MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
CONS172 – TECHNICAL STATICS

Created by: JFR
Updated by: JFR

Canino School of Engineering Technology
Department: CIVIL and CONSTRUCTION TECHNOLOGIES
Semester/Year: FALL/2018
A. **TITLE:** TECHNICAL STATICS

B. **COURSE NUMBER:** CONS172

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

   # Credit Hours: 3
   # Lecture Hours: (2) one-hour lectures per week
   # Lab Hours: (1) two-hour lab 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:**

   The course provides application of Newton’s First and Third Laws of motion in the force analysis of statically determinate structures such as pinned connections, trusses, beams, frames, and cables. The determination of centroids and moment of inertia is also covered. The course requires extensive application of geometry, trigonometry and algebra. The course provides fundamentals that are used in strength of materials and structural analysis.

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

   MATH 123 (Pre-Calculus) and PHYS 121 (College Physics I); More advanced MATH or PHYS may be substituted.

   **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:

<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>Calculate the total moment about a point created by a system of coplanar forces acting on a rigid body.</td>
<td>1a, 2abc, 4ab, 6ab</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<tr>
<td>Draw and label free body diagrams clearly and accurately.</td>
<td>1a, 2abc, 4ab, 6ab, 7c</td>
<td>5-Ind, Prof, Disc, Know Skills 1-Comm Skills ISLO</td>
<td>Subsets W Subsets Subsets Subsets</td>
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<tr>
<td>Apply the equations of equilibrium to determine the unknowns in a system of concurrent forces.</td>
<td>1a, 2abc, 4ab, 6ab</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<tr>
<td>Analyze the member forces in a truss using the method of joints.</td>
<td>1a, 2abc, 4ab, 6ab</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>Analyze the member forces in a truss using the method of sections</td>
<td>1a, 2abc, 4ab, 6ab</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>Determine the forces in the members of a rigid structural frame.</td>
<td>1a, 2abc, 4ab, 6ab</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>Task</td>
<td>Groups</td>
<td>ISLO</td>
<td>Subsets</td>
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<td>Determine the centroid of composite sections and built up</td>
<td>1a, 2abc, 4ab, 6ab</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<tr>
<td>sections</td>
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<td>Calculate the Moment of Inertia of composite sections and</td>
<td>1a, 2abc, 4ab, 6ab</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>built-up sections</td>
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<tr>
<td>Apply the equations of equilibrium in determining the</td>
<td>1a, 2abc, 4ab, 6ab</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>reactions at the supports of statically determinate,</td>
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<td>two-dimensional structures such as beams, trusses and</td>
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<td>frames.</td>
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<td>KEY</td>
<td>Institutional Student Learning Outcomes [ISLO 1 – 5]</td>
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<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  

K. **TEXTS:**

Statics and Strength of Materials, Cheng, Glencoe Publishing  

Statics and Strength of Materials, Onouye, Pearson  


L. **REFERENCES:**

NONE  

M. **EQUIPMENT:** None ☒  Needed:  

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

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

HOMEWORK 25%, EXAMS 75 %  

P. **DETAILED COURSE OUTLINE:**

Review of essential math requirements  

a. Units of linear measure, force, moment and stress (US and SI)  
b. Unit conversions  
c. Trigonometry  
   i. Law of Sines  
   ii. Law of Cosines  
   iii. Pythagorean theorem  
   iv. Right triangle trig  
   v. Similar triangles  
d. Algebra  
   i. Solving simultaneous equations  
   ii. Writing equations to model a structural system  

II. Review of Vector Physics
a. Definition of vector and scalar quantities
b. Force vectors
c. Addition of vectors
d. Resultant of concurrent force systems
e. Resolution of a force into rectangular components

III. Rotational effects of a force
a. Definition of a moment
b. Units
c. Sign convention
d. Calculation of the moment of a force
e. Addition of moments caused by a force system
f. Varignon’s theorem
g. Force Couples
h. Resultant of distributed loads

IV. Equilibrium
a. Equilibrium equations
b. Drawing free body diagrams
c. Assigning reactions at supports
d. Two Force members
e. Solving for unknown forces in concurrent, coplanar force systems
i. Cables
f. Solving for unknown forces in non-concurrent, coplanar force systems
i. Beam reactions
ii. Frame reactions
g. Distributed Loads
h. Principle of superposition

V. Analysis of structures, forces in members
a. Truss Analysis
i. Method of Joints
ii. Method of Sections
b. Frame Analysis

VI. Centroids
a. Center of Gravity
b. Center of Area
c. Centroids by Composite shape method

VII. Moment of Inertia
a. I – defined (2nd moment of the area about an axis)
b. I by formula definition
c. I by common shape
d. I by composite shape, parallel axis theorem (transfer formula)

VIII. Friction (optional)

Q. LABORATORY OUTLINE: None ☒ Yes ☐