CONS 324 - STRUCTURAL STEEL DESIGN

A. **TITLE:** Structural Steel Design

B. **COURSE NUMBER:** CONS 324

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:**
   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).

I. **PRE-REQUISITES:** MECH/CONS220 (Engineering Materials Lab), CONS 336 (Structural Analysis)

J. **GOALS (STUDENT LEARNING OUTCOMES):**
   By the end of this course, the student will be able to:

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<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tr>
<td>a) Explain and implement both ASD and LRFD design philosophies.</td>
<td>3. Professional Competence</td>
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<td>1. Communication</td>
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<td>b) Analyze and select tension members (x-bracing, truss members, and threaded rods) IAW AISC.</td>
<td>3. Professional Competence</td>
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<td>2. Critical Thinking</td>
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<td>c) Analyze and select compression members (columns) IAW AISC.</td>
<td>3. Professional Competence</td>
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<td>2. Critical Thinking</td>
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<td>d) Analyze and select flexural members (beams) IAW AISC.</td>
<td>3. Professional Competence</td>
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<td>2. Critical Thinking</td>
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e) Select the number of bolts and “workable” combinations for connections IAW AISC.

f) Utilize the AISC Manual of Steel Construction efficiently in the execution of b – d.


L. **REFERENCES:** AISC ASD/LRFD Manual of Steel Construction, current Edition

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

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

O. **MEASUREMENT CRITERIA/METHODS:**

- Exams
- Solved problems
- Project (optional)

P. **DETAILED COURSE OUTLINE:**

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:

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.