Course Syllabus

Department: Science and Technology

Date: 12/12/12

I. Course Prefix and Number: TECH 248

Course Name: Structural Design

Credit Hours and Contact Hours: 3 credit hours / 5 contact hours

Catalog Description including pre- and co-requisites:

Students will be introduced to fundamental concepts related to the design of building structures. Topics that will be covered include 1) forces, 2) trusses, 3) shear & bending moment diagrams, 4) properties of sections, 5) estimating live & dead loads, 6) designing wood beams, columns, & connections, and 7) designing steel beams, columns, and connections. Prerequisites: TECH 216 and MAT 145 (or placement into Math Level 3 or higher) or permission of the instructor.

Relationship to Academic Programs and Curriculum including SUNY Gen Ed designation if applicable:

The course is required for A.A.S. Architectural Technology & Building Sciences. The course may be taken as a technology elective for A.A.S. Mechanical Technology. Students in other programs may take the course if they have the appropriate background.

II. Course Student Learning Outcomes:

Students will:
1. Implement the terminology, materials, and problem solving approaches related to the structural design of buildings.
2. Identify and apply code-related structural requirements.
3. Use algebraic and graphic methods to solve structural problems.
4. Select structural components using formulas, tables, and graphs.
5. Identify and resolve forces; break a force into horizontal and vertical components; combine multiple forces into a single resultant force.
6. Analyze a truss; determine forces acting on each member of the truss.
7. Perform calculations involving direct stress, deformation, and modulus of elasticity.
8. Analyze beams; calculate beam reactions; draw shear and moment diagrams.
9. Calculate and use section properties such as area, centroid, moment of inertia, and section modulus.
10. Design steel beams; use the flexure formula and shear formula to select appropriately sized steel shapes.
11. Design steel columns; use slenderness ratio and tables to select appropriately sized steel columns.
13. Design wood beams; use the flexure formula and shear formula to correctly size wood beams.
14. Design wood columns; use formulas and tables to select appropriately sized wood columns.
15. Design simple bolted connections for wood components.
16. Estimate dead loads and live loads in buildings; identify load paths.
17. Apply steel design topics to a small commercial building.
18. Apply wood design topics to a small residential structure.

**College Learning Outcomes Addressed by the Course:**

- writing
- oral communications
- reading
- mathematics
- critical thinking
- computer literacy
- ethics/values
- citizenship
- global concerns
- information resources

**III. Assessment Measures:**

<table>
<thead>
<tr>
<th>Identified College Learning Outcomes</th>
<th>Specific Assessment Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>Comprehensive exams will be given at various milestones during the semester (for example, approximately at week 5, week 10, and week 15).</td>
</tr>
<tr>
<td>Critical Thinking (Problem Solving)</td>
<td></td>
</tr>
<tr>
<td>Information Resources</td>
<td></td>
</tr>
</tbody>
</table>

**IV. Instructional Materials and Methods**

**Types of Course Materials:**

Textbook, scientific calculator

**Methods of Instruction:**

Lecture, lab, demonstrations, reading assignments, homework problems, lab problems, project
V. General Outline of Topics Covered:

A. Introduction
   a. Forces Acting on a Building
   b. Code Requirements

B. Working With Forces
   a. Adding Force Vectors
   b. Finding Resultant Forces
   c. Separating a Force into Horizontal & Vertical Components

C. Laws of Equilibrium
   a. \( \Sigma H = 0, \Sigma V = 0, \Sigma M = 0 \)

D. Analyzing a Truss

E. Direct Stress & Deformation
   a. \( f = \frac{P}{A} \) (Stress = Force / Area)
   b. Modulus of Elasticity

F. Analysis of Beams
   a. \( \Sigma H = 0, \Sigma V = 0, \Sigma M = 0 \)
   b. Finding Reactions
   c. Shear Diagrams
   d. Moment Diagrams
   e. Properties of Sections
   f. Flexure Formula: \( M = fS \)
   g. Horizontal Shear: \( f_v = \frac{VQ}{Ib} \)

G. Steel Design
   a. Beams
   b. Columns
   c. Connections

H. Wood Design
   a. Beams
   b. Columns
   c. Connections