COURSE SYLLABUS

71957 ENGR M16 - Engineering Statics & Strength of Materials, 4.0 Units
Prerequisites: PHYS M20A/M20AL
Class Time: T & Th 8:00 AM - 9:50 AM; **Classroom:** PS-207 (or PS-208)

INSTRUCTOR & DEPARTMENT INFORMATION

Instructor & Dept. Chair:	Scarlet Relle, Ph.D.
Office Hours in PS-235:	**M** 11 – 1 pm; **T** 10 – 11; **W** 10 – 11 am; **Th** 10 – 11 am AND by appointment which could be scheduled in person or on Zoom
Voicemail:	(805) 553 – 4162
E-mail:	srelle@vcccd.edu
Dean:	Robert Cabral
E-mail:	rcabral@vcccd.edu
Phone:	(805) 378-4721

IMPORTANT NOTES ABOUT COVID-19 PROTOCOLS:

In order for all of us to have a Safe Return to campus and be able to continue with our on-ground classes, we must all follow the following rules set forth by our College District:

- All faculty, staff, administrators, and students must be fully vaccinated and have their vaccination verification uploaded to the MyVCCCD mobile app by October 15th. This is a mandate and not a choice. There are medical and religious exemptions but you must contact the Student Health Center immediately for further details on these exemptions.
- If you have not been vaccinated yet, in order to obtain the required vaccination verification by October 15th, you must arrange to receive the first shot of the 2 dose vaccine series no later than September 1st.
- Every time you come to campus you must complete a self-assessment health questionnaire using the MyVCCCD mobile app prior to coming to campus. Please see the **Healthy Return to Campus** webpage for details.
- Once you complete the questionnaire, you must stop at a check-in location to get a wristband for that day.
- Once you enter a building and/or a classroom, you must scan the QR code of that building for contact tracing notifications.
- Please see the campus map uploaded to Canvas and also on our college website to become familiar with check-in locations around the parking lots.
  https://www.vcccd.edu/alerts/healthy-return-to-campus
- Parking during the Fall semester is Free. You do not need to purchase any parking permits.
- Since check-in may take some time, do allow yourself extra time to get to class and complete the self-assessment health questionnaire on the MyVCCCD mobile app prior to coming to campus.

ABOUT THIS CLASS

- The class will be on-campus, in-person. You are expected to attend class, take notes, and participate in all class activities.
- This course covers a wide range of topics in Statics and then applies these concepts in the Strength of Materials potion of the course in terms of civil/structural engineering design considerations. This course draws heavily from concepts in trigonometry, calculus, and physics. This course requires reading and problem solving skills.

Please try hard to be present in class (unless if you are ill or have an emergency), otherwise, you'll miss a lot and it will be difficult to catch up.

- Most course materials will be posted on Canvas in the course shell, this includes lecture notes, solutions to assigned problems, some assignments, quizzes, study guides, project guidelines, etc.
- Graded assignments will be collected on Canvas on Tuesdays, Thursdays, and/or Sundays (unless otherwise stated) and the grades will be posted on Canvas under Grades. Some assignments may be collected on paper.
- Quizzes will be timed and on Canvas. The time for quizzes will be 30 to 45 minutes, depending on the complexity of the quiz. All exams will be administered in class, in person, on paper. The time for each exam will be 110 minutes but the final exam will be 2 hours. More on quizzes and exams on page 3.

Technical Content: This course examines the relationships which exist between two important branches of mechanics, namely, statics and strength of materials. Principles of statics are used to determine the forces that act both on and within a body, whereas principles of strength are used to investigate the effect of these forces on the stability and deformation of the body. In particular, principles of statics are used for analysis of two- and three-dimensional force systems in equilibrium, including frictional forces, trusses, beams, distributed forces, shear and bending moment diagrams, center of gravity, centroids, and area moments of inertia. Principles of strength are used for analysis of stresses, strains and deformations associated with axial, torsional and flexural loading of bars, shafts and beams, as well as pressure loading of thin-walled pressure vessels. The course also covers stress transformation, Mohr's Circle, introduction to statically indeterminate systems, and ductile and brittle failure theories.

