

ME319 - STRESS ANALYSIS**SYLLABUS**

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Instructor: Dr. Todd D. Coburn

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Office Hours: 10:30 -11:30 AM MWF & 1:00 -2:00 PM MW, or by appt.

Office: Bldg 17, Office 2111

Required Text & Tools:

- Budynas & Nisbett. Shigley's Mechanical Engineering Design. 9th Edition preferred, any addition acceptable. McGraw Hill. 2011. (Hardcopy Required)
- Pencil, Paper (Quad or Quint Pad Recommended), Engineering or Scientific Calculator

Useful Additional Texts (Hardcopy Recommended, Any Edition Acceptable):

- Mechanics of Materials by Hibbeler, or Beer & Johnson, or similar.
- Bruhn. Analysis & Design of Flight Vehicle Structures. S.R. Jacobs & Associates. 1973.

Prerequisites:

- C- or better in EGR 104, ME 219 and ME 220L and ME 233/L.

Course Description: Thin and thick-walled pressure vessels, shrink fit, contact stresses, Castigliano's theorem, & other special topics. Failure theories, stress concentration, steady & repeated loading, fatigue & endurance strength, shaft design & analysis, fastener & spring analysis.

| Course Grading | ----- | ----- | Grading Scale | ----- | ----- |
|----------------|---|-------|---------------|--------------|----------------|
| Homework | 20% | | A | 100 % - 93 % | A- 92 % - 90 % |
| Quizzes | 20% | B+ | | 86 % - 83% | B- 82 % - 80% |
| Test #1 | 15% | C+ | | 76 % - 73% | C- 72 % - 70% |
| Test #2 | 15% | D+ | | 65 % - 61% | D- 60 % - 56% |
| Test #3 | 15% | | F | 55 % - 0% | |
| Final Exam | 15% (optional for those with a cumulative grade of 93% or higher after Test #3) | | | | |

Work Standards:

Engineering is a precise discipline. Analytical work should be neat, clear, concise, and easy to follow. Avoiding, identifying and eliminating errors are highly dependent on being able to clearly review the analysis presented, both in the classroom and in the workplace. Credit on homework, quizzes and tests will be highly dependant on how easy it is to follow the thoughts and judgments of the student. Work that is cluttered, overly sloppy, jumbled, or simply hard to follow will lose points, even if the final answer is correct. The following standards are expected and will result in maximum credit:

- Homework should be worked on Quad (4 squares/inch) or Quint (5 squares/inch) paper. Ampad's Engineering paper (22-141, 22-142, or equivalent) is one of the best for this.
- Homework, test, & design project data should be worked on only one side of the paper.
- Each assignment should clearly identify the student's name (first & last).
- Each separate sheet of homework, quiz, or test should also clearly identify the class (ME319), the assignment & number (HW #1, HW #2, Quiz #1, Test #1, etc.), the date, & the problem number.
- Each homework problem should be clearly identified with three primary sections, GIVEN, FIND, & SOLUTION, with each section title identified & underlined.
- GIVEN: List given data. Include sketch of problem with appropriate dimensioning and/or labeling that identifies pertinent information.
- FIND: State what you are trying to find in this problem.
- SOLUTION: Solve the problem in a neat and logical manner. Draw sketches & FBDs as needed to show how problem is idealized and how loads are applied and reacted. Show each equation prior to inserting appropriate values. Show each step in solving the problem clearly as you proceed down the page.

Important Notes, Expectations & Comments:

- Most Quizzes & Exams will be open book (hardcopy only) and closed notes. No electronic devices (including electronic texts) will be allowed during exams except calculators.
- One 3"x5" or 5"x8" card of student-prepared equations will be permitted on exams in lieu of the text, if preferred. Card MUST be yellow, and may be written front and back with formulas, conversion factors, etc.
- Quizzes will be given frequently & will be unannounced.
- No make-up quizzes or exams will be administered.
- Homework is due at the start of each class indicated in Syllabus. Half credit will be lost for turning in after the start of class. No credit will be awarded after that.
- No Late Homework or Quizzes will be accepted or scored.
- Collaboration on homework is recommended. Copying homework is considered cheating.
- Cheating is unacceptable at any time, and will result in immediate failure of the class.
- Attendance is required. Every class has deliverables which will result in loss of points for missing class. Also, students who do not attend class may be dropped from the class.
- Cell Phones, pagers & laptops may not be used in class. Use will result in loss of class credit.
- Eating or drinking is not allowed in the classroom.
- January 10th is the last day to drop without a petition.
- Participation in class is desired, recommended, and rewarded.

