



## COURSE OUTLINE

Course Number	Course Title	Credits
ARC 134	Building Construction Systems	3
Hours: lecture/Lab/Other	Co- or Pre-requisite	Implementation Sem/Year
3 / 0	none	Fall 2017

### Catalog description:

#### **ARC 134 - Building Construction Systems (3 )**

Introductory survey of general concepts of sustainable design as they relate to building construction. Includes site, structural, environmental, envelope systems, materials and building systems. Focus is primarily on low-rise wood and steel structures. *3 lecture hours*

**Required texts/other materials:** BUILDING CONSTRUCTION ILLUSTRATED: 4th Ed., Francis D.K. Ching

**Revision date:** 2017

**Course coordinator:** Perryman, perrymag@mccc.edu 609-570- 3357

### Information resources:

- Architectural Graphic Standards, on reserve in Library
- Fine Homebuilding Magazine,
- Architecture and Architecture Record Magazines, in library

### Course Competencies/Goals:

#### ***The student will be able to:***

- A. Understand the basic principles and appropriate application and performance of construction materials, products, components, and assemblies, including their environmental impact and reuse
- B. Demonstrate knowledge of the science of materials and methods of construction as they apply to the Construction Specifications Institute (CSI) Divisions.
- C. Raise clear and precise questions, consider diverse points of view, reach well-reasoned conclusions, and test them against relevant criteria and standards in the selection of building construction materials and systems
- D. Illustrate through drawing the relationship of various materials that makeup a building construction assembly
- E. Understand the principles of sustainability in making building construction decisions that conserve natural and built resources, including materials, products, components, and assemblies

## Course-specific General Education Knowledge Goals and Core Skills.

### General Education Knowledge Goals

**Goal 1. Communication.** Students will communicate effectively in both speech and writing.

**Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

**Goal 3. Science.** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

**Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

**Goal 9. Ethical Reasoning and Action.** Students will understand ethical issues and situations.

### MCCC Core Skills

**Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

**Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.

**Goal C. Ethical Decision-Making.** Students will recognize, analyze and assess ethical issues and situations.

**Goal D. Information Literacy.** Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

**Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems, and communicate with others.

**Goal F. Collaboration and Cooperation.** Students will develop the interpersonal skills required for effective performance in group situations.

### Units of study:

#### Unit I The Building Delivery Process, Governmental Constraints, and Principles of Sustainable Construction

##### Learning Objectives *The student will be able to...*

- Understand traditional project phases including pre-design, design, design development, construction documents, construction, and contract administration.
- Discuss and interpret the CSI MasterFormat system.
- Understand some of the governmental constraints on building design and construction, including building codes, zoning ordinances and accessibility.
- Understand the underlying premises and organization of a model building code.
- Calculate preliminary maximum allowable area and height for selected building construction types.
- Develop an awareness fundamental considerations of sustainable architecture.
- Develop an awareness of methods for eco-labeling buildings and building materials.
- Develop an understanding of characteristics of “green” building products and assemblies.

## **Unit II BUILDINGS LOADS AND LOAD RESISTANCE, THERMAL PROPERTIES OF MATERIALS, FIRE-RELATED PROPERTIES**

**Learning Objectives** *The student will be able to...*

- Understand the types of building loads and how they influence the design requirements for a building.
- Develop a preliminary estimate of building live and dead loads
- Begin to understand basic structural properties and behaviors of materials.
- Develop an understanding of basic thermal properties of materials and the thermal principles as they relate to designing the building enclosure.
- Understand the types, materials and performance characteristics insulating materials.
- Understand the mechanisms of air leakage and the movement of water vapor through envelope assemblies.
- List design strategies, materials and construction practices to control unwanted air leakage and water condensation in wall, roof and floor assemblies.
- Develop an awareness of factors that affect fire safety in buildings.
- Understand construction materials and design strategies for the prevention of flame and smoke spread in a building.

Understand the key elements of a means of egress system.

## **Unit III Soils; Foundation and Basement Construction and Portland Cement and Concrete and Concrete Construction**

**Learning Objectives** *The student will be able to...*

- Developed an understanding of the physical characteristics of soil as they relate to building design.
- Understand the basic requirements for soil testing and a geotechnical report.
- Understand the planning and design considerations related to site excavation.
- Understand structural principles and methods of constructing deep and shallow foundations
- Develop a basic understanding of the physical and chemical properties of concrete, including the role of the key ingredients of lime, Portland cement and aggregate.
- Develop an understanding of processes involved in manufacturing, mixing and placing concrete.
- Understand of the role of admixtures in the production of concrete.
- Develop a basic understanding of materials used for steel reinforcement.
- Understand the role of reinforcement in concrete structures and construction.
- Understand the design, construction and removal of formwork, in concrete construction.
- Understand slab-on-ground construction methods.
- Understand the fundamentals of elevated concrete floor systems and typical applications for each system.
- Understand the types of structural precast concrete members and methods of assembly.
- Understand the advantages and disadvantages of structural site-cast and precast concrete construction methods.

#### **Unit IV Materials for Wood Construction (Lumber) Wood Light Frame Construction Structural Insulated Panel Systems**

**Learning Objectives** *The student will be able to...*

- Developed an understanding of the growth and performance characteristics of wood.
- Understand the manufacturing process from plant to lumber.
- Apply methods of measuring wood products and graphically representing wood members.
- Understand the concepts of durability, performance and appearance characteristics of wood.
- Develop familiarity with types and physical properties of manufactured wood products.
- Understand the difference between solid wood products and manufactured wood products.
- Understand wood panel types and rating systems.
- Understand methods of connecting wood or manufactured wood members.
- Develop an understanding of the principles of wood light frame construction.
- Develop a vocabulary of wood light frame construction terms.
- Understand the underlying structural principles of wood light frame construction.
- Develop an understanding of exterior wall finishes.
- Develop an awareness of the types and applications of gypsum wall board.
- Develop an understanding of the basics structural principles and construction methods of structural insulated panels.
- Perform preliminary design and layout of a simple stair.
- Understand the principles and materials used in the design and construction of wood, stairs.
- Develop an understanding of the requirements for providing a good quality subfloor and or underlayment system.
- Evaluate the performance of a wide range of floor covering materials.

