## CE 545 METAL STRUCTURE BEHAVIOR AND DESIGN

SCOPE:	This course covers advanced topics in elastic and inelastic structural metal member behavior and the theoretical basis of design codes and procedures. Philosophies of design, fatigue, bending stability, torsion, stability of plates, stability of columns, stability of beam-columns, connections, and frame stability will be covered in depth in addition to other topics relating to advanced behavior and design of metal structures.	
TEXTS:	Salmon, Johnson and Malhas, <i>Steel Structures: Design and Behavior</i> , <i>Emphasizing Load and Resistance Factor Design</i> , 5 <sup>th</sup> Edition, Pearson Prentice Hall, New Jersey, 2009 ISBN 13: 978-0-13-188556-1	
	American Institute of Steel Construction, <i>Steel Construction Manual</i> , Load and Resistance Factor Design, 13 <sup>th</sup> Edition, 2005	
	CE545 Course Packet available in the Engineering Copy Center	
INSTRUCTOR:	J.A. Laman, 231J Sackett Bldg., 863-0523, jlaman@psu.edu Office Hours: M and W, 1:30 to 3:00 pm or by appointment	
LECTURES:	MWF, 11:15am to 12:05pm, Room 111 Borland	
DESIGN PROBLEMS:	Design problems emphasizing concepts discussed in class are included in the course packet. Design problems must be submitted, but will not be graded. Instructor solutions will be posted on the course ANGEL site.	
COURSE PROJECT:	The course project is specified at the end of the course pack and will be discussed in class. This project is to be completed individually.	
EXAMS/ FINAL:	Two evening semester exams and a comprehensive final exam will be administered for the course. Times and dates for semester exams are provided in the course calendar. Time and date of the final exam will be determined by the registrar and posted on elion.	
GRADING:	The course grade will be based on:	
	5% - Engineer's Notebook 10% - Homework 25% - Course Project 40% - Mid-term exams (2 @ 20%) <u>20% - Final Examination</u> 100% - Total	

The Student Guide to General University Policies and Rules applies to this course

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Course Outline – Fall 2010

## The Pennsylvania State University Dept. of Civil and Environmental Engineering

Topic	Reading
INTRODUCTION/ADMINISTRATION (~1 lecture)	course notes
PHILOSOPHIES OF DESIGN (~2 lectures) ASD vs LRFD and Structural Reliability Failure Criteria	course notes S&J Ch 1 AISC Part 16 Commentary, Ch B
<ul> <li>FRAME BEHAVIOR AND DESIGN (~9 lectures)</li> <li>AISC Stability Analysis and Design</li> <li>AISC Anaylsis Methods: 1<sup>st</sup> Order, Effective Length, Direct</li> <li>AISC Second Order Effects and Moment Magnification</li> <li>Pattern Loads, Load Combinations, Live Load Reduction</li> <li>Leaning Columns</li> </ul>	S&J Ch 12, 14 AISC Part 16, Ch C and H corresponding AISC Commentary
FATIGUE (~2 lectures) Variable Amplitude Loading and Miner's Rule AISC Fatigue Design Requirements	course notes AISC Appendix 3 corresponding AISC Commentary
BENDING BEHAVIOR (~12 lectures) General Flexural Theory Unsymmetrical Bending Tapered Members Plate Girders	course notes S&J Ch 7, 11 AISC Part 16, Ch F AISC Part 16, Ch G corresponding AISC Commentary
TORSION (~6 lectures) Pure Torsion Shear Flow, Shear Center of Open Thin-Walled Sections Torsion of Structural Shapes Torsion of Closed Thin-Walled Sections	S&J Ch 8 AISC Design Guide 9
LATERAL TORSIONAL BUCKLING (~1 lecture) Elastic and Inelastic	S&J Ch 9
COLUMNS, PLATES, and COMPRESSION MEMBERS (~5 lectures) Local Buckling of Plate Elements AISC Design Criteria Torsional Compression Buckling	S&J Ch 6 AISC Part 16, Ch B AISC Part 16, Ch E corresponding AISC Commentary
CONNECTIONS (~6 lectures) Review of Bolt and Weld Strength AISC Connection Design Aids	S&J Ch 4, 5, and 13 AISC Parts 7 through 12 – Design Aids