**School of Architecture | Georgia Tech | Spring 20xx**

ARCH 4025: Structures II (3 credits)

Credit Hours: 3 credits (3 contact hours)

Days and hours of class: Tuesday and Thursday, 9:30 to 10:45 a.m.

Prerequisite: ARCH 4015

Instructor: Name

Office location/Email address

Office Hours

**Course Description** (from the Catalog) Go to <http://www.catalog.gatech.edu/colleges/coa/architecture/#coursestext> to find the course description for the class.

Introduction to structural design and framing systems for steel and concrete with consideration of lateral loads and lateral load resisting systems.

**Learning Objectives**

This course is a requirement for the professional degree in architecture and as such focuses on the core knowledge of building structures as contained in the Architectural Registration Exam (ARE). The prerequisite course, ARCH 4015 provides an introduction to structural analysis, structural material science and building structures constructed primarily of wood members. This course covers the design of building structures in structural steel and reinforced concrete, and the design of all building structures to resist lateral loads. The National Architectural Accrediting Board (NAAB) in the 2014 Conditions of Accreditation[[1]](#footnote-1)sets forth the following provisions for the technical competency expected of architects as related to building structures and materials as follows:

* A.5 Ordering Systems: Ability to apply the fundamentals of both natural and formal ordering systems and the capacity of each to inform two- and three-dimensional design.

Realm B: Building Practices, Technical Skills, and Knowledge. Graduates from NAAB accredited programs must be able to comprehend the technical aspects of design, systems, and materials and be able to apply that comprehension to architectural solutions. In addition, the impact of such decisions on the environment must be well considered.

* B.5 Structural Systems: Ability to demonstrate the basic principles of structural systems and their ability to withstand gravitational, seismic, and lateral forces, as well as the selection and application of the appropriate structural system.
* B.8 Building Materials and Assemblies: Understanding of the basic principles used in the appropriate selection of interior and exterior construction materials, finishes, products, components, and assemblies based on their inherent performance, including environmental impact and reuse.

The specific objectives of Building Structures II are as follows:

* To introduce the physical concepts of lateral load events (wind, earthquake, blast), to understand the physical principles of how these events are quantified in terms of loadings, and to introduce design concepts for lateral force resisting systems in buildings;
* To introduce structural design in structural steel using allowable stress design for tension members, compression members, and flexural members.
* To introduce cementitious materials: Portland cement, mortar, sand concrete, and normal concrete through descriptions of how Portland cement is manufactured, how it hydrates, and how it is combined with fine and coarse aggregates to make concrete;
* To describe the mechanical, thermal, and weathering properties of plain concrete and reinforced concrete in terms of both “engineering” units and in non-quantitative terms;
* To review the practical aspects of concrete construction: concrete mix design, formwork, shoring, rebar placement, concrete placement, finishing, and curing;
* To present the design of common reinforced concrete floor systems: concrete joist systems, one-way slabs, waffle-slabs, flat plates and flat slabs – and methods for integrating these systems into architectural design proposals;
* To review design of typical structural members of reinforced concrete: beams, columns, slabs, spread foundations and introduce the design and behavior of other concrete structural systems: pre-cast concrete, pre-stressed and post-tensioned concrete and load-bearing concrete masonry;

In addition to its technical role, the course content complements architectural studio by focusing on the form-giving and construction-technology aspects of building structures.

**Textbook and References**

The course does not have a required text. The following reference texts are recommended – we will assign readings in some of these during the semester.

**Reference texts:**

Statics and Strength of Materials for Architecture and Building Construction, 4th Edition (2011),   
by Onouye and Kane

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

Fundamentals of Building Construction 6th Edition, 2013 by Edward Allen

Building Construction Illustrated, 5th Edition (2011) by Francis Ching

Structures, by Daniel Schodek and Martin Bechthold, Prentice Hall , 7th Ed., 2013

Origins of Form, Christopher William, 1995

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

Minimum Design Loads for Buildings and Other Structures, ASCE 7-10, American Society of Civil Engineers, 2005.

Steel Roof and Floor Deck, Vulcraft.

Steel Joists and Joist Girders, Vulcraft.

Design and Control of Concrete Mixtures, Portland Cement Association

ACI 318, Building Code Requirements for Reinforced Concrete, American Concrete Institute

**Homework**

Approximately six homework assignments will be given during the semester. 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. 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. All calculations must be shown. Homework grades will be based on neatness, presentation and completeness of work, and inclusion of required sketches.

**Laboratory**

The purpose of the laboratory is to allow us to hold more in-depth discussions than are possible in the lectures. In general, the laboratory period will not be used for the presentation of new material (unless we are making up for time missed in a regularly-scheduled class). Specifically, the laboratory period will be used for:

* presentation and discussion of case studies and worked problems,
* demonstration of structures computer software,
* materials demonstrations and labs,
* completion of lab projects
* field trips, and
* exam preview and review.

