Fall 2024 University of New Mexico
Structural Design in Metals

Course Title CE424-001 / CE524–001 (29796 / 29807)

Credits 3 credits

Instructor

Dr. Fernando Moreu, PE
fmoreu@unm.edu (best way to contact me)
CENT-3056 (third floor Centennial Engineering Center, South West corner),
Office phone (505) 277-1784

Dr. Fernando Moreu is an Associate Professor in the Department of Civil, Construction and Environmental Engineering (CCEE). He has worked for over ten years as a structural engineer involved in the design and construction of over 30 bridges across seven states in the US Midwest. He is the founder and director of the Smart Management of Infrastructure Laboratory (SMILab http://smilab.unm.edu/).

Class hours Tuesdays and Fridays 2:00-3:15 PM

Office hours TBD

Class location CEC 3001; Students should plan to be ready to start the class at 2PM.

Course Goals

To develop excellent structural engineers who understand the fundamental behavior of steel members, connections, and systems, and can apply this understanding to analysis, design, investigation, and assessment. The primary materials studied in this course are steel analysis and design. This course will provide a high-level view of structural steel engineering design will be provided with multiple industry examples and hand-on design assignments. This course is offered for structural engineers. Those who are interested in structural design but without structural engineering background (other majors or areas of concentration) are encouraged to contact the instructor to discuss the contents of the course and whether this is the right course for their studies.

Student Learning outcomes

This course will enable students to:

1. Understand the principles and procedures for designing structural steel systems which are common in civil engineering, with an emphasis on buildings and bridges.
2. Comprehend and apply the theoretical and experimental background related to the behavior and performance of structural steel, connections, and systems.
3. Design structural steel elements, connections, and system using standard codes, manuals, and specifications.
4. Comprehend the fundamental decisions and components involved in the structural performance of systems by understanding their fundamental design and behavior.
5. Develop an ability to solve structural steel design challenges in close-to-real design projects that will be assigned during the semester.
6. Be better prepared to know what is the profession of structural engineers in private and public positions through guest lecturers, discussions on structural skills, and practice in the design of steel details.
7. Be inspired by the new technologies related to steel design, construction, inspection, and repair for future careers in research, national laboratories, or entrepreneurship in structural design.

Texts

1. American Institute of Steel Construction, "Steel Construction Manual," 16th Edition, 2023.
2. Segui, William T., "Steel Design," Sixth Edition, Cengage Learning, 2018. (Earlier editions are also okay.)
3. (Optional)"Minimum Design Loads for Buildings and Other Structures," ASCE7-10, American Society of Civil Engineers, 2010.
4. Various supplementary materials will be provided

Software

1. SAP2000 (obtain from the Civil Engineering System Administrator)
2. AutoCAD (obtain from the Civil Engineering System Administrator)
3. MatLab (download from http://it.unm.edu/download/index.html)

Grading

Up to 2 Midterms:	40 points
Homework:	10 points
Final Exam:	20 points
Semester Project (s):	20 points
Quizzes and Participation:	10 points

Grade Scale

A (>90%), A- (85-90%), B+ (80-85%), B (75-80%), B- (70-75%), C (60-70%), F (<60%)

Course Contents (Approximate)

1. Background on structural steel and introduction to design philosophies
2. Behavior and design of tension members
3. Behavior and design of compression members (columns)
4. Behavior and design of flexural members (beams)
5. Introduction to members with axial and flexural loads (beams-columns)
6. Behavior and design of simple (tension) and welded connections
7. Introduction to new technologies for steel structural design: Computer-Aided Augmented Reality (AR) and human-steel structural design interfaces (depending on time and schedule)

Course Requirement

CE308

Homework

Homework will typically consist mostly of hard copy solutions for problems related to the concepts of the class. The homework will generally be delivered electronically (scanned) but there will be times when the homework is handed in before the start of class.

Your problem solutions will generally involve sketches, calculations, and written, detailed descriptions of your solution method and procedure/s. Consequently, organization and neatness are essential and will be graded. Given this is the first time this course is presented with distancing, there will be innovative resources for students to access the materials. Given in-person activities will be reduced, interaction with the materials will be enhanced.

You are encouraged to work together with classmates to understand concepts and develop approaches for problem-solving throughout the course. However, each student must submit their own/individual work. Evidence of inappropriate collaboration (i.e., submitting identical assignments) will result in no credit for that homework. Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments, claiming credit for work not done or done by others, hindering the academic work of other students, misrepresenting academic or professional qualifications within or without the University, and nondisclosure or misrepresentation in filling out applications or other University records.

The homework is due at a given date and time. I recommend you submit your homework before this time. I strongly recommend you send your homework on time.

Semester Project/s

There will be group projects during the semester that will include design, analysis, and online reporting to the class of the final design. The group projects expect high-level design details as well as high quality reporting to the rest of the classmates and external judges. There will be one or possibly two-semester projects throughout the semester.

Quizzes and Participation

It is imperative to contribute to the class action and there will be quizzes and other activities (seminars, lectures, videos) to enhance your engagement with the instructor. Quizzes may take place during classes and may or may not be announced throughout the semester. They may or may not include collaborative problems.

Class Etiquette

In this class, you are expected to attend professionally. Some students taking this class are working full time. Everyone attending the class is expected to participate in a learning environment in the lecture, as well as office hours. In general, you will benefit the most if you participate in the active Q&As, contribute to the discussion sessions, and ask questions. Every student is expected to behave professionally while attending college, and this class will ensure there is a professional environment, promoting student learning during the class.

Expected Work in This Class

This is a three credit-hour course. Class meets for three 50-minute sessions of direct instruction for fifteen weeks during the Fall 2022 semester. Please plan for a *minimum* of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.

Course Outcomes

Regarding:
Engineering Accreditation Commission Accreditation Board for Engineering and Technology (ABET)

The following ABET-specified outcomes are required from this course:

(a) An ability to apply knowledge of mathematics, science, and engineering
(c) An ability to design a system, component, or process to meet desired needs
(e) An ability to identify, formulate, and solve engineering problems
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

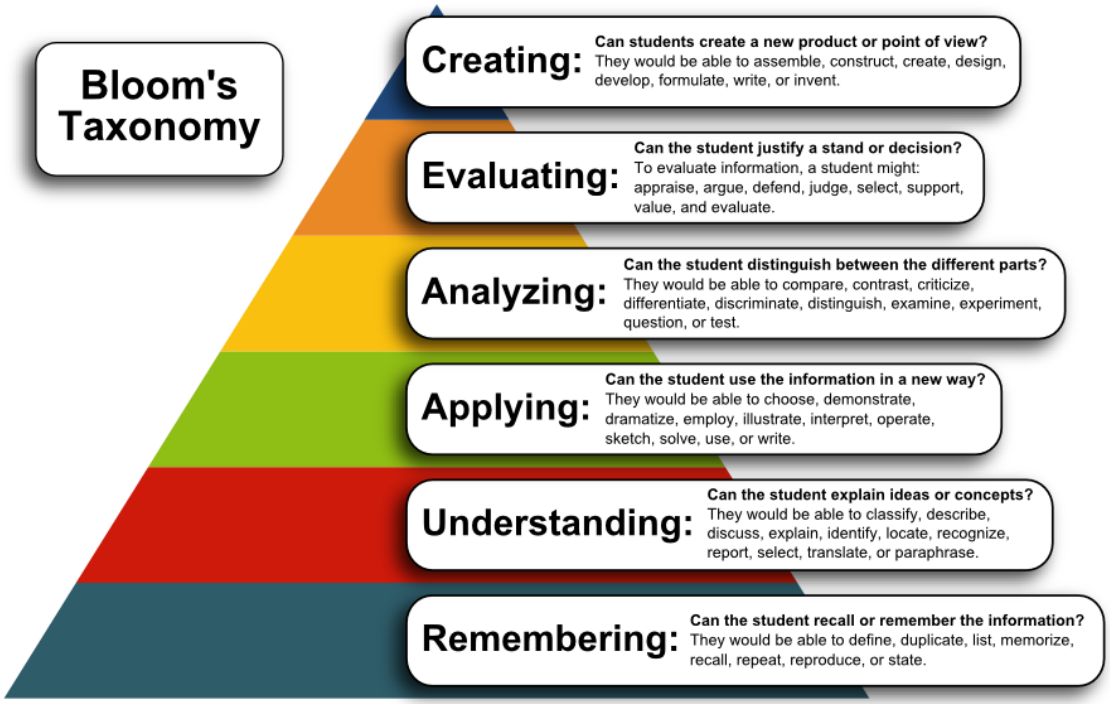
The following UNM Civil Engineering-specified outcomes are required from this course:

A. Graduates will achieve an appropriate level of **technical competence** in:
   2. Using modern tools for engineering analysis, including computers and sophisticated laboratory equipment.
   3. Approaching and solving engineering problems in a structured manner.
   4. Synthesizing knowledge from various sources to produce creative, cost-effective designs for civil engineering facilities.

B. Graduates will be prepared for the **engineering profession** through:
   8. An ability to communicate effectively, both in written and oral forms, as well as an ability to listen.

C. Graduates will have an **educated view of the world**, including:
   11. An understanding of the role and limitations of technology in addressing society's problems.

