ARCH 631. Applied Architectural Structures

Instructor: Prof. Anne B. Nichols
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Office Hours: 9-10 am and 2-3 pm MW
11-12 pm TR
(*and by appointment M-R)*

Prerequisites: ARCH 331 & ARCH 431 (or equivalent hours and content)

Course Description: Structural analysis of building structural systems: components, frames, shapes; selection and economics of structural systems; survey of current structural design codes; supervision practices in structural construction.

Goals: ARCH 631 encompasses structural analysis of building structural systems: components, frames, and shapes. Also covered is the selection and economics of structural systems; survey of current structural design codes; supervision practices in structural construction. Case studies and writing exercises will be utilized. The course follows the content areas of the ARE 4.0 section of Structural Systems section: **General Structures** is the application of general structural principles to building design and construction considering the code requirements, implication of alternate systems, materials and construction details along with site and environmental characteristics. **Wind Forces, Seismic Forces & Lateral Forces** is the application of lateral force principles to the design and construction of buildings to resist lateral, wind and seismic forces considering the code requirements, implication of alternative systems, materials and constructions details along with site and environmental characteristics.

Objective: To synthesize knowledge of components, systems and framing with environmental loads (particularly hazard) and design codes and standards.

Text: Structures, 6th ed., Daniel L. Schodek and Martin Bechthold, (2007) Pearson – Prentice Hall, ISBN 0-13-178939-2

Recommended Texts:

A Structures Primer, Kaufman, (2010) Prentice Hall, ISBN 978-0-13-230256-3
Understanding Structures, Moore, (1999) McGraw-Hill, ISBN 9780070432536
The Structural Basis of Architecture, Sandaker, et.al, (2011) Routledge, ISBN 978-0415415477

References: AIA Publications
Adoptable codes (ICBO, SBCCI, BOCA, CABO)
International Building Code, International Residential Code
Structural Design Codes (ACI, PCI, AISC, MSJC, etc.)
Material and Professional Standard Documents (ANSI, ASCE, ASTM, ASHRAE)

Timetable: 9:35-10:50 am Lecture T,R (section 600)

Grading:

Assignments	20%
Mid-term Exams	40%
Team Project	20%
Final Exam	20%

Letter Grades (Approximate):

90-100.....	A
80-89.....	B
70-79.....	C
60-69.....	D
0-59.....	F

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. Doctor visits not related to immediate illness or injury are not excused absences.

2) **Lecture:** The lecture slides should be viewed prior to class. Class–will also require problem solving with the lecture examples, assignments, and case studies. The lecture slide handouts are available on the class web page (see #3) and Vista (see #9). *Use of electronic devices during lecture is prohibited.*

3) **Notes:** The notes and related handouts are available on the class web page at http://faculty.arch.tamu.edu/anichols/631frame.html, or on Vista (see #8). A bound set can be purchased from the Notes-n-Quotes at 701 W. University, directly across from the Mitchell Physics Building in the Northgate Neighborhood.

4) **Assignments:** Due as stated on the assignment statements. Only *one* assignment without University excuse may be turned in for credit no later than one week after the due date **and** before final exams begin. All other assignments and projects will receive *no credit* if late without a recognized excuse or after final exams have begun.

5) **Team Project:** A term project to be completed in teams is due the last week of class. Presentations of the projects will be made during class periods.

6) **Mid-term Exams:** Mid-term exams will be given in lecture at any time during the period. Make-up exams without an excuse will not be given.

7) **Teaching Assistant:** Kara Wetzel ..... (kewetz@neo.tamu.edu)

8) **Structures Help Desk:** Ryan Buys ..... (syubnayr@neo.tamu.edu)
ARCA129 845-6580 Posted Hours (link)

9) **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/

10) **Final Exam:** The final exam will be comprehensive and is officially scheduled for ***12:30-2:30 PM Friday, December 7***.

11) **Other Resources:** The Student Learning Center provides tutoring in math and physics. See their schedule at http://slc.tamu.edu/tutoring.shtml The Student Counseling Center has programs for study and learning (PASS), and tutoring services. See the resources at http://scs.tamu.edu/

12) **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/

13) **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

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

Student Life, Services for Students with Disabilities, in Cain Hall or call 845-1637. Also contact Prof. Nichols at the beginning of the semester.

14) **Grievances:** For grievances other than those listed in Part III in Texas A&M University Student Rules: http://student-rules.tamu.edu/ the *instructor* must be the first point of contact.