Homework Grading Procedure:

Each student must grade their own Homework prior to submitting to instructor, as follows:

- Using a colored pen or marker that stands out from your homework, score each problem next to its identification, and circle the score of each.
- Score each problem as follows:
 - **SETUP:** Score 1 point if all the following is present in your solution:
 - Problem Number - Identified (1, 2, 3, etc) & circled
 - Given, Find, & Solution - Clearly marked & appropriate pertinent data recorded.
 - Sketch – Pertinent sketch of problem shown.
 - Neatness – Setup is legible & clear.
 - **WORK:** Score 2 points if all the following is present in your solution:
 - Equations – All pertinent equations needed and/or used are shown
 - Sketches & FBDs – Includes sketch of problem or idealization & FBDs showing applied loads and reactions wherever possible.
 - Neatness – All work is legible and clear.
 - Complete - Problem is worked to completion & all answers are boxed.
 - **ACCURACY:** Score 0, 1, or 2 points, as follows.
 - If all answers requested match the answer provided, score 2 points.
 - In only some of the answers provided match the solution, score 1 point.
 - If no answer is provided, score 0 points.
- This means each problem score will range from 0 to 5 based on the above.
- Sum your scores to the top of the first page with the total points earned over the total possible (5 times the number of problems), and circle the total score conspicuously.
- If you want me to see or score something, write "See XYZ" & I will take a look & evaluate.
- I will make any modifications to the grades as needed, and may score punitive point reductions if I feel the scoring is intentionally misleading.
- Any ungraded Homework or homework without a name will not be scored, and will show a zero in my gradebook.
- Some homework problems will be designed to measure student performance. These will initially be graded by student per normal procedure, but will be rescored by professor and will typically be worth more points.

If there are questions, see me.

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| Class | Section | Number | Lecture | Location |
|-------|---------|--------|-------------------------|------------------|
| ME319 | 1 | 14464 | 11:45 am – 12:50 pm MWF | Bldg 9, Room 209 |

CLASS SCHEDULE

| Week | Date | Lec | Day | Topics | Shigley's | HW Due |
|------|---------------|-----|----------|--|-----------------------------|--------|
| 1 | 6-Jan | 1 | M | Intro, Goals, & Review | 1, 2, 3-1,3-2, 3-3, 4-11-16 | - |
| 1 | 8-Jan | 2 | W | Shear | 3-11, 4-2 | 1 |
| 1 | 10-Jan | 3 | F | Torsion | 3-12, 4-2 | 2 |
| 2 | 13-Jan | 4 | M | Bending - Elastic | 3-10,18, 4-3,4,5,6,9 | 3 |
| 2 | 15-Jan | 5 | W | Bending - Plastic | --- | 4 |
| 2 | 17-Jan | - | F | No Class - Todd @ Workshop | | |
| 3 | 20-Jan | - | M | HOLIDAY - Martin Luthor King Jr | --- | --- |
| 3 | 22-Jan | 6 | W | Stress, Strain, & Mohr's Circle | 3-4 thru 3-8 | 5 |
| 3 | 24-Jan | 7 | F | Pressure & Contact Stresses | 3-14,15,16,19 | 6 |
| 4 | 27-Jan | 8 | M | Strain Energy & Castigliano's Thm | 4-7 & 4-8 | 7 |
| 4 | 29-Jan | 9 | W | Stress Concentrations | 3-13 | 8 |
| 4 | 31-Jan | 10 | F | Failure Theories | 5-1 to 5-11, 5-14 | 9 |
| 5 | 3-Feb | - | M | Test #1 (Lectures 1-9) | --- | --- |
| 5 | 5-Feb | 11 | W | Fracture Mechanics | 5-12 | 10 |
| 5 | 7-Feb | 12 | F | Fatigue | 6-1 to 6-8 | 11 |
| 6 | 10-Feb | 13 | M | The Endurance Limit | 6-7, 6-9, 6-10 | 12 |
| 6 | 12-Feb | 14 | W | Fluctuating Stresses | 6-11 to 6-13 | 13 |
| 6 | 14-Feb | - | F | HOLIDAY - President's Day | --- | --- |
| 7 | 17-Feb | 15 | M | Cumulative Fatigue Damage | 6-14 to 6-16 | 14 |
| 7 | 19-Feb | 16 | W | Shaft Stress Analysis | 7-1 to 7-8 | 15 |
| 7 | 21-Feb | 17 | F | Fasteners - General | 8-1, 8-3, 8-6 | 16 |
| 8 | 24-Feb | - | M | Test #2 (Lectures 10-16) | --- | --- |
| 8 | 26-Feb | 18 | W | Fasteners - Stiffness, Load & Fatigue | 8-4 to 8-11 | 17 |
| 8 | 28-Feb | 19 | F | Fasteners in Shear | 8-12 | 18 |
| 9 | 3-Mar | 20 | M | Welds - Stresses | 9-1 to 9-9 | 19 |
| 9 | 5-Mar | 21 | W | Welds - Static & Fatigue Strength | 9-1 to 9-9 | 20 |
| 9 | 7-Mar | 22 | F | Springs - Compression & Extension | 10-1 to 10-6 | 21 |
| 10 | 10-Mar | 23 | M | Springs - Torsion & Other | 10-11 to 10-15 | 22 |
| 10 | 12-Mar | - | W | Test #3 (Lectures 18-23) | --- | 23 |
| 10 | 14-Mar | - | F | Review & Wrap Up | | --- |
| 11 | 21-Mar | - | F | Final Exam 11:30 AM - 1:30 AM | --- | N/A |