

Department of Architectural Technology

ARCH 1230

BUILDING TECHNOLOGY II

1 classroom hours, 4 lab/studio hours, 3 credits

Course Description: This course will study the basic materials of construction as well as the theory and practice of building technology. The course will include investigation of the assembly of building components and methods of construction while developing proficiency in both analog and digital drawing building information modeling (BIM) techniques, and professionally presented construction drawing page composition.

Course context: This is the second course in the Building Technology sequence required for both the AAS and the BTech degrees offered by the Department of Architectural Technology. Each course in this sequence is a pre-requisite for the following course. There are four Building Technology courses.

Prerequisites: ARCH 1130 Building Technology I with a grade of C or higher

Required Texts:

Allen, Edward. *Fundamentals of Building Construction: Materials and Methods, 5th Edition*. John Wiley and Sons, 2008.

Ching, Francis. *Building Construction Illustrated*. John Wiley and Sons, 2008.

Recommended Texts:

Ramsey, Charles George, Harold Reeve Sleeper, and Bruce Bassler. *Architectural Graphic Standards: Student Edition (Ramsey/Sleeper Architectural Graphic Standards Series)*. John Wiley and Sons, 2008.

Ching, Francis. *Architectural Graphics, 5th Edition*. John Wiley and Sons, 2009.

Attendance Policy: No more than 10% absences are permitted during the semester. For the purposes of record, two lateness are considered as one absence. Exceeding this limit will expose the student to failing at the discretion of the instructor.

Course Structure: This course will combine weekly lectures focused on particular materials and methods of construction and studio lab time to acquire hand sketching and digital drafting and modeling skills while developing a series of case drawing and modeling investigations of the materials and assemblies discussed in the lectures. There will be one or more research assignments as well as several quizzes based on key terms and concepts discussed in the class and in the assigned readings. There will be a comprehensive final exam. A portfolio will be developed to document the studio lab work as the semester progresses. Field trips will offer first hand on-site investigation of the materials and methods covered in the course.

Grading: Final grade will be determined according to the following grade weighting:

45%	Studio Lab Assignments
15%	Quizzes
10%	Research Assignments
25%	Final Exam
5%	Class Participation

Academic Integrity: Students and all others who work with information, ideas, texts, images, music, inventions and other intellectual property owe their audience and sources accuracy and honesty in using, crediting and citation of sources. As a community of intellectual and professional workers, the college recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension and expulsion.

Learning Objectives

Upon successful completion of this course, the student will:

1. **Understand** the relationship of technology to tectonics and architectural character. (Knowledge)
2. **Recall and recite** the key terms and characteristics of the materials reviewed in the lectures and readings. (Gen Ed)
3. **Develop and apply** a professional vocabulary of architectural terminology. (Gen Ed)
4. **Understand and apply** professional etiquette to classroom situations. (Gen Ed)
5. **Define and compare** the environmental implications of specific materials and types of construction including embodied energy, sourcing, and the processing of materials. (Gen Ed)
6. **Generate clear and concise talking points** to guide oral presentations of lab assignment reviews. (Gen Ed)
7. **Manipulate and apply** geometric, proportional and scale systems. (Gen Ed)
8. **Apply** an understanding of the relationship of physiology and anatomy to building construction. (Gen Ed)
9. **Research, report on and apply** appropriate details of the selected materials and methods of construction through review of professional literature. (Gen Ed)
10. **Use and apply procedural** texts to supplement instruction on the use of hardware and software. (Gen Ed)
11. **Sketch and draft** details in orthographic and 3 dimensional views in analogue and digital media. (Skill)
12. **Develop** analog and digital models of construction assemblies. (Skill)
13. **Analyze** assemblies and details; demonstrate an understanding of fundamental construction types both by detailed research and visual observation. (Skill)
14. **Demonstrate knowledge** of building codes, professional construction drawing standards for composition, title blocks, annotation, and schedules. (Skill)
15. **Develop** a coordinated drawing set for the given building design(s) including plan diagrams, sections, and details of steel and concrete structures that illustrates and identifies the materials and construction types. (Skill)

Assessment

To evaluate the students' achievement of the learning objectives, the professor will do the following:

