

## FLORIDA STATE COLLEGