CE 202: Engineering Mechanics: Statics

Spring 2021 CRN 64311 3 Cr. Hrs.
Remote Arranged – Synchronous Online T/TH 3:00-4:15
Zoom id: https://unm.zoom.us/j/94299939535
Passcode: 000587

Instructor: Nancy Engler
Instructor Email: englern@unm.edu

Instructor Led Study Sessions: Zoom T/Th at 10:15-12:15, 2:15-3 and by appointment.
Zoom id: https://unm.zoom.us/my/profengler

MECS Division Chair: Elaine W. Clark ewclark@unm.edu

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COURSE DESCRIPTION

Statics deals with forces acting on bodies that are in static equilibrium. It is typically the first course where science (physics) and mathematics (trigonometry & calculus) are brought to bear upon engineering applications. This course will cover statics of particles and rigid bodies in two- and three-dimensions using vector algebra as an analytic tool; centroids; distributed loads; trusses and frames; internal forces and friction. Critical thinking, problem solving methodologies, and three-dimensional visualization are just some of the skills that will be developed through this course.

Course Goals:

The emphasis in this course is on clearly communicating engineering ideas in an organized manner using correct notation.

Student Learning Outcomes/Course Objectives:

By the end of the course students will demonstrate understanding of:

- Forces, moments, and related vector mathematics operations;
- Equations of equilibrium for rigid bodies.
- The use of free-body diagrams to approach problems of equilibrium;
- Analysis of equilibrium systems that include frictional forces;
- Concepts of centroids and second moments of areas;
- Sketching of shear force and bending moment.

Prerequisites

- Math 1522 and Physics 1310

NOTE: if the embedded hyperlinks provided below will not open, go to the indicated footnote for the full URL link to open

In order to participate and succeed in this class, you will need to be able to perform the following basic technical tasks:

- Use UNM Learn (help documentation located in "How to Use Learn" link on left course menu, and also at Online Student Documentation[1]). Also, UNM-Valencia provides a Blackboard Learn Jumpstart self-learning module to give you practice with the most commonly used tools in UNM Learn. Ask Prof. Engler if you do not see the UNM-Valencia Blackboard Learn Jumpstart in your list of classes in UNM Learn.
- Use email – including attaching files, opening files, downloading attachments
- Copy and paste within applications including Microsoft Office
- Open a hyperlink (click on a hyperlink to access a website or online resource)
- Use Microsoft Office applications (see below about the free MS Office Suite available to UNM students)
    - Create, download, update, save and upload MS Word documents
    - Create, download, update, save and upload MS PowerPoint presentations
    - Create, download, update, save and upload MS Excel spreadsheets
    - Download, annotate, save, and upload PDF files
    - Access MS Teams
- Use Zoom web conferencing tool (see below)
- Download and install an application or plug in

TECHNICAL REQUIREMENTS

Computer

- A high-speed Internet connection is highly recommended.
- Supported browsers include: Detailed Supported Browsers and Operating Systems[2]
- Any computer capable of running a recently updated web browser should be sufficient to access your online course. However, bear in mind that processor speed, amount of RAM and Internet connection speed can *greatly* affect performance. ***Be aware, some programs that use mathematics will not work well on mobile devices such as smart phones or tablets.***
- For the best experience when using the Kaltura Media Tools inside UNM Learn, be sure to use a supported browser[3] on a desktop.
- Microsoft Office products are available free for all UNM students (more information on the UNM IT Software Distribution and Downloads page[4])
- Please update your contact information in Loboweb: MyUNM Login[5]. When you log into MyUNM, Enter LoboWeb. Click on the Personal Information link to make sure your contact information is up to date.

[1] http://online.unm.edu/help/learn/students/
[2] https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support
[3] https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support
[4] http://it.unm.edu/software/index.html
[5] http://my.unm.edu/home

- Laptops may be available for checkout for the Fall semester from the UNM-Valencia Library[6]. Contact UNM-Valencia Student Services[7] for more information.

Web Conferencing
Web conferencing will be used in this course for all class meetings or help sessions with the instructor. For these online sessions, you will need:

- A headset with microphone. (Recommended, not required) Headsets are widely available at stores that sell electronics, at the UNM Bookstore, or online.
- A high-speed internet connection is highly recommended for these sessions. A wireless Internet connection may be used if successfully tested for audio quality prior to web conferencing.
- You should also dress as you would when attending an in-person class, even if you do not turn on your video camera.
- To create a UNM supported Zoom account, visit the UNM Zoom[8] log in page.

Technical Support

- For UNM Learn Technical Support: (505) 277-0857 (24/7) or use the "Create a Tech Support Ticket" link in your course.
- For UNM-Valencia IT Support: (505)925-8911
- For UNM Web Conference Technical Help: (505) 277-0857

TEXTBOOK AND SUPPLEMENTAL MATERIALS

Required Textbook:
The text for this course is ***Engineering Mechanics: Statics***, 14th ed. by R. C. Hibbeler. ISBN-13: 978-0-13-391892-2. You can purchase this at the UNM-Valencia Bookstore, or wherever else you choose.

Recommended and/or Optional Textbooks, Journals and Articles:
Any additional readings for this class will be provided via links in UNM Learn.

Supplemental Materials:
You will need a non-graphing scientific calculator, straight edge, protractor, and compass. You may additionally use cell phones, computational websites, and computational software on course assignments. However, these additional tools **can not be used on exams**, so make sure you are familiar with the functions available on your scientific calculator.

[6] http://valencia.unm.edu/library/index.html
[7] http://valencia.unm.edu/students/student-services.html
[8] https://unm.zoom.us/

COURSEWORK, SCHEDULE, AND PARTICIPATION

Instructor Response Time

E-mail sent to me must include your course and section, full name, and the problem number of your question as listed on the assignment.
Exam grading inquiries must be submitted within one week of the return of the exam for consideration. These questions must include a photo, screen shot, or scan of the entire problem in question.
I will be checking email and UNM Learn regularly. You may expect a response within 24-48 hours from your email. If you have not heard from me by then, please contact me again. Massive numbers of emails received means yours may slip past me.

Procedures for Completing Coursework

- Each student is allowed one (1) unexcused late or resubmitted assignment each semester. Excused extensions will be granted for university or medical excused absences if you contact me at least 24 hours before the due date.
- Any other late work will be penalized by deducting 10% of the available points for each day it is late to a maximum of 50% unless arrangements are made **in advance.**
- Homework will be handwritten and must follow the format of the problem attached at the end of this syllabus. It will be uploaded through the Learn system. If you upload illegible, or incorrectly formatted work, it will not be graded. (If it is sideways, upside down, too pale or sloppy to read, or missing the identifying headers)
- **No assignments will be accepted after the Final Exam.**

Quizzes will be administered through UNM Learn. Exams will require you to be online at the pre-arranged class time where I will proctor the exam via Zoom.
If you anticipate difficulty meeting a deadline, I expect to be notified as far in advance. If possible. That notification should be sent to me via email at englern@unm.edu.
All written work needs to be submitted online. If you have a difficulty using a tool to complete work, use the “Create a Tech Support Ticket” link in the Course Menu immediately and notify your instructor as well.

Estimated Course Schedule

Week	Topics	Learning Objectives	Sects. in Text
1	Course Introduction and Syllabus	Describe Course Policies and Procedures	
	Vectors and Units	Review of Newton's three laws of motion. Use consistent units and convert between different formats. Explain the difference between a vector and a scalar. Recall vector notation in the text and notes. Recall rules for vector addition. Compute components of vectors by multiple techniques.	Sect 1.1- 1.6 Sects. 2.1-2.3
2	Cartesian Vectors and Position Vectors	Coplanar forces, Cartesian Vectors, Addition of Cartesian vectors, Position Vectors	Sects. 2.4-2.7
3	Vector Dot products	Force Vector Directed Along a Line using unit vectors, Dot Product to compute projection of one force on another, Dot product to find the angle between two vectors in space.	Sects. 2.8-2.9
4	Equilibrium of a Particle	Explain how a pulley can be frictionless, Draw 2D and 3D free body diagrams (FBD) for a particle	Sects. 3.1-3.4
5	Moments and Cross Products	Explain Right Hand Rule for moments, use the cross product to evaluate 2-D moments, compute the moment about a point, demonstrate how 2-D and 3-D moments are similar. Compute the moment about a given axis.	Sects. 4.1-4.5
6	Couples and Force Systems	Calculate the moment produced by a force couple, Express a system of forces as a force-couple, Solve for resultants and components of 2-D force systems.	Sects. 4.6-4.8 and First exam
7	Free body diagrams (FBD) 2-D Equilibrium	Identify the forces provided by different kinds of supports. Draw FBDs using forces as above. Write a set of rules or guidelines to help draw accurate FBDs. Define static equilibrium. Solve 2-D equilibrium problems.	Sects. 5.1- 5.4

Week	Topics	Learning Objectives	Sects. in Text
8	3-D Equilibrium, Externally Statical determinacy	Find FBDs, 3-D equilibrium, rectangular components of vectors in 3-D, define statically determinate and indeterminate, explain constraint requirements for a stable system	Sects. 5.5-5.7
Spring Break from March 15-19			
9	Introduction to Trusses, the method of Joints, zero force members, the method of sections	Describe how a truss carries load. List assumptions made when analyzing a truss. Distinguish between tension and compression. Use the method of Joints to compute truss bar forces. Use the method of sections to find truss bar forces. Identify zero force members.	Sects. 6.1- 6.4
10	Frames and Machines, Internal Loadings, Shear and Moment Equations Diagrams	Explain the definition, utility, and how to solve problems involving multi-force members. Draw shear and moment diagrams. Derive the differential relationships between distributed loading, shear, and bending moment	Sets. 6.6, 7.1-7.3
11	Center of Gravity, Center of Mass, centroids, and Composite Bodies	Describe the center of mass. Find the centroid of a function using an integral. Compute the centroid of regular and composite shapes using algebraic equations and composite bodies.	Exam 2, Sects. 9.1-9.2
12	Resultant of a General Distributed Load, Intro to Friction, Slipping vs. Tipping	Find the resultant of a distributed load. Find the reactions for beams. Explain static, impending, and kinetic friction. Solve equilibrium including friction.	Sects.9.4&4.9, 8.1-8.2
13	Friction: Wedges, Screws, Flexible belts, Journal Bearings	Solve equilibrium problems including the effect of friction on wedges and screws. Describe the action of friction on flexible belts and solve problems involving screws or belts. Derive and apply the fundamental equations to solve for Journal Bearings.	Sects. 8.3-8.5, 8.7
14	Moment of Inertia (MOI), MOI: Composite	Explain the significance of the area MOI, Compute rectangular MOI using integrals. Use the parallel axis theorem to transfer axes. Explain when you need to use the parallel axis theorem.	Sects. 10.1- 10.4
15	MOI: Products of Inertia	Compute the area product of inertia using integration and composite areas. Review for the final exam.	Sect. 10.5 and Review

Week	Topics	Learning Objectives	Sects. in Text
16	Final Exam May 13, 3:00-5 p.m.		

Expectations for Participation

Example Expectations:

- time required (9-12 hrs per week)
- students are expected to learn how to navigate in Learn
- students are expected to keep abreast of course announcements
- students are expected to use the Learn course email as opposed to a personal email address
- students are expected to keep instructor informed of class related problems, or problems that may prevent the student from full participation
- students are expected to address technical problems immediately
- students are expected to observe course netiquette at all times

Netiquette

NOTE: For links to online PDF formatted documents, you may need to give permission for the document to open. Look for a pop-up window asking for your permission

One of the overriding principles in online conversations is to "craft your responses effectively." It is sometimes difficult to remember that there are real people reading posted messages. This is especially true of online communication where others do not have the opportunity to see body language or hear tone of voice; therefore, misunderstandings are more likely.

Please, follow these guidelines in all of your online responses and discussion postings.

- Honor everyone's right to an opinion.
- Respect the right of each person to disagree with others.
- Respond honestly but thoughtfully and respectfully; use language which others will not consider foul or abusive. You may also use emoticons to convey a lighter tone.
- Respect your own privacy and the privacy of others by not revealing information which you deem private and which you feel might embarrass you or others
- Be prepared to clarify statements which might be misunderstood or misinterpreted by others.

A Special Note about Anger

- Do not send messages that you have written when you are angry, even anonymous ones. In the online world, angry messages are known as "flaming" and are considered bad behavior. Venting and flaming are two different things. It is possible to vent without becoming "ugly." Stick to the facts of what is causing you frustration.
- Do not send messages that are written all in upper case; this is the visual equivalent of SHOUTING. It is considered aggressive and is considered bad

behavior. If you ever feel like shouting a message, take a deep breath and wait until you have calmed down before responding. Then, respond in a calm and factual manner.

UNM Netiquette document[9]

NOTES TO STUDENTS ABOUT PARTICIPATION IN A COURSE USING UNM LEARN:

Tracking Course Activity

UNM Learn automatically records all students' activities including: your first and last access to the course, the pages you have accessed, the number of discussion messages you have read and sent, web conferencing, discussion text, and posted discussion topics. This data can be accessed by the instructor to evaluate class participation and to identify students having difficulty

Submitting Assignments

When you submit an assignment via UNM Learn, you will receive an email receipt of your submission from *do-not-reply@learn.unm.edu*. Save this email as confirmation of your submission.

GRADING PROCEDURES

Grade Weighting:	
Learning Exercises	20%
Written Homework	20%
2 Exams(20%each)	40%
Final Exam	20%

I will drop the lowest score from the MML HW and MML quizzes

Grading Scale

Final grades will be based on the weighted average of the categories as described above. Percentage earned:

Grade	
90 -100	A
80 -89	B
70 -79	C
60 -69	D
< 60	F

I will award grades with (+) as appropriate. I will not award grades with (–) as I consider them to be punitive.

[9] http://online.unm.edu/help/learn/students/pdf/discussion-netiquette.pdf

UNM POLICIES

Equal Opportunity and Non-Discrimination

In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered "responsible employees" by the Department of Education [10] (see pg. 15). This designation requires that any report of gender discrimination which includes sexual harassment, sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office of Equal Opportunity[11].

Read more about UNM policy regarding sexual misconduct[12].

Copyright Issues

All materials in this course fall under copyright laws and should not be downloaded, distributed, or used by students for any purpose outside this course.

The UNM Copyright Guide[13] has additional helpful information on this topic.

Accessibility and Accommodations

The American with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you have a disability requiring accommodation, please contact:

- UNM-Valencia Student Services[14] if you are a Valencia campus student. The phone number is 505-925-8560
- UNM Accessibility Resource Center[15] in 2021 Mesa Vista Hall ***if you are a main campus student***. The phone number is 505-277-3506.

Information about your disability is confidential and your instructor cannot refer you for accommodations. Be aware that you will need to provide documentation. If you need assistance in obtaining documentation, the offices above can assist you.

Accessibility Statements

Blackboard's Accessibility statement[16]
Microsoft's Accessibility statement[17]
Include links to accessibility statements for all other technologies included in the course.

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[10] https://www2.ed.gov/about/offices/list/ocr/docs/qa-201404-title-ix.pdf
[11] http://oeo.unm.edu/
[12] https://policy.unm.edu/university-policies/2000/2740.html
[13] https://copyright.unm.edu/
[14] http://valencia.unm.edu/students/student-services.html
[15] https://arc.unm.edu/
[16] https://www.blackboard.com/blackboard-accessibility-commitment
[17] https://www.microsoft.com/en-us/accessibility/

Academic Integrity
You should be familiar with UNM's Policy on Academic Dishonesty[18] and the Student Code of Conduct[19] which outline academic misconduct defined as plagiarism, cheating, fabrication, or facilitating any such act.

Drop Policy:

UNM Policies: This course falls under all UNM policies for last day to drop courses, etc. Please see or the UNM Course Catalog for information on UNM services and policies. Please see the UNM academic calendar for course dates, the last day to drop courses without penalty, and for financial disenrollment dates.

UNM RESOURCES

- **UNM Valencia Campus Tutoring Services[20]**
- **UNM Main Campus CAPS Tutoring Services[21]**
- **UNM-Valencia Library[22]**
- **UNM Libraries[23]**
- **"Life" Resources available to UNM-Valencia Students[24]**
- **Student Health & Counseling (SHAC) Online Services[25]**

FOR MILITARY-CONNECTED STUDENTS
There are resources on campus designed to help you succeed. You can approach any faculty or staff for help with any issues you may encounter. Many faculty and staff have completed the GREEN ZONE training to learn about the unique challenges facing military-connected students. If you feel that you need help beyond what faculty and/or staff can give you, please reach out to the Veterans Resource Center on main campus at 505-277-3181, or by email at vrc@unm.edu. The Veterans Coordinator at UNM-Valencia is in the Student Services Office, at 505-925-8560.

[18] https://pathfinder.unm.edu/campus-policies/academic-dishonesty.html
[19] https://pathfinder.unm.edu/code-of-conduct.html
[20] http://valencia.unm.edu/campus-resources/the-learning-center/learning-center.html
[21] http://caps.unm.edu/services/online-tutoring/olc.php
[22] http://valencia.unm.edu/library/index.html
[23] https://library.unm.edu/
[24] http://valencia.unm.edu/students/student-resources.html
[25] https://shac.unm.edu/

SEMESTER DEADLINES

Spring 2021 – 16-week classes

- Tuesday, January 19: First day of class, classes available in Blackboard Learn
- Friday, January 29, by 5:00 PM: Last day to add a class or to change credit hours or grade mode in LoboWEB.
- Friday, February 5: Last day to drop without "W" grade and with 100% refund on LoboWEB
- Friday, February 12: Last day to change grade mode
- Wednesday, March 15-19: SPRING BREAK
- Friday, April 16: Last day to drop *without* Dean's permission on LoboWEB. Will receive "W" grade and will be responsible for tuition for the course.
- Friday, May 5: Last day to add sections and/or change credit hours with form, last day to drop *with* Dean's permission. Will receive "W" grade and will be responsible for tuition for the course.
- May 10-14: Finals week. All final exams given remotely. May 13, 3:00-5:00 p.m.