

ARC 112
CONSTRUCTION MATERIALS AND METHODS

COURSE DESCRIPTIONS:

Prerequisites: None
Corequisites: None

This course introduces construction materials and their methodologies. Topics include construction terminology, materials and their properties, manufacturing processes, construction techniques, and other related topics. Upon completion, students should be able to detail construction assemblies and identify construction materials and properties. Course Hours Per Week: Class, 3. Lab, 2. Semester Hours Credit, 4.

COURSE OBJECTIVES:

A student who successfully completes this course should be:

- a. Be familiar with and able select and use appropriate construction materials
- b. Able to graphically communicate and produce working details and architectural sections
- c. Be familiar with and able to apply different construction methods and techniques
- d. Be familiar with construction methods and terminology
- e. Be familiar with construction manufacturing processes

OUTLINE OF INSTRUCTION:

- I. Course Introduction
 - A. Course Outline and Policies
 - B. General Planning Constraints
 - 1) Building Codes
 - (a) Model Codes
 - (b) State Codes
 - (c) Occupancy Types
 - (1) Construction Types
 - (d) Fire protection issues
 - 2) Zoning
 - (a) Setbacks
 - (b) Parking Requirements
 - (c) Fire zone
 - 3) Owner's Programs
 - 4) Budget
 - 5) Site
 - (a) Landform
 - (b) Access
 - (c) Climate
 - (d) Circulation
 - (e) View
 - C. Project manual organization
 - 1) CSI Master format

- 2) Uniformat
- 3) EJD OC

II. Site work and site preparation

- A. Soil types
 - 1) Particle size
 - 2) Classification system
 - 3) Permeability
 - 4) Bearing Capacity
 - 5) Shrink/ Swell potential
- B. Soil testing
- C. Site preparation
 - 1) Soil erosion control
 - 2) Grading
 - 3) Excavation
 - (a) Sheet piling Techniques
 - (1) Bracing
 - (b) Dewatering considerations
 - (c) Permanent sheet piling
 - 4) Backfill
- D. Foundation systems and types
 - 1) Piling V.s. Caissons
 - 2) Grade Beams
 - 3) Mat Foundations
 - 4) Turned down footings
 - 5) Spread footings
- E. Retaining Walls
 - 1) Gravity
 - 2) Cantilever
 - 3) Weep holes
 - 4) Failure modes
- F. Geotextiles
 - 1) Soil reinforcement
 - 2) Filter fabrics
- G. Paving
 - 1) Concrete
 - 2) Asphalt
 - 3) Permeable
 - 4) Pavers

III. Concrete

- A. Ingredients
- B. Additives and their effects on concrete
- C. Cement types and properties
- D. Reinforcement
 - 1) Size
 - 2) Grade
 - 3) Support
 - 4) Lap

- 5) Hooks
 - 6) Mesh categories
 - E. Formwork
 - F. Placement
 - G. Finishing
 - H. Testing
 - 1) Compression
 - 2) Slump
- IV. Site Cast Concrete
- A. Slabs
 - 1) On grade
 - 2) Void
 - B. Joists
 - 1) Distribution ribs
 - C. Drop panels
 - D. Columns
 - E. Special systems
 - 1) Lift slab
 - 2) Tilt up
 - 3) Shotcrete
 - 4) Slip forming
- V. Precast Concrete
- A. Types and sizes
 - B. Joints
 - C. Span capabilities
 - D. Economic and production considerations.
- VI. Masonry
- A. Types of masonry
 - B. Brick
 - 1) Sizes
 - 2) Bond patterns
 - (a) Orientation of bricks
 - (1) Header
 - (2) Stretcher
 - (3) Rowlock
 - (4) Sailor
 - (5) Soldier
 - (6) Shiner
 - 3) Manufacturing techniques
 - C. Mortar
 - 1) Mixtures
 - 2) Joints
 - (a) Bed
 - (b) Collar
 - (c) Head
 - 3) Joint profiles