**Laboratory Projects**

There will be one major laboratory projects during the term: a lateral load model project. 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 college shop. 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.

**Grading**

The hourly quizzes will be announced at least a 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 or receive explicit permission to take it later. I reserve the right to give the same exam or a different exam as a makeup, at my discretion. The final exam can only be taken on the assigned date, so do not plan to leave campus before the final.

Course credit is distributed as follows:

Homework 15%

Attendance and Participation 5%

Lab Project 10%

Hourly Quizzes 45%

Final Exam 25%

**TOTAL 100%**

# COURSE POLICIES

**Attendance**

If you are to do well in this class, you must attend. Much of the information needed to complete the course will come from the 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. Students who are chronically absent or are repeatedly late to class will lose the attendance and participation portion of their grade.

Link to GT Attendance Policy - <http://catalog.gatech.edu/rules/4/>

**Grading**

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| --- | --- |
| Grades Are Earned as Follows: | Percentage |
| A | 90-100% |
| B | 80-89% |
| C | 70-79% |
| D | 60-69% |
| F | < 60% |

Evaluation of a student’s performance in each course is the responsibility of the instructor for that course. If the grade is disputed, a student may appeal to the instructor for a review. If, after the review, the student still believes that a grade has been assigned unfairly, the student may submit a written request for a grade appeal to the School Chair. The petition must clearly state the reasons for the appeal. A committee of faculty and students will convene to review the work and make a decision as to whether the grade will stand or be changed. Petitions must be settled and a final grade submitted to the registrar no later than three weeks after the end of the term in which the course was completed. The School Chair will inform the student of the committee’s decision regarding the grade appeal, and their decision is final.

A student may receive a grade of incomplete (I) by requesting permission from the instructor prior to the date of the final examination or presentation. Permission will be granted only under extraordinary circumstances and usually for medical reasons.

# Academic Integrity and Conduct

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. All Georgia Tech students should familiarize themselves with and abide by the Georgia Tech Honor Code: <http://www.catalog.gatech.edu/rules/18/>. Any student suspected of cheating on a quiz or exam or caught plagiarizing will be reported to the Office of Student Integrity.

For expectations of student and instructor conduct more generally, consult section 19 of the catalog listed above, entitled “Code of Conduct,” http://www.catalog.gatech.edu/rules/19/, and section 22, entitled “Student-Faculty Expectations,” at http://www.catalog.gatech.edu/rules/22/.

All persons in the classroom are expected to behave with courtesy towards others and in a way that does not interfere with the regular conduct of the class. Cell phones are to be turned off when students enter the classroom and should remain off for the duration of class; laptop computers are to be used only for taking notes; and students should not engage in private conversations while the instructor or other students are speaking. Anyone who does not adhere to these basic courtesies will be asked to leave.

# Accommodations for Students with Disabilities

Any student with a disability, that may require accommodation, should contact Office of Disability Services at 404-894-2563 or visit <http://disabilityservices.gatech.edu> to make an appointment to discuss his or her special needs and obtain an accommodations letter. He or she should also schedule an appointment to speak with the course instructor.

**Emergencies**

In case of emergency (e.g., fire, accident, or criminal act), please call the Georgia Tech Police at 404-894-2500. Please note that Perry Minyard, IT Support Administrator for the College of Architecture, is also a firefighter and an Emergency Medical Technician (EMT) certified in performing CPR.

**Ownership**

Physical copies of student work submitted to the school to satisfy course requirements—including, but not limited to digital files, papers, drawings, and models—become the property of the school. It is assumed as no obligation to safeguard such materials and may, at its discretion, retain them, return them to the student, or discard them.

# College of Design Facility Rules and Guidelines

Please consult the Georgia Tech Student Handbook regarding the use of facilities and all Institute policies. Aerosol sprays of any kind are strictly banned from the studio and surrounding areas. A new spray painting booth is now in operation in the COA shop, on the ground floor of the East Architecture Building.

Shop Use: All students using shop facilities must first have completed an orientation. Safety first, always! Noise should be kept to a minimum. Music may be listened to only through headphones, including evenings and weekends.

Studio Housekeeping: Students should feel free to organize their space creatively and expressively, but with respect to others around them. Try to prevent clutter from becoming a nuisance, distraction, or a hazard. The cleaning staff makes every effort to determine what is and is not trash, but their job can be made easier if you keep drawings filed and models off of the floor.

1. http://www.naab.org/accreditation/2014\_Conditions [↑](#footnote-ref-1)