CVEN 305-302 Syllabus
MECHANICS OF MATERIALS
Summer 2013 - C.E. Room 118
MWF 8:00 am - 9:20 am

Professor: Lee L. Lowery, Jr., PhD, P.E.

Office: Old CE Building, Room 139C
Phone: 979-845-4395 (Office), 979-775-5401 (Home)
e-mail: Lowery@tamu.edu

Office Hours:

NOTE: Office hours listed below are suspended on the day before a major exam, giving me time to make it out. Do not wait until the day before a major exam for help, unless the tutor has office hours on that day.

- MWF 8:00 am - 9:30 am
- MTWRF 3:30 pm - 5:00 pm

Half of my time is spent teaching CVEN 305. During the remaining hours I serve as a departmental adviser and register new students. Since I have limited time for tutoring please plan on assistance either during my office hours, or see the tutor during their office hours. On TR in the afternoons I present our Departmental New Student Conferences. Then on WF we register them in from 12:00 to about 4:00 in the afternoon. Please note that you probably won't find me during those hours. Don't wait until just before class or a quiz to get help or you likely won't get any, especially around quiz days.

It will always be in your best interest to call before you come by, unless you are already in the area.

Teaching Associate: Tony Hasenack

Office: CE 023
Hours: MTWRF 1:00 - 3:00 pm
Desk: #2 (Far right-hand corner - map on door - 305 sign on partition)
Email: Tonyph@neo.tamu.edu

Textbook: The textbook is excellent - one of the best:

  Note that you can sometimes find a much cheaper paperback version, but it has to be the 6th edition.

Looking for a used textbook? This is the ISBN number: ISBN-10 Number 0073380288, ISBN-13 Number 9780073380285
Note that the internet is a thieves paradise. If they won't show you this cover, it's probably not the correct 6th edition. 

- WWW.CampusBooks4Less.com
- DealOz
- Allbookstores.com
- Campusbooks.com
- Bigwords.com
- AbeBooks.com
- TextbooksRus.com <-- International edition info

Bookstore or Internet?

- The bookstore has to charge you tax, whereas (for a few more months perhaps) the internet seller does not.
- The bookstore has to charge you for a nice bricks and mortar store, whereas the books on the internet are languishing in a trashy warehouse outside of Saginaw.
- The bookstore has to staff the place for rush hour at a living wage, even if no one is there much of the time, whereas the internet cuts all kinds of corners.
- The bookstore is ready to take your book back if it's wrong, no questions asked. The internet may/may not be as helpful.
- The bookstore may well have made a deal with the publisher to bundle other helpful aids at no extra cost above list, such as access to web problem solutions, disks, etc. You would have to call them and ask if all you get is the book.
- All that all being said, the internet is cheaper, and usually by quite a bit.
- The book is the same and usually gets delivered quickly.
- You should be careful about International versions. They often have only SI examples and homework problems, whereas the U.S. version often has a mixture of SI and US Customary.

Catalog Description:

Stress/deformation relationships for continuous media to structural members; axially loaded members; thin-walled pressure vessels; torsional and flexural members; shear; moment; deflection of members; combined loadings; stability of columns; non-symmetrical bending, shear center; indeterminate members; elastic foundations. Prerequisite Satisfactory completion of CVEN 221 or equivalent (Statics).

Course Objectives:

- To introduce students to applications of stress and deformation relationships for structural members subjected to axial, torsional, and bending loads, and thin-walled pressure vessels. Students will study stress and deformation of structural members under combined loadings, stability of columns, nonsymmetrical bending, including indeterminate members.

Learning Outcomes - This course emphasizes the following ABET Learning Outcomes. Note that the letters refer to those used by ABET.

- (a) Ability to apply knowledge of basic mathematics, science, and engineering.

Course Prerequisites:
To take CVEN 305, you must have been admitted to upper level in Civil Engineering, and have received a passing grade (no D's, F's or I's) in CVEN 221 or MEEN 221 or equivalent, and completed MATH 251.

