ENDS 231. Architectural Structures I

Instructor: Prof. Anne B. Nichols
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Office Hours: 12:30-1:30 pm MW
10:00-11:30 am TR
(*and by appointment M-R)*

Prerequisites: ENDS 106; MATH 142 or equivalent (linear algebra and calculus); PHYS 201

Catalogue Description: Introduction to the physical principles that govern classical statistics and strengths of materials through the design of timber and steel components of architectural structures; computer applications.

Goals: ENDS 231 is the study of structural design concepts that influence the development of architectural space and form. In all engineering construction, the component parts of a structure must be assigned definite physical sizes, constructed of specific materials and designed to resist various load combinations. The course is divided into two parts: Statics and Strength of Materials. **Statics** is the branch of mechanics that involves the study of external forces and the effects of these forces on bodies or structural systems in equilibrium (at reset or moving with a constant velocity). **Strength of Materials** involves analytical methods for determining the strength, stiffness (deformation characteristics), and stability of the various load-carrying members. Members are designed for specific materials using current national design specifications.

Objective: To understand the significance, assumptions, applications, and limitations of the basic principles of Statics and Strength of Materials as they apply to the design and analysis of structural members and simple connections.

Text: Statics and Strength of Materials –Foundations for Structural Design, Onouye, (2005) Pearson - Prentice Hall, ISBN 0-13-111837-4

Reference: ACI 318-02 Code and Commentary
AISC 3rd ed. Load and Resistance Factor Design
AISC 9th ed. Allowable Stress Design
National Design Specifications for Wood

Timetable:

CREDIT 3.0 (2:2)	2:20-3:10 pm	Lecture	T,R
(section 500)	3:10-4:00 pm	Lab	T,R

Grading: The levels listed for graded work (projects, quizzes, exams) and pass-fail work (assignments) ***must be met or exceeded*** to earn the course letter grade:

Letter Grade	*Graded work*	*Pass-fail work*
A	A average (90-100%)	Pass for 90% or more of assignments
B	B average (80-89%)	Pass for 83% or more of assignments
C	C average (70-79%)	Pass for 75% or more of assignments
D	D average (60-69%)	Pass for 65% or more of assignments
F	F average (<59%)	Pass for 0% or more of assignments

Policy:

1) **Attendance:** Necessary. Required.* And subject to University Policy. See Part I Section 7 in Texas A&M University Student Rules: http://student-rules.tamu.edu/ Absences related to illness or injury must be documented according to http://shs.tamu.edu/attendance.htm *including* the Explanatory Statement for Absence from class for 3 days or less. Doctors visits not related to immediate illness or injury are not excused absences.
2) **Lecture, Lab and Textbook:** The lecture slide shows that correspond to the Handouts (see #3) are to be viewed prior to lecture which will be reserved for review of the full lecture and text reading. Lab will consist of problem solving requiring the textbook. The lecture shows are available on the class web page, class folder (see #3), and WebCTVista (see #7). Attendance is required for both lecture and lab.
3) **Handouts:** The handouts are available on the class web page at http://archoneb.tamu.edu/faculty/anichols/index_files/courses/ends231/index.html, on WebCT (see #7) or in the class folder on \\Xavier\classes\ENDS231500. A full set of notes can be purchased from the TEES copy center located on the second floor of Wisenbaker Engineering Research Lab. They are listed under Anne Nichols, ENDS 231. **COSC 321 notes are NOT EQUIVALENT.**
4) **Assignments:** Due as stated on the assignment statements. One late assignment will be allowed without excuse turned in no later than one week after the due date. All other assignments and projects will receive no credit if late. Assignments with incorrect formatting will be penalized.

Format:

Date Name Course
Given:
Find:
Solution:
:

5) **Quizzes:** Quizzes will be given at any time during the period. Make-up quizzes without an excuse will not be given. Practice quizzes will be posted electronically.
6) **Teaching Assistant:** Janelle Seigart Franklin (jseigart@tamu.edu)
7) **WebCTVista:** WebCT Vista is a web course tool for posting, reading messages and replying as well as recording scores and is accessed with your neo account. This will be used to post questions and responses by class members and the instructor, for posting scores and for e-mail. It can be accessed at http://elearning.tamu.edu/
8) **Final Exam:** The final exam will be comprehensive, and is officially scheduled for ***1:00-3:00 PM, Wednesday, May 9.***
9) **Other Resources:** The Student Learning Center provides tutoring in math and physics. See their schedule at http://slc.tamu.edu/tutoring.shtml
10) **Aggie Honor Code:** "An Aggie does not lie, cheat, or steal or tolerate those who do." The University policy will be strictly enforced. See Part I Section 20 in Texas A&M University Student Rules: http://student-rules.tamu.edu/ Plagiarism (deliberate misrepresentation of someone else's work as your own) will be treated strictly according to University policy as outlined by the Office of the Aggie Honor System: http:/www.tamu.edu/aggiehonor/
11) **The American with Disabilities Act** (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please contact the Department for Student Life, Services for Students with Disabilities, in

* Except for death in the family, medical or deans' excuse, and natural disasters.

Cain Hall or call 845-1637. Also contact Prof. Nichols at the beginning of the semester.

Learning Objectives:

1) The student will be able to read a text or article about structural technology, identify the key concepts and related equations, and properly apply the concepts and equations to appropriate structural problems (**relevance)**. The student will also be able to define the answers to key questions in the reading material.

2) The student will be able to read a problem statement, interpret the structural wording in order to identify the concepts and select equations necessary to solve the problem presented (**significance)**.

3) The student will be able to identify common steps in solving structural problems regardless of the differences in the structural configuration and loads, and apply these steps in a clear and structured fashion (**logic)**.

4) The student will be able to evaluate their own skills, or lack thereof, with respect to reading and comprehension of structural concepts, **clarity** of written communication, reasonable determination of **precision** in numerical data, and **accuracy** of computations.

5) The student will draw upon existing mathematical and geometrical knowledge to gather information, typically related to locations and dimensions, provided by representational drawings or models of structural configurations, and to present information, typically in the form of plots that graph variable values.

6) The student will be able to draw representational structural models and diagrams, and express information provided by the figures in equation form.

7) The student will be able to articulate the physical phenomena, behavior and design criteria which influence structural space and form. (**depth)**

8) The student will be able to identify the structural purpose, label, behavior, advantages and disadvantages, and interaction of various types of structural members and assemblies. (**breadth)**

9) The student will interact and participate in group settings to facilitate peer-learning and teaching. In addition, the student will be able to evaluate the comprehension of concepts, clarity of communication of these concepts or calculations, and the precision and accuracy of the data used in the computations in the work of their peers.

10) The student will create a structural model with a computer application based on the concepts of the behavior and loading of the structural member or assemblage. The student will be able to interpret the modeling results and relate the results to the solution obtained by manual calculations.

11) The student will create a physical structure or structures using non-traditional building materials, considering material and structural behavior, in order to demonstrate the behavior and limitations of a variety of structural arrangements.

12) The student will compare the computational results in a design problem to the requirements and properly decide if the requirements have been met. The student will take the corrective action to meet the requirements.

