

CE 3202 – Structural Analysis I Spring Semester 2013

Course Information:

Professor: Dr. Andrew Swartz, Ph.D.
201D Dillman Hall

raswartz@mtu.edu
(906) 487-2439

Office Hours: Monday 11 AM-noon, Wednesday and Thursday 2-3 PM, or by arrangement.
(Also see: Student Success Center in Dillman 102)

Lecture Hours: MWF 10:05 - 10:55 AM; Dow 642

Course Website: <http://www.cee.mtu.edu/~raswartz/CEE3202/CEE3202home.htm>

Textbook: Fundamentals of Structural Analysis, 4th Ed.: Leet, Uang, and Gilbert (2010)

Course Description: As a first course in structural engineering, this class provides an introduction to structural concepts, as well as an overview of specific techniques for analyzing trusses, determinate and indeterminate beams, and small frame structures. Structural analysis involves the application of concepts from calculus, statics, and mechanics of materials to determine internal forces and deflections of structural members and systems.

Prerequisites: ENG 2120 or MEEM 2150. It is expected that all students understand (and are able to apply) general concepts of equilibrium; basic force analysis of determinate trusses, beams and frames; shear and moment diagrams for determinate beams; and the superposition of loads. Furthermore, it is assumed that students have mastered basic engineering mathematical concepts from college algebra, trigonometry, integral and differential calculus, as well as linear algebra.

Course Policies:

Grading:

Canvas Quizzes	3%
Homework Assignments (about 8)	25%
Exam 1	25%
Exam 2	25%
Exam 3	25%
Total	100%

Attendance: Lecture attendance for CE3202 is mandatory.

Exams: Exams will be in-class; dates are provided in the attached schedule. Missed exams will receive a score of zero and will not be rescheduled without a university excuse from the office of the Dean of Students.

Exam Calculator Policy: Graphing calculators are not allowed on exams, nor are calculators with symbolic equation solving packages. Use of basic scientific calculators is encouraged.

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Homework: All homework will be collected on the date due. Homework may be turned in during class or by 5:00 PM to the CE3202 mailbox (1st Floor Dillman Hall). Late assignments will not receive credit but may be turned in for feedback up to three days late.

- Your homework average will not include your lowest homework grade (I will drop your lowest scoring homework assignment when computing your final grade).
- Incomplete homework assignments will not be graded and will receive a score of zero.
- Assignment should be written neatly, with the answer circled.
- Begin each new problem on a new page.
- Supporting work is necessary to receive credit.
- Symbolic math must be done by hand and supported by written calculations.
- Engineering paper is preferred.

Detailed assignment guidelines specific to each homework set will be distributed via the course website. Keep in mind the exam calculator policy when working on homework.

Scheduling of the Final Exam: The final exam will be give on the day and time specified by the University. No exceptions will be made for this time without a university excuse.

Collaboration Policy: Homework sets should be done with minimal collaboration as they are intended to serve as practice for exams. That said, students are free to decide for themselves what level of collaboration they think is appropriate for their own homework preparation. However, wholesale copying another student's homework is not likely to be an effective learning strategy. Copying solutions from a solutions manual is also unlikely to be helpful to you and that practice is considered to be cheating. Exams are to be strictly non-collaborative.

Course Email List: Dr. Swartz maintains an email list for CE3202 to share information he thinks may benefit the class on an *ad-hoc* basis. Dr. Swartz considers this information to be a supplement to the classroom experience, not a replacement for lecture attendance.

Final Grade Basis:

A 93 – 100 AB 87 – 92.9 B 83 – 86.9 BC 77 – 82.9
C 73 – 76.9 CD 67 – 72.9 D 63 – 66.9 F Below 63

Accreditation Information:

ABET Course Outcomes: Significant ABET outcomes for this class include: that students are to develop an ability to apply knowledge of mathematics, science, and engineering; as well as develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. In addition, moderate ABET outcomes include: that students will learn an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability; students will gain some ability to identify, formulate, and solve engineering problems; add to their understanding of professional and ethical responsibility; and learn to communicate effectively.

