ENR 3131 - Strength of Materials
Instructor: Daniel Kuemmerle, PE
Course Syllabus –

Course Description:

Strength of Materials investigates how structures in our world (beams, columns, trusses, etc.) respond to loads. Will the beam break? How much will the rod stretch under tension? These and similar questions are addressed, and students will understand how engineers design structures to resist loads safely and without excessive deformation.

Topics include the study and mathematical modeling of the mechanical behavior of materials under load. Emphasis will be on the elastic conditions of equilibrium, compatibility, and material behavior. In this course, you will learn to calculate the stress, strain, and deformation of various elements subjected to load. You will also get an introduction to statically indeterminate members, where deformation equations are used to help solve the statics of the system.

Course Goals:

- This course will provide you with the knowledge and experience to analyze and design basic structural members subjected to the many various types of loads.
- You will also be given the tools to synthesize correlations between engineering materials and their properties to predict performance using the fundamental concepts of stress, strain, and elastic behavior of materials.
- While the content can be challenging, this course is a foundational building block that will give you the tools needed to excel in your future coursework in your engineering academic and professional career.

Instructor:

Daniel Kuemmerle, PE
Lecturer
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Office Location: L-115

Class Time and Location:

Lecture: MW 11:00am – 12:15pm
Room: Q-109

Credit Hours:

3-0-3 (Lecture-Lab-Total Credit Hours)

Required or Elective:

This course is required for all civil, construction, environmental, mechatronics, and mechanical engineering majors.

Textbook (Required):

Please note that you will need to acquire the textbook (either electronic copy or hardcopy—see below) as well as a subscription to "*Modified Mastering Engineering*" (the textbook publisher's online learning portal).
The *Modified Mastering Engineering* web access is required for this course.
Hibbeler, R.C.: *Mechanics of Materials*, *10th edition*, Pearson, 2017
Purchase Options:
Hardcopy, bound text plus *Modified Mastering Engineering* web access: ISBN-13: 9780134583235
Hardcopy, loose leaf text plus *Modified Mastering Engineering* web access: ISBN-13: 9780134583228
Electronic textbook plus *Modified Mastering Engineering* web access: ISBN-13: 9780134321295
If you already own a textbook, you may also purchase access to just *Modified Mastering Engineering* directly through the publisher's website (see the course D2L page for additional info).

Prerequisites:

ENGR 2214 Statics, MATH 2202
This course requires a sound knowledge of statics, including the application of equilibrium equations, calculation of centroid and area moment of inertia, drawing free body diagrams, and solving for internal forces. Further, you need to be familiar with the application of algebra, trigonometry, and calculus to solve problems related to physics and statics.

Co-requisite:

ENGR 3132
You must register for a strength of materials lab ENGR 3132 with ENGR 3131. The lab is a separate course, and you register for the lab separately. Having the same instructor for the lab and the lecture is not required.

Calculator Policy:

Only the following calculators can be used during exams in this course. This calculator policy is the same as the NCEES calculator policy in place for the FE Exam.
Casio: All fx-115 and fx-991 models (Any Casio calculator must have "fx-115" or "fx-991" in its model name.)
Hewlett Packard: The HP 33s and HP 35s models, but no others.
Texas Instruments: All TI-30X and TI-36X models (Any Texas Instruments calculator must have "TI-30X" or "TI-36X" in its model name.)

Learning Outcomes:

Upon completion of this course, you will be able to:

1. Calculate stress, strain, and deformation for basic structural elements subjected to axial, torsional, bending, and transverse loading.
2. Utilize the stress-strain diagrams for determining the mechanical properties of various materials.
3. Analyze simple indeterminate members subjected to axial loading by using equilibrium and compatibility equations.
4. Draw shear and bending moment diagrams for beams.
5. Design and analyze determinate beams under bending.
6. Calculate stresses resulting from combined loads.
7. Use the stress transformation equations and Mohr's circle to calculate the principal stresses and the max in-plane shear stress for plane stress.

Course Outcome Measures and Assessment:

Measures and assessment of the outcomes will be made by:

- Periodic homework assignments.

