

CIVL 310 Statics and Mechanics of Materials for Non-Civil Engineers

Class Time: MW 17:00 – 20:00, May 10-June 25

COURSE INFORMATION**Professor Information.**

Professor: Dr. Mostafa Batouli
Office: 311 LeTellier Hall
Phone: (843) 953-1390
Email: sbatouli@citadel.edu

Office Hours: Virtual office hours by appointment
Please seek additional assistance outside of class.

Course Description.

“Vector solutions of problems in statics; principles of statics, resultants, reactions, and equilibrium forces. In addition, the brief study on mechanics of materials including stress and strain relationships and various types of loading of structural members.” (The Citadel 2019)

Prerequisites.

MATH 132 and PHYS 221/271

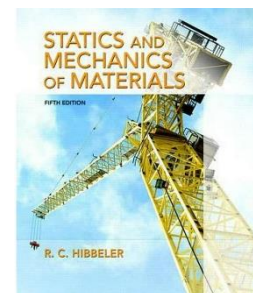
Course Learning Outcomes / Expected Performance Criteria.

Upon completion of the course, a student should be able to demonstrate an understanding of the following topic areas by applying their knowledge to problems in engineering mechanics:

- Vector forces
- 2 & 3-dimensional equilibrium
- Concurrent force system
- Friction
- Simple trusses
- Centroids and center of gravity
- Normal and shearing stresses
- Stress-strain relationships

Required Materials.

- An NCEES-approved calculator (<http://ncees.org/exams/calculator/>).
Only NCEES-approved calculators will be permitted during exams.
- Gridded engineering paper for homework submissions.
- Textbook
 - “Statics and Mechanics of Materials,” by R. C. Hibbeler, 5th edition, Prentice Hall, 2014.
 - Other editions are acceptable.



POLICIES

Canvas and Email.

By departmental policy, all students must check their Citadel email account for messages and course announcements from the Department Head and faculty more than twice a week.

Canvas functions as the repository for class announcements, information, and homework. The professor will also post some, but not all, student grades on Canvas. Students are encouraged to interact with the professor about grades' details and feedback.

Academic Support.

The Citadel endeavors to create an institutional climate where all students thrive. A student with a disability should contact Dr. Jane Warner in 103 Thompson Hall at 843-953-6877 to schedule an appointment. Any student with approved accommodations should present accommodation letters to the professor as soon as possible.

Exams.

Students may not use any electronic device during exams with the exception an NCEES-approved calculator. Students may not communicate with each other during graded events. Failure to follow exam policies will result in the professor terminating the exam for a grade of zero. Other exam policies are:

1. Students may not access their book bag during an exam.
2. Cell phones will remain inaccessible during exams even if a student temporarily leaves the course virtual meeting.
3. Headphones are not permitted.

Attendance.

"Absences, whether excused or unexcused, in excess of 20% of the meetings of a particular course can, at the discretion of the professor, result in a grade of "F" in the course" (The Citadel 2019). Attendance may be taken any time during the class period as part of a pop reading quiz. If late for class, the student must inform the professor of his or her presence.

Professional Practice.

Students will meet professional practice expectations including professional demeanor and work ethic, consistent daily preparation, commitment to learning and fulfilling obligations, and engagement in classroom activities.

Attendance and note taking is *the* way to obtain the course notes. If absent, students may acquire notes from their classmates. Students must have their textbook, notes, note-taking material, and calculator to every online class. Colored pencils and a straight edge can help with emphasis and clarity. Meaningful note creation (not class transcription) effectively engages long-term memory; "I'm writing it down to remember it now" (Field Notes 2017).

Students may not use music or video players during class. Analogue note taking is strongly preferred. ***The use of an electronic device for non-class activities will result in a deduction of 1% from the final grade per infraction with or without warning.***

Cancellation of lectures

- Extreme conditions as announced by the University's emergency system are considered reasons to cancel the class, and all deliverables due on that day will be postponed to a date to be announced.
- If the instructor cannot attend a class, the students will be informed as soon as possible. A make-up session will be held and the recording of the session will be posted on course Canvas page. All deliverables (assignments, exam, etc.) will remain intact.