Lecture	Text Topic	Articles/ Problems
1.	Basic Concepts and Principles	**Read:** Text Chap. 1, Appendix B; note sets 1-2
2.	Forces	**Read:** Text 5.1, 2.1–2.3; note set 3 **Solve:** Assignment 1
3.	Moments	**Read:** Text 2.4; note set 4
4.	Equilibrium of a Particle	**Read:** Text 3.1; note set 5 **Solve:** Assignment 2
5.	Free Body Diagrams Support Conditions	**Read:** Text 3.2, 4.3; note set 6
6.	Introduction to Trusses Method of Joints	**Read:** Text 4.1 (89-87); note set 7 **Solve:** Assignment 3
7.	Design Project Reviews	**Project due**
8.	Trusses – Method of Sections	**Read:** Text 4.1 (89-110); (note set 7) **Quiz 1**
9.	Pinned Frames & Hinged Arches	**Read:** Text 4.2; note set 8 **Solve:** Assignment 4
10.	Distributed Loads on Beams, Concentrated Loads Load Tracing	**Read:** Text 3.3, 5.2-5.3; note set 9 **Quiz 2**
11.	Structural Properties of Areas - Centroids	**Read:** Text 7.1; note set 10 **Solve:** Assignment 5
12.	Structural Properties of Areas –Moment of Inertia	**Read:** Text 7.2-7.4; note set 11 **Quiz 3**
13.	Beam Forces	**Read:** Text 8.1-8.2; note set 12 **Solve:** Assignment 6
14.	Shear and Bending Moment Diagrams	**Read:** Text 8.3-8.4; (note set 12) **Quiz 4**
15.	Material Properties – Stress & Connections	**Read:** Text 6.1; note set 13 **Solve:** Assignment 7
16.	Material Properties – Strain, Strength and Elasticity	**Read:** Text 6.2-6.3; note set 14 **Quiz 5**
17.	Torsion Stress and Thermal Strain	**Read:** Text 6.4; note set 15 **Solve:** Assignment 8
18.	Stresses in Beams – Bending	**Read:** Text 9.1-9.2; note set 16 **Quiz 6**
19.	Design Project Reviews	**Project due**

Lecture	Text Topic	Articles/ Problems
20.	Stresses in Beams –Shear & Connectors	**Read:** Text 9.3-9.4; note set 16 **Solve:** Assignment 9
21.	Beam Deformation & Design	**Read:** Text 9.5-9.6; note set 17 **Quiz 7**
22.	LRFD Steel Design – Beams	**Read:** note set 18 **Solve:** Assignment 10
23.	Stability of Structures & Design	**Read:** Text 10.1-10.2; note set 19 **Quiz 8**
24.	Column Design – Wood, Steel & LRFD Steel	**Read:** Text 10.3-10.4; note set 20 **Solve:** Assignment 11
25.	Design of Eccentrically Loaded Columns	**Read:** Text 10.5; note set 21 **Quiz 9**
26.	Tension Members and Connections - Steel	**Read:** note set 22 **Solve:** Assignment 12
27.	Rigid and Braced Frames	**Read:** note set 23 **Quiz 10**
28.	Review	**Learning Portfolio due**
	Final Exam Period	**Exam**

DEPARTMENT OF ARCHITECTURE ENDS 231 SPRING 2007

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
JANUARY		1	2	3	4	5	6
	7	8	9	10	11	12 last day to register	13
	14	15 King Holiday	16 **Lect 1** classes begin	17	18 **Lect 2**	19	20
	21	22 last day to add/drop	23 **Lect 3**	24	25 **Lect 4**	26	27
	28	29	30 **Lect 5**	31	1 **Lect 6**	2	3
FEBRUARY	4	5	6 **Lect 7**	7	8 **Lect 8**	9	10
	11	12	13 **Lect 9**	14	15 **Lect 10**	16	17
	18	19	20 **Lect 11**	21	22 **Lect 12**	23	24
	25	26	27 **Lect 13**	28	1 **Lect 14**	2	3
MARCH	4	5 mid-term grades due	6 **Lect 15**	7	8 **Lect 16**	9	10
	11	12	13	14 Spring Break	15	16	17
	18	19	20 **Lect 17**	21	22 **Lect 18**	23	24
	25	26	27 **Lect 19**	28	29 **Lect 20**	30	31
APRIL	1	2 last day to Q-drop	3 **Lect 21**	4	5 **Lect 22**	6 Reading Day	7
	8	9	10 **Lect 23**	11	12 **Lect 24** Preregistration begins (to 27st)	13	14
	15	16	17 **Lect 25**	18	19 **Lect 26**	20	21 Muster
	22	23	24 **Lect 27**	25	26 **Lect 28**	27	28
	29	30 (dead day) Monday classes	1 (dead day) Friday classes	2 Reading	3 Days	4 Final exams	5
MAY	6	7	8	9 1-3pm 231 FINAL	10	11 Commencement (and Saturday)	12
	13	14 Grades due	15	16	17	18	19