- Periodic quizzes—during class and/or through *D2L Brightspace* (D2L).
- Midterm exams during the semester (see "Grading" for quantity of exams).
- One final exam.
- Course and instructor evaluation at the end of the semester to provide student feedback on the quality of the course and effectiveness of the instructor.

Grading:

Coaching Activities (through *Modified Mastering Engineering*): 10%
Homework: 10%
Quizzes: 15%
Midterm exam 1: 20%
Midterm exam 2: 20%
Final Exam (during finals week): 25%
The grade scale is A ≥ 90.0%; 80.0% ≤ B < 90.0%; 70.0% ≤ C < 80.0%; 60.0% ≤ D < 70.0%; F < 60.0%

Modified Mastering Engineering:

This course utilizes *Modified Mastering Engineering*, which is the textbook publisher's online learning portal. Your student access to this portal is granted as part of the textbook package listed in this syllabus. This learning portal contains a wealth of content for your use, ranging from some graded content (the "Coaching Activities") to additional tutorial videos and study areas that can help you with concepts that give you trouble. As some of the course's graded material is worked in this portal, it is required that you have access to *Modified Mastering Engineering*.
Please note that "*Modified Mastering Engineering"* is a different interface than "*Mastering Engineering*." The main difference is that *Modified Mastering Engineering* interfaces, links, and synchronizes directly with your course D2L page.
Please note: you will obtain access to your *Modified Mastering Engineering* account through clicking on the green "Pearson" widget located on the course's D2L homepage. Do not attempt to register for *Modified Mastering Engineering* by going any other route, including going directly to the publisher's website. Linking to the publisher's website through the course's D2L page is how the link is established between your D2L page and your *Modified Mastering Engineering* account. There is more detailed information about registering with *Modified Mastering Engineering* in the "Syllabus & Start Items" area of the course's D2L page.

Coaching Activities:

This course has "Coaching Activities" that usually consist of videos, interactive tutorials, and/or. These tutorials walk you through the problems, giving you feedback as you perform each step of a problem. Students are required to complete each coaching activity. You are allowed unlimited attempts per question for each coaching activity. However, some credit is deducted for each incorrect attempt (5% deduction per attempt for most problems). There are often "hints" within *Mastering Engineering* problems that can help you when you are stuck in a problem. There is a small bonus for answering a question without opening a hint (2%). Conversely, there is a small deduction of credit if opening a hint (3%). This policy is intended to let you use the hints when you need them without severe penalty, while at the same time rewarding you for the times you do not need the hint.

Homework:

Homework assignments will be assigned regularly throughout the term. The homework problems will be comprised of some problems from the course textbook, as well as other problems. The goal of the homework is to give the student practice in larger scope engineering problems, and usually cover topics in their entirety. These longer problems prepare the student for "real world" engineering type problems, and are modeled to be similar to the types of questions found in the midterm exams.

Unless specifically instructed otherwise, you are to submit all written work to the instructor in class in hard copy. Homework shall adhere to the following guidelines:

- Homework is due at the START of class on the due date.
- Homework shall be submitted on engineering calculation sheets or plain white copier paper and must be bound or stapled. Do not use notebook paper or ruled paper.
- All problems must be clearly delineated by starting a new page or, if placing more than 1 problem per page, by drawing straight lines between each problem (use of a straight edge is required). In no event shall more than 3 problems occupy one page!
- Write on one side of page only.
- Use a pencil when writing your work. Ink is not allowed.
- Draw figures, free body diagrams, or graphs where appropriate.
- All answers must be boxed.
- Units, where appropriate, should be written for the answer and in every step of each problem.

All students are expected to complete all assignments given. The homework is intended to give you the necessary exposure and experience for you to succeed in grasping a firm understanding of the course objectives. The instructor reserves the right to modify assignments as necessary. Work turned in late will not be graded/given credit except in approved cases of documented emergency.
Homework is usually returned within a week to give you feedback on your understanding of key concepts.

