CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
CONS 324 – STRUCTURAL STEEL DESIGN

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Canino School of Engineering Technology

Department: Civil and Construction Technology

Semester/Year: Spring 2021

A.   **TITLE**: Structural Steel Design

B.   **COURSE NUMBER:** CONS 324

C.   **CREDIT HOURS: 3 credit hour(s) per week for 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:**

An introduction to the theory, analysis and design of the elements that comprise structural steel
buildings. Instruction follows the specifications and selection techniques provided in the American
Institute of Steel Construction (AISC) Manual of Steel Construction. Subject areas include
determination of controlling load combinations, analysis and selection of tension members, analysis and
selection of flexural members, analysis and selection of compression members, fastener strength and
connection design and combined bending and axial stresses (beam-columns).

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

CONS 336 (Structural Analysis) and CIVL 339 (Structural Analysis Lab)

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

CIVL 339 (Structural Analysis Lab) could be taken concurrently with this class.

I.   STUDENT LEARNING OUTCOMES: (see key below)

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

Course Student Learning Outcome [SLO]	Program Student Learning Outcome [PSLO]	GER [If Applicable]	ISLO & SUBSETS	
a) Explain and implement both ASD and LRFD design philosophies.			5-Ind, Prof, Disc, Know Skills 1-Comm Skills ISLO	Subsets Subsets Subsets Subsets
b) Analyze and select tension members (x-bracing, truss members, and threaded rods) IAW AISC.			5-Ind, Prof, Disc, Know Skills 2-Crit Think ISLO	Subsets Subsets Subsets Subsets
c) Analyze and select compression members (columns) IAW AISC.			5-Ind, Prof, Disc, Know Skills 2-Crit Think ISLO	Subsets Subsets Subsets Subsets
d) Analyze and select flexural members (beams) IAW AISC.			5-Ind, Prof, Disc, Know Skills 2-Crit Think ISLO	Subsets Subsets Subsets Subsets
e) Select the number of bolts and "workable" combinations for connections IAW AISC.			5-Ind, Prof, Disc, Know Skills 2-Crit Think ISLO	Subsets Subsets Subsets Subsets

KEY	Institutional Student Learning Outcomes [ISLO 1 – 5]
ISLO #	ISLO & Subsets
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. <u>**TEXTS:**</u>

Steel Design, 6th Ed., William T. Segui, (2017) Cengage Learning

L. <u>**REFERENCES:**</u>

AISC ASD/LRFD Manual of Steel Construction, current Edition

M. <u>**EQUIPMENT:**</u> **None** ☒ **Needed:**

N. <u>**GRADING METHOD:**</u> A-F

O. <u>**SUGGESTED MEASUREMENT CRITERIA/METHODS:**</u>

• **Exams**
• **Solved problems**
• **Project (optional)**

P. <u>**DETAILED COURSE OUTLINE:**</u>

1. Introduction
  a. Steel Structures
  b. Handbooks and Specifications
  c. Steel Properties
  d. Design Considerations
  e. Load Paths
  f. LRFD theory
  g. ASD theory

2. Determining factored loads for LRFD

3. Tension Members
  a. Review of tensile stress
  b. Rupture limit state
  c. Fracture limit state
  d. Tension Member Analysis
    i. Net area
    ii. Effective Net Area
    iii. Length Effects
  e. Block Shear
  f. Design of Tension Members
  g. Threaded Rods in Tension

4. Axially Loaded Column
  a. Introduction
  b. Ideal Columns
  c. Effective Lengths from the LRFD
  d. AISC Resistance factors for Compression Members
  e. Analysis of Columns (AISC)
    i. By formula

    ii. Using the column tables (LRFD)
  f. Design of Axially Loaded Columns
  g. Column Base Plates (Axial Load) (Optional)

5. Beams
  a. Review of the Mechanics of Bending (Moment diagrams)
  b. Plastic Hinge and Plastic Modulus (Z)
  c. Analysis of Beams based on Moment Strength
  d. Use of Beam Curves
  e. Inadequate Lateral Support
  f. Design of Beams based on Moment Strength
  g. Shear in Beams
  h. Deflection

6. Eccentrically Loaded Columns
  a. Introduction
  b. Analysis of Beam-Columns (AISC)
  c. Design of Beam-Columns (AISC)

7. Bolted Connections (Optional)
  a. Introduction
  b. Types of Bolted Connections
  c. High-Strength Bolts
  d. Strength and Behavior of High Strength Bolted Connections
  e. Framed Beam Connections
  f. Unstiffened Seated Beam Connections

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

NA – The 2 hour recitation session will not be operated as a traditional lab. Rather the additional time will allow the instructor to engage the student in lengthy problem solutions associated with current lecture topics.

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