

Instructor: Prof. Anne B. Nichols **Office Hours:** 1-2 pm MW
Format: A413 Langford 10:00-11:30 am TR
 (979) 845-6540 *(and by appointment M-R)*
anichols@tamu.edu

Prerequisites: ARCH 612, Math (Basic, Geometry, Linear Algebra)

Catalogue Description: Investigation of the structural factors that influence the development of architectural space and form; introduction of the physical principles that govern statics and strength of materials through design of timber and steel components of architectural structures.

Goals: ARCH 614 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 rest 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. The form of structures and the relations to structural members will be studied.

Objective: To develop an understanding of 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: Simplified Engineering for Architects and Builders, Ambrose & Tripeny, (2006) Wiley, ISBN 0-471-67607-1

Reference: ACI 318 Code and Commentary
 AISC 3rd ed. Load and Resistance Factor Design
 AISC 8th ed. Allowable Stress Design
 Masonry Joint Structural Code
 National Design Specifications for Wood

Timetable: CREDIT 3.0 (2:2) 8:00-8:50 am Lecture T,R
 (section 600) 8:50-9:40 am 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:

<i>Letter Grade</i>	<i>Graded work</i>	<i>Pass-fail work</i>
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

ARCH 614

Syllabus

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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 Notes (see #Notes: The handouts are available on the class web page at http://archone.tamu.edu/faculty/anichols/index_files/courses/arch614/index.html, or on Vista (see #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/> 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, ARCH 614. 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, and Vista (see #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/>. Attendance is required for both lecture and lab.

Notes: The handouts are available on the class web page at http://archone.tamu.edu/faculty/anichols/index_files/courses/arch614/index.html, or on Vista (see #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/> 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, ARCH 614.

3) **Assignments:** Due as stated on the assignment statements. One late assignment (without University excuse) will be “pardoned” if turned in no later than one week after the due date. All other assignments and projects will receive no credit if late without a recognized excuse. Assignments with incorrect formatting will be penalized.

4) **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.

5) **Grader:** Tan Zhang (tan1984@neo.tamu.edu)

6) **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/>

7) **Final Exam:** The final exam will be comprehensive, and is officially scheduled for *1:00-3:00 PM, Monday, May 11.*

8) **Other Resources:** The Student Learning Center provides tutoring in math and physics. See their schedule at <http://slc.tamu.edu/tutoring.shtml>

9) **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/>

10) **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:

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.

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.

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.

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 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.

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

Lecture	Text Topic	Articles/ Problems
Basic Concepts and Principles	Read*: Text Introduction (1-7); note sets 1.1, 1.2 & 1.3	Practice: <i>Math Worksheets</i>
Forces	Read: Text 1.1-1.4; note set 2	
Equilibrium, Free Body Diagrams & Analysis of Planar Trusses	Read: Text 1.6; note set 3.1 Reference: <i>note set 3.2</i> Solve: Assignment 1 (<i>start</i>)	
Response to Forces and Temperature	Read: Text 2; note set 4	
Moments, Rotational Equilibrium & Beam Reactions	Read: Text 3.1-3.2; note set 5 Due: Assignment 1	
Beam Shear and Bending	Read: Text 3.3-3.6; note set 6.1 Reference: <i>note set 6.2</i> Due: Project Part I	
Semi-graphical Method: Shear and Bending Moment Diagrams	Read: note set 6.1 Reference: <i>note set 6.3</i> Due: Assignment 2	
Beam Section Properties	Read: Text Appendix A.1-A.3; note set 8 Quiz 1	
Beam Stresses	Read: Text 3.7-3.8 & Appendix A.4; note set 9 Due: Assignment 3	
Other Beams and Pinned Frames	Read: Text 3.9-3.10; note sets 10.1 & 10.2 Quiz 2	
Rigid Frames - Compression & Buckling	Read: Text 3.11-3.13 (not footing pressure analysis); note set 11.1 Reference: <i>note set 11.2</i> Due: Assignment 4	
Design Loads and Methodology	Read: Text 4; note set 12.1 Reference: <i>note sets 12.2, 12.3, 12.4 & 12.5</i> Quiz 3	
Wood Construction Materials & Beam Design	Read: Text 5, note sets 13.1 & 13.2 Due: Assignment 5	

Wood Construction Column Design	Read: Text 6; note set 13.2 Quiz 4
Joints and Connection Stresses	Read: Text 7; note sets 13.2 & 15 Due: Assignment 6
Steel Construction Materials & Beam Design	Read: Text 8; Text 9.1-9.8; note set 16 Quiz 5
Trusses, Decks & Plate Girders	Read: Text 9.9-9.12; note sets 16 & 17 Due: Assignment 7
Column Design	Read: Text 10; note set 16 Reference: <i>Text page 312 correction</i> Quiz 6
Bolted Connections & Tension Members	Read: Text 11; note set 16 Due: Assignment 8
Welds and Light Gage Steel	Read: Text 12; note set 16 Quiz 7
Concrete Construction Materials & Beam Design	Read: Text 13.1–13.3; note set 21.1 Reference: <i>note set 21.2</i> Due: Assignment 9
T-beams & Slabs	Read: Text 13.4-13.5; note set 21.1 Quiz 8
Shear, Torsion, Reinforcement & Deflection	Read: Text 13.6-13.8; note sets 21.1 & 23 Due: Assignment 10
Floor Systems & Continuous Beams	Read: Text 14; note sets 21.1 & 24.1 Reference: <i>note set 24.2</i> Quiz 9
Columns & Frames	Read: Text 15; note set 21.1 Due: Assignment 11 & Project Part II
Foundation Design & Footings	Read: Text 3.11 (footing pressure section only), Text 16; note sets 26.1 & 26.2 Quiz 10
Masonry Construction Beams & Columns	Read: note sets 27.1, 27.2 & 27.3
Shell Systems and Synthesis	Read: Text 17; note sets 28.1 & 28.2 Due: Assignment 12 & Learning Portfolio
Final Exam Period	Exam

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