Continuity of Instruction (COI): During a pandemic or catastrophic event, and after all face-to-face instruction has been suspended, communication for our class will continue to take place through Citadel email and Canvas. In the event of such an emergency, check your Citadel email account and Canvas course announcements for instructions. The following areas will also adjust during COI:

Course Requirements

- Computer
- Reliable Internet connection and software (DSL, LAN, or cable connection desirable)
- Access to Canvas
- Headset or Earbuds
- Webcam
- Scanning (possibly with smartphone)

Academic Integrity Statement: Students will submit only their own work for evaluation in this course, except as appropriately documented. All rules and stipulations of The Citadel's Honor Manual and Honor Code apply to this course, including its definitions and policies related to cheating, lying, stealing, and non-tolerance. Cheating or evidence of academic dishonesty on any work submitted for evaluation will result in an "F" for both the assignment and the course. To ensure academic integrity, you must abide by both the letter and spirit of all honor, documentation, and citation requirements. Plagiarism in any form is unacceptable, as it fails to meet any standard of academic work. It is your responsibility to read and understand what constitutes intentional and negligent plagiarism. Plagiarism, intentional or negligent, may be referred as an honor violation. The complete Honor Manual may be found at: <http://krausecenter.citadel.edu/wp-content/uploads/2019/08/2019-2020-Honor-Manual-WEB.pdf> and the Honor Code can be found in the CGC Course Catalog: <http://www.citadel.edu/root/images/cgc/cgc-academic-catalog.pdf>

ASSIGNMENTS AND GRADING

Grading is a subjective and non-scientific exercise on the part of the professor of any academic course. The professor must balance fairness to the student while maintaining high expectations in learning course material. In some cases (such as for multiple choice problems), grading may be done on a "right or wrong" basis. This, of course, takes the subjective decisions out of the grading. While in the "real world" completing a significant amount of professional work that is only partially correct would not help an engineer advance in his or her career, the classroom is not an exact model of the real world. For this reason, partial credit may be given for a problem or discussion question where deemed appropriate. *However, the decision of the amount given is solely the responsibility of the professor.* **Re-evaluation of grades on any assigned work will**

be done only by written request. The written request must be submitted no later than the next period and must clearly state the reasons for the re-evaluation.

Table 1 shows the learning activities used to determine final grades based on a standard scale ($A \geq 90\%$, $B \geq 80\%$, $C \geq 70\%$, $D \geq 60\%$, $F < 60\%$). Throughout the semester the professor may collect student work to support ABET accreditation efforts or use in engineering education research. The professor may keep the original and return a copy of the graded work to the student.

Table 1. Grading Distribution

Expected Performance Criteria	% of Grade
Discussions and Reading Quizzes	10%
Individual Homework	30%
Weekly Quizzes	25%
Practice Exam	10%
Final Exam	20%
Participation	5%
Total	100%

Discussions and Reading Quizzes.

Engineers must increase their understanding of a topic through reading. In the professional world, the engineer must read, interpret and apply various policy documents and codes. The professor will expect students to have read the narrative and summaries from the assigned reading (see tentative course schedule in Appendix B) before class. Prior preparation and an attempt at author-directed learning will make class time and professor-directed learning much more effective. The assigned reading addresses additional topics not covered in class.

Please see the following books on author-directed learning:

Adler, M. J., and Doren, C. V. (1972). *How to Read a Book: The Classic Guide to Intelligent Reading*. Touchstone, New York.

Piper, J., and Noll, M. A. (2011). *Think*. Crossway, Wheaton, Ill.

Regular reading quizzes at the beginning of and/or during each class will evaluate the depth of student reading and assess student mastery of previous material. Students should be able to identify keywords from the reading assignment, the concepts the key words represent, and respond accordingly to simple true/false and multiple-choice questions. The reading quizzes may also be used to assess students' attendance and participation grade.

