

CEE/ME 3350 Structural Analysis

(Required Course for CEE)

Catalog Course Description

Emphasis on the classical methods of analysis of statically determinate and indeterminate structural systems. Computation of reactions, shears, moments, and deflections of beams, trusses, and frames. Use of computers as an analytical tool.

Structural Analysis builds on the foundation of solid mechanics obtained in statics and mechanics of deformable bodies. Structural analysis is the first step in the design of any structural or mechanical system, and should be taken prior to any upper level or senior design classes. The use of computer software for structural analysis is becoming increasingly prevalent in design firms and research settings. Students taking this course will experience and master practical applications of fundamental principles of structural analysis through computer analyses of a unique structure. Project-based case studies and analyses of an actual structure will provide a hands-on approach to structural analysis.

Learning Outcomes and Benefits

- How do design engineers determine the layout and size of a structural system?
- How do I apply my mechanics knowledge in a practical analysis?
- How do earthquakes and hurricanes affect the design of a structure?
- Do all structural or mechanical failures occur because of inadequate strength?

CEE/ME 3350 will answer these questions and provide opportunities to:

- Obtain the analytical background necessary to analyze and design mechanical and structural systems.
- Utilize structural analysis software used in leading design firms and research organizations.
- Master the principles of structural analysis *before* taking an upper level design course.

Instructor: Brett Story, Ph.D.
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Brett Story serves as an Assistant Professor in the Department of Civil and Environmental Engineering in the Lyle School of Engineering at Southern Methodist University. Before joining Southern Methodist University, he received his Ph.D. in Civil Engineering from Texas A&M University and served as a researcher and lecturer where he taught mechanics courses. Dr. Story's research interests include structural analysis and bridge engineering, structural impairment detection, finite element analysis, instrumentation, and soft computing methods for solving engineering problems relating to structural and mechanical systems. Dr. Story's experience in analyzing complex structures will be integrated into the classroom through practical application of structural principles to a case study and analysis of a unique structure.

Prerequisites

CEE/ME 2340/2140 Mechanics of Deformable Bodies/Mechanics of Materials Laboratory

Textbook and Other Related Materials

Kassimali, A. *Structural Analysis*. Fifth Edition, 2015. Cengage Learning, Stamford, CT.
ISBN-13 978-1-133-94389-1

The structural analysis package, RISA-2D Educational, will be used extensively throughout the course. Instructions for accessing RISA 2D will be given in class.

Course Learning Outcomes/ Expected Performance Criteria

To provide students the fundamentals to perform structural analysis – an initial step to the design process of trusses, beams, and frames.

Course Requirements are:

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| • Assignments (In-Class, Take-Home) | 20% |
| • Projects (In-Class, Take-Home) | 30% |
| • Exam 1 (In-Class, 1/9/2013 9am-noon) | 20% |
| • Final Exam (In-Class, 1/14/2013, 9am-noon) | 30% |

Class/Laboratory Schedule

Two, 180-minute class sessions per day – 9:00 am to 12:00 pm and 1:00 pm to 4:00 pm.

Class attendance is required.

Curriculum Professional Component Allocation

Engineering Science and Design: 3 Semester Hours or 100 percent of the course content.

Relationship of Course to Program Outcomes

This course includes, but is not limited to contents that support the educational objectives and outcomes of the environmental and civil engineering programs. Specific emphasis is placed on students attaining and demonstrating:

- 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 (Outcome C).
- An ability to identify, formulate and solve engineering problems (Outcome E).
- An ability to use techniques, skills and modern engineering tools necessary for engineering practice (Outcome K).

Exams: There will be 2 major exams (1 midterm, 1 final). Makeup exams for excused absence(s) will be given TBD. An **original** note signed by your physician will be required.

Assignments

and Projects: Homework problems and/or projects will be assigned daily and are due at the beginning of the next class. Assignments must be **neatly** presented with handwritten work on engineering pad sheets (format requirements will be specified in class). Work that is produced using spreadsheet, word processing, or other software should be printed on plain copy paper.

Take home assignments will be given daily and will consist of approximately 5 problems.

Project efforts will be a combination of in-class and after class work.

Course Schedule:

		Monday	Tuesday	Wednesday	Thursday	Friday		Monday	Tuesday	Wednesday
Hour	Start	1/5/2014	1/6/2014	1/7/2014	1/8/2014	1/9/2014		1/12/2014	1/13/2014	1/14/2014
1	9:00 AM	Introduction, Orientation	Truss Introduction	Shear and Moment Diagrams	Virtual Work	Exam 1		Influence Lines	Flexibility Method	Final Exam
2	10:00 AM	Analysis and Design	Trusses	Frames	Virtual Work: Trusses	Exam 1		Influence Lines	Flexibility Method	Final Exam
3	11:00 AM	Statics	Stability	Frames	Virtual Work: Frames	Exam 1		Assignment 4	Approximate Methods	Final Exam
4	1:00 PM	Statics	Beam Introduction	Deflections	Project 1: RISA	Project 2: Bridge Assignment		Project 2: Bridge Assignment	Direct Stiffness Method	Project 2: Bridge Presentations
5	2:00 PM	External Loads	RISA 2D	Deflections	Project 1: RISA	Project 2: Bridge Assignment		Project 2: Bridge Assignment	Direct Stiffness Method	Project 2: Bridge Presentations
6	3:00 PM	Assignment 1	Assignment 2	Assignment 3	Review	Project 2: Bridge Assignment		Project 2: Bridge Assignment	Review	Project 2: Bridge Discussion

Prepared by: Brett Story Date: 9/13/2014

Disability Accommodations

Students needing academic accommodations for a disability must first be registered with Disability Accommodations & Success Strategies (DASS) to verify the disability and to establish eligibility for accommodations. Students may call 214-768-1470 or visit <http://www.smu.edu/alec/dass> to begin the process. Once registered, students should then schedule an appointment with the professor to make appropriate arrangements.

Religious Observance

Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

Excused Absences for University Extracurricular Activities

Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue).