

## SCHOOL OF ENGINEERING

### COURSE SYLLABUS

**COURSE TITLE:** Strength of Materials

**TERM:** Fall

**COURSE:** ENGR 3131

**YEAR:** 2012

**SECTION NO.:** 003

**TIME:** TR 1:00 – 2:15 pm

**PLACE:** Q 314

**INSTRUCTOR:** Dr. M. A. Karim, P.E.

**OFFICE LOCATION:** M-162B

**OFFICE HOURS:** MW 06:30-07:30 pm

**OFFICE PHONE:** (678) 915-3026

T 05:00-08:00 pm

**HOME PHONE:** TBD

\*Other hours by appointment

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**MY WEBSITE:** <http://educate.spsu.edu/mkarim>

**NUMBER OF CREDIT HOURS:** 3-0-3 (Lecture-Lab-Total)

**PREREQUISITS:** ENGR 2214 and MATH 2254

**COREQUISITS:** ENGR 3132

**COURSE CATALOG DESCRIPTION:** 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. Includes study of stress and strain in columns, connectors, beams, eccentrically-loaded members, as well as introduction to statically indeterminate members.

**REQUIRED or ELECTIVE:** Required.

**REQUIRED TEXT:** Mechanics of Materials by R. C. Hibbeler, Prentice Hall (Pearson), Eighth Edition, 2011; ISBN-13: 978-0-13-602230-5; ISBN-10: 0-13-602230-8.

**REFERENCES:** None.

**OTHER MATERIALS:** Handouts may be provided as needed. It is recommended that students take notes in a three ring binder since they may be receiving handouts throughout the semester. SPSU email and GeorgiaView/Vista systems will be used for messages and content delivery, respectively. Students should access these sites regularly.

**COURSE LEARNING OUTCOMES:** Upon successful completion of this course, students shall be able to:

1. Calculate stress, strain, and deformation for basic geometric shapes 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 force and bending moment diagrams and write beam equilibrium equations.
5. Design and analysis of 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 REQUIREMENTS:**

1. **Attendance:** Students are expected to attend class. Advance notice of an absence should be provided whenever possible. Makeup exams, quizzes, and acceptance of late assignments will be considered only for documented medical reasons, emergency circumstances, or other university sponsored activities.
2. **Homework:** All problem assignments must be submitted in the next class following the class in which the topic is discussed. Late homework WILL NOT be accepted. Exceptions may be considered in case of illness, serious emergencies, or other university sponsored activities. However, appropriate evidence must be presented in order to qualify for exceptions. All homework must be submitted on 8½"x11" white paper or on engineering design paper (preferable) with a cover page. Cover page should include student's name, course number and name, assignment number, assignment date, and due date. Show the detail works for full credit. Graded homeworks will be returned to students; however, students need to preserve them until the grades are finalized and show them to the instructor if there is any dispute in grades.
3. **Exams/Quizzes:** All exams are closed books and notes unless advised otherwise. NO make-up exams will be given. Exceptions may be considered in case of illness, serious emergencies, or other university sponsored activities. However, appropriate evidence must be presented in order to qualify for exceptions. Graded exams/quizzes will be returned to students; however, students need to preserve them until the grades are finalized and show them to the instructor if there is any dispute in grades.
4. **Cheating:** Cheating on assignment and particularly on the examinations will not be tolerated. If you are caught cheating, you will get zero on the exam. You will be asked to move if you are caught looking at another student's work. 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.
5. **Term Paper/Presentation:** No term paper/presentation for this course.

6. **Class Decorum:** No cell phone use, eating, and/or multitasking are allowed during the class. For emergency, cell phone can be operated in vibration mode; however, students can receive an emergency call only stepping out of the class room. No feet on the table and/or on the nearby chair are allowed during the class.
7. **Honor Code:** SPSU has an Honor Code and a procedure for handling cases when academic misconduct is alleged. All students should be aware of them. Information about the Honor Code and the misconduct procedure may be found at <http://www.spsu.edu/honorcode/>.
8. **ADA Provisions:** "Students with disabilities, as defined by the Americans with Disabilities Act (ADA) of 1990, should contact the instructor during the first week of the semester regarding the accommodations necessary to complete the requirements of this course. The instructor will make reasonable adjustments to take into consideration the specific handicap of each student covered under the ADA. The students can also contact SPSU ADA coordinator at 678-915-7244 for additional help."