In addition, the professor will occasionally post questions for students to discuss in Canvas page of the course. Participation in these discussions are required to keep students engaged in online learning environment and will hence be graded.

Individual Homework.

Homework is *for the student*, for his or her learning, practice and assessment. Many of the homework problems represent intentionally-challenging, real world problems. Working engineers and engineering students must practice problem formulation, problem solving, and solution documentation. Therefore, a proper solution format is required (see Appendix A). Students may work together on homework assignments to *gain additional understanding*. More

than any other academic activity, continuous practice of concepts establishes long-term mastery. Students should consider the assigned homework as the minimum required practice.

Please see the following book on problem formulation, solving, and documentation:

Polya, G., and Conway, J. H. (1945). *How to Solve It: A New Aspect of Mathematical Method*. Princeton University Press, Princeton, NJ.

Honor code, cheating and plagiarism

“A cadet does not lie, cheat, or steal, nor tolerate those who do” (The Citadel 2018). Society places its trust in engineers to ensure public safety. Accordingly, neither the Citadel Honor Code nor the engineers Code of Ethics will tolerate any form of cheating (ASCE 2017; NSPE 2007).

Any evidence of direct copying of homework assignments may result in an honor violation; therefore, students should not share homework.

Homework documentation

All homework must be properly documented. Students must document any help received from supplemental instruction, classmates, reference books, or the internet. Information from the course textbook (equations and outlines of procedures), class notes, or the professor is considered immediately available to all students and requires no documentation. For written homework, insert documentation at the point the help was received, stating who and what assistance was provided.

Homework solutions

The use of solutions during homework attempts is strongly *discouraged*. Relying on solutions from previous classes, the textbook, or the internet will result in poor performance during the exams. Never-the-less, if published solutions reveal errors, subsequent corrections require proper documentation.

Homework Grading

Homework grading by problem focusses on effort, completeness, and timeliness. Each homework problem can earn up to 10 points (100%). The grade is composed of 70% based on a *complete* homework attempt and 30% on *self-assessment* of the homework attempt. Each problem will be collected twice:

1. Initial Homework Attempt:

An initial submission of homework before the solution posts.

Each problem will be evaluated based on *effort* and *completeness* for 70%. A homework missing any sections, appropriate diagrams, or a good faith effort at the solution in the required homework format (Appendix A) will receive no credit. Problems must be uploaded as PDF documents. Free document scanning apps available for smart phones include Genius Scan, Microsoft Lens, and Dropbox. The Daniel Library also has document scanners available for use.

2. Homework Self-Assessment:

A self-assessed homework after the solution posts.

The remaining 30% will be awarded for submitting of the *complete* and *self-assessed* homework problem. The professor will provide a minimum of 36 hours for homework assessment. An incomplete hard-copy problem will receive no additional credit.

- Assessment should provide clear documentation of corrections made in a different color.

- A minimum of a check mark in a different color next to the correct answer is required.

Typically, five potential grades can be earned.

- 100% An on-time, complete, submitted initial homework attempt *with* an on-time, accurate homework self-assessment:
70% for attempt + 30% for assessment
- 70% An on-time, complete, submitted initial homework attempt *without* an on-time, accurate self-assessment:
70% for attempt + 0% for assessment
- 60% An on-time, accurate homework self-assessment *without* an on-time, complete, submitted initial homework attempt:
30% for attempt + 30% for assessment
- 30% A homework self-assessment on Amnesty Day *without* an on-time, initial or self-assessment submission:
0% for attempt + 30% for corrections
- 0% All other homework submissions:
0% for attempt + 0% for assessment

Exams and weekly quizzes.

Exams are *for the professor* to evaluate student understanding. All exams must be taken on the assigned day. Prior to exams, the best prepared student will read the text before class, actively participate in class, do the homework, and assess the homework, *i.e.* master the course material as it is covered.

Any scheduling exceptions must be approved by the professor in advance. Exceptions will be granted only for reasons beyond the control of the student. Only NCEES-approved calculators will be permitted during exams (see Required Materials).

Five, 55minute, in-class exams will be administered on a weekly basis each of which has 5% of the total course grade. Students should meet with the professor outside of class to resolve questions before and after exams. The 180minute, final exam will be cumulative and holds 20% of total course grade. Students must submit all homework and assignments by Amnesty Day in order to take the final exam for full credit.

Prior to the final exam, the professor will provide a practice exam, very similar in format and content to the actual exam. Solutions will not be released for the practice exam; students should work together, seek help during SI, and meet with the professor to discuss and clarify any questions. Practice exams will hold 10% of total course grade and is key to favorable exam performance.

Attendance, Participation, and Professional Practice.

- Students are expected to be prepared for class by having read the assigned material and by actively participate in the class discussions/activities. Class meetings will consist of lectures followed by in-class activities. In each class period, one or two students will lead the activities related to material presented in lecture and readings. In addition to attending all classes, students are expected to participate in these activities/discussions by reading assigned materials before class and thinking about the themes, questions, and patterns the readings suggest.

Students who do not fully participate in class activities, will not receive full participation points even if they have no unexcused absences.

- Assessing the student's credit for the "class participation" portion of the final grade is at the sole discretion of the instructor.

Attendance.

- **Attendance is required at all class sessions. Unexcused absences and late arrivals will be penalized.** The instructor MUST be notified of any anticipated absences in writing (email). Otherwise, the absence will be noted as unexcused.

Right to Revise

The instructor reserves the right to modify, solely at his discretion, the course content, and the number, format, and due dates of exams, assignments, quizzes, or projects as well as their weights that will be used to determine the final grade.

REFERENCES

Adler, M. J., and Doren, C. V. (1972). *How to Read a Book: The Classic Guide to Intelligent Reading*. Touchstone, New York.

ASCE. (2017). *Code of Ethics*. American Society of Civil Engineers, Reston, VA.

Field Notes. (2017). "From Seed." text/html, <<https://fieldnotesbrand.com/from-seed>> (Dec. 11, 2017).

Hibbeler, R. C. (2015a). *Engineering Mechanics: Statics & Dynamics*. Pearson, Hoboken.

Hibbeler, R. C. (2015b). *Engineering Mechanics: Statics*. Pearson, Hoboken.

NCEES (Ed.). (2013). *FE Reference Handbook*. National Council of Examiners for Engineering and Surveying, Clemson, S.C.

NSPE. (2007). *Code of Ethics for Engineers*. National Society of Professional Engineers, Alexandria, VA.

Piper, J., and Noll, M. A. (2011). *Think: The Life of the Mind and the Love of God*. Crossway, Wheaton, Ill.

Polya, G., and Conway, J. H. (1945). *How to Solve It: A New Aspect of Mathematical Method*. Princeton University Press, Princeton, NJ.

The Citadel. (2018). *Catalogue*. The Citadel: The Military College of South Carolina, Charleston, SC.

APPENDIX A. Mandatory Homework Structure

Neat, well-organized, and useful homework requires effort. Each complete homework problem must contain the structure and information required for understanding the context, scope, process, calculations, and reasonableness of the solution. For simple problems, writing the solution may take longer than solving the problem.

Engineers check their work and the work of others; therefore, calculations must be clear, thorough, and presentable. Industry and consulting engineers need new graduates capable of solving problems *and* producing acceptable engineering calculations. A solution should read like a textbook example problem with pertinent details and text explaining the analysis, steps, equations, etc.

The professor will review homework submissions and may make suggestions for improvement. However, disorderly, poorly formatted homework will be returned without a grade. Students must follow the instructions listed below and the format shown on the next page.

Additional homework requirements.

