# MEEM 2150-R03: Mechanics of Materials
Department of Mechanical Engineering - Engineering Mechanics
Michigan Technological University
Spring 2019

**Instructor:** Prof. Gregory M. Odegard
**Office:** MEEM 810
**Email:** gmodegar@mtu.edu
**Class:** MEEM 112, M,W,F 11:05-11:55 am
**Office hours:** M,W,F 12:00 -1:00 pm, or you can contact me by email to schedule an appointment.

**Course description**: Introduction to mechanical behavior of materials, including stress/strain at a point, principle stresses and strains, stress-strain relationships, determination of stresses and deformations in situations involving axial loading, torsional loading of circular cross sections, and flexural loading of straight members. Also covers stresses due to combined loading and buckling of columns.

**Required text**: R.C. Hibbeler,"Mechanics of Materials", Tenth Edition, Pearson, 2017

**Problem sets:** Problem sets must be scanned and submitted online via Canvas by 11:59 pm on the due date. No late sets will be accepted, however, the score of the lowest set will be discarded. Students are allowed to work with others to complete the assignments, however, all work turned in must be original, not a simple copy of someone else's work. The assignments will not be rigorously graded. Students are responsible for making sure that they understand all of the solution steps for each problem. The grading rubric for problems will be posted on Canvas.

**MasteringEngineering practice problems:** Students have the option of working problems via the publisher's MasterningEngineering portal; however, this option is only for practice and will not count for points. The portal can be accessed from Canvas.

**Pre-lecture quizzes:** Prior to each lecture, students are required to take a short online quiz posted on Canvas that covers the reading assignment listed for the upcoming lecture. The Quizzes will be available in a time window between lectures that closes at 11:00 am on the day of the lecture. Missed quizzes cannot be made up, however, the lowest quiz grade will be discarded. Students are expected to work alone on the quizzes.

**Exams:** Evening exams will cover material from the reading assignments, problem sets, and lectures. Missed exams cannot be made up without a formal note from the Dean of Students.

**Grading distribution:**
    Problem sets: 10%
    Pre-lecture quizzes: 10%
    Hour exams: 60% (3 exams × 20% each)
    Final exam: 20%

**Letter grade distribution:**

| | |
|---|---|
| A | 100% to 90% |
| AB | < 90% to 85% |
| B | < 85% to 80% |
| BC | < 80% to 75% |
| C | < 75% to 70% |
| CD | < 70% to 65% |
| D | < 65% to 60% |
| F | < 60% to 0% |

ABET Criterion 3 student outcomes addressed: a, e (high); b,c,k (moderate); d,f,g,h,i,j (minimal)

**Assessment statement**: Student work products may be used for purposes of university, program, or course assessment. All work used for assessment purposes will not include any individual student identification.

**University policies**: http://www.mtu.edu/ctl/instructional-resources/syllabus/policies/index.html

## MEEM 2150 – R03 Spring 2019 (Prof. Odegard)
## Lecture and assignment schedule

| Week | Date | Lecture topic | Reading | Assignments | Quiz |
|---|---|---|---|---|---|
| | M – 1/14 | Introduction, Force equilibrium | 1-1,2 | **1:** 1-2,11,17 | |
| 1 | W – 1/16 | Stress | 1-3 | **2:** Custom – see Canvas | 1 |
| | F – 1/18 | Average normal and shear stress | 1-4,5 | **3:** 1-35,38,43,53 | 2 |
| | M – 1/21 | **Martin Luther King Day** | | | |
| 2 | W – 1/23 | Allowable stress design | 1-6 | **4:** 1-71,74,81 | 3 |
| | F – 1/25 | Strain | 2-1,2 | **5:** 2-3,5,14,18 | 4 |
| | M – 1/28 | Mechanical properties of materials | 3-1,2,4,5,6 | **6:** 3-1,7,8,27 | 5 |
| 3 | W – 1/30 | Axial loading | 4-1,2,3 | **7:** 4-3,10,22,25 | 6 |
| | F – 2/1 | Statically indeterminate axial loading | 4-4,5 | **8:** 4-41,43,50,63 | 7 |
| | M – 2/4 | Thermal stress, SCF | 4-6,7 | **9:** 4-69,71,82,94 | 8 |
| 4 | W – 2/6 | Torsional loading | 5-1,2,3,4 | **10:** 5-7,9,14,23 | 9 |
| | F – 2/8 | **Winter Carnival** | | | |
| | M – 2/11 | Torsional loading | 5-1,2,3,4 | **11:** 5-51,54,62,72 | 10 |
| 5 | W – 2/13 | **EXAM 1 – MEEM 111+112, 6-7 pm** | | | |
| | F – 2/15 | Statically indeterminate torsion, SCF | 5-5,8 | **12:** 5-78,85,94,123 | 11 |
| | M – 2/18 | Shear and moment diagrams | 6-1 | **13:** 6-3,5,7 | 12 |
| 6 | W – 2/20 | Shear and moment diagrams | 6-2 | **14:** 6-13,22,28,30,43 | **Career Fair** |
| | F – 2/22 | Flexural stress | 6-3,4 | **15:** 6-48,49,57,101 | 13 |
| | M – 2/25 | Composite beams, SCF | 6-6,9 | **16:** 6-123,129,155 | 14 |
| 7 | W – 2/27 | Transverse shear | 7-1,2 | **17:** 7-3,11,25 | 15 |
| | F – 3/1 | Shear flow | 7-3,4 | **18:** 7-38,43,61 | 16 |
| | M – 3/4 | Pressure vessels | 8-1 | **19:** 8-4,7,9 | 17 |
| 8 | W – 3/6 | Combined loading | 8-2 | **20:** 8-22,33,37 | 18 |
| | F – 3/8 | Combined loading | 8-2 | **21:** 8-41,49,54 | |
| | M – 3/11 | | | | |
| | W – 3/13 | **Spring break** | | | |
| | F – 3/15 | | | | |
| | M – 3/18 | Plane stress transformation | 9-1,2 | **22:** 9-3,7,10,12 | 19 |
| 9 | W – 3/20 | **EXAM 2 – MEEM 111+112, 6-7 pm** | | | |
| | F – 3/22 | Principal stress | 9-3 | **23:** 9-14,17,29 | 20 |
| | M – 3/25 | Mohr's circle | 9-4,5 | **24:** 9-45,54,59,67 | 21 |
| 10 | W – 3/27 | Mohr's circle | 9-4,5 | **25:** 9-79,85,86 | |
| | F – 3/29 | Plane strain | 10-1,2,3,4 | **26:** 10-2,5,10 | 22 |
| | M – 4/1 | Plane strain | 10-1,2,3,4 | **27:** 10-13,16,19 | |
| 11 | W – 4/3 | Strain rosettes | 10-5 | **28:** 10-23,26,28 | 23 |
| | F – 4/5 | Hooke's law | 10-6 | **29:** 10-33,38,49 | 24 |
| | M – 4/8 | Failure theories | 10-7 | **30:** 10-69,71,78 | |
| 12 | W – 4/10 | Failure theories | 10-7 | **31:** 10-86,87,90 | |
| | F – 4/12 | Deflection of beams | 12-1,2 | **32:** 12-3,9,11 | 25 |
| | M – 4/15 | Deflection of beams | 12-1,2 | **33:** 12-13,14,23 | |
| 13 | W – 4/17 | **EXAM 3 – MEEM 111+112, 6-7 pm** | | | |
| | F – 4/19 | Statically indeterminate beams | 12-6 | **34:** 12-99,106,109 | |
| | M – 4/22 | Euler buckling | 13-1,2,3 | **35:** 13-3,6,7 | 26 |
| 14 | W – 4/24 | Euler buckling | 13-1,2,3 | **36:** 13-9,12,18 | |
| | F – 4/26 | Review | | | |
| | | **Final - Room, building, time TBA** | | | |