

New York City College of Technology – City University of New York
300 Jay Street, Brooklyn, New York 11201

Department of Architectural Technology

ARCH 1140 MATERIALS IN ARCHITECTURE
2 Classroom hours, 2 credits

Course Description: The introduction to basic materials of construction and their employment in the building construction industry with emphasis on wood, masonry, steel and concrete.

Prerequisites: CUNY Certification in Reading and Writing

Pre or Corequisite: ENG 1101

Required Text: "Fundamentals of Building Construction / Materials and Methods"
By Edward Allen (4th Edition) John Wiley and Sons, Publisher

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.

Grading: During the semester there will be short weekly quizzes and a final exam. A semester project by each student to prepare a model or make a full visual presentation to the class of one of the structural systems discussed during the semester (e.g. wood platform frame, trusses) will be required.

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 the successful completion of this course, the students shall be able to:

1. Clearly explain the different structural principles entailed in architectural construction
2. Identify all the key components involved in wood frame, concrete, masonry and steel frame construction.
3. Explain in detail the various methods used in concrete construction and explain the function of formwork, reinforcement, joints, curing, admixtures
4. Cite the applications of the various masonry systems and materials

Assessment:

Students will be given weekly quizzes and a final exam to test their ability to:

1. Cite the key factors an architect must consider in wood, concrete, steel and masonry construction.
2. Explain what is meant by each of the “key terms and concepts” listed at the end of each chapter of the assigned text.
3. Draw a building section of a wood frame two-story platform framed house, and be able to identify all the key components.
4. Draw a wall section of a cavity wall suspended on a steel skeleton frame and be able to identify all the key components such as spandrel beam, floor joists, lintel, cavity, flashing, weep holes, ties, coping, roof decking, etc.

Also, each student will be required to make a presentation to the class explaining in detail a structural or material application related to wood, concrete, masonry or steel construction.

Course Outline:

Week 1: Introduction to wood, concrete and steel. Structural behavior with concepts of statics, stress, bending, beam analysis, span, and shapes.

Week 2: Wood: Characteristics, structure, classification of trees and properties, limitations, manufacture of lumber, grading of lumber, softwoods and hardwoods, plywood, glue laminated lumber, composite boards, wood joining and interior finishes

Week 3: Wood Construction: Platform, balloon and braced frame. Terminology, joist tables, roof types (gable, hip, mansard, etc.) pitch designation, stressed skin construction

Week 4: Iron and Steel. General considerations (strength, workability, weatherability, finishes. Ferrous metals: iron, wrought iron, cast iron, steel. Non-ferrous metals: aluminum, copper, brass, lead, etc..

Weeks 5 & 6: Steel construction: Structural shapes and properties, built-up beams, girders, structural design in steel, beam connections, columns, and wind bracing. Hot rolled sections, light gage framing, structural fasteners, open web joists, metal decking. Miscellaneous metal (metal stairs, fire escapes, gratings). Ornamental metal (railings, louvers, etc.)

Week 7: Concrete: composition, weight, properties. Portland cement, water, aggregates, admixtures. Construction considerations: testing, reinforcement, formwork, placing, curing, joints, lightweight concrete

Week 8: Reinforced concrete: Nature of material, design, reinforcement, principles of bending, shear, tension. Slab construction, columns

- Week 9: Precast and prestressed concrete. Precast floor and roof systems, tilt-up and lift- slab construction. Pretensioning and post tensioning
- Week 10: Long span construction: Column and beam long span systems (trusses, wood laminated beams, steel plate girders), arches, shells and domes, compression and tension rings, suspension structures
- Week 11: Brick: types, manufacture, grading of common brick, brick varieties: common, jumbo, roman, firebrick, facebrick, pavers, sewer brick, hollow tile, glazed brick
- Week 12: Masonry: characteristics, masonry construction, construction considerations, weatherability. Tile: various types, colors, applications, structural vs. non-structural, fireproofing. Stone: granite, slate, sandstone, limestone, marble, flagstone. Terra cotta
- Week 13: Composite construction: steel frame and concrete slab, curtain wall with steel or concrete frame. Floor and roof systems: slab on grade, wood floors, steel floors, concrete floors (precast slabs, tees).
- Week 14: Review of semester work. Student presentation of models or powerpoints demonstrating a structural system.
- Week 15: Final exam