- Materials
 - Work in pencil.
 - Write on 8.5in.× 11in. engineering paper.
 - Use a straight edge, compass, and/or protractor as required to draw diagrams.
 - Staple multi-page submissions together.
- Presentation
 - Include no more than one problem per page.
 - Number pages per problem if more than one page is needed.
 - Each problem should have a neatly drawn figure(s).
 - Figures should be large enough to be easily read.
 - Variables should appear on figures.
 - Variables should be described using words and symbols
 - Write legibly, in clear, easy-to-read print.
 - Completely erase any extraneous material.
 - No crossed-out material should appear on the solutions.
 - Leave blank lines between steps, providing space for correction, assessment and comment.
- Organization using Homework Format (next page).

Homework Format.

Submittal Date

CIVL 310, HW #, Page #/#

Student Name

Problem #:Statement: Briefly describe the problem.Given: Identify known values. Symbolically note all the given information; include necessary figures.Find: Identify unknown values. State the desired result(s) using words and symbols.Procedure: Briefly outline the general approach to solve the problem and identify appropriate fundamental concepts.Solution: Write out in detail the formulation of the solution following the outlined procedure. Text and figures must be neat and professional. Show all the pertinent details of the solution approach.

- The solution should begin with an appropriate diagram
- From the diagram write the general equation(s) symbolically.
- Simplify the equation(s) explaining simplifications.
- Populate the simplified symbolic equations with physical quantities represented numerically with units.
- Calculate the final answer, round to appropriate significant figures, and determine the final units.
- Consider and describe the reasonableness of the results.

Answer: Copy those variables identified in the *Find* section and calculated in the *Solution* section.

- Confirm the reasonableness of the answer.
- Check the answer with other sources.
- If there is a discrepancy, go back and rethink the analysis.
- Do not attempt to reverse engineer the correct answer; consult with peers, the SI instructor and/or the professor as needed to identify mistakes.

Appendix B. Tentative Course Schedule

Session			Date	Lecture	Topics	Assignment
1	M	10-May-21	Ch1 Lecture Ch2 Lecture 1	Introduction, Newton's 3 laws of motion and Gravitational Attraction, Unit Conversion, Basic Terms, 2D Vectors	Introduce Yourself + Review Syllabus	
2	W	12-May-21	Ch2 Lecture 2 Ch2 Lecture 3	3D Vectors, Position & Force Vectors	Quiz 1	
3	M	17-May-21	Ch3 Lecture 1 Ch3 Lecture 2	Moment of a Force, Moment About an Axis	HW1	
4	W	19-May-21	Ch3 Lecture 3 Ch3 Lecture 4	Moment of a Couple, Equivalent Force-Couple Systems	HW1 Corrections+ Quiz 2	
4	M	24-May-21	Ch4 Lecture 1 Ch4 Lecture 2	Equilibrium of a Rigid Body, Equations of Equilibrium in 2-D	HW3	
6	W	26-May-21	Ch4 Lecture 3 Ch4 Lecture 4	Rigid Body Equilibrium in 3-D, Friction	HW3 Corrections+ Quiz 3	
7	M	31-May-21	Memorial Day- No Classes			
8	W	2-Jun-21	Ch5 Lecture 1 Ch5 Lecture 2	Trusses – Methods of Joints, The Method of Sections	HW 4	
9	M	7-Jun-21	Ch5 Lecture 3 Ch6 Lecture 1	Frames and Machines, Center of Gravity and Centroid	HW4 Corrections+ Quiz 4	
10	W	9-Jun-21	Ch6 Lecture 2 Ch6 Lecture 3	Centroid and Moment of Inertia of Composite Bodies	HW 5	
11	M	14-Jun-21	Ch7 Lecture 1 Ch7 Lecture 2	Internal Forces, Shear and Moment Equations and Diagrams	HW5 Corrections+ Quiz 5	
12	W	16-Jun-21	Ch 8 Lecture	Stress and Strain	HW 6	
13	M	21-Jun-21	Practice Exam			HW6 Corrections
14	W	23-Jun-21	Final Exam			

DISCLAIMER

The course schedule is a plan. The professor reserves the right to make changes in the schedule. Students will be notified accordingly. It is students' responsibility to keep abreast of the course schedule.