applying the flexure formula in design
b. Applying the shear formula in design
c. Steel beam selection
d. Timber beam selection

IX. Deflection of beams
a. When loaded uniformly
b. When subjected to symmetric, concentrated loads
c. Superposition of deflection

Q. LABORATORY OUTLINE:

NA – The 2 hour session will not be operated as a traditional lab. Rather the additional time will allow the instructor to (1) engage the student in lengthy problem solutions and (2) engage the students in a hands-on apparatus that demonstrates principles associated with current lecture topics