COURSE OBJECTIVES

Upon completion of the course student should be able to:

1. communicate effectively and legibly the formulation of solutions to engineering problems that can be understood by engineers within and outside of their specific disciplines.
2. determine the forces that act on rigid bodies and their effects on the equilibrium of rigid bodies including external forces, weight, normal and frictional forces, distributed loads, and reactions at supports.
3. calculate internal forces and stresses in rigid bodies and create shear and bending moment diagrams for beams.
4. perform vector analysis to determine the net effect of forces, bending moments, and torques acting on rigid bodies, trusses, frames, machines, beams, and shafts.
5. analyze two- and three-dimensional force systems and moments acting on rigid bodies in static equilibrium.
6. analyze statically indeterminate systems using compatibility condition or the principle of superposition.
7. perform stress transformation using equilibrium methods and Mohr's circle.

COURSE LEARNING OUTCOMES (CLOs)

Upon completion of the course student should be able to:

1. apply appropriate knowledge of physics, engineering, and mathematics to explain, calculate and manipulate vector quantities such as resultant force and moment of a force about a point or an axis.
2. apply appropriate engineering problem solving techniques, including free body diagrams, identification of applicable laws of physics, and shear and bending moment diagrams to problems that involve statically determinate and indeterminate systems.
3. use the geometric properties of bodies such as centroid and area moment of inertia appropriately to calculate resultant forces, moments, and internal loadings.
4. discuss and calculate mechanical properties related to stress-strain diagrams, and stress transformations using Mohr's circle for commonly used engineering materials.
5. in groups of 2 or 3 employ engineering problem solving techniques and the engineering design process to design, analyze, build, and present a truss bridge made out of Popsicle sticks.

INSTRUCTIONAL MATERIALS

Textbook: R.C. Hibbeler, Statics and Mechanics of Materials, Fourth Edition, 2014, Pearson.

Lecture Notes and Lecture Slides: Summary lecture notes or lecture slides will be posted on Canvas. These are to serve as study guides and to help you stay organized.

EVALUATION & GRADING POLICY

The following rubric will be used in determining your final grade in this course:

Class Participation/Problem Solving Exercises	(15%)
Quizzes	(15%)
Design Project	(15%)
Exams	(30%)
Final Exam	(25%)

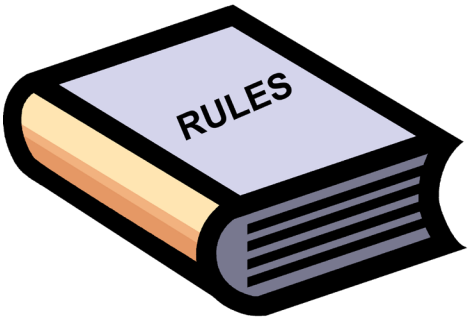
A: (90.0-100%) **B**: (80.0-89.9%) **C**: (70.0-79.9%)
D: (60.0 – 69.9%) **F**: (less than 60.0%)

Please note that grades are rounded to one digit to the right of the decimal and grades are absolutely not negotiable.

RECEPIE FOR SUCCESS IN THIS COURSE

For students to be successful in this course, the following actions and student engagement activities are strongly recommended and encouraged:

- Attend the lectures and take notes. Study every week, don't wait until a week before the exam to begin studying.
- Read the lecture slides and the relevant sections in the textbook before class and after the lectures.
- Do not hesitate to ask questions: Write down any questions that you may have and bring your questions to class or to my office hours or email them to me.
- Complete the assigned homework from the textbook and check your work against the solutions provided.
- Turn on your Canvas Notifications so that when I post an Announcement about the course you get notified immediately as Announcements are going to be one of my primary means of communication with you.
- Late work will not be accepted. However, if life circumstances happen contact me immediately before the due date so that we can have a discussion and find a path forward, in other words, communicate with me. Exams have their own rules. See below under EXAMS.
- Be sure to find classmates that you can study with and collaborate with on the bridge design project.



TEXTBOOK PROBLEMS

Textbook problems will be assigned for each chapter and the solutions will be posted on Canvas. These assignments will not be collected; however, you are STRONGLY ENCOURAGED to complete them as this is the best way to learn the material! The assigned problem sets are only a representative set of the type of problems that you should know how to solve. Therefore, it is STRONGLY RECOMMENDED that you attempt to solve other problems of similar nature.

QUIZZES

Online timed quizzes will be assigned on Canvas for each chapter. Instructions for each quiz will be provided. If you miss a quiz, it will be a zero. I do not drop any quiz grades. Quizzes will be available for 12 hours, but as soon as you sign on to take the quiz, the timer will begin for the allotted time on the quiz.

