The Pennsylvania State University
CE 342 – Design of Steel Structures
Spring Semester 2002
MWF 3:35-4:25, 358 Willard

Prerequisites: CE 240 (Structural Analysis)

Objectives:

1. To expand the student's knowledge and understanding of the field of structural engineering, with particular emphasis placed upon designing steel structures.
2. To present methods for designing steel members and connections using the Load and Resistance Factor Design (LRFD) approach.
3. To introduce the student to the organization and use of the AISC Manual of Steel Construction
4. To develop skills in completing and checking individual component and complete structural system designs using the AISC Manual of Steel Construction.

Textbooks: LRFD Steel Design, 2nd Edition, William T. Segui

Manual of Steel Construction, Load and Resistance Factor Design (LRFD), 3rd Edition, American Institute of Steel Construction, 2001

Instructor: Dan Linzell (dlinzell@engr.psu.edu, 3-8609)
231L Sackett Building (Mailbox 216 Sackett)

Office Hours: MW 8-10 a.m. or by Appointment

Tentative Schedule:

I.	Introduction to Structural Steel Design		2 hrs.
II.	Tension Members		5 hrs.
III.	Compression Members		9 hrs.
IV.	Flexural Members		9 hrs.
V.	Composite Beams		4 hrs.
VI.	Beam-Columns		5 hrs.
VII.	Connections		6 hrs.
VIII.	Introduction to Allowable Stress Design (ASD)	1 hr.	
	Exams (2)		2 hrs.
			43 hrs.

Grading:	Exam 1 (Mon., Feb. 11th, 6:30-7:45, Rm. TBA)	20%
	Exam 2 (Mon., Mar. 25th, 6:30-7:45, Rm. TBA)	20%
	Final (Fri., May 3rd, 4:40-6:30, Rm. TBA)	25%
	Homework	25%
	Project	10%
		100%

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Tentative Outline:

I. Introduction to Structural Steel Design

Reading: Segui: Chs. 1 & 2
AISC: *GNRL.* → 2-5 to 2-60, *SPEC.* → 16.1-1 to 16.1-9 (Ch. A), *Commentary* → 16.1-164 to 6.1-176 (Ch. A)

- Structural Engineering – overview of the profession
- The Design Process – goals, steps
- Structural Steel – types, uses, properties, etc.
- Steel Structures
- Specifications and Codes (AISC, ANSI, AASHTO, AREA, IBC, etc.)
- Loads
- Design Philosophies (ASD, PD, LRFD)
- Introduction to LRFD

II. Tension Members

Reading: Segui: Ch. 3
AISC: *TEN.* → 3-1 to 3-34, *SPEC.* → 16.1-10 to 16.1-11 (Ch. B), 16.1-24 to 16.1-26(Ch. D), *Commentary* → 16.1-202 (Ch. D)

- Failure Modes – gross area, net area, block shear
- Design Procedures (AISC)
- "Other" Tension Members – threaded rods, built-up members, cables, pin-connected members

III. Compression Members

Reading: Segui: Ch. 4
AISC: *GNRL.* → 2-12 to 2-13, *COL.* → 4-1 to 4-152, *SPEC.* → 16.1-11 to 16.1-16 (Ch. B), 16.1-18 to 16.1-19 (Ch. C), 16.1-27 to 16.1-30 (Ch. E), *Appendix* → 16.1-89 to 16.1-93 (Ch. B), 16.1-94 to 16.1-95 (Ch. E), *Commentary* → 16.1-188 to 16.1-195 (Ch. C), 16.1-203 to 16.1-205 (Ch. E)

- General Behavior – Euler buckling, elastic/inelastic buckling, BC's and effective length, local buckling
- Design Procedures (AISC)
- "Leaning" Columns

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Tentative Outline (cont.):

IV. Flexural Members

Reading: Segui: Ch. 5
AISC: *BEAM* → 5-1 to 5-178, *Specification* → 16.1-11 to 16.1-16 (Ch. B), 16.1-31 to 16.1-38 (Ch. F), *Appendix* → 16.1-89 to 16.1-93 (Ch. B), 16.1-96 to 16.1-106 (Ch. F), *Commentary* → 16.1-206 to 16.1-211 (Ch. F), 16.1-268 to 16.1-270 (App. Ch. F)

