



Broward Community College

Course Outline

STATUS: A

COMMON COURSE NUMBER: ETC1250c

COURSE TITLE: Materials and Processes

CREDIT HOURS: 3

CONTACT HOURS BREAKDOWN:

Lecture/Discussion	<u> 32 </u>
Lab	<u> 32 </u>
Other	<u> </u>
Contact Hours/Week	<u> 4 </u>

CATALOG COURSE DESCRIPTION: Introduces the materials and processes commonly used in building construction. Provides background relating to physical properties, sources and costs. Includes a study of standard manufacturing processes and recent methods of application, and ASTM procedures for testing concrete and steel, soils, and other building materials.

Prerequisite: None

Corequisite:

UNIT TITLES:

1. Concrete, Masonry, and Glass
2. Wood and Wood Products
3. Ferrous Alloys - Wrought Iron, Steel and Cast Iron
Non-ferrous Alloys - Aluminum and Copper
4. Gypsum and Asbestos Cement Products
5. Bituminous Products, Paints, and Protective Coatings
6. Plastics
7. Standard Method of Test for Specific Gravity and Absorption of Coarse and Fine Aggregates for Concrete [ASTM C127 & C128].
8. Standard Method of Test for Slump of Portland Cement Concrete [ASTM C143].
9. Standard Method of Test for Compressive Strength of Molded Concrete Cylinders [ASTM C39].
10. Stress-Strain Diagram for Mild Steel.

I. Course Overview:

Upon successful completion of this course, the students should be able to demonstrate a proficiency in the constituents of materials used in construction, including their physical/chemical properties, and performances under stress and varying climatic conditions, with a high degree of accuracy. Students should be able to test basic construction materials and interpret the results according to the established procedures by the American Society for Testing and Materials [ASTM] with a high degree of accuracy.

II. Units:

Unit 1. Concrete, Masonry and Glass

General Outcome:

1.0 The students should be able to demonstrate a proficiency in the fundamental properties of concrete, masonry, and glass, and the use of these materials in modern construction.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 1.1 Mix, work and cure Portland Cement concrete.
- 1.2 Identify the compression strength of concrete and the applications of reinforced concrete to modern building construction.
- 1.3 Describe the manufacture process and classification of clay and concrete masonry units.
- 1.4 Describe the manufacturing processes of soda-lime glass and identify the mechanical and optical properties of glass.
- 1.5 Point out the applications of flat glass products in modern building construction.

Unit 2. Wood and Wood Products

General Outcome:

2.0 The students should be able to demonstrate a proficiency in the composition and fundamental properties of wood and the use of wood products in modern construction.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 2.1 Identify the division of wood species in two classes, softwood and hardwood.
- 2.2 Describe the physical and chemical composition of wood and its cellular structure.
- 2.3 Identify Fungi and insect hazards of wood.
- 2.4 Describe the process of lumber manufacture, marketing and measure.
- 2.5 Describe the manufacturing process of plywood, including its physical and mechanical properties.
- 2.6 Point out the applications of wood products in modern building construction.

Unit 3. Ferrous Alloys - Wrought Iron, Steel and Cast Iron Non-Ferrous Alloys - Aluminum and Cooper

General Outcome:

3.0 The students should be able to demonstrate a proficiency in the basic manufacturing process of ferrous and aluminum alloys, their mechanical properties and use in modern construction.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

3.1 Describe the composition and manufacture of wrought iron, steel and cast iron.

3.2 Describe the properties of cast iron, carbon steels, high strength, low alloy steels and stainless steel.

3.3 Describe the steel products used in modern construction.

3.4 Describe the composition and manufacture of aluminum alloys and copper.

3.5 Describe the physical properties of non-heat treatable and heat treatable aluminum alloys.

3.6 Describe the applications of aluminum alloys in modern construction.

Unit 4. Gypsum and Asbestos Cement Products

General Outcome:

- 4.0 The students should be able to demonstrate a proficiency in the fundamental properties of gypsum and asbestos cement products, and the use of these materials in modern construction.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 4.1 Describe the manufacturing processes of plaster and gypsum board products.
- 4.2 Identify the heat retardant action of gypsum products and the fire resistance of wall board application over wood frame construction.
- 4.3 Describe the manufacturing process of asbestos cement products.
- 4.4 Identify the properties and applications of mineral fiber siding, roof shingles and corrugated sheets in contemporary construction.

Unit 5. Bituminous Products, Paints and Protective Coatings.

General Outcome:

5.0 The students should be able to demonstrate a proficiency in the composition and fundamental properties of bituminous products and paints including their use in modern construction.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 5.1 Describe the manufacturing process of bituminous products.
- 5.2 Identify the classification and uses of asphalt roofing products such as: (a) asphalt coating and cements, (b) products made on a felt base and (c) products made on a glass fiber base.
- 5.3 Identify the classification, properties and use of interior and exterior primers in modern construction.
- 5.4 Identify the classification, properties and uses of interior and exterior finish coats in modern construction.

Unit 6. Plastics

General Outcome:

6.0 The students should be able to demonstrate a proficiency in the basic composition of Plastics, including their physical properties and application.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 6.1 Describe the molecular structure of plastics.
- 6.2 Identify the two basic categories of plastics, based on their molecular structure.
- 6.3 Identify the properties of thermoplastic and thermoset materials.
- 6.4 Describe the use of plastics in modern building construction.

Unit 7. Standard Method of Test for Specific Gravity and Absorption of Coarse and Fine Aggregates for Concrete [ASTM C127 & C128]

General Outcome:

- 7.0 The students should be able to demonstrate a proficiency in the basic procedures of testing concrete aggregates in accordance with the American Society for Testing and Materials [ASTM].

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 7.1 Define the concepts of density, specific weight, specific gravity and absorption.
- 7.2 Describe the procedure for testing absorption and specific gravity of coarse aggregates in accordance with ASTM C127.
- 7.3 Describe the procedure for testing absorption and specific gravity of fine aggregates in accordance with ASTM C128.
- 7.4 Interpret the results of test C127 and C128 and apply these variables in the design of Portland Cement concrete mixes.

Unit 8. Standard Method of Test for Slump of Portland Cement Concrete [ASTM C143]

General Outcome:

8.0 The students should be able to demonstrate a proficiency in the basic procedures of testing for slump of concrete in accordance with the American Society for Testing Materials [ASTM].

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 8.1 Describe the methods of testing for slump of concrete according to ASTM C-143.
- 8.2 Identify the slump test as a rough measure of the concrete according to ASTM C-143.
- 8.3 Relate the slump of concrete to variations in size or proportion of the aggregate and water content in the concrete.

Unit 9. Standard Method of Test for Compressive Strength of Molded Concrete Cylinders [ASTM C39]

General Outcomes:

- 9.0 The students should be able to demonstrate a proficiency in the basic procedure of testing the compressive strength of concrete in accordance with ASTM C-39.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 9.1 Describe the method of testing for compressive strength of concrete.
- 9.2 Relate the compressive strength of concrete to the water cement ratio and proportion of aggregates.
- 9.3 Explain the relationship between the proper curing of concrete and its compressive strength.
- 9.4 Explain the variation of compressive strength with curing time.

Unit 10. Stress-Strain Diagram for Mild Steel

General Outcome:

10.0 The students should be able to demonstrate a proficiency in lab procedures to obtain the stress-strain diagram of mild steel.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 10.1 Define stress and strain.
- 10.2 Describe the tension test of a mild steel specimen.
- 10.3 Draw stress-strain diagrams from tension test results.
- 10.4 Identify the modules of elasticity, proportional limit, elastic limit and yield point of steel in the stress-strain diagram.
- 10.5 Explain the 0.2% offset method to obtain the yield point of materials that do not possess a well define yield point.