COURSE NUMBER – COURSE NAME
CONS 275 – Strength of Materials Lab

Created by: Joseph F. Reilly
Updated by: Yilei Shi

Canino School of Engineering Technology
Department:  Civil and Construction Technologies
Semester/Year:  Spring/2021
A. **TITLE:** Strenght of Materials Lab

B. **COURSE NUMBER:** CONS 275

C. **CREDIT HOURS:** 1 credit hour(s) per week for 15 weeks

- [x] Two to three hours of lab or clinical per week Two Hours

D. **WRITING INTENSIVE COURSE:** Yes [ ] No [x]

E. **GER CATEGORY:** None [x] Yes [ ] GER
   
   If course satisfies more than one: GER

F. **SEMESTER(S) OFFERED:** Fall [ ] Spring [x] Fall & Spring [ ]

G. **COURSE DESCRIPTION:**

   This course supplements the material presented in strength of materials, by providing laboratory tests, hands-on projects and practical applications. The course also introduces new and basic topics related to structural analysis. Engineering materials to be worked with include steel, aluminum, concrete, timber, and composite materials. Topics will include: tension test, compression test, bending test, deflection test, elastic plate test under uniformly distributed area load, dead load, live load, and snow load calculations.

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

   CONS 272 Strength of Materials OR ENGS 203 Engineering Strength of Materials

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

   May be taken coincident with CONS 272 or ENGS 203
I. **STUDENT LEARNING OUTCOMES: (see key below)**

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

<table>
<thead>
<tr>
<th>Course Student Learning Outcome [SLO]</th>
<th>Program Student Learning Outcome [PSLO]</th>
<th>GER [If Applicable]</th>
<th>ISLO &amp; SUBSETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct and analyze data from a tensile test including determination of the ultimate strength, yield strength and modulus of elasticity for steel specimen</td>
<td>3a, 3b</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets</td>
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<tr>
<td>Conduct and analyze data from a tensile test including determination of the ultimate strength, yield strength and modulus of elasticity (if any) for aluminum and composite material specimens, and compare different mechanical properties among different materials</td>
<td>3a, 3b</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets</td>
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<tr>
<td>Conduct and analyze data from a compression (column strength) test by creating the bi-modal column strength curve for a section</td>
<td>3a, 3b</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets</td>
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<tr>
<td>Predict and examine experimentally the impact of moment of inertia, modulus of elasticity and orientation on the bending resistance of a flexural member</td>
<td>3a, 3b</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets</td>
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<tr>
<td>Conduct and analyze the deflection test of a beam and compare to expected deflection from standard formulas</td>
<td>3a, 3b</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets</td>
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<tr>
<td>Task</td>
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<tr>
<td>Calculate Dead Loads for typical steel, concrete and timber structures per ASCE 7-10</td>
<td>2c</td>
<td>ISLO ISLO</td>
<td>Subsets</td>
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<tr>
<td>Determine Live Loads for typical structures per ASCE 7-10</td>
<td>2c</td>
<td>ISLO ISLO</td>
<td>Subsets</td>
</tr>
<tr>
<td>Calculate Snow Loads per ASCE 7-10</td>
<td>2c</td>
<td>ISLO ISLO</td>
<td>Subsets</td>
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<tr>
<td>Analyze loadings for One-Way and Two-Way Slabs under dead and live loads</td>
<td>2c</td>
<td>ISLO ISLO</td>
<td>Subsets</td>
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<td>KEY</td>
<td>Institutional Student Learning Outcomes [ISLO 1 – 5]</td>
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<tr>
<td>ISLO #</td>
<td>ISLO &amp; Subsets</td>
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</tbody>
</table>
| 1 | Communication Skills  
Oral [O], Written [W] |
| 2 | Critical Thinking  
Critical Analysis [CA], Inquiry & Analysis [IA], Problem Solving [PS] |
| 3 | Foundational Skills  
Information Management [IM], Quantitative Lit/Reasoning [QTR] |
| 4 | Social Responsibility  
Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T] |
| 5 | Industry, Professional, Discipline Specific Knowledge and Skills |

*Include program objectives if applicable. Please consult with Program Coordinator*
J. **APPLIED LEARNING COMPONENT:**  Yes ☒  No ☐

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

- ☒ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service

- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship
  (program, class, project)
K. **TEXTS:**

none required

L. **REFERENCES:**

The texts used in CONS272 and CONS 336 will serve as a reference (e.g. Statics and Strength of Materials by Cheng, Glencoe Publishing; Statics and Strength of Materials by Onouye; Pearson Applied Statics and Strength of Materials by Limbrunner and Spiegel, Pearson Publishing; R. C. Hibbeler, Structural Analysis, 9th Edition, Pearson – Prentice Hall, 2015.)

ASCE 7-10 (or current edition) Minimum Design Loads for Buildings and Other Structures

M. **EQUIPMENT:** None ☒ Needed: Materials Testing Lab (NS-110) - instron (300K loading), tension test machine, beam bender, compression strength testing machine, polishing machine, hardness testing, heat treating furnace, jamany

N. **GRADING METHOD:**

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

Lab Write-ups and Reports, Synthesis of Material Properties Assignment, Exams

P. **DETAILED COURSE OUTLINE:**

Q. **LABORATORY OUTLINE:** None ☐ Yes ☒

1. Material Properties
2. Tensile Test of Steel
3. Tensile Test of Aluminum
4. Tensile Test of Composite Materials
5. Synthesis of Tensile Properties for Different Materials
6. Compressive Test of Concrete
7. Compressive Strength Test
8. Flexural test of timber
9. Deflection of a Beam
10. Structural Design Philosophy and ASCE 7-10 Loads and Load Combinations
11. Dead and Live Loads
12. Snow Load
13. Test of Elastic Plate under Uniformly Distributed Area Load
14. One-Way and Two-Way Slabs
15. Load Path of Buildings and Bridges (Optional)