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.


CE545 Course Packet available in the Engineering Copy Center

J.A. Laman, 231J Sackett Bldg., 863-0523, jlanam@psu.edu

Office Hours: M and W, 1:00 to 3:00 pm or by appointment

MWF, 11:15 to 12:05 am, Room 212 Hammond

Practice design problems emphasizing concepts discussed in class are included in the course packet. Problems will not be graded, however, students are encouraged to complete the problems as reinforcement of class discussions and examination preparation. Solutions will be posted on the ANGEL site for the course.

A semester steel design project will be assigned in class and is described in the course packet.

Two evening semester exams and a comprehensive final exam will be administered for the course. Times and dates are indicated in the course schedule.

The course grade will be based on:

- 10% - Engineers Notebook
- 15% - Design Project
- 50% - Mid-term exams (2 @ 25%)
- 25% - Final Examination
- 100% - Total

The *Student Guide to General University Policies and Rules* applies to this course
<table>
<thead>
<tr>
<th>Topic</th>
<th>Reading</th>
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| FRAME DESIGN REVIEW | S&J Ch 12, 14  
AISC Second Order Effects and Moment Magnification  
AISC Stability and Leaning Columns |
| PHILOSOPHIES OF DESIGN | course notes  
ASD vs LRFD and Structural Reliability  
Failure Criteria  
Brittle Fracture/Ductile Yielding  
Von Mises Yield Criteria |
| FATIGUE | course notes  
Stress Life, Strain Life, Fracture Mechanics  
Variable Amplitude Loading and Miner’s Rule  
AISC Fatigue Design Requirements |
| BENDING BEHAVIOR | S&J Ch 7  
General Flexural Theory  
Unsymmetrical Bending  
Biaxial Bending  
Tapered Members |
| TORSION | S&J Ch 8  
Pure Torsion  
Shear Flow  
Shear Center of Open Thin-Walled Sections  
Uniform Torsion  
Torsion of Structural Shapes  
Nonuniform Torsion  
Combined Torsion and Bending  
Torsion of Closed Thin-Walled Sections, Single Cell and Multi-Cell |
| LATERAL TORSIONAL BUCKLING | S&J Ch 9  
Elastic and Inelastic |
| COLUMNS, PLATES, and COMPRESSION MEMBERS | S&J Ch 6  
Local Buckling of Plate Elements  
AISC Design Criteria (App. B)  
Torsional Compression Buckling (App. E) |
| BEAM-COLUMN AND FRAME BEHAVIOR | S&J Ch 12  
Approximate 2nd order effects  
Elastic and Inelastic Behavior |
| CONNECTIONS | S&J Ch 13  
Review of Bolt and Weld Strength  
AISC Design Aids  
Example |