CEE 220 Mechanics of Materials
Winter Quarter 2012
MWF 8:30-9:20 AM Anderson 223[Lecture]
Lab-Quiz Sections on Thursdays

Catalog Description:
Introduction to the concepts of stress, deformation, and strain in solid materials. Development of basic relationships between loads, stresses, and deflections of structural and machine elements such as rods, shafts, and beams. Load-carrying capacity of these elements under tension, compression, torsion, bending, and shear forces. Prerequisite: AA 210.

Class website: http://courses.washington.edu/c220/

Instructor:
Professor Reed, reed@u.washington.edu, 263 Wilcox, (206)543-0351, Office hours Tuesdays 3-5 PM.

Teaching Assistants:
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Text:
Mechanics of Materials, UW Edition, R.C. Hibbeler. If you are using an earlier version, check with the TAs to see if the sections are the same.

Grading:

Homework Assignments	20%
Lab Assignments	5%
Quizzes (3)	75%

For all quizzes, you may use the equation sheet I hand out during the first week of class. The quizzes will be closed book and notes. For Quiz 2, you will need a compass and protractor for drawing Mohr's circle.

Tentative Outline:

Date	Topics	Reading (Text)	Due Date for Homework: Due at Beginning of Class	Homework Set [posted online]
Jan. 4-6	Stress, Deformation and Strain; Mechanical Properties	Chapters 1-3		
Jan 9-13	Hooke's Law and Axial Loadings	1-3,4	Jan 11	1
Jan 18-20	January 16 is a class holiday; Stress Transformation	4,9	Jan 18	2

Jan 23-27	*Quiz 1 on Thursday Jan 26th in your lab section;* Mohr's Circle	9,10	Jan 25	3
Jan 30 – Feb 3	Strain Transformation and Mohr's Circle; Strain Gauges and Applications	9, 10	Feb. 1	4
Feb 6-10	Torsion and Bending	5,6, Appendix A	Feb. 8	5
Feb 13-17	*Quiz 2 on Thursday, Feb. 16th in your lab section* Bending, Deflection and Beams and Shafts	6,12	Feb. 15	6
Feb 22-24	Shear, Pressure Vessels, Combined Loadings	12, 8	Feb. 22	7
Feb 27-March 2	Shear and Combined Loadings	7,8	Feb. 29	8
March 5-9	Combined Loadings	7,8,11	March 7	9
March	***The final quiz will be given in the lab sections. Locations will be announced*** *when confirmed with Classroom Support Services.*			

Notes:

- All quizzes will be given in the lab sections. The location of the final will be announced when the rooms for the labs are confirmed.
- Unfortunately, cheating has become a problem in large courses. ***Talking during the quizzes, even while the test sheets are being handed out, is considered cheating.*** If you talk, you will be reported for cheating.
- In order to receive full credit for the lab, you must remain in the lab for the entire time period. You cannot be more than 10 minutes late or you will receive a "0" for the lab.
- In order to receive full credit for the homework assignments, you must complete the problems according to the format shown on the example attached. Sloppy homework will not be graded. Late homework will not count.

General Format of Problem Solutions:

1. Given: Draw a free body diagram and label all known forces and dimensions as relevant. Provide all given information.
2. Find: State what the ultimate objective is. Usually you will be searching for a stress or strain value.
3. Solution: Provide equations to solve the problem. Your final answer should be boxed.

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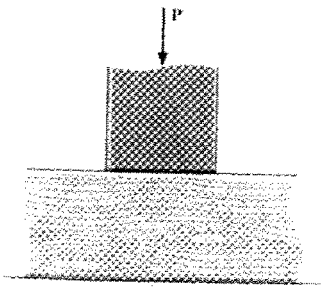
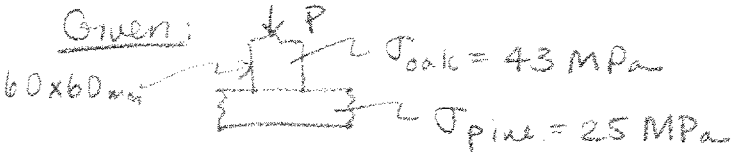
Homework Example Problem.

1-81. The 60 mm × 60 mm oak post is supported on the pine block. If the allowable bearing stresses for these materials are $\sigma_{oak} = 43$ MPa and $\sigma_{pine} = 25$ MPa, determine the greatest load P that can be supported. If a rigid bearing plate is used between these materials, determine its required area so that the maximum load P can be supported. What is this load?



Problem Statement: 60 mm x 60 mm oak post on pine block. Given the allowable stresses, find the maximum P possible. What is the maximum P if a bearing plate is used?

Given:



Find: Pmax

Solution: $\sigma = P/A$ for the case shown

where A = area $= (0.06\,m)(0.06\,m)$

$= 0.0036\,m^2$

Pine block: $\sigma = \frac{P}{A}$ ← note: (provide units)

$P = 25(10^6)\frac{N}{m^2}\left(.0036\,m^2\right)$

$= 90{,}000\,N$

$= \boxed{90\,kN}$ at failure: maximum

Oak post: $\sigma = \frac{P}{A}$

$$43(10^6)\frac{N}{m^2} = \frac{P}{.003\,6\,m^2}$$

$$\boxed{P = 154.8\ kN}$$

Area of post based on strength of pine block:

$$\sigma = \frac{P}{A}$$

$$25(10^6)\frac{N}{m^2} = \frac{154.8(10^3)\,N}{A\,[m^2]}$$

$$A = \frac{154.8(10^3)\,N}{25(10^6)\,N/m^2}$$

$$\boxed{= 6.19\,(10^{-3})\,m^2}$$

$\therefore$ P_{max} for this case is $154.8 \approx \boxed{155\ kN}$