CE 353 STEEL STRUCTURES

Required Course

Fall 2008

Instructor: *Name:* Kutay Orakçal
Office Hours: M 3, T 3, Th 3, F 3

Course Data: Hours (Room) MM 78 (M2100), ThTh 78 (M2181)

Course Description (Catalog):

CE353 Steel Structures **(2+0+2)3**

Design of steel structures, material properties of steel. Allowable stress design approach. Introduction to Turkish standards, Eurocodes and AISC codes. Connections, tension members, compression members, beam-columns. Beams and girders. Design of frames, trusses and industrial buildings.

Prerequisite: CE 246 Strength of Materials

Course Objectives (Learning Outcomes):

To help the student develop a background on the basic history, mechanical properties, fundamental attributes, and usage of structural steel as a construction material.

To discuss fundamental mechanical principles related to the analysis and design of various types of structural steel members, including tension members, compression members, beams, and connections; and provide the students an intuitive feeling for the advanced principles of mechanics underlying the simplified design methods.

To develop an understanding of and appreciation for fundamental concepts in structural design including design formats, design codes, structural loads, structural safety, and economy.

To introduce modern code-compliant methodologies, based both national and international codes, used in design of steel structures, considering safety, stability, economy, serviceability, and installation.

Textbook: N/A. Detailed lecture notes will be provided.

Reference Books:

Vinnakota, S., ***"Steel Structures: Behavior and LRFD"***, McGraw Hill, 2006.

McCormac, J.C., "***Structural Steel Design***", 4th edition, Pearson Prentice Hall, 2008.

Turkish Standards: TS 498, TS648, TS910, TS912, TS-EN1056, TS 3357

Curricular Context

This course teaches using fundamental principles of mechanics of materials to the analysis and design of real-life structural steel members and connections compliant with modern design codes & specifications. Structural design objectives including safety, stability, economy, and serviceability are introduced and implemented. Estimated design content is 75%.

Laboratory and Computer Usage: N/A

Class Policies:

Homework: Homework questions to be assigned from each topic. 10% of the course grade.

Midterm exams: Two exams, each 50% of the course grade.

Final exam: Comprehensive exam at the end of the semester, 40% of the course grade.

Contribution of the Course to Program Outcomes:

(a) An ability to apply knowledge of mathematics, science, and engineering

(c) An ability to design a system, component, or process to meet desired needs

(e) An ability to identify, formulate and solve engineering problems

(i) A recognition of the need for, and an ability to engage in life-long learning

(k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Course Assessment:

Course will be assessed on the basis of the accomplishments regarding the course objectives and the contributions to the program outcomes. The evaluation will consist mainly of the responses from the students, who will provide their comments to various course related questions in the final week of the semester.

Week	Topics	Reading Assignment	Homework Assignment	Content
1	Introduction to Structural Steel	Lecture Notes and Relevant Sections in Reference Books	Homework I	Principles of design. Design procedure. Standards and specifications. Historical development of structural steel. Steel structures in general.
2				Design loads. Allowable Stress Design and Load and Resistance Factor Design approaches. Use of steel in structural design. Advantages/disadvantages of steel structures. Types and mechanical properties of structural steel.
3	Behavior and Design of Tension Members		Homework II	Types of tension members. Rods, bars, and cables. Structural shapes. Stresses and failure modes in tension members. Design of tension members. Lateral bracing.
4				
5	Analysis and Design of Axially-Loaded Compression Members		Homework III	Elastic buckling of columns. Euler formula. Inelastic bucking of columns. Effective length. Column stress analysis. Column design. Built-up columns.
6				
7	Analysis and Design of Beams		Homework IV	Flexural analysis. Biaxial bending. Unsymmetrical bending. Torsion of beams. Lateral Buckling. Deflections. Beam Design.
8				
9	Behavior and Design of Beam-Columns			Beam-column behavior. Stress calculation under combined axial load and flexure. Code formulations and simplifications. Design of beam-columns.
10	Analysis and Design of Connections		Homework V	Fastened connections. Fasteners, rivets, bolts. Fastener spacing. Types of fastened connections. Load transfer. Design of fastened connections. Welded connections. Weld types and specifications. Inspection and control. Stresses in welds. Welded connection design. Code requirements.
11				
12				
13	Review and Structural System Design		Homework VI	Truss and frame design. Truss types. Design of roof trusses and portal frames. Example structures.