

## CE-807 Steel Structure Design

Code	Credit Hours	Category
CE-807	3	Elective

### Course Description:

This course aims to provide students with the knowledge and tools for choosing appropriate design and analysis strategies for steel structures. Students will explore topics such as the design process, LRFD tension members, connections, plastic analysis of beams and frames, and multistory building plastic design (LRFD). Practical/project/research work involves applying these concepts to real-world steel structure projects. It provides skill set to undertake analysis and design problems in Steel Construction using various design methods as per current AISC code (American Institute for Steel Construction - AISC) of practice. This comprehensive approach prepares students for advanced analysis and design of steel structures.

### Text Book:

- Steel Design by William T. Segui. Fifth Edition
- Steel Structures: Design and Behavior: Emphasizing ASD method. By Charles G. Salmon, John E. Johnson, Faris Amin Malhas, 2009 Pearson Education, Inc, Pearson Prentice hall, New Jersey

### Reference Books:

- Steel Construction Manual 14<sup>th</sup> Edition (AISC Manual)
- Simplified Design of steel structures By James E. Ambrose, Harry Parker, 1997 John Wiley & sons Inc
- Structural Steel Design by Jack C. McCormac
- Charles G. Salmon, John E. Johnson (1996): Steel structures: design and behavior: emphasizing load and resistance factor design, 4th Edition, HarperCollins College Publishers, New York.
- Edwin H. Gaylord, Jr., Charles N. Gaylord, James E. Stallmeyer (1992): Design of steel structures, 3rd Edition, McGraw-Hill, New York.
- Bernard George Neal (1977): The plastic methods of structural analysis, 3rd Edition, Chapman and Hall, London.

### Prerequisites:

BE (Civil, Architecture, Construction Engineering & Management)

## Assessment System

Component	Percentage Range
Quizzes	10-15%
Assignments	10-15%
Mid Terms	20-30%
ESE	40-50%
Project (optional)	10-15%

## Teaching Plan:

Week	Topic Covered
1-2	<b>Introduction to Structural Steel Design</b> <ul style="list-style-type: none"><li>• Properties of Steel as structural material.</li><li>• Structural design and design loads.</li><li>• Safety factors and load factors.</li><li>• Specifications and codes of practice.</li><li>• Stress-strain Relationship in Structural Steel.</li><li>• Introduction to ASD (Allowable Stress Design) and LRFD (Load and Resistance Factor Design) methods (Design will be by ASD)</li><li>• Fabrication and erection methods of steel structures.</li></ul>
3-6	<b>Tension Members</b> <ul style="list-style-type: none"><li>• General design procedure.</li><li>• Allowable tensile stresses and loads.</li><li>• Effective net areas.</li><li>• Effect of staggered holes.</li><li>• Design examples.</li></ul>
7-8	<b>Compression Members</b> <ul style="list-style-type: none"><li>• Residual Stresses.</li><li>• Brief review of column formulae.</li><li>• AISC design requirements.</li><li>• General design procedure.</li></ul> Selected design examples.
9	<b>Mid Term Exam/ OHT, (As per NUST Exam Policy)</b>

10-12	<p><b>Design of Beams</b></p> <ul style="list-style-type: none"> <li>• Beam types.</li> <li>• AISC design procedure.</li> <li>• Compact sections and lateral support of beams.</li> <li>• Design of laterally unsupported and continuous beams.</li> <li>• Unsymmetrical bending.</li> <li>• Design of beam-columns.</li> <li>• Beam Bearing Plates.</li> <li>• Selected design examples</li> </ul>
13-15	<p><b>Connection Design</b></p> <p>Riveted connections.</p> <p>Types of rivets.</p> <p>AISC allowable strength rivets.</p> <p>Bolted connections</p> <ul style="list-style-type: none"> <li>• Types of bolts.</li> <li>• Advantages of High Strength Bolts.</li> <li>• Joint types and failure modes of bolted joints.</li> <li>• Specifications for High Strength Bolts.</li> <li>• AISC requirements.</li> <li>• Bearing type and Friction type connections.</li> <li>• Selected design examples.</li> </ul> <p>Welded Connections</p> <ul style="list-style-type: none"> <li>• Advantages of welding.</li> <li>• Welding processes and classification of welds.</li> <li>• Strength of welds-AISC requirements,</li> <li>• General procedure for simple fillet weld design.</li> <li>• Selected design examples.</li> <li>• <b>Problem Solving Activity 3. Quiz 4</b></li> </ul>
16	<p><b>Plastic Analysis and Design</b></p> <ul style="list-style-type: none"> <li>• Theory of Plastic analysis.</li> <li>• Introduction to plastic design.</li> </ul> <p><b>Design of Roof Trusses</b></p> <ul style="list-style-type: none"> <li>• Roof trusses-introduction.</li> <li>• Design loads and load combinations.</li> <li>• Roof truss analysis.</li> <li>• Design of roof trusses, using AISC specification.</li> </ul>
17	<p><b>End Semester Exam</b></p>