- Laterally Braced Beam Behavior - stress-strain, formation of plastic hinges, effect of residual stresses
- Laterally Braced Beam Design Procedures (AISC) - flange and web local buckling, web crippling, compact sections
- Laterally Unbraced Beam Behavior - elastic/inelastic lateral-torsional buckling
- Laterally Unbraced Beam Design Procedures (AISC)
- Shear Behavior – shear buckling
- Shear Design Procedures (AISC)

V. Composite Beams

Reading: Segui: Ch. 9
AISC: *BEAM* → 5-9 to 5-10, *Specification* → 16.1-40 to 16.1-48 (Ch. I), *Commentary* → 16.1-214 to 16.1-228 (Ch. I)

- Composite Beams – introduction and behavior
- Composite Beam Design Procedures (AISC)

VI. Beam-Columns

Reading: Segui: Ch. 6
AISC: *COMB.* → 6-1 to 6-54, *Specification* → 16.1-17 to 16.1-23 (Ch. C), 16.1-38 to 16.1-39 (Ch. H), *Appendix* → 16.1-112 to 16.1-114 (Ch. H), *Commentary* → 16.1-184 to 16.1-201 (Ch. C), 16.1-212 to 16.1-213 (Ch. H), 16.1-272 (App. Ch. H)

- Behavior – interaction of axial and bending loads
- Design Procedures (AISC)

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VII. Connections

Reading: Segui: Ch. 7
AISC: *CONN.* → 9-1 to 9-44, *SHEAR* → 10-1 to 10-7, *Specification* → 16.1-49 to 16.1-70 (Ch. J), *Appendix* → 16.1-115 to 16.1-117 (Ch. J), *Commentary* → 16.1-229 to 16.1-248 (Ch. J), 16.1-273 to 16.1-275 (App. Ch. J)

- Bolted Connection Behavior – types of connections, failure modes, governing specifications
- Bolted Connection Design Procedures
- Welded Connection Behavior – types of welds, failure modes, governing specifications
- Welded Connection Design Procedures

VIII. Introduction to Allowable Stress Design (ASD)

Reading: Segui: App. B

- Overview of AISC ASD Specification

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Academic Integrity:

From the PSU web site (http://www.psu.edu/ufs/policies/):

49-20 Academic Integrity
Definition and expectations: Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

To protect the rights and maintain the trust of honest students and support appropriate behavior, faculty and administrators should regularly communicate high standards of integrity and reinforce them by taking reasonable steps to anticipate and deter acts of dishonesty in all assignments (Senate Policy 44-40: Proctoring of Examinations). At the beginning of each course, it is the responsibility of the instructor to provide students with a statement clarifying the application of University and College academic integrity policies to that course

Homework:

All homework should be completed in a neat and orderly fashion on engineering paper and in pencil. Homework is typically assigned weekly. Problems are to be submitted at the beginning of class typically one week after their assignment. Late homework can be submitted at the beginning of the class period immediately following the due date with a *10% penalty* being assessed. Solutions to the assigned homework problems will be available on the web after they are returned (**http://www.courses.psu.edu/courseweb/courses/?course=c_e342_dgl3**). Once graded homework is returned, you have 24 hrs. after receiving it to question the grades that were given. All questions and concerns must be submitted in writing.

Exams:

Two mid-term and one final examination are scheduled as shown on sheet 1. All exams will be open book and open note. The final will be cumulative. **NO** make-up exams will be given except as required by University policy. See me at least 24 hrs. *prior* to any anticipated absence. You have 24 hrs. after receiving a graded exam to question the grade that was given. All questions and concerns must be submitted in writing.

Project:

A design project will be assigned and completed individually. It should be completed in a neat and orderly fashion on engineering paper and in pencil. The project will involve designing a steel framed building and will be due at the beginning of class on Friday, April 19th. Projects received after the deadline will be assessed a 10% penalty for each weekday that they are late. No projects will be accepted after 9a.m. on Friday, April 26th.