**Course Assessment:**
- Graded major exams (Quiz A, Quiz B, Final Exam = 3 @ 30% each)
- Graded homework assignments, Readiness Assessment Tests (RATs), Class Participation, Attendance, Projects (all of equal value) totaling 15%

**Syllabus Information:**
- **Class Expectations**
- **General Information Regarding Format for Exams, Quizzes, and Homework**
- **Where to get help for 305**
- **Grading**
- **Make-up exams**
- **Attendance**
- **Illness**
- **Academic Dishonesty Policy**
- **Finally, click here!**

**Resources available to the student:**
- Instructor of record: Dr. Lee L. Lowery, Jr.
- Teaching associate: elearning.tamu.edu
- List of homework problems and pop quizzes assigned during the semester.
- Computer software (Excel, EES, etc.)
- Computers in the Civil Engineering Computer Labs
- Old Exams and this semester’s exam solutions
- Chances of making what grade in Lowery's 305 class after Quiz A and after Quiz B
- First few homework problems assigned for use until texts come in are here
- Summer 2013 class lectures and notes posted during this semester
- Summer 2012 class lectures and notes posted during this semester
- Summer 2011 class lectures and notes posted during a previous semester
- Summer 2010 class lectures and notes posted during a previous semester
- Spring 2010 class lectures and notes posted during a previous semester
- Fall 2009 class lectures and notes posted during a previous semester
- Fall 2008 class lectures and notes posted during a previous semester
- Tutoring and Student use of the solution manual
- Make-up exams
- Access to the Civil Engineering Apps Server
- Some good videos on plane stress, principal stresses, Mohr's circle, failure theories, pressure vessels
- Typical point deductions you can expect on exams and pop quizzes
- Class seating Chart
- First few homework problems

*The correct time* (to the nanosecond)

**Course Schedule:**

**NOTE ON HOMEWORK:**
The homework assignments may have to be modified from that shown below, depending on our progress during the semester. Please check the list for changes each day before you work them.

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**Daily Problem Assignments**

Read the following: [Homework Requirements](#)

Homework is assigned on the dates shown below, and due one week later unless otherwise noted, **before you sit down for class.**
<table>
<thead>
<tr>
<th>(Week) Dates</th>
<th>Textbook Reading Assignments</th>
<th>Sections in text</th>
<th>Monday Assignment: A1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) 6/3 - 6/7</td>
<td>Monday: Sections 1.1 – 1.8</td>
<td></td>
<td>1.1, 1.2, 1.3, 1.4, 1.8, 1.14, 1.15, 1.16, 1.19, 1.21, 1.23</td>
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<td></td>
<td>Wednesday: Sections 1.9-1.13</td>
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<td>(Due on 6/10)</td>
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<td>Friday: Sections 2.1-2.8</td>
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<td>(2) 6/10 – 6/14</td>
<td>Monday: Sections 2.9 - 2.12</td>
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<td></td>
<td>Wednesday: Sections 2.14, 2.17, 2.18</td>
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<td></td>
<td>Friday: Sections 3.1-3.4</td>
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<td>At this point, students are strongly encouraged to study Appendix A thoroughly.</td>
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<tr>
<td>(3) 6/17 - 6/21</td>
<td>Monday: Sections 3.5, 3.6, 3.7</td>
<td>Detailed procedure for drawing shear and moment diagrams</td>
<td>A1 - Monday Assignment: A7</td>
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<tr>
<td></td>
<td>Wednesday: Sections 3.8</td>
<td>Interactive practice drawing shear and moment diagrams</td>
<td>3.33, 3.36, 3.37, 3.49, 3.53, 3.54, 3.55, 3.67, 3.72, 3.75, 3.142</td>
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<td></td>
<td>Friday: Sections 4.1-4.4</td>
<td></td>
<td>(Due on 6/24)</td>
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<td>(4) 6/24 - 6/28</td>
<td>Monday: Sections 4.5 - 4.7, 4.12</td>
<td></td>
<td>Wednesday Assignment: A8</td>
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<td></td>
<td>Wednesday: Sections 4.13, 4.14</td>
<td></td>
<td>3.84, 3.90, 4.2, 4.4, 4.3, 4.7</td>
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<td></td>
<td>Friday: Sections 5.1, 5.2</td>
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<td>(Due on 6/26)</td>
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</tbody>
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Homework handed in at the end of class will be counted as late. Sorry, but "I didn't want to disturb you since I came in 20 minutes late" won't change it's being counted late.

Some problems have hints or corrections. Click on those with links below.

Monday Assignment: A10
4.33, 4.34, 4.37, 4.40, 4.61, 4.63, 4.102, 4.105, 4.108, 4.116 (Due on 7/1)

Monday Assignment: A11
4.127, 4.132, 4.133, 4.144, 4.148 (Don't ask. Due on 7/3)

Monday Assignment: A12
5.3, 5.5, 5.9, 5.11, 5.16, 5.22 (Due on 7/5)

Monday Assignment: A13
5.44, 5.54, 5.57, 5.51

https://ceprofs.civil.tamu.edu/lrowery/cven305/Syllabi/305-13b-threeaweek.htm

6/2/2013
Monday: Sections 5.3

(5) 7/1 - 7/5

Wednesday: QUIZ A
8:00 - 9:00 a.m.

Friday: Sections 5.4

(6) 7/10 - 7/12

Monday
No class

Wednesday
Sections 6.1-6.4, 6.6-6.7

Friday
Sections 7.1-7.3

(7) 7/15 - 7/19

Monday
Sections 7.4, 7.6

Wednesday
Sections 7.9

Friday
Sections 9.1-9.3

(8) 7/22 - 7/26

5:00 pm Tuesday 2013
July 23rd Last day to Q-drop or Withdraw

Monday
Sections 9.5, 9.6

Wednesday
Sections 9.7

Friday
Sections 9.8

(Due on 7/10)

Wednesday:
Quiz A - Given in class from 8:00 to 9:00 during regular class time. Covers everything through homework problem #4.25.

You are permitted to bring one 8.5" x 11" cheat sheet to the quiz, hand written by you (no copies) on TWO SIDES, no example problems. Equations only.

You may also bring a copy of the F.E. Exam Reference Manual. No notes of any kind are permitted on these sheets.

Friday Assignment: A14
5.74, 5.76, 5.77, 5.79, 5.81
(Due on 7/12)

Wednesday Assignment: A15
6.1, 6.2, 6.3, 6.5, 6.7, 6.9, 6.11, 6.13
(Due on 7/17)

Friday Assignment: A16
6.16, 6.21, 6.29, 6.33, 6.36, 6.37, 6.41, 6.45
(Due on 7/19)

Monday Assignment: A17
7.1, 7.3, 7.13, 7.16, 7.17, 7.5, 7.6, 7.8, 7.9, 7.10, 7.12
(Due on 7/22)

Wednesday Assignment: A18
7.19 (I may be wrong, but I think he used the wrong angle on 7.19), 7.20, 7.21, 7.27, 7.29
(Due on 7/24)

Friday Assignment: A19
7.31, 7.32, 7.34, 7.68
(Due on 7/26)

Monday Assignment: A20
7.70, 7.98, 7.107, 7.109, 7.115, 7.117, 7.120 - Note tank is pressurized, twisted, and bent
9.1, 9.2, 9.4, 9.5
(Due on 7/29)

Wednesday Assignment: A21
(Due on 7/31. Yep, don't ask, 7/31)

Friday Assignment: A22
(Due on 8/2)

Monday Assignment: A23
9.46, 9.49, 9.50, 9.53, 9.54, 9.65, 9.69, 9.73
(Due on 8/5)

Monday
Sections 10.1

Wednesday:
Wednesday
QUIZ B

(9) 7/29 - 8/2

Quiz B - Given in class from 8:00 to 9:00 during regular class time. Covers everything through homework problem #7.68. Emphasis will be on material covered since Quiz A, but you are responsible for everything covered.
You are permitted to bring one 8.5" x 11" cheat sheet to the quiz, handwritten by you (no copies) on TWO SIDES, no example problems. Equations only.
You may also bring a copy of the F.E. Exam Reference Manual. No notes of any kind are permitted on these sheets.

