ARCH 4251 – Architectural Structures and Design Integration I

Course Objectives

This course and its follow-on course (ARCH 4252) are requirements for the professional degree in architecture and as such focus on the core knowledge of building structures as contained in the Architectural Registration Exam (ARE). In addition, the course content complements architectural studio by focusing on the form-giving and construction-technology aspects of building structures. Architectural Structures 1 covers the design of building structures in wood and structural steel.

The specific objectives of Structures 1 are as follows:

To introduce you to the structural design process: geometric synthesis → structural idealization → load rundown → structural analysis → structural design;

To familiarize you with reading and creating typical structural framing plans in steel and wood structures

To review and expand your knowledge of solid structural materials; to define what constitutes a "structural" material and to quantify the engineering properties of these materials;

To introduce structural steel and other metals important to architecture and the building trades;

To introduce you to the wood products used in residential and commercial buildings — both common dimensional lumber and the so called engineered wood products and wood composites;

To review the form that residential construction in wood commonly takes, the platform frame, along with alternatives like heavy timber construction;

To review common modes of steel framing using hot-rolled sections, open-web steel joists, steel deck and concrete fill;

To introduce connection methodologies used in wood and steel structures: nailing, screwing, bolting, welding

To introduce structural design in steel and wood using allowable stress design for tension members, compression members, and flexural members;

Reference Texts

There is no required text for the class. If you wish to have a structural reference for use in this and the following course, the suggested text is:

Building Structures, 2nd Edition (1993), by James Ambrose.

The syllabus contains a listing of suggested readings in Building Structures which will assist you in keeping up with the class.

The following texts will be used as references in the class:

Fundamentals of Building Construction by Edward Allen 5th Edition, 2008.

Building Construction Illustrated, 4th Edition (2008) by Francis Ching.

Manual of Steel Construction (ASD and LRFD),13th Edition, American Institute of Steel Construction, 2006.

Structures, by Daniel Schodek, Prentice Hall: New Jersey, 6th Ed., 2007.

National Design Specification for Wood Construction (w/ Design Supplement), American Forest and Paper Association.

Statics and Strength of Materials for Architecture and Building Construction, 3rd Edition, by Barry Onouye and Kevin Kane.

Minimum Design Loads for Buildings and Other Structures, ASCE 7-05, American Society of Civil Engineers, 2005.

U.S. Span Book for Major Lumber Species, 1999 Edition, Canadian Wood Council.

Steel Roof and Floor Deck, Vulcraft.

Steel Joists and Joist Girders, Vulcraft.

Wood Construction Connectors, Simpson Strong-Tie Company.

Homework
The GTA will grade the homework and post solutions on t-square. Each homework will be assigned a due date. Homework must be turned in on time to receive a grade — *late homework will not be not be accepted.* The lowest homework grade will be dropped (it is possible that one or two key homeworks will be critical to the course and must be completed). Homework must be neat and well laid out. Your logic should be easy to follow. Use a straight edge, underline intermediate answers, and box your final answers. Homework grades will be based on neatness, presentation and completeness of work, and inclusion of required information.

Laboratory
The purpose of the laboratory is to allow us to hold more in-depth discussions than are possible in hour-long lectures. In general, the laboratory period will not be used for the presentation of new material. Specifically, the laboratory period will be used for:

- presentation and discussion of case studies,
- demonstration of structures computer software,
- materials demonstrations,
- completion of team and individual lab projects
- field trips, and
- exam preview and review.

The laboratory will contain an in-class component and an out-of-class component that you will complete individually or in teams.

Laboratory Projects
The laboratory projects will be completed in groups of three to five students. I will select the groups. In the first project you will describe a structure in Atlanta in a verbal and pictorial narrative – “a structural reading”. This short project will be completed early in the term. In the second project you will design, detail, and construct a steel/wood hybrid structure. You will present written calculations describing the design along with a narrative in the form of a short technical memorandum. You will make a presentation to the class describing the design, materials, construction, and predicted capacity of your structure. We will then test the structures to failure and observe the failure modes. This project will be completed at the end of the term.

Grading
The hourly quizzes will be announced at least one week in advance. They are preliminarily scheduled in the course outline below. If you must miss an exam, you must inform me and complete a makeup exam *before* the scheduled date. I reserve the right to give the same exam or a different exam as a makeup, at my discretion. Grades on the exam will not be curved. I reserve the right to shift exam grades if I deem that the test was too difficult or too long to complete in the allotted time. Course credit is distributed as follows:

Homework	15%
Attendance/Participation	5%
Lab Projects	10%
Hourly Quizzes (2)	40%
Final Exam	30%
	100%

Attendance Et Cetera
If you are to do well in this class, you must attend. Much of the information needed to complete the course will come from my lectures and handouts. Absence from class is not considered a valid excuse for not turning in your homework. If you have a problem that prohibits your participation, you must let me know beforehand. I have never found it necessary to reduce the grades of people who do not attend class regularly; they typically reduce them without my help. Students who are chronically absent or are repeatedly late to class will lose 5% of their final grade.

Students with special needs that are administered by the Dean of Students or by the ADAPTS office should contact the appropriate office and inform me at the start of the term so that I can ensure that we accommodate you to the fullest degree possible.

Construction of laboratory projects for this class may be completed in the college shop if you have completed the safety training course offered by the shop supervisor. Students who abuse their shop privileges by ignoring safety procedures, by neglecting to clean up after themselves, or by leaving material in the shop without permission will be asked to complete their course projects elsewhere.

Honor Policy and Academic Conduct
It is expected all homework assignments will be completed solely by the student. It is appropriate to seek guidance from your classmates as to the way in which they tackled an individual assignment - it is not appropriate to copy from others. For research and writing assignments, it is critical that all references, including web sites, be identified in footnotes or a bibliography. Note that it is improper to cut and paste text from web documents and represent it as your own work. You are expected to abide by the provisions of the Georgia Tech Honor Code. Details of this policy are found at:
http://www.honor.gatech.edu/plugins/content/index.php?id=9

Preliminary Schedule
We will follow the preliminary schedule presented below. The suggested readings and references for the course are assigned in the schedule below, by chapter. Additional readings may be assigned during the term. Text abbreviations are as follows: