CEM 270 CONSTRUCTION ENGINEERING MECHANICS

University of Nevada, Las Vegas
Civil and Environmental Engineering and Construction Department

Course Information:

Semester: Fall 2021
Lecture Day: Monday and Wednesday
Lecture Time: 4:00 p.m. – 5:15 p.m.
Classroom: GRA 129
Credit Hours: 3

Catalog Description:

Basic Principles of engineering mechanics for constructors. Vector, static analysis, stress, strain, Mohr's circle, beams, columns and trusses are covered. Computer application

This course is to develop a basic understanding of principles of engineering mechanics in context of statics for civil engineers including constructors. Specifically, the course will introduce the concepts of engineering based on forces in equilibrium. Vectors, static analysis, beams, columns, trusses, and simple framed structures are covered. Computer applications will be also introduced.

Prerequisites:

CEM 250, Math 181 and (Phys 151/151L or Phys 180/180L); All prerequisites must be completed with a grade of C or better.

Course Learning Outcomes:

- Develop competence in basic principles of statics
- Apply the general analysis procedure to statics
- Apply free-body diagrams for statics problems
- Develop a flow chart for a general and specific engineering problems
- Conduct analysis using equivalent force/moment system problems ***(SLO #19 – Understand the basic principles of structural behavior)***
    - Evaluate rigid-body equilibrium conditions for two dimensional problems using various techniques
    - Evaluate rigid-body equilibrium conditions for three dimensional problems using vector analysis
    - Evaluate rigid-body equilibrium conditions for plane trusses using the methods of joints and sections
    - Evaluate rigid-body equilibrium conditions for simple frames and beams
    - Evaluate stress and strain under application of loads
    - Apply Mohr's Circles for stress and strain analysis
- Compute the centroid and moment of inertia for a cross-section

Required Skills:

Proficient in mathematics from the prerequisites (particularly, vector, trigonometry, and calculus including derivation and simple integration)

Computing Tools:

A scientific calculator can be used for any activities in this course. Calculators currently approved by NCEES for the FE (EIT) test are:

- Hewlett Packard — HP 33S or 35s
- Casio: Ali fx-115 models. Any Casio calculator must contain fx-115 in its model name.
- Texas Instruments - All TI-30X and TI-36X models. Any Texas Instruments calculator
- must contain either TI-30X or TI-36X in its model name.
- See: http://ncees.org/exams/calculator-policy/

It is required to use engineering grid papers for homework.

Instructional Methods:

This course will be conducted in a lecture format. The instructor will make in-person presentations for each lecture in the classroom during the class hours. Class lectures are premised on familiarity with assigned readings and homework assignments. Therefore, class material will not necessarily replicate assigned reading material, and both will be covered on exams. The instructor will try to provide additional videos from YouTube or other sources to help students learning. Any material covered by videos shown and speakers presentations may also be covered on exams. Students are responsible for reading the appropriate material before it is covered in lecture. Additionally, it is recommended that students have their copy of the text and other reading materials to each lecture (used as a reference), specifically, when the instructor is covering textbook material.

Course Topics:

The following topics will be covered in the course. The following listing is a general indication of the order of their coverage. However, I reserve the right to change the order of coverage and the topics to be covered based upon the class's performance and interests.

- Mathematics review
- General engineering analysis procedure
- Coordinate systems and two- and three-dimensional vector analysis
- Vector analysis
- Flow charts and procedures for solving a class of problem
- Forces (concentrated and distributed)
- Moments
- Equilibrium equations
- Equilibrium of a particle
- Free-body diagrams for rigid bodies
- Equilibrium of rigid bodies

- Plane trusses
- Method of Joints
- Method of Sections
- Frames and Machines
- Internal shear and moment of beams
- Shear and Moment Diagrams
- Center of mass, center of gravity, and the centroid
- Stress, Strain, and Mohr's Circle

Course Requirements:

Students will engage in the following activities:

- Attend classes
- Read assigned material prior to class sessions
- Participate in discussions and problem solving
- Complete homework
- Complete class assignments
- Complete major examinations
- Complete a final examination

Required and/or Recommended Books and Materials:

- Text Book (main book): ***Engineering Mechanics: Statics, 14th edition*** by R.C. Hibbeler
- and: ***Mechanics of Materials***, by R.C. Hibbeler, or ***Mechanics of Materials***, by F.P. Beer, E.R. Johnston et al.

Out-of-class Assignments and Due Dates:

(Refer to the schedule in the last page)

Assignment Weights:

- Homework: 15 %
- Quizzes: 15 %
- Exam I: 20 %
- Exam II: 25 %
- Final Exam: 25 %

Extra Credit Assignment Options:

Professor, at his sole discretion, may provide students with an opportunity to complete extra credit test or assignments.
Students who actively and continuously participate in class activities (e.g., Q&A in and out of class, problem solving…) will receive additional points towards their final grades. Extra points that students receive will be officially noted.

Homework:

Homework will be due at the commencement of the specified class period. Assignments must be submitted on-Canvas, before or when due even if the student will be absent from

class on the due date. All problem-solving/computation homework will be done in ***"engineering grid paper"*** and will not be accepted on standard ruled paper. Assignments with spelling, grammatical, or mechanical errors—or with obvious erasures, cramped margins, coffee stains, etc.—will be downgraded. For certain problems that you are not satisfied, redoing them is permitted to claim half of the lost points. Redoing must be done within a week after the homework is returned to students.

Examinations:

Students are expected to take two midterm exams that will be held during the semester and one final exam at the end of the semester. All three exams will be in-person. unless the university changes its policies and opens the campus for in-person meetings. The first midterm exam is tentatively scheduled for week 7 of the semester. The second is tentatively scheduled for week 10 of the semester. The exams will be cumulative although more contents will be from newly learned topics. After exams are graded, they will be reviewed, but not returned. Exams will be closed book and closed notes, except for one 8.5x11 page, double-sided, of notes, which will be allowed for each exam.

Exams are strictly individual efforts. Cheating in any form will not be tolerated, including bringing additional materials to the exam, collaborating or sharing notes with other students, talking during the exam, using cellphones, etc.

Methods of Course Learning Outcome Assessments:

- Homework Assignments – Individual assignments (SLO#19)
    - Homework assignment will assess the student's ability to use techniques to analyze force and reactions for a structure given loadings
- Two mid-term exams and one final exam (SLO#19)
    - The selected questions in these exams will assess the individual knowledge on analysis of force/moment system problems in a comprehensive manner

Grading Performance Criteria:

Letter Grade	GPA	Score Range	Subjective Criteria	Range
A	4.0	≥ 93	Superior knowledge	**Accepted**
A-	3.7	≥ 90	Exceptional knowledge	**Accepted**
B+	3.3	≥ 87	Good knowledge	**Accepted**
B	3.0	≥ 84	Above average knowledge	**Accepted**
B-	2.7	≥ 80	Above average knowledge	**Accepted**
C+	2.3	≥ 77	Met minimum knowledge standards	**Marginally Acceptable**
C	2.0	≥ 74	Met minimum knowledge standards	**Marginally Acceptable**
C-	1.7	≥ 70	Did not meet minimum standards	**Unacceptable**
D+	1.3	≥ 67	Did not meet minimum standards	**Unacceptable**

D	1.0	≥ 64	Did not meet minimum standards	**Unacceptable**
D-	0.7	≥ 60	Did not meet minimum standards	**Unacceptable**
F	0.0		Did not meet minimum standards	**Unacceptable**

Class policies:

Incomplete Grades:
The grade of I—Incomplete—can be granted when a student has satisfactorily completed three-fourths of course work for that semester/session but for reason(s) beyond the student's control, and acceptable to the instructor, cannot complete the last part of the course, and the instructor believes that the student can finish the course without repeating it. The incomplete work must be made up before the end of the following regular semester for undergraduate courses. If course requirements are not completed within the time indicated, a grade of F will be recorded and the GPA will be adjusted accordingly. Students who are fulfilling an Incomplete do not register for the course but make individual arrangements with the instructor who assigned the "Incomplete" grade.

Late Policy:
No late homework, quizzes, examinations will be accepted unless valid reasons, such as doctors' notes, official work activities, and proof of official academic activities, are presented in advance.

Communication Skills:
Communication skills are paramount to a successful career. Therefore, communication skills, written and oral, will be evaluated in all coursework; Neatness counts in grade. Lengthy and major assignments involving significant writing will have writing as 30 percent of their evaluation criteria.

Class Attendance Policy:
Class attendance is vital for student and professor communication and learning. Attendance is mandatory. The following is directly quoted from the Fall 2020- Spring 2021 University Undergraduate Catalog: http://catalog.unlv.edu/index.php

"Class Attendance Policy: Registration in a course obligates the student to be regular and punctual in class attendance. Students who without previous arrangement with the instructor or department fail to attend the first two class meetings of a course that meets multiple times per week or the first meeting of a class that meets one time per week may be dropped from the course. Nonattendance for a web-based course shall be defined as failure to log onto Web Campus or other instructor-designed website within one week of course start date without previous arrangements with the instructor or department. A student may be dropped for nonattendance only during the regular drop/add period of the term. Nonattendance does not release students from the responsibility to officially drop any course for which they have enrolled and choose not to complete, nor from financial obligation to pay for the course.

Class Absences:
There are no official absences from any university class. It is the student's responsibility to consult with the teaching faculty regarding absences from their class. Students may be dropped from classes for nonattendance during the first week of instruction upon notification by the instructor.
It is the policy of the Nevada System of Higher Education to be sensitive to the religious obligations of its students. Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The makeup will apply to the religious-holiday absence only. It shall be the responsibility of the student to notify the instructor no later than the last day of late registration of his or her intention to participate in religious holidays that do not fall on state holidays or periods of class recess. This policy shall not apply in the event that administering the test or examination at an alternate time would impose an undue hardship on the instructor or the university that could not reasonably have been avoided.
Any student who is denied a make-up option after appropriately notifying the teaching faculty, shall have the right to appeal that decision through the normal appeal mechanism in place at the university."

Because many of our students are employed, the Construction Management faculty has established a policy that considers the needs of our students. This policy allows for some **authorized** absences. However, no more than six (6) employment-related excused absences will be allowed. An absence is defined as missing one 1-hour and 15-minute lecture. Employment-related absences require an official letter from the employer's human resources department (NO EXCEPTIONS – a note from your project manager is not acceptable – so don't even ask). The letter must be on official company letterhead and signed by the human resources department manager. At the instructor's sole discretion employment-related absences may be independently verified with the human resources department. If your human resources manager will not provide the necessary documentation then the absence is unexcused. Medically-excused absences must be accompanied by an official document written by a physician. **More than six (6) or more unauthorized class absences will result in a failing grade. The student is personally** responsible for acquiring the information missed as a result of an absence, excused or otherwise. If you miss class for any reason, you are still responsible for the material and content of the class and for any assignment given for the next class. Also, assignments must be submitted when due even if the student will be absent from class on the due date. Religious holidays and university activities are covered in a later section.

Other Pertinent Information

Final Date:
to drop or withdraw from this class without a refund, or change from credit to audit, without refund is ***November 2, 2020***.

Faculty Titles:
Students are to address faculty members in a professional manner with their appropriate title. If the individual holds the Doctor of Philosophy degree (Ph.D.), Doctor of Engineering (D.Eng.), Doctor of Science (Sc.D.), Doctor of Education (Ed.D.) or other doctoral degree and is instructing your class, you may address them as Dr. (surname) or Professor (surname) depending on that faculty member's preference. In all other cases the faculty member shall be addressed as Professor (surname). Do not address a faculty member as Mr., Mrs., or Ms. as that does not convey your acknowledgement of the faculty member's professional relationship to you. Under no circumstances are you to address the faculty member in a familiar manner using their first name, nickname, or just their surname.

Respect for Faculty Time:
Faculty have myriad responsibilities ranging far beyond this course within the university environment. The CEM Faculty will be accommodating as reasonably possible. Most faculty spend considerably more time on a course per week than does the individual student. It is not reasonable to expect that a faculty member will take on the role of a tutor nor will he/she.

Instructor:
- Name:
- Office:
- Phone:
- E-mail:

Office Hours:
Meetings will be in-person or online (based on campus rules) by appointment. All appointments must be scheduled at least one day in advance.

Disclaimer:
The contents of this document are to be considered "tentative" and subject to change as the instructor deems necessary.

University Policies

Public Health Directives
Face coverings are mandatory for all faculty and students in the classroom. Students must follow all active UNLV public health directives while enrolled in this class. UNLV public health directives are found at https://www.unlv.edu/coronavirus/health-requirements. Students who do not comply with these directives may be asked to leave the classroom. Refusal to follow the guidelines may result in further disciplinary action according to the UNLV Code of Student Conduct, https://www.unlv.edu/sites/default/files/page_files/27/StudentConduct-Code.pdf, including being administratively withdrawn from the course.

Academic Misconduct
Academic integrity is a legitimate concern for every member of the University community. We all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility, and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy, and are encouraged to always take the ethical path whenever faced with choices. Students enrolling at UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's educational mission. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another person, from the Internet or any other source without proper citation of the source(s). See the Student Conduct Code, https://www.unlv.edu/studentconduct/student-conduct.

Auditing Classes
Auditing a course allows a student to continue attending the lectures and/or laboratories and discussion sessions associated with the course, but the student will not earn a grade for any component of the course. Students who audit a course receive the same educational experience as students taking the course for a grade, but will be excused from exams, assessments, and other evaluative measures that serve the primary purpose of assigning a grade.

Classroom Conduct
Students have a responsibility to conduct themselves in class and in the libraries in ways that do not interfere with the rights of other students to learn, or of instructors to teach. Use of devices such as cellular phones and pagers, or other potentially disruptive activities are only permitted with the prior explicit consent of the instructor. Students are specifically prohibited to record classes without instructor authorization, including online/remote classes (either audio only, or video and audio). The instructor may rescind permission at any time during the class. If a student does not comply with established requirements or obstructs the functioning of the class, the instructor may initiate an administrative withdrawal of the student from the course.

Since the COVID-19 pandemic forced some instruction to be delivered remotely starting in Spring 2020, numerous students have asked instructors to record their synchronous classes, so that they can access them at their convenience. Instructors who agree to record their classes (audio only, or video and audio) should inform students in advance. Recorded lectures may not be broadly released to anyone, but made available exclusively to those students enrolled in the class during the particular academic term. Recorded lectures must be stored securely, and are subject to the Nevada System of Higher Education's Records Retention Policy, meaning that the recordings can only be deleted 120 days after the end of class (i.e., after grades are posted). Once this requirement is met, the recordings should be deleted. Class recordings are protected from disclosure, as they are deemed part of an educational record under the Family Educational Rights and Privacy Act (FERPA).

Copyright
The University requires all members of the University Community to familiarize themselves with, and to follow copyright and fair use requirements. You are individually

and solely responsible for violations of copyright and fair use laws. The University will neither protect nor defend you, nor assume any responsibility for employee or student violations of fair use laws. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional copyright policy information is available at https://www.unlv.edu/provost/copyright.

Disability Resource Center (DRC)
The UNLV Disability Resource Center (Student Services Complex, SSC-A, Room 143, https://www.unlv.edu/drc, telephone 702-895-0866) provides resources for students with disabilities. Students who believe that they may need academic accommodations due to a permanent disability, temporary or permanent medical need, or academic support due to pregnancy are encouraged to contact the DRC as early as possible in the academic term. A Disabilities Specialist will discuss what options may be available to you. Students who are already registered with the DRC should request their accommodations online each semester, and make an appointment to discuss their accommodations with their instructors.

Final Examinations
The University requires that final exams given at the end of a course occur on the date and at the time specified in the Final Exam schedule. The Final Exam schedule is typically available at the start of the semester, and the classroom locations are available approximately one month before the end of the semester. See the Final Exam Schedule, https://www.unlv.edu/registrar/calendars.

Identity Verification in Online Courses
All UNLV students must use their Campus-issued ACE ID and password to log in to WebCampus-Canvas.

UNLV students enrolled in online or hybrid courses are expected to read and adhere to the Student Academic Misconduct Policy, https://www.unlv.edu/studentconduct/misconduct/policy, which states that "acting or attempting to act as a substitute for another, or using or attempting to use a substitute, in any academic evaluation or assignment" is a form of academic misconduct. Intentionally sharing ACE login credentials with another person may be considered an attempt to use a substitute, and could result in investigation and sanctions, as outlined in the Student Academic Misconduct Policy.

UNLV students enrolled in online courses are also expected to read and adhere to the Acceptable Use of Computing and Information Technology Resources Policy, https://www.it.unlv.edu/policies/acceptable-use-computing-and-information-technology-resources-policy, which prohibits sharing university accounts with other persons without authorization.

To the greatest extent possible, all graded assignments and assessments in UNLV online courses should be hosted in WebCampus-Canvas or another UNLV-managed platform that requires ACE login credentials for access.

Incomplete Grades
The grade of "I" (Incomplete) may be granted when a student has satisfactorily completed three-fourths of course work for that semester/session, but cannot complete the last part of the course for reason(s) beyond the student's control and acceptable to the instructor, and the instructor believes that the student can finish the course without repeating it. For undergraduate courses, the incomplete work must be made up before the end of the following regular semester. Graduate students receiving "I" grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the period indicated, a grade of "F" will be recorded, and the student's GPA will be adjusted accordingly. Students who are fulfilling an Incomplete grade do not register for the course, but make individual arrangements with the instructor who assigned the "I" grade.

Library Resources
Librarians are available to consult with students on research needs, including developing research topics, finding information, and evaluating sources. To make an appointment with a subject expert for this class, please visit the Libraries' Research Consultation website, https://guides.library.unlv.edu/appointments/librarian. You can also ask the library staff questions via chat and text message at https://ask.library.unlv.edu/.

Missed Classwork
Any student missing class, quizzes, examinations, or any other class or laboratory work because of observance of religious holidays will be given an opportunity during that semester to make up the missed work. The make-up opportunity will apply to the religious holiday absence only. It is the responsibility of the student to notify the instructor within the first 14 calendar days of the course for Fall and Spring courses (except for modular courses), or within the first 7 calendar days of the course for Summer and modular courses, of their intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit the Missed Work policy, under Registration Policies, on the Academic Policies webpage, https://catalog.unlv.edu/content.php?catoid=29&navoid=7326.

In accordance with the policy approved by the Faculty Senate regarding missed class time and assignments, students who represent UNLV in any official extracurricular activity will also have the opportunity to make up assignments, provided that the student provides official written notification to the instructor no less than one week prior to the missed class(es).

The spirit and intent of the policy for missed classwork is to offer fair and equitable assessment opportunities to all students, including those representing the University in extracurricular activities. Instructors should consider, for example, that in courses which offer a "Drop one" option for the lowest assignment, quiz, or exam, assigning the student a grade of zero for an excused absence for extracurricular activity is both contrary to the intent of the Faculty Senate's policy, and an infringement on the student's right to complete all work for the course.

This policy will not apply in the event that completing the assignment or administering the examination at an alternate time would impose an undue hardship on the instructor or the University that could be reasonably avoided. There should be a good faith effort by both the instructor and the student to agree to a reasonable resolution. When disagreements regarding this policy arise, decisions can be appealed to the Department Chair/School Director, College/School Dean, and/or the Faculty Senate Academic Standards Committee.

For purposes of definition, extracurricular activities may include, but are not limited to: academic recruitment activities, competitive intercollegiate athletics, fine arts activities, liberal arts competitions, science and engineering competitions, and any other event or activity sanctioned by a College/School Dean, and/or by the Executive Vice President and Provost.

Rebelmail
Rebelmail is UNLV's official email system for students and by University policy, instructors and staff should only send emails to students' Rebelmail accounts. Rebelmail is one of the primary ways in which students receive official University communications, information about deadlines, major Campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the University. Emailing within WebCampus-Canvas is also acceptable.

Tutoring and Coaching
The Academic Success Center (ASC), at the Claude I. Howard Building, provides tutoring, academic success coaching, and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring times, and other ASC programs and services, please visit the ASC website, https://www.unlv.edu/asc, or call 702-895-3177. The ASC is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of SSC A, Room 254. Drop-in tutoring is located on the second floor of the Lied Library, and on the second floor of the College of Engineering building (TBE A 207).

UNLV Writing Center
One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, https://writingcenter.unlv.edu/, located in the Central Desert Complex, Building 3, Room 301 (CDC 3–301). Walk-in consultations are sometimes available, but students with appointments receive priority assistance. Students may make appointments in person or by calling the Center, telephone 702-895-3908. Students are requested to bring to their appointments their Rebel ID Card, a copy of the instructions for their assignment, and two copies of any writing they have completed on their assignment.

Diversity Statement
As an institution of higher learning, UNLV represents a rich diversity of human beings among its faculty, staff, and students, and is committed to aspiring to maintain a Campus environment that values that diversity. Accordingly, the University supports understanding and appreciation of all members of its community, regardless of race, sex, age, color,

national origin, ethnicity, creed, religion, disability, sexual orientation, gender, gender identity, marital status, pregnancy, genetic information, veteran status, or political affiliation. Please see University Statements and Compliance, https://www.unlv.edu/about/statements-compliance.

A successful learning experience requires mutual respect and trust between the students and the instructor. Accordingly, the instructor asks that students be willing to listen to one another's points of view, acknowledging that there may be disagreements, keep discussion and comments on topic, and use first person, positive language when expressing their perspectives.

Schedule: The following table shows our tentative schedule (subject to change)

	Day	Date	Topic	Chapters	HW
1	Mon.	8/23	Syllabus, Introduction (basic math, units)	1.3 – 1.6	1
2	Wed.	8/25	Force vector: vector operations, coplanar	2.1 – 2.4	2
3	Mon.	8/30	Cartesian vectors, addition, position vectors	2.5 - 2.7	3
4	Wed.	9/01	Dot product	2.9	4
-	Mon.	9/06	Labor day recess	-	
5	Wed.	9/08	Quiz, Equilibrium of particles, Free Body Diagram	3.1 – 3.2	5
6	Mon.	9/13	Coplanar force systems	3.3	6
7	Wed.	9/15	Moment of force, cross product, principle	4.1 – 4.4	7
8	Mon.	9/20	Moment about a specific axis, couples	4.5 – 4.6	8
9	Wed.	9/22	Equivalent system, force and couple resultant	4.7 – 4.9	9
10	Mon.	9/27	Quiz, Equilibrium of rigid body: FBD (2D)	5.1 – 5.3	10
11	Wed.	9/29	Two and Three force members, constraints	5.4 , 5.7	11
12	Mon.	10/04	Exam 1 Review		
13	Wed.	10/06	Exam 1		
14	Mon.	10/11	Structural analysis: simple truss	6.1 – 6.3	12
15	Wed.	10/13	Method of sections	6.4	13
16	Mon.	10/18	Frames, machines,	6.6	14
17	Wed.	10/20	Quiz, Friction: dry friction	8.1 – 8.2	15
18	Mon.	10/25	Exam 2 review		
19	Wed.	10/27	Exam 2		
20	Mon.	11/01	Internal forces in structural members	7.1	16
21	Wed.	11/03	Shear and Moment Diagrams	7.2 – 7.3	17
22	Mon.	11/08	Quiz, Center of gravity, centroid	9.1 – 9.2	18
23	Wed.	11/10	Moment of Inertia	10.1-10.4	19
24	Mon.	11/15	Review		
25	Wed.	11/17	Quiz, Stress and strain (Axial)	TBD	20
26	Mon.	11/22	Stress and strain (Shear)	TBD	21
27	Wed.	11/24	Stress orientations (Mohr's Circle)	TBD	22
28	Mon.	11/29	Study week, Final Review		
29	Wed.	12/01	Study week, Final Review		
30	Mon.	12/06	Final Exam		
	Wed.	12/08			