Friday Assignment: A24
(Due on 8/9)

Monday
Sections 10.3

Monday Assignment:
10.9, 10.10, 10.12, 10.14 (Not to be turned in, but you are responsible for being able to do them on the Final.)

Wednesday
Sections 10.4

Wednesday Assignment:
10.20, 10.21, 10.22, 10.23 (Not to be turned in, but you are responsible for being able to do them on the Final.)

Friday
Cover missed materials from previous lectures

Pick up any old homework outside of my office in a day or two.

(10) 8/5 - 8/9

Monday
Final Exam Review

25% on Quiz A material
25% on Quiz B material
50% on material after Quiz B

Your copy of the F.E. Exam Reference Manual must have no notes of any kind written on it.

Final Exam:
Tuesday 8/13/2013
8:00 a.m. to 10 a.m.
In regular classroom

The Americans 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 accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Cain Hall or call 845-1637.

The following is the University required Academic Integrity Statement:

"An Aggie does not lie, cheat, or steal or tolerate those who do."

All syllabi and examinations shall contain a section that states the Aggie Honor Code and refers the student to the Honor Council Rules and Procedures or the web: http://www.tamu.edu/aggiehonor
~ Notes are on the web from last semester

www.foundationcoalition.org

[Diagram with annotations: SMHT HELP QUIZ]
reactions, therefore, will be represented by two components, $A_x$ and $A_y$ at $A$, and $C_x$ and $C_y$ at $C$. We write the following three equilibrium equations:

\[
\Sigma F_x = 0 = -CB \left( \frac{800}{1000} \right) - AB = 0
\]

\[
\Sigma F_y = 0 = CB \left( \frac{600}{1000} \right) - 30
\]

\[
\Sigma M_A = C_y \cdot 0.8 = 0
\]

Fig. 1.1 Boom used to support a 30-kN load.

$\Sigma F_x = 0 = -CB \left( \frac{800}{1000} \right) - AB = 0$

$\Sigma F_y = 0 = CB \left( \frac{600}{1000} \right) - 30$

\[
\Sigma M_A = C_y \cdot 0.8 = 0
\]

Fig. 1.1 Boom used to support a 30-kN load.

Fig. 1.2

Fig. 1.3
1.3 STRESSES IN THE MEMBERS OF A STRUCTURE

Fig. 1.7

Fig. 1.8 Member with an axial load.

\[ A = 2\text{ in}^2 \]
\[ P = 8000 \text{ lb} \]
\[ \sigma = \frac{P}{A} = \]
1.4 ANALYSIS AND DESIGN

Consider
is made
Can rod
magnitude
Recall
determin
have

\[ P = \]

\[ A = \]

\[ \sigma = \]

Since the allowable support analysis of the \( \sigma \) the stress discussion the deflection study of An additional load will be considered.

Thus, the structure even greater and to perform the structure will still be possible from Eq. (1.2),

\[ \sigma_{\text{all}} = \frac{P}{A} \quad A = \frac{P}{\sigma_{\text{all}}} = \frac{50 \times 10^3 \text{N}}{100 \times 10^6 \text{Pa}} = 500 \times 10^{-6} \text{ m}^2 \]

and, since \( A = \pi r^2 \),

\[ r = \sqrt{\frac{A}{\pi}} = \sqrt{\frac{500 \times 10^{-6} \text{ m}^2}{\pi}} = 12.62 \times 10^{-3} \text{ m} = 12.62 \text{ mm} \]

\[ d = 2r = 25.2 \text{ mm} \]

We conclude that an aluminum rod 26 mm or more in diameter will be adequate.
In general, the value obtained for the stress $\sigma$ at a given point $Q$ of the section is different from the value of the average stress given by formula (1.5), and $\sigma$ is found to vary across the section. In a slender rod subjected to equal and opposite concentrated loads $P$ and $P'$ (Fig. 1.10a), this variation is small in a section away from the points of application of the concentrated loads (Fig. 1.10c), but it is quite noticeable in the neighborhood of these points (Fig. 1.10b and d).