**GRADING POLICY:** All exams, quizzes, and assignments must be completed satisfactorily in order to pass the course. The evaluation process described below is subject to change by the instructor. The changes will be announced in the class.

<b><u>Class Work:</u></b>		<b><u>Total Grade:</u></b>			
		<b><u>Scale, Letter Grade, and GPA</u></b>			
1. Homework	- 10%	90%	-	100%	A 4.0 (Excellent)
2. Quiz	- 20%	80%	-	90%	B 3.0 (Good)
3. Mid Term 1	- 20%	70%	-	80%	C 2.0 (Satisfactory)
5. Mid Term 2	- 20%	60%	-	70%	D 1.0 (Passing)
5. Final Exam (Comprehensive)	- 30%		<	60%	F 0.0 (Failure)
<b>TOTAL</b>		--	--		WF 0.0 (Withdrawn after deadline)
<b>- 100%</b>					

The following symbols are approved for use in the cases indicated, but will not be included in the determination of the grade point average.

**"I"** This symbol indicates that the student was doing satisfactory work but, for non-academic reasons beyond his control, was unable to meet the full requirements of the course. The requirements for removal of an "I" are left to the respective institutions; however, if an "I" is not satisfactorily removed after three quarters of residence, the symbol "I" will be changed to the grade "F" by the appropriate official. (See Southern Tech policy - Removal of an Incomplete "I", on page 2).

**"W"** This symbol indicates that a student was permitted to withdraw without penalty. Withdrawals without penalty will not be permitted after the mid-point of the total grading period (including final examinations) except in cases of hardship as determined by the appropriate official of the respective institution.

**"V"** This symbol indicates that a student was given permission to audit this course. Students may not transfer from audit to credit status or vice versa.

**"K"** This symbol indicates that a student was given credit for the course via a credit by examination program approved by the respective institution's faculty (CLEP, AP, Proficiency, etc.)

**SCHEDULE:** Two 75-minute classes or 3-50 minute classes or 1-150 minutes class per week

**TENTATIVE LECTURE TOPIC/OUTLINE:** The following lecture topic/outline is subject to change by the instructor. Changes will be announced in the class.

Class/Week	Tentative Lecture Topic/Outline	Chapter
Week 1 - 2	<b>Stress</b> - introduction, equilibrium of a deformable body, stress, average normal stress in an axially loaded bar, average shear stress, allowable shear stress, and design of simple connections.	Chapter 1 (1.1-1.7)
Week 3	<b>Strain</b> – deformation and strain.	Chapter 2 (2.1 - 2.2)
Week 4 – 5	<b>Mechanical Properties of Materials</b> – the tension and compression test, stress-strain diagram, stress-strain behavior of ductile and brittle materials, Hooke’s law, strain energy, Poisson’s ratio, and shear stress-strain diagram.	Chapter 3 (3.1-3.7)
Week 5	<b>Mid Term Exam 1</b>	---
Week 6 - 7	<b>Axial Load</b> – Saint-Venant’s principle, elastic deformation of an axially loaded member, principle of superposition, statically indeterminate axially loaded member, the force method of analysis for axially loaded members, and thermal stress.	Chapter 4 (4.1-4.6)
Week 8 - 9	<b>Torsion</b> – torsional deformation of a circular shaft, the torsion formula, power transmission, and of twist, and statically indeterminate torque-loaded members.	Chapter 5 (5.1-5.5)
Week 9	<b>Mid Term Exam 2</b>	---
Week 10 – 11	<b>Bending</b> – shear and moment diagrams, graphical methods for constructing shear and moment diagrams, the flexural formula, composite beams, and reinforced concrete beams.	Chapter 6 (6.1-6.2, 6.4, 6.6-6.7)
Week 12	<b>Design of Beams and Shafts</b> - basis for beam design and prismatic beam design. Shear in straight members, the shear formula, shear flow in built-up members, and shear flow in thin-walled members. Stresses due to combined loadings.	Chapter 11 (11.1-11.2) (7.1-7.4) (8.1-8.2)
Week 14	<b>Stress Transformation</b> - plane-stress transformation, general equations of plane stress-transformation, principal stresses and maximum in-plane shear stress, and Mohr’s circle – plane stress.	Chapter 9 (9.1-9.4)
Week 15	<b>Buckling of Columns</b> – critical load, ideal column with pin supports, and column having various types of supports.	Chapter 13 (13.1-13.3)
Week 16	<b>Final Exam - Comprehensive</b>	---

**ABET CATEGORY:** Engineering science: 3 credit hours (100%)