

ARC 362: STRUCTURES II: WOOD AND CONCRETE

3 credits

Course Description: Study of wood and concrete structural framing systems: investigation of wood and concrete materials and their limitations, and the use of appropriate structural design procedures for wood and concrete structures through selection of appropriate, common and economical shapes to satisfy building structural requirements and applicable building code requirements. Prerequisite: ARC 361. Restricted to major.

Course Goals and Objectives:

Upon completion of this course, the student will:

1. Continue the development of an understanding of the principles of structural behavior in withstanding gravity and lateral forces; and the evolution, range, and appropriate application of contemporary structural systems.
2. Develop an appreciation for the aesthetic, economic, and functional characteristics of wood and concrete structural framing systems materials, and their influences upon architectural design.
3. Provide additional understanding of the strength, performance characteristics, and field control of wood and concrete structural materials.
4. Develop basic skills in structural design methods and investigation of typical wood and concrete structural components for future application in performing assigned tasks in an architectural firm.
5. Understand the “Building Code Compliance” regulations and standards issues related to building “structural” design using wood and concrete materials.
6. Continue “Sustainable Design” focus on embodied energy, permanence, reusable materials, resources, and integration.

NAAB Student Performance Criteria:

A.4: Technical Documentation **B.9:** Structural Systems
B.12: Building Materials and Assemblies

Topical Outline

Percentage of time

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| I. Review of Forces and Properties: | 5% |
| A. Forces on systems – reactions/shear/moment/deflection diagrams | |
| B. Properties of sections - centroids, moments of inertia, section modulus, radius of gyration, transfer of moments of inertia | |
| II. Wood Structural Design: | 45% |
| A. Materials and properties–national design specification for wood construction | |
| B. Structural elements and systems | |
| C. Bending systems – joists, rafters, beams, girders, plank floors | |
| D. Axially loaded systems, combined systems - columns | |
| E. Trusses – Pratt, Howe, Fan, Fink, other | |
| F. Connections – nails, spikes, bolts, connectors, plates | |
| III. Concrete Structural Design: | 50% |
| A. Materials and properties – ACI Code | |
| B. Mix design and admixtures | |

- C. Handling, placing, curing
- D. Bending members – beams, slabs, square and running footings
- E. Axially loaded members – columns (tied & spiral)
- F. Connections – anchorage and embedment
- G. Special systems – pre-cast, pre-stressed, post-tensioned

Prerequisites: ARC 361

Textbooks

Ambrose, James & Harry Parker. *Simplified Design of Wood Structures*. 5th ed. New York: John Wiley & Sons, Inc., 1994.

American Wood Council. *2005 Wood Design Package: The ASD/LRFD National Design Specification for Wood Construction*. 2005 edition with NDS Commentary and Supplement – Design Values for Wood Construction.

ASD/LRFD Special Design Provisions for Wind and Seismic (SDPWS) with Commentary.

ASD/LRFD Manual for Engineered Wood Construction. 2005 edition. American

Forest & Paper Association. *Structural Wood Design Solved Example Problems*. Washington, DC.

Limbrunner, George & Abi Aghayre. *Reinforced Concrete Design*. 6th ed. Upper Saddle River, NJ: Prentice Hall, 2007.

Offered: Spring semester

Faculty: Swenson