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Course Objectives: After completing CEE 3202, students should be able to:

- Utilize mathematical tools learned in prerequisite courses to set up and solve relevant engineering problems.
- Derive code appropriate design loads for structures and learn their proper application.
- Classify frames and trusses in terms of stability and determinacy.
- Find reaction forces for determinate and indeterminate trusses and frames.
- Compute internal forces and deflections in trusses and frames.
- Draw shear and moment diagrams; check accuracy by comparison to deflected shape.
- Understand the assumptions and limitations inherent in the analysis methods presented.
- Communicate their analysis procedures via neatly written and logically organized computation sheets.

From the University Academic Affairs Office:

All students should be aware of the following policies.

Academic Integrity:

<http://www.mtu.edu/dean/conduct/policy/academic-integrity>

Academic regulations and procedures are governed by University policy. Academic misconduct cases will be handled in accordance the University's policies.

Disability Services:

<http://www.mtu.edu/dean/disability/policies/>

If you have a disability that could affect your performance in any class or that requires an accommodation under the Americans with Disabilities Act, please contact your instructor as soon as possible so that appropriate arrangements can be made.

Affirmative Programs:

<http://www.admin.mtu.edu/aao/>

The Affirmative Programs Office has asked that you be made aware of the following:

Michigan Technological University complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office at 487-2212.

Equal Opportunity, Discrimination, or Harassment Statement:

<http://www.admin.mtu.edu/admin/boc/policy/ch5/>

For other concerns about discrimination, you may contact your advisor, Chair/Dean of your academic unit, or the Affirmative Programs Office at 487-3310.

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Week	Topic	Reading
1/14	Introduction and Review of Statics M: Introduction to structural engineering W: Forces and equilibrium; free body diagrams and reactions F: Stability and determinacy	Chapter 3
1/21	Analysis of Trusses M: Martin Luther King Jr. Day Recess – no class W: Method of Joints F: Method of sections	Chapter 4
1/28	Shear and Moment Diagrams; Deflected Shapes M: Shear and moment diagrams W: Shear and moment in frames; relationship to deflected shape F: Principle of Superposition	Chapter 5
2/4	Beam Deflections M: Double integration method for deflection W: Double integration method (continued) (<i>Last topic on Exam 1</i>) F: Winter Carnival Recess – no class	Chapter 9
2/11	Beam Deflections (continued) M: Moment-area method W: Moment-area method (continued) F: <u>Exam 1 – in class</u>	
2/18	Beam, Truss, and Frame Deflections – Energy Methods M: Introduce work and strain energy in structural analysis; method of real work W: Analysis of trusses by virtual work F: Analysis of beams by virtual work	Chapter 10
2/25	Beam, Truss, and Frame Deflections – Energy Methods (continued) M: Analysis of frames by virtual work W: Analysis of frames by virtual work F: Summary of energy methods; Maxwell-Betti law of reciprocal deflections	
3/4	Influence Lines M: Introduction to influence lines W: Influence lines: Müller-Breslau principle for deterministic structures F: Additional influence line topics (<i>Last topic on Exam 2</i>)	Chapter 8
3/11	Spring Break Recess – no class	

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Week	Topic	Reading
3/18	Exam Review and Introduction of Indeterminate Beams M: Review for Exam 2 W: <u>Exam 2 – in class</u> Indeterminate Beams – Consistent Deformations F: Flexibility method and superposition	Chapter 11
3/25	Indeterminate Beams – Consistent Deformations (continued) M: Flexibility method (continued) W: Flexibility method (continued) F: Flexibility method (continued)	
4/1	Introduction to the Direct Stiffness (Matrix) Method M: Direct stiffness method – introduction W: Comparison to flexibility and slope deflection methods Truss Analysis using the Direct Stiffness Method F: Member/structure stiffness matrices; review of matrix multiplication	Chapter 16 Chapter 17
4/8	Truss Analysis using the Direct Stiffness Method (continued) M: Assembly of the global stiffness matrix; solution of the direct stiffness method W: Inclined bars; coordinate transforms Simple Beam Analysis using the Direct Stiffness F: Member stiffness matrix formulation for beams	Chapter 18
4/15	Loads on Structures M: Building codes, load types, and load combinations W: Gravity loads F: Gravity loads (continued)	Chapter 2
4/22	Loads on Structures (continued) – Lateral Loads M: Lateral loads: wind loads W: Lateral loads: wind loads (continued) F: Seismic loads	
4/29	Finals Week: <u>Exam 3</u>	