It follows from Eq. (1.6) that the magnitude of the resultant of the distributed internal forces is

$$
\sigma = \frac{dF}{dA} \quad \int dF = \int_{A} \sigma \, dA
$$

But the conditions of equilibrium of each of the portions of rod

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Fig. 1.10 Stress distributions at different sections along axially loaded member.

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Fig. 1.11

---

†See Mc Ne...
Fig. 1.12

Fig. 1.13  Eccentric axial loading.

Fig. 1.15
obtain the \textit{average shearing stress} in the section. Denoting the shearing stress by the Greek letter \( \tau \) (tau), we write

\[
\tau_{\text{ave}} = \frac{P}{A} \tag{1.8}
\]

It should be emphasized that the value obtained is an average value of the shearing stress over the entire section. Contrary to what we said earlier, you will see in Chapter 4 that stresses in 

\[
\tau = \frac{P}{2 \text{A BOLT}}
\]

Shear used to connect components (Plate rivets and other components) was connected by a shear force of magnitude corresponding to the bolt diameter of the bolt. We conclude that the average shearing stress by dividing the forces is

\[
\tau_{\text{ave}} = \frac{F}{A} \tag{1.9}
\]

\textbf{Fig. 1.16} Bolt subject to single shear.

\textbf{Fig. 1.17 (a)}

\textbf{Fig. 1.17 (b)}
o be in single shear. For example, if $A$ and $B$ (Fig. 1.18), two planes $KK'$ and $LL'$ are said to be in double shear, as in each plane, we take the portion of bolt located between the planes, that the shear $P$ in the average shear.

\[(1.10)\]

\[A_{\text{BEARING}} = (d_{\text{BOLT}})(t_{\text{PLATE}})\]

For members they connect, see Figs. 1.16. The bolt exerts the force $F$ exerted by the pull on the bearing surface of a half-thickness of the bolt head of the corresponding nut. Practice an average bearing stress, obtained by single representing the flange (Fig. 1.21). Since this area $A$ and $d$ the diameter of

\[(1.11)\]

\[A = \frac{21n^2}{A} \]

AND DESIGN

Pressures in the members of the structures and,
1.3 Two solid cylindrical rods $AB$ and $BC$ are welded together at $B$ and loaded as shown. Determine the magnitude of the force $P$ for which the tensile stress in rod $AB$ has the same magnitude as the compressive stress in rod $BC$.

$$F = 20kN$$

Figure P1.3

1.4 In Prob. 1.3 knowing that $P = 40$ kips determine the average

$$
\sigma = \frac{20kN \times \text{comp}}{20 \text{ in.}^2} = 1 \text{kips/In}^2
$$

Figure P1.3
**POP QUIZ**

10\( \text{kN} \)  \[ \rightarrow \]  20\( \text{kN} \)  \[ \rightarrow \]  40\( \text{kN} \)  \[ \rightarrow \]  50\( \text{kN} \)  

\[ F_{CD} = ? \]

\[ \Sigma F_H = 0 = -10 \text{kN} - 20 \text{kN} + 40 \text{kN} - P_D + 50 \text{kN} \]

\[ P_D = +60 \text{kN} \text{ i.e. } 60 \text{kN} \text{ as shown} \]

**Using FB#1**

\[ \Sigma F_H = 0 = -10 - 20 + 40 + F_{CD} \]

\[ F_{CD} = -10 \text{kN} \text{ i.e. } F_{CD} = 10 \text{kN} \text{ or } F_{CD} = 10 \text{ Comp.} \]

**Using FB#2**

\[ \Sigma F_H = 0 = -F_{CD} - 60 \text{kN} + 50 \text{kN} \]

\[ F_{CD} = -10 \text{kN} \text{ i.e. } F_{CD} = 10 \text{kN} \text{ or } F_{CD} = 10 \text{ Comp.} \]