ENDS 231. Architectural Structures I

Instructor: Prof. Anne B. Nichols
A413 Langford
(979) 845-6540
anichols@tamu.edu

Office Hours: 1-2 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 statics 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)	3:55-4:45 pm	Lecture	T,R
(section 501)	4:45-5:35 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% to 100% of assignments
B	B average (80-89%)	Pass for 83% to 100% of assignments
C	C average (70-79%)	Pass for 75% to 100% of assignments
D	D average (60-69%)	Pass for 65% to 100% of assignments
F	F average (<59%)	Pass for 0% to 100% of assignments

Graded work: This typically constitutes 10 quizzes, a learning portfolio (worth 1.5 quizzes) and a final exam (worth 4 quizzes). This equates to proportions of approximately 64.5% to quizzes, 9.7% to the learning portfolio, and 25.8% to the final exam.

Pass/fail work: This constitutes all practice assignments and projects, each with a value of 1 unit. Criteria for passing is *at least* 75% completeness and correctness along with every problem attempted. Percent effort expected for a problem in a practice assignment is provided on the assignment statement. This is considered a lab course and the assignments **are required work** with credit given for competency. The work is necessary to apply the material and prepare for the quizzes and exam. It is expected that this work will be completed with assistance or group participation, but all *graded* work is only by the individual.

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 Vista (see #7). Attendance is required for both lecture and lab.
3) **Notes:** The notes and related handouts are available on the class web page at http://archone.tamu.edu/faculty/anichols/index_files/courses/ends231/index.html, on Vista (see #7) or in the class folder on \\Xavier\classes\ENDS231501. A full set 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) **Grader:** Hidekazu Takahashi....(wish-takahashi@tamu.edu)
7) **Vista:** 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, Tuesday, May 6.***
9) **Other Resources:** The Student Learning Center provides tutoring in math and physics. See their schedule at http://slc.tamu.edu/tutoring.shtml

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

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 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. 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.

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

3) 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.

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

5) 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.

Lecture	Text Topic	Articles/ Problems
1.	Basic Concepts and Principles	**Read*:** Text Ch. 1, Appendix B; note sets 1.1, 1.2 & 1.3
2.	Forces	**Read:** Text 5.1, 2.1–2.3; note set 2 **Solve:** Assignment 1
3.	Moments	**Read:** Text 2.4; note set 3
4.	Equilibrium of a Particle	**Read:** Text 3.1; note set 4 **Solve:** Assignment 2
5.	Free Body Diagrams Support Conditions	**Read:** Text 3.2, 4.3; note set 5
6.	Introduction to Trusses Method of Joints	**Read:** Text 4.1 (89-97); note set 6 (first part) **Solve:** Assignment 3
7.	Design Project Reviews	**Project due**
8.	Trusses – Method of Sections	**Read:** Text 4.1 (98-110); note set 6 (rest) **Reference:** note set 8 **Quiz 1**
9.	Pinned Frames & Hinged Arches	**Read:** Text 4.2; note set 9 **Solve:** Assignment 4
10.	Distributed Loads on Beams, Concentrated Loads and Load Tracing	**Read:** Text 3.3, 5.2-5.3; note set 10 **Quiz 2**
11.	Structural Properties of Areas - Centroids	**Read:** Text 7.1; note set 11 **Solve:** Assignment 5
12.	Structural Properties of Areas – Moment of Inertia	**Read:** Text 7.2-7.4; note set 12 **Quiz 3**
13.	Beam Forces	**Read:** Text 8.1-8.2; note set 13 **Solve:** Assignment 6
14.	Shear and Bending Moment Diagrams	**Read:** Text 8.3-8.4; (note set 13) **Reference:** note set 14 **Quiz 4**
15.	Material Properties – Stress & Connections	**Read:** Text 6.1; note set 15 **Solve:** Assignment 7

Lecture	Text Topic	Articles/ Problems
16.	Material Properties – Strain, Strength and Elasticity	**Read:** Text 6.2-6.3; note set 16 **Quiz 5**
17.	Torsion Stress and Thermal Strain	**Read:** Text 6.4; note set 17 **Solve:** Assignment 8
18.	Stresses in Beams – Bending	**Read:** Text 9.1-9.2; Appendix C.1; note set 18 (first part) **Quiz 6**
19.	Design Project Reviews	**Project due**
20.	Stresses in Beams –Shear & Connectors	**Read:** Text 9.3-9.4; Appendix C.2; note set 18 (rest) **Solve:** Assignment 9
21.	Beam Deformation & Design	**Read:** Text 9.5-9.6; Appendix C.3; note set 21 **Quiz 7**
22.	LRFD Steel Design – Beams	**Read:** note set 22 **Solve:** Assignment 10
23.	Stability of Structures & Design	**Read:** Text 10.1-10.2; note set 23 **Quiz 8**
24.	Column Design – Wood, Steel & LRFD Steel	**Read:** Text 10.3-10.4; note set 24 **Solve:** Assignment 11
25.	Design of Eccentrically Loaded Columns	**Read:** Text 10.5; note set 25 **Quiz 9**
26.	Tension Members and Connections - Steel	**Read:** note set 26 **Solve:** Assignment 12
27.	Rigid and Braced Frames	**Read:** note set 27.1 **Reference:** note set 27.2 **Quiz 10**
28.	Review	**Read:** note set 28 **Learning Portfolio due**
	Final Exam Period	**Exam**

*Note: Materials in the Class Note Set not specifically mentioned above are provided as references or aids.

DEPARTMENT OF ARCHITECTURE ENDS 231 SPRING 2008

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