#### **Unit V The Material Steel and Structural Steel Construction and Light-Gauge Steel Construction**

**Learning Objectives** *The student will be able to...*

- List the physical and performance characteristics of structural steel.
- Understand the steel fabrication and erection process.
- Demonstrate the basic strategies for designing steel frame structures and methods for connecting steel members.
- Develop an understanding of light gauge steel construction (LGSC) methods.

#### **Unit VII Masonry Materials I**

**Learning Objectives** *The student will be able to...*

- Understand the principles of masonry construction.
- Understand the types and applications of different types of mortar and clay brick.
- Understand the concept of modularity and bond patterns as applied to masonry construction.
- Understand the physical and performance characteristics of mortar and clay brick.
- Understand concrete masonry materials and construction methods, and the differences between brick and CMU as construction materials.
- Understand the physical characteristics of stone as a construction material, and its applications to masonry construction.
- Gain a familiarity with glass masonry materials and assemblies.

## **Unit VIII PRINCIPLES OF JOINTS AND SEALANTS RAINWATER INFILTRATION CONTROL IN EXTERIOR WALLS TRANSPARENT MATERIALS WINDOWS AND DOORS AND ROOFING**

**Learning Objectives** *The student will be able to...*

- Developed an understanding of the causes of movement in buildings and building components.
- Identify design strategies and types of joints used to control movement in buildings and components.
- Understand the forces that result in the movement of water through building assemblies.
- Understand the design strategies to control rainwater infiltration in cladding systems.
- Understand the difference between a drainage wall and a barrier wall.
- Understand the physical and performance characteristics of most commonly used glass materials.
- Understand the issues related to the transmission of longwave and shortwave solar radiation.
- Understand the methods commonly used in window glazing.
- Understand the range of possible window and door assemblies available.
- Develop a beginning window and door description vocabulary.
- Understand the advantages and disadvantages of working with aluminum.
- Develop a familiarity with the range of low slope roofing materials and assemblies currently available.
- Develop a understanding of design considerations related to low slope roofs.
- Develop a familiarity with commonly used materials and methods for installation of steep slope roofing systems.
- Develop an understanding of design principles for steep slope roofing.

### **IV. Evaluation of Student Learning / Course Grading**

**Assignments:** All assignments will be graded on an A to F basis. Late assignments will be subject to grade reductions of one letter grade per class session. Assignments not turned in will be recorded as a zero grade. (30% of final grade)

**Quizzes:** Quizzes may be given at any time during the class. They may be written or performance based, and students may or may not be given prior notice. Quizzes missed because of student absence may not be made up and will be recorded as a zero. (30% of final grade)

**Projects:** 2-4 Sketch / drawing projects will be assigned at the beginning or end of various topic units (40% of final grade)

**Final Grade Calculation:** Your final grade will be calculated by averaging all of your grades and weighing them as indicated above.

**Final Examination:** Because this course requires the cumulative mastery of previously taught skills for the completion of each successive assignment, a comprehensive final examination is not required to measure the attainment of course objectives.

The student is responsible for his/her regular attendance, participation in class discussions.

The grade of "A" will be earned by students who demonstrate mastery of the essential objectives of the project, as well as demonstrating excellence in aesthetics and originality, and in completing course objectives and learning unit objectives with at least 90% accuracy.

The grade of "B" will be earned by students who demonstrate more than adequate mastery of the essential objectives of the project, as well as demonstrating a more than adequate level of aesthetics and originality, and in completing course objectives and learning unit objectives with at least 80% accuracy.

The grade of “C” will be earned by students who demonstrate adequate mastery of the essential objectives of the project, as well as demonstrating an adequate level of aesthetics and originality, and in completing course objectives and learning unit objectives with at least 70% accuracy.

The grade of “D” is undesirable and indicates a less than adequate mastery of the essential objectives of the project and a less than adequate level of aesthetics and originality, with a minimum level of completion of course objectives and learning unit objectives.

The grade of “F” will be earned by students who do not demonstrate achievement.

#### **I. Academic Integrity Statement:**

Students are expected to comply with the college-wide requirements for academic integrity. Mercer County Community College is committed to Academic Integrity—the honest, fair, and continuing pursuit of knowledge, free from fraud or deception. This implies that students are expected to be responsible for their own work. Presenting another individual’s work as one’s own and receiving excessive help from another individual will qualify as a violation of Academic Integrity. The entire policy on Academic Integrity is located in the Student handbook and is found on the college website ([http://www.mccc.edu/admissions\\_policies\\_integrity.shtml](http://www.mccc.edu/admissions_policies_integrity.shtml)).

#### **VI. Special Needs Students Statement**

Mercer County Community College is committed to ensuring the full participation of all students in all activities, programs and services. If you have a documented differing ability or think that you may have a differing ability that is protected under the ADA and Section 504 of the Rehabilitation Act, please contact Arlene Stinson in LB 216 [stinsona@mccc.edu](mailto:stinsona@mccc.edu) for information regarding support services. If you do not have a documented differing ability, remember that other resources are available to all students on campus including academic support through our Academic Learning Center located in LB 214.