Quizzes:

The quizzes given in this course generally cover smaller, more concentrated learning objectives than do the homework and the midterm exams. The quizzes are meant to ensure that you are familiar with particular steps or components of larger problems. These smaller problems are formatted to prepare you for the format and question types covered in the course final exam.
Quizzes will usually be administered online through D2L Brightspace, but the instructor does reserve the right to administer some quizzes during class time. It is your responsibility to ensure that the required technology (such as the student's personal computer) is functional during the quiz window. Please be sure to check that D2L Brightspace is not down for maintenance during the desired quiz taking time. It is strongly recommended that you not wait until the very end of the quiz open window to attempt to take a quiz.

Midterm Exams:

The midterm exams are meant to assess your grasp of more in-depth, large-scale problems, and contain problems similar in size and scope to the assigned homework. Generally, the mid-term exams are not cumulative, but rather cover material delivered since the previous exam.
Unless directed otherwise, exams will be held in the usual classroom during scheduled class meetings. Unless instructed otherwise, exams will be closed book and notes, with the exception that the current FE handbook can be used as a reference. The FE handbook shall be unmarked and bound (book form or stapled as one volume). "Unmarked" means that no handwritten notes or comments are allowed in the reference. The current FE handbook is available for purchase or free download at: http://ncees.org/exams/study-materials/download-fe-supplied-reference-handbook/.

Final Exam:

The course final exam is a cumulative exam, covering all topics covered during the term. As there are many topics covered, the questions are typically small in scope, and are most similar in format to the questions found in the periodic quizzes. A clean, bound FE handbook (free of marks) can be used as a reference (as described above).
Unless directed otherwise, the final exam will be held during finals week in the usual classroom. Check the KSU registrar's website for additional scheduling information. Similar to the midterm exams, the exam will be closed books and notes, with the exception that the FE Handbook may be used.

Course Schedule:

The schedule below is meant as a guideline only. Topics, their order, and the time spent on each may change as time permits. Likewise, the dates of the exams are subject to change. Other important dates are listed.

Week	Week of	Topic	Textbook Sections	Remarks
1	1/8	Introduction	1.1-1.4	
2	1/15	Normal Stress, Shear Stresses, Stresses on Inclined Planes, Allowable Stresses, Bearing Stress	1.3-1.6	1/15: No classes 1/16: Drop/Add ends
3	1/22	Design of Axial & Shear Members, Normal & Shear Strain	2.1-2.2	
4	1/29	Mechanical Properties of Materials	3.1-3.6	
5	2/5	Axial Deformation due to Loads, Thermal Stress & Strain	4.1-4.4 4.6	
Midterm 1: 2/7 (Chapters 1-3; Learning Outcomes 1 & 2)				
6	2/12	Axial Deformation due to Loads, Thermal Stress & Strain	4.1-4.4 4.6	
7	2/19	Torsional Stress and Strain Shear and Moments using equations	5.1-5.5 6.1	
8	2/26	Shear and Moments using Relationships	6.2	2/28- Last day to drop without academic penalty
9	3/5	Flexural Stresses	6.3-6.4	
10	3/12	Composite Beams	6.6	
Midterm 2: 3/14 (Chapters 4-6; Learning Outcomes 1, 3, 4, & 5)				
11	3/19	Beam Shear Stress	7.1-7.2	
12	3/26	Combined Stresses	8.2	
13	4/2	**Spring Break- No Classes**		
14	4/9	Plane Stress Transformations Principle Stresses & Maximum Shear Stresses	9.1-9.3	
15	4/16	Mohr's Circle	9.4	
16	4/23	Beam Design Problems	11.1-11.2	4/30- Last day of classes
Final Exam:* 5/2 10:30am – 12:30pm in usual classroom (covers all content)				

Final Exam information is per the registrar's website and is subject to change. Consult the registrar's website for official information.

Policies:

- **Class Attendance Policy:** Attendance is necessary for all class lectures unless you are ill or officially excused by the instructor (such as a result of official, documented participation in a university function). In the case of unavoidable absences, you are responsible for making up the work done in class. It is not the instructor's responsibility to provide the student with that information outside of class. It is the student's responsibility to obtain any missed information or handouts given in class from a classmate.
- **Make-up Policy (Assignments, Quizzes, Exams, etc.):** There will be no make-up exams under any circumstances, except medical reasons. Provide your instructor with a letter from your medical doctor. If your absence is excused, then the instructor reserves to have you either make up the exam, or to have subsequent exams/final exam weighted more heavily to make up for the missing points.
- **Methods of Communicating:** D2L shall be considered the primary method of communication from the instructor, and the student should check D2L regularly. You can ask questions and ask for clarification by e-mail, in class, or by visiting the instructor during office hours or by appointment. http://d2l.kennesaw.edu
- **Electronic Communications:** The University provides all KSU students with an "official" email account with the address "students.kennesaw.edu." As a result of federal laws protecting educational information and other data (see the following section entitled "FERPA," this is the sole email account you should use to communicate with your instructor or other University officials.
- **Response Timeframe:** Grading of homework/assignments may take up to a week. I will try to respond to any discussions, comments, and questions within 24 hours Monday through Friday.
- **Course Withdrawal Policy:** Please refer to the KSU catalog for specific information regarding course withdrawal. Students are solely responsible for managing their enrollment status in a class; nonattendance does not constitute a withdrawal.
- **Grade Dispute/Appeal:** Final grade dispute/appeal must be submitted within a week of the final exam. The procedure has been outlined in the KSU website that can be accessed via the link at http://www.kennesaw.edu/registrar/policies/grade_appeals.php.
- **Readings, Preparation, and Participation:** The reading assignments, problems cases and discussion forums are an integral element of the course. Students are expected to complete readings and other assigned work prior to each class, in order to fully participate in the discussion. Learning is approached as a participatory process, which benefits from student/teacher and student/student interaction. The lectures may not explicitly follow the assigned book reading, but are designed to bring together diverse information from various sources.
- **Computer Use:** Much of the course materials, quizzes, assignments, and communication will be through D2L Brightspace. It is the student's responsibility to stay current with D2L content. In the classroom, laptop/handheld computers may be used as long as it is not distracting to other students.
- **Cell Phones:** All communication devices must be turned off or to silent mode in the classroom. The use of cell phones or other communication devices is disruptive, and is therefore prohibited during class.
- **Instructor's Absence or Tardiness:** If the instructor is late in arriving to class, you must wait 20 minutes after the start of class before you may leave without being counted absent, or you must follow any written instructions the instructor may give you about an anticipated absence or tardiness.
- **What is Plagiarism?** KSU defines Plagiarism as the practice of taking someone else's work or ideas and passing them off as one's own. When unaware or uncertain on how to properly cite a particular source, please do not neglect to add the citation — KSU considers not doing so as plagiarism. If you have questions on how to cite your work, please contact me immediately! For more information, please refer to the "Plagiarism Policy" under the *Policies* section of this syllabus.