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 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 structural models 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 be able to identify the configuration, label, behavior, advantages and disadvantages, and interaction of various types of structural members and assemblies with respect to materials (e.g. reinforced concrete beams or frames). The student will draw upon existing organizational and communication skills to clearly present concepts and personal interpretation of structural knowledge in writing assignments and examinations (**clarity, precision, accuracy, relevance, depth, breadth, logic, significance)**.

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. The student will participate in the classification and identification of structural components and assemblages and purposes with a case study chosen by a group in order to show synthesis of structural knowledge including modeling and analysis.

Tentative Schedule *(subject to change at any time throughout the semester)*

Lecture	Text Topic	Articles/Problems
1.	Structures: An Overview Introduction to Structural Analysis and Design	**Read*:** Ch. 1 **Solve:** Assignment 1 (*start*)
2.	Review of Statics and Mechanics	**Read:** Ch. 2; note sets 2.1 & 2.2 **Reference:** *Appendices 1-5*
3.	Overview of Building Codes	**Read:** Ch. 3; note sets 3.1 & 3.2 **Reference:** *note sets 3.3, 3.4 & 3.5*
4.	Overview of Design Philosophies and Beams	**Read:** § 6.1-6.4.1 & § 8.1-8.3 **Reference:** *Appendices 6-9; note set 4.2* **Due:** Assignment 1 over material from lectures 1-2
5.	Trusses & Columns	**Read:** Ch. 4 & § 7.1-7.4.2 **Reference:** *note set 5.1*
6.	Funicular Structures: Cables & Arches	**Read:** Ch. 5 **Due:** Assignment 2 over material from lectures 3-4
7.	Rigid Frames: Analysis & Design	**Read:** Ch. 9; note set 7.1 **Reference:** *note set 7.2* **Due:** CPR 1 Text over material from lecture 4
8.	Plates and Grids	**Read:** Ch. 10 & § 8.4; note set 8.1 **Due:** Assignment 3 over material from lectures 5-6 & CPR 1 Reviews
9.		**Mid-term Exam**
10.	Reinforced Concrete Construction	**Read:** § 15.3, 6.4.4-6.4.7, 7.4.5 & 8.4.6, Appendix 12; note set 10.1
11.	CASE STUDY – Reinforced Concrete	**Read:** note set 11
12.	CASE STUDY – Reinforced Concrete	**Read:** note set 11 **Due:** Assignment 4 over material from lecture 7
13.	Membrane, Net, and Shell Structures	**Read:** Ch. 11 & 12; note set 13.1
14.	Structural Planning & Design Issues	**Read:** Ch. 13; note set 14 **Due:** Assignment 5 over material from lectures 7-8

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

Lecture	Text Topic	Articles/Problems
15.	Design for Lateral Loads Wind and Flood	**Read:** § 14.1; note set 15.1 **Re-read:** § 1.3.1, 1.3.2, 3.3.3 **Due:** CPR 2 Text over material from lecture 10
16.	Design for Lateral Loads Seismic	**Read:** § 14.2; note sets 16.1, 16.2 & 16.3 **Re-read:** § 3.3.4 **Due:** Assignment 6 over material from lectures 10-12 & CPR 2 Reviews
17.	Structural Connections: Wood and Steel	**Read:** § 16.1-16.3; note set 17.1
18.		**Mid-term Exam**
19.	Wood Construction	**Read:** § 15.2, 6.4.2, & 7.4.3; note set 19.1
20.	CASE STUDY - Wood	**Read:** note set 20 **Due:** Assignment 7 over material from lectures 13-15
21.	Steel Construction	**Read:** § 15.4, 6.4.3 & 7.4.4; note set 21.1 **Due:** CPR 3 Text over material from lectures 15 and 17
22.	CASE STUDY – Steel	**Read:** note set 22 **Due:** Assignment 8 over material from lectures 15-17 & CPR 3 reviews
23.	Masonry Construction	**Read:** note set 23.1
24.	Foundations and Retaining Walls	**Read:** §15.5; note sets 24.1 & 24.2 **Due:** Assignment 9 over material from lectures 19-22
25.		**Mid-term Exam**
	Thanksgiving Break	
26.	Project Presentations	
27.	Project Presentations	
28.	Construction & Inspection Review	**Reference:** *note set 28.1* **Due:** Assignment 10 over material from lectures 23-24 & Project Report
	Final Exam Period	**Exam**

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