



National University of Engineering (UNI)

School of Civil Engineering
Syllabus 2026-II

1. COURSE

CE2S3. Steel Design (Mandatory)

2. GENERAL INFORMATION

2.1 Course	: CE2S3. Steel Design
2.2 Semester	: 7 th Semester.
2.3 Credits	: 5
2.4 Hours	: 4 HT; 2 HP;
2.5 Duration of the period	: 16 weeks
2.6 Type of course	: Mandatory
2.7 Learning modality	: Face to face
2.8 Prerequisites	: CE2M2. Mechanics of Materials II. (5 th Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Steel Design covers the fundamentals and application of the limit states design method (LRFD/ASD) to structural steel members and connections. The course addresses structural steel grades, design criteria and load combinations, the design of tension and compression members, compact and non-compact beams and plate girders, beam-columns under combined flexure-compression/tension, bolted and welded connections, and composite members in compression and in flexure. It provides the design competencies required for steel-framed buildings and industrial structures.

5. GOALS

- Apply LRFD/ASD design criteria and load combinations to structural steel members.
- Design tension members, compression members, beams, and plate girders using the limit states method.
- Design beam-columns under combined axial force and bending, and their bolted and welded connections.
- Design composite members in compression (encased and concrete-filled columns) and in flexure (composite beams).

6. COMPETENCES

ABET-1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (Usage)

ABET-2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (Usage)

7. TOPICS

Unit 1: Design of Steel Members in Tension and Compression (19 hours)	
Competences Expected: ABET-1,ABET-2	
Topics	Learning Outcomes
• Tension member design and effective area considerations • Compression member design and column buckling	• Design tension members considering net area and block shear [Assessment] • Select appropriate column sections and check buckling capacity [Usage]
Readings : [MC19], [Ste17]	

Unit 2: Design of Steel Members in Flexure (29 hours)	
Competences Expected: ABET-1,ABET-2	
Topics	Learning Outcomes
• Flexural design of beams and lateral-torsional buckling • Combined axial force and bending interaction • Plate girders and web design	• Proportion steel beams considering both local and lateral-torsional buckling [Assessment] • Evaluate beam-columns using interaction equations [Usage] • Design plate girders with consideration of web buckling and stiffeners [Assessment]
Readings : [MC19], [Ste17]	

Unit 3: Steel Connections and Composite Systems (36 hours)	
Competences Expected: ABET-2	
Topics	Learning Outcomes
• Bolted connections design and failure modes • Welded connections and design considerations • Composite beams and shear connectors • Moment-resisting frames and seismic provisions for steel structures • Braced frames and concentrically braced frame design • Connection design for special moment frames and prequalified connections	• Design bolted connections for shear, tension, and combined loading [Assessment] • Specify welded connections and determine weld sizes [Usage] • Analyze composite beams and design shear stud connectors [Usage] • Design moment-resisting frames for seismic and wind loads [Assessment] • Proportion bracing members and connections in braced frame systems [Usage] • Detail prequalified moment connections according to seismic provisions [Assessment]
Readings : [Seg18], [Ste17]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

***** EVALUATION MISSING *****

10. BASIC BIBLIOGRAPHY

- [Ste17] American Institute of Steel Construction. *Steel Construction Manual*. Tech. rep. American Institute of Steel Construction, 2017.
- [Seg18] William T. Segui. *Steel Design*. 6th. Cengage Learning, 2018.
- [MC19] Jack C. McCormac and Stephen F. Csernak. *Structural Steel Design*. 6th. Pearson, 2019.