- **Plagiarism Policy:** KSU considers committing plagiarism as an act of academic dishonesty, and takes all occurrences very seriously. Any instances where academic dishonesty is suspected will result in an automatic grade of a zero for all students involved. The instructor reserves the right to remove any student from the class if the student's behavior is of a disruptive nature or if there is an evidence of academic dishonesty. Further disciplinary action may be taken such as suspension or expulsion from the University.
- **Disruptive Behavior and Academic Dishonesty:** Every KSU student is responsible for upholding the provisions of the Student Code of Conduct, as published in the Undergraduate and Graduate Catalogs. Section 5c of the Student Code of Conduct addresses the university's policy on academic honesty, including provisions regarding plagiarism and cheating, unauthorized access to university materials, misrepresentation/falsification of university records or academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the Department of Student Conduct and Academic Integrity (SCAI), which includes either an "informal" resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct's minimum one semester suspension requirement. See also https://web.kennesaw.edu/scai/content/ksu-student-code-conduct.
- **Statement on Publication of Course Materials:** Some lecture slides, course notes, or assignments used in this course may be the property of the textbook publisher or other third parties. All other course material, including but not limited to slides developed by the instructor(s), the syllabus, assignments, course notes, course recordings (whether audio or video) and examinations or quizzes are the property of the University or of the individual instructor who developed them. Students are free to use this material for study and learning, and for discussion with others, including those who may not be in this class, unless the instructor imposes more stringent requirements. Republishing or redistributing this material, including uploading or linking the material it to web sites, violates the rights of the copyright holder and is prohibited. There are civil and criminal penalties for copyright violation. **Publishing or redistributing this material in a way that might give others an unfair advantage in this or future courses is may subject you to penalties for academic misconduct.**
- **FERPA:** The Family Education Rights and Privacy Act (FERPA) is a federal law designed to protect the privacy of educational records by limiting access to these records, and precludes Kennesaw State University from providing information regarding the student to anyone without written authorization. Examples of records not released are grades; grade point average; the specific number of hours/credits enrolled, passed, or failed; Social Security Number; student ID number; name of parents or next of kin; and/or residency status.
- **Ethics and Sexual Harassment Policy:** Sexual harassment in any situation is reprehensible. It subverts the mission of the University, and threatens the careers of students, faculty, and staff. It is viewed as a violation of Title VII of the 1964 Civil Rights Act as amended by the 1991 Civil Rights Act. Sexual harassment will not be tolerated at KSU. KSU is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, religion, color, sex, national origin, disability, age, sexual orientation, or veteran status. In adhering to this policy, the University abides by the requirements of Title IX of the Education Amendments of 1972; by Title VII of the Civil Rights Act of 1964, as amended by the Civil Rights Acts of 1991; by Sections 504 and 504 of Rehabilitation Act of 1973; by Executive Order 11246, as amended by 38 U.S.C. 2012; the Vietnam Era Veterans Readjustment Assistance Act of 1972, as amended; and by other applicable statutes and regulations relating to equality of opportunity. This policy on sexual harassment applies to the entire University and to the conduct of students, faculty, and staff alike.

- **Student Rights and Responsibilities:** Students of KSU are entitled to an environment that is conducive to learning and individual growth. To this end, students enrolling at KSU assume a responsibility to abide by the policies and regulations expressed in this section. By doing so, students may fulfill their responsibilities and enjoy the exercise of their own rights while also respecting the rights of others. Information about the student rights and responsibilities can be found at http://catalog.kennesaw.edu/content.php?catoid=27&navoid=2263
- **ADA/504 Compliance:** Students with qualifying disabilities under the Americans with Disabilities Act (ADA) and/or Section 504 of the Rehabilitation Act who require "reasonable accommodation(s)" to complete the course may request those from Office of Student Disability Services. Students requiring such accommodations are required to work with the University's Office of Student Disability Services rather than engaging in this discussion with individual faculty members or academic departments. If, after reviewing the course syllabus, a student anticipates or should have anticipated a need for accommodation, he or she must submit documentation requesting an accommodation and permitting time for a determination prior to submitting assignments or taking course quizzes or exams. Students may not request retroactive accommodation for needs that were or should have been foreseeable. Students should contact the office as soon as possible in the term for which they are seeking accommodations. Student Disability Services is located in the Student Center, building A, Suite 160G. Please visit the Student Disabilities Services website at www.kennesaw.edu/stu_dev/sds for more information, or call the office at 678-915-7244 or 470-578-2666.
- **Policy Changes:** Information contained in the course syllabus may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.

Contacts to get Help:

- D2L Technical Support, go to https://d2lhelp.view.usg.edu/ or call 678-915-HELP
- D2L Brightspace website at https://kennesaw.view.usg.edu/d2l/login
- KSU Help Desk Phone Number: (678) 915-HELP (4357).
- KSU Distance Learning at http://distancelearning.kennesaw.edu/support/content-tools.php
- KSU UITS at http://uits.kennesaw.edu/
- Accessibility policy of all technologies: https://softchalkcloud.com/lesson/serve/jV10GKPfztZwQn/html

Additional Resources

- Remote access to Library Resources at http://www.kennesaw.edu/library/Dl/dl.html
- You can find The USG Copyright Policy at http://www.usg.edu/copyright/
- Other help for student success at http://sss.kennesaw.edu/
- Academic support services and student services at (http://kennesaw.edu/currentstudents.php)
- KSU CETL Thank a Teacher at http://cetl.kennesaw.edu/thank-a-teacher