Educational Psychology - Bloom's Taxonomy
(Bloom 1956, revised by Anderson 2001)



(Figure from Baruch College)

COVID-19 Health and Awareness: UNM is a mask friendly, but not a mask required, community. If you are experiencing COVID-19 symptoms, please do not come to class. If you do need to stay home, please communicate with me at fmoreu@unm.edu; I can work with you to provide alternatives for course participation and completion. Let me, an advisor, or another UNM staff member know that you need support so that we can connect you to the right resources. Please be aware that UNM will publish information on websites and email about any changes to our public health status and community response.

Respectful and Responsible Learning We all have shared responsibility for ensuring that learning occurs safely, honestly, and equitably. Submitting material as your own work that has been generated on a website, in a publication, by an artificial intelligence algorithm, by another person, or by breaking the rules of an assignment constitutes academic dishonesty. It is a student code of conduct violation that can lead to a disciplinary procedure. *Please ask me for help in finding the resources you need to be successful in this course. I can help you use study resources responsibly and effectively.* Off-campus paper writing services, problem-checkers and services, websites, and AIs can produce incorrect or misleading results. Learning the course material depends on

completing and submitting your own work. UNM preserves and protects the integrity of the academic community through multiple policies including policies on student grievances (Faculty Handbook D175 and D176), academic dishonesty (FH D100), and respectful campus (FH CO9). These are in the *Student Pathfinder* (https://pathfinder.unm.edu) and the *Faculty Handbook* (https://handbook.unm.edu).

Accommodation Statement UNM is committed to providing equitable access to learning opportunities for students with documented disabilities. As your instructor, it is my objective to facilitate an inclusive classroom setting, in which students have full access and opportunity to participate. To engage in a confidential conversation about the process for requesting reasonable accommodations for this class and/or program, please contact Accessibility Resource Center at arcsrvs@unm.edu or by phone at 505-277-3506. For support, you can contact me at fmoreu@unm.edu at office hours or schedule a meeting.

Title IX Statement: Our classroom and our university should always be spaces of mutual respect, kindness, and support, without fear of discrimination, harassment, or violence. Should you ever need assistance or have concerns about incidents that violate this principle, please access the resources available to you on campus. Please note that, because UNM faculty, TAs, and GAs are considered "responsible employees" any disclosure of gender discrimination (including sexual harassment, sexual misconduct, and sexual violence) made to a faculty member, TA, or GA must be reported by that faculty member, TA, or GA to the university's Title IX coordinator. For more information on the campus policy regarding sexual misconduct and reporting, please see: https://policy.unm.edu/university-policies/2000/2740.html. For example, you can contact the Women's Resource Center, the LGBTQ Resource Center, Student Health and Counseling (SHAC), or LoboRESPECT. LoboRESPECT can be contacted on their 24-hour crisis line, (505) 277-2911, and online at loborespect@unm.edu. You can receive non-confidential support and learn more about Title IX through the Title IX Coordinator at (505) 277-5251 and http://oeo.unm.edu/title-ix/. Reports to law enforcement can be made to UNM Police Department at (505) 277-2241.

Citizenship and/or Immigration Status: All students are welcome in this class regardless of citizenship, residency, or immigration status. Your professor will respect your privacy if you choose to disclose your status. As for all students in the class, family emergency-related absences are normally excused with reasonable notice to the professor, as noted in the attendance guidelines above. UNM as an institution has made a core commitment to the success of all our students, including members of our undocumented community. The Administration's welcome is found on our website: http://undocumented.unm.edu/.

Support in Receiving Help and in Doing What is Right: I encourage students to be familiar with services and policies that can help them navigate UNM successfully. Many services exist to help you succeed academically, and to find your place at UNM, see students.unm.edu or ask me for information about the right resource center or person to contact. UNM has important policies to preserve and protect the academic community, especially policies on student grievances (Faculty Handbook D175 and D176), academic dishonesty (FH D100), and respectful campus (FH CO9). These are in the *Student*

Pathfinder (https://pathfinder.unm.edu) and the *Faculty Handbook* (https://handbook.unm.edu). Please ask for help in understanding and avoiding plagiarism or academic dishonesty, which can both have very serious disciplinary consequences.

Land Acknowledgement: Founded in 1889, the University of New Mexico sits on the traditional homelands of the Pueblo of Sandia. The original peoples of New Mexico Pueblo, Navajo, and Apache since time immemorial, have deep connections to the land and have made significant contributions to the broader community statewide. We honor the land itself and those who remain stewards of this land throughout the generations and also acknowledge our committed relationship to Indigenous peoples. We gratefully recognize our history.

Connecting to Campus and Finding Support: UNM has many resources and centers to help you thrive, including opportunities to get involved, mental health resources, academic support such as tutoring, resource centers for people like you, free food at Lobo Food Pantry, and jobs on campus. Your advisor, staff at the resource centers and Dean of Students, and I can help you find the right opportunities for you.