EXAMS

There will be 3 exams covering material from first, second, and third parts of the course. You will have the entire class period to complete each exam (unless noted otherwise). The final exam will cover selected topics from the entire course, and you will have 2 hours to complete the final exam. All exams will consist of problem sets, and perhaps some short answers. If you miss an exam, you will receive zero points on that exam. However, if life circumstances happen and if you contact me before the exam date and time to inform me of a legitimate conflict or an extenuating circumstance, we

may have a conversation. The legitimacy of the conflict or the extenuating circumstance will be decided on a case-by-case basis according to my judgement. If you wait to contact me after the exam is administered, then there will be no conversation, and you will receive a grade of zero on that exam. I do not drop any exam grades. Exams will be given during regularly scheduled class times.

DESIGN PROJECT

You will design, analyze, and build a truss-bridge according to a set of specifications. The construction of the bridge will be entirely out of Popsicle sticks and non-toxic, all-purpose white glue. The strength of the bridge will be tested by loading the bridge deck until the point of failure as defined in the rules. A written report, complete force analysis of each member of the truss, building of a prototype bridge, and failure analysis of the bridge (discussing reasons for failure) will all be requirements of this project. Information on due dates, design criteria, and grading will be provided. I will provide for you the necessary supplies for this project. More information will be provided and posted on Canvas.

ADDITIONAL POLICIES

PARTICIPATION

Participation in my online class is mandatory. I expect you to be present in class and be prepared and ready to learn and to participate. I will occasionally ask you to upload the notes that you have taken during our lecture sessions for participation points.

STUDENT RESPONSIBILITY

You, as the student, are responsible for **all** material presented in class and in assignments.

DISABILITIES ACCOMODATION

Appropriate accommodations will be made for students with disability related needs. Students with a disability, whether physical, learning, or psychological, who believe they will need accommodations in this class, are encouraged to contact ACCESS as soon as possible so accommodations can be set up in a timely fashion. Accommodations are based on eligibility and can only be provided if you have submitted verification from ACCESS in the form of a Confidential Memo. The ACCESS office can be reached at (805) 378-1461.
https://www.moorparkcollege.edu/departments/student-services/access

ACADEMIC INTEGRITY

Academic integrity and honesty is of utmost importance. Cheating of any kind will not be tolerated in this course. Cheating includes turning in someone else's work as your own, using the textbook or any course material and online resources such as Chegg during quizzes and exams. Cheating will result in a letter grade of "F" equivalent to zero points for that particular assignment/quiz/test, and any previous assignments will be called into question. In addition, a report will be made to the Behavior Intervention Team (BIT).

TITLE IX / SEXUAL MISCONDUCT

Incidents of sexual misconduct can involve students and employees and include: sexual harassment, gender/sexual orientation based slurs, social media harassment related to sex/gender/sexual orientation/gender identity, sexual assault of any type, stalking (including text/digital stalking), dating/domestic violence, gender/sex-based hate crimes, etc. If you or another student has experienced any of these types of events, regardless of where they occurred or who the perpetrator may have been, please immediately contact your instructor, Dean or the Title IX Coordinator: Priscilla Mora (pmora@vcccd.edu). It is the responsibility of the College to investigate the matter and provide support and appropriate assistance to the student who may have been affected. Questions? Visit our website on TIX/Sexual Misconduct: MC Title IX / Sexual Misconduct website .

HEALTH, SAFETY, BEHAVIOR

Your health, safety, and behavior in our classroom and when you are on campus are of utmost importance. If I see, recognize, or find out about a concerning behavior or a health and safety issue, I will both approach you first and then make a report to the BIT team, or I may just directly make a report to the BIT team. The BIT team is committed to helping protect everyone's safety and well-being, in addition to helping to maintain the integrity of our academic environment.

NO SMOKING POLICY
Moorpark College is 100% TOBACCO FREE – No smoking, vaping, chewing.
No tobacco is permitted on or in buildings, campus grounds or parking lots at all times.
Violators shall be subject to appropriate disciplinary action. AP 6800, BP 6810, AB 846.