1. **Review** research assignment focused on the analysis of assemblies and details and the relationship of technology to tectonics, human scale, and architectural character. (Los: 1,8,13)
2. **Test** the students' ability to recall and recite the key terms and material of the readings and lectures through weekly quizzes and a final exam. (Los: 2, 5, 9)
3. **Review** students' drawing and modeling work where students must exhibit their visual representation skills (2-D and 3-D). (Los: 7, 10, 11, 12, 14, 15)
4. **Assess** the students' use of professional vocabulary and etiquette during discussions, studio work, and oral presentations. (Los: 3, 4, 6)
5. **Inspect** student submissions for quality of drafting including use of line weights, lettering, and proper use of scale. (Los: 7, 11, 14, 15)
6. **Confirm** the proper coordination of the students' submitted drawing sets. (Los: 14)
7. **Review** the quality and accuracy of the students' submitted analogue and digital models of construction assemblies. (Los: 11, 12)

Course Outline:

WEEK 1:

*Week 1 Lecture: **Course Introduction, Making Buildings: Materials and Systems:*** Introduction to the scope of this course. Discussion on tectonics, sustainability, and economics as context for the work of the architect. Discussion on nature of materials + selecting construction systems, inherent properties. Introduction to steel and concrete. Structural behavior of steel and concrete with concepts of statics, stress, bending, span and shapes.

*Week 1 Lab: **Review of Lab Required Equipment and Protocols for Presentation:*** Architectural Drawing + Modeling: analog and digital tools and techniques. SketchUp, AutoCAD and BIM Software (current industry standard is Revit): Introduction to AutoCAD Interface, Terminology, and Key Commands. Introduction to Drawing Assignment A: Grids of Steel and Concrete Frames (2-D digital).

*Week 1 Homework: **Drawing Assignment A:*** Grid Drawings for Concrete and Steel Structures (Based on Case Study Building #1)

Week 1 Reading: Allen and Iano, Making Buildings Chapter 1, pp. 3-27

WEEK 2:

*Week 2 Lecture: **Building Codes:*** Introduction to IBC, IRC, occupancy groups, construction types, fire resistance ratings, allowable building height and area calculations.

*Week 2 Review: **Requirements of Research Assignment*** (Due Week 14)

*Week 2 Lab: **Introduction to Case Study Building #1.*** Review of general planning of case study building. Introduction to Drawing Assignment B: Code Analysis / Life Safety Diagram (2-D digital- AutoCAD.)

*Week 2 Homework: **Drawing Assignment B:*** Code Analysis / Life Safety Diagram for Case Study Building #1.

Week 2 Reading: Allen and Iano, Foundations Chapter 2, pp. 29-38

WEEK 3:

*Week 3 Lecture: **Geotech + Excavations + Foundations Part I:*** Procedures and Consultants, Geotechnical Investigation, Soils, Bearing Pressure. Excavation and Shoring.

*Week 3 Lab: **Pin Up:*** Drawing Assignments A (complete) and B (progress). Continue Introduction to AutoCAD commands and techniques to aid execution of Drawing Assignment B.

*Week 3 Homework: **Complete Drawing Assignment B:*** Code Analysis / Life Safety Diagram for Case Study Building #1.

Week 3 Reading: Allen and Iano, Foundations Chapter 2, pp. 56-71

WEEK 4:

*Week 4 Lecture: **Geotech + Excavations + Foundations Part II:*** Foundation materials: concrete, wood, and steel. Foundation types: deep foundations. Underpinning existing foundations.

*Week 4 Lab: **Foundation Types and Details:*** Introduction to digital modeling in SketchUp and AutoCAD. Introduction to Drawing Assignment C: Foundation Development for Case Study Building #1 (3-D digital – SketchUp or REVIT)

*Week 4 Homework: **Drawing Assignment C:*** Foundation Development for Case Study Building #1.

Week 4 Reading: Allen and Iano, Concrete Construction Chapter 13, pp. 515-551

WEEK 5:

*Week 5 Lecture: **Concrete Construction:*** History, cement and concrete, making and placing concrete, formwork, reinforcing, creep, prestressing, and innovations.

*Week 5 Lab: **Concrete Frame Model:*** Introduction to Drawing Assignment D: Concrete Frame and Core Model for Case Study Building #1 (3-D digital – SketchUp or REVIT)

*Week 5 Homework: **Drawing Assignment D:*** Concrete Frame and Core Model for Case Study Building #1.

Week 5 Reading: Allen and Iano, Sitecast Concrete Framing Systems Chapter 14, pp. 553-609

WEEK 6:

*Week 6 Lecture: **Site Cast Concrete Construction:*** Slab on grade, concrete walls, concrete columns, one-way systems, two-way systems, stairs, posttensioning, selecting a system, innovations, architectural concrete.

*Week 6 Lab: **Pin Up:*** Drawing Assignments C (complete) and D (progress). Continue Introduction to Sketch Up and REVIT commands and techniques to aid execution of Drawing Assignment D.

*Week 6 Homework: **Complete Drawing Assignment D:*** Concrete Frame and Core Model for Case Study Building #1.

Week 6 Reading: Allen and Iano, Cladding with Metal and Glass Chapter 21, pp. 839-867

WEEK 7:

*Week 7 Lecture: **Cladding with Metal and Glass:*** aluminum extrusions, aluminum and glass framing systems, modes of assembly, the rain screen principle, expansion joints, dual-layered glass cladding, curtain wall design process.

Week 7 Lab: Introduction to Drawing Assignment E: Curtain Wall Kit of Parts and Assembly for Case Study Building #1 (3-D digital – SketchUp or AutoCAD.)

*Week 7 Homework: **Drawing Assignment E:*** Curtain Wall Kit of Parts and Assembly for Case Study Building #1.

Week 7 Reading: Allen and Iano, Steel Frame Construction Chapter 11, pp. 411-440

WEEK 8:

*Week 8 Lecture: **Steel Frame Construction:*** History, the material steel, steel alloys, production of structural shapes, details of framing, typical connections, stabilizing the building frame, shear connections and moment connections.

*Week 8 Lab: **Pin Up:*** Assignment D (complete) Assignment E (progress)

*Week 8 Homework: **Complete Drawing Assignment E:*** Curtain Wall Kit of Parts and Assembly for Case Study Building #1.

Week 8 Reading: Allen and Iano, Steel Frame Construction Chapter 11, pp. 441-487

WEEK 9:

*Week 9 Lecture: **Steel Frame Construction:*** The construction process, the fabricator, the erector, floor and roof decking, architectural steel, fireproofing steel.

*Week 9 Lab: **Field Trip: Introduction to Case Study Building #2.*** Introduce Assignment F (team assignment): On Site Documentation: organize the following into a power point presentation: site documentation, photographic survey, GIS documentation, exterior wall component sketches: windows, stonework, metal work (proportions, size, key relationships, floor to floor, stone coursing)

*Week 9 Homework: **Complete Assignment F (team assignment):*** On Site Documentation

Week 9 Reading: Allen and Iano, Designing Exterior Wall Systems Chapter 19, pp.783-807

WEEK 10:

*Week 10 Lecture: **Designing Exterior Wall Systems:*** design requirements, environmental performance, watertightness, sealant joints, load bearing versus curtain wall.

*Week 10 Lab: **Case Study Building #2 BIM Model Set Up:*** Introduction to Revit, process and set up. Key commands, interface. Introduction to Drawing Assignment G: Set up levels, property line, structural grid. Build structural frame.

*Week 10 Homework: **Drawing Assignment G:*** Case Study Building #2 Revit model set up, levels, property line, structural grid, and structural frame.

Week 10 Reading: Allen and Iano, Cladding with Masonry and Concrete Chapter 20, pp. 809-837

WEEK 11:

*Week 11 Lecture: **Cladding with Masonry and Concrete:*** masonry veneer curtain walls, stone curtain walls, precast concrete curtain walls, EIFS, future directions.

*Week 11 Lab: **Case Study Building #2 BIM Model:*** Introduce Drawing Assignment H: Horizontal and Vertical Circulation. Define Lobby volume, corridors, elevators, shafts, and stairs.

*Week 11 Homework: **Complete Drawing Assignment G. Continue Drawing Assignment H:*** Horizontal and Vertical Circulation

Week 11 Reading: On Stairs

WEEK 12:

*Week 12 Lecture: **Stairs and Elevators***

*Week 12 Lab: **Pin Up:** Assignment G (Complete), Assignment H (progress) Introduce Drawing Assignment I: Exterior Wall Assembly*

Week 12 Homework: Complete Drawing Assignment H. Continue Drawing Assignment I.

Week 12 Reading: to be determined

WEEK 13:

*Week 13 Lecture: **Drawing Coordination, Presentation,** and Introduction to Drawing Assignment J: Final Presentation, Case Studies #1 and #2.*

*Week 13 Lab: **Pin Up:** Assignment H (complete). Assignment I (progress)*

Week 13 Homework: Complete Drawing Assignment I.

Week 13 Reading: Final Exam preparation

WEEK 14:

*Week 14 Lecture: **Research Presentations***

Week 14 Lab: Drawing Assignment J support.

Week 14 Homework: Complete Drawing Assignment J.

WEEK 15:

*Week 15 Lecture: **Final Exam***

*Week 15 Lab: **Formal Presentation/Review:** Coordinated Drawing Sets for Case Study Buildings #1 and #2.*