- 4) Strength considerations
 - 5) Reinforcement
 - D. Anchors
 - E. Concrete masonry
 - 1) Sizes
 - 2) Types
 - (a) Standard
 - (b) Architectural
 - 3) lintel types
 - F. Stone
 - 1) Types and uses
 - (a) Igneous
 - (b) Sedimentary
 - (c) Metamorphic
 - 2) Patterns
 - (a) Ashlar
 - (b) Rubble
 - 3) Anchoring
 - G. Arches
 - 1) Types
 - 2) Terminology
 - 3) Structural behavior
 - 4) History
 - H. Construction joints
 - 1) Control
 - 2) Expansion
 - I. Flashing
 - 1) Locations
 - 2) Weep holes
 - J. Wall types
 - 1) Solid
 - 2) Cavity
 - 3) Barrier
 - 4) Rainscreen
- VII. Steel, steel properties, and Steel Framing Methods
- A. Steel V.s. Iron
 - B. Influence of trace elements on properties
 - 1) Carbon
 - 2) Metal alloys
 - C. Elastic behavior
 - 1) Yield stress
 - 2) Ultimate stress
 - D. Standard rolled shapes
 - E. Steel Joists
 - F. Decking
 - G. Welded joints
 - 1) Detailing symbols
 - 2) Joint types

- H. Bolted joints
 - 1) Bolt types
 - 2) Friction V.s. Shear connections
 - 3) Moment V.s. Shear connections
 - 4) Eccentric V.s. Concentric connections
 - 5) Gage
- I. Joint types
 - 1) Beam to column connections
 - 2) Beam to girder connections
 - 3) Coping flanges and webs
- J. Avoiding galvanic corrosion by insulating dissimilar metals from one another.

VIII. Wood and Plastics

- A. Wood properties
 - 1) Softwood V.s. Hardwood
 - 2) Non isotropic behavior
 - 3) Hygroscopicity
 - 4) Seasoning defects
 - (a) Warps
 - (b) Knots
 - (c) Insect damage
 - (d) Rot
- B. Lumber sizes
 - 1) Nominal V.s. Actual sizes
- C. Framing member terminology
- D. Connections
 - 1) Nailed joints
 - 2) Stapled joints
 - 3) Bolted joints
 - 4) Specialty connectors
- E. Sheet and panel products
 - 1) Plywood
 - 2) Engineered wood products
 - 3) Engineered woodboard products
 - 4) Grade stamps and performance

IX. Thermal and Moisture Protection

- A. Waterproofing
- B. Dampproofing
- C. Insulation
 - 1) Board
 - 2) Batt
 - 3) Blown
- D. Roofing
 - 1) Roof styles
 - 2) Shingles
 - 3) Built up roofing
 - 4) Single ply membranes
 - 5) Sprayed applied

- X. Doors and Windows
 - A. Door types
 - 1) Swing doors
 - (a) Hand
 - 2) Fire doors and egress
 - B. Window types
 - C. Glazing types
 - 1) Annealed
 - 2) Heat strengthen
 - 3) Tempered
 - 4) Laminated
 - D. Glazing coatings
 - E. Glazing systems
 - F. Storefront

- XI. Finishes and Finish Carpentry
 - A. Plaster
 - B. Drywall
 - C. Partitions and demountable partitions
 - D. Ceilings
 - E. Interstitial ceilings

- XII. Curtain wall Systems
 - A. Stick built
 - B. Column and Spandrel
 - C. Units
 - D. Column and Cover
 - E. Panel Systems

- XIII. Storefront Systems and Glazing

- XIV. Paints and Coatings
 - A. Pigments
 - B. Driers
 - C. Extenders
 - D. Surface preparation
 - E. Sprayed applied

- XV. Roofing Systems and Types
 - A. Roofing
 - 1) Roof styles
 - 2) Shingles
 - 3) Built up roofing
 - 4) Single ply membranes
 - 5) Sprayed applied

- XVI. Fire Protection
 - A. Egress (doors/windows) (corridor sizing & stairwells)

- B. Flame spread and fire dynamics
- C. Wall ratings
- D. Fire walls and smoke doors/partitions
- E. UL wall and ceiling/roof assemblies
- F. Wall penetration
- G. Insulation materials
- H. Sprinklers
- I. Emergency lighting
- J. Fire rated materials
- K. Elevator shafts

REQUIRED TEXTBOOKS AND MATERIALS:

To Be Announced

STATEMENT FOR STUDENTS WITH DISABILITIES:

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 686-3652 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.