IMPORTANT DATES

- August 27th: Last day to add and drop with full refund or credit (All students/Fall semester only)
- September 3rd: Last day to drop a semester-length class without a "W"
- November 19th: Last day to drop a semester-length class with a "W"
- Follow this link to double check the more up-to-date information regarding add/drop dates and other important dates: https://www.moorparkcollege.edu/apply-and-enroll/academic-calendar/fall-2021

CLASS SCHEDULE

DATE	TEXT	TOPICS	EXAM
8/17	Chapter 1 General Principles Review Chapter 2 Force Vectors 2.1 – 2.6	Units of measurements; SI units; numerical calculations; analysis procedure Scalars and vectors; vector operations; vector addition; Cartesian vectors; addition of Cartesian vectors	
8/19	Chapter 2 Force Vectors 2.7 – 2.9	Position vectors; force vector; dot product	
8/24	Chapter 3 Force System Resultants 3.1 – 3.4	Moment of a force-scalar/vector; cross-product; principle of moments	
8/26	Chapter 3 Force System Resultants 3.5 – 3.8	Moment of a force about an axis; moment of a couple; simplification of a moment and couple system	
8/31	Chapter 4 Equilibrium of a Rigid Body 4.1 – 4.6	Conditions for equilibrium; FBD; equations of equilibrium 2-D & 3-D	
9/2	Chapter 4 Equilibrium of a Rigid Body 4.7 – 4.10	Characteristics of dry friction; problems involving dry friction; frictional forces on flat belts and screws	
9/7	Chapter 4 Equilibrium of a Rigid Body	In-class problem solving	
9/9	Chapter 5 Structural Analysis	Trusses; method of joints; zero-force members	

9/14	Chapter 5 Structural Analysis	Method of sections; frames and machines	
9/16	Chapter 6 Center of Gravity, Centroid, and Moment of Inertia 6.1-6.2	Center of gravity, center of mass, centroid; composite bodies	
9/21	No lecture Only exam day		**Exam I** Ch. 1, 2, 3, 4, 5
9/23	Chapter 6 Center of Gravity, Centroid, and Moment of Inertia 6.3-6.6	Resultant of distributed loading; moments of inertia for areas; parallel-axis theorem; moments of inertia for composite areas	
9/28	Chapter 6 Continued		
9/30	Chapter 7 Stress and Strain 7.1 – 7.4	Internal resultant loadings; stress; average normal stress	
10/5	Chapter 7 Stress and Strain 7.5 – 7.9	Average shear stress; allowable stress; design of simple connections; deformations; strain	
10/7	Chapter 8 Mechanical Properties of Materials 8.1 – 8.4	Tension and compression test; stress-strain diagram; stress-strain behavior of ductile and brittle materials; Hooke's law	
10/12	Chapter 8 Mechanical Properties of Materials 8.5 – 8.7	Strain energy; Poisson's ratio; shear stress-strain diagram	
10/14	Chapter 14 Stress and Strain Transformation 14.1 – 14.4	Plane-stress transformation and equations; principal stresses and maximum in-plane shear stress; Mohr's circle plane stress	
10/19	Chapter 14 Stress and Strain Transformation 14.5 – 14.10	Absolute maximum shear stress; plane strain; equations of plane strain; strain rosettes; material-property relationships	
10/21	Chapter 9 Axial Load 9.1 – 9.2	Saint-Venant's Principle; elastic deformation of an axially loaded member	
10/26	No lecture Only exam day		**Exam II** Ch. 6, 7, 8, 14
10/28	Chapter 9 Axial Load 9.3 – 9.6	Principal of superposition; statically indeterminate axially loaded member; the force method of analysis; thermal stress	
11/2	Chapter 10 Torsion 10.1 – 10.4	Torsional deformation of a circular shaft; torsion formula; power transmission; angle of twist	
11/4	Chapter 10 Torsion 10.1 – 10.4	Torsional deformation of a circular shaft; torsion formula; power transmission; angle of twist	

11/9	Chapter 11 Bending 11.1 – 11.2	Shear and moment diagrams and graphical methods	
11/11	**Holiday – Non-Instructional Day**		
11/16	Chapter 11 Bending 11.3 – 11.4	Bending deformation of a straight member; flexure formula	
11/18	Ch. 11 - Continued		
11/23	Ch. 15 Beam Design	Basis for beam design; prismatic beam design; In-class problem solving	
11/25	**Thanksgiving Holiday; Non-Instructional Day**		
11/30			**Exam III** Ch. 9, 10, 11, 15
12/2	Chapter 13 Combined Loadings 13.1 – 13.2	Thin-walled pressure vessels; state of stress caused by combined loadings • Physical bridge is due	
12/7	**Bridge Project is Due – and make-up day if needed or review** • **The physical bridge will need to be dropped off the week before**		
T - 12/14	**Final Exam: Selected topics from the entire course** **8:00 am – 10:00 am**		

The instructor reserves the right to change class policies and class schedule if necessary. The instructor reserves the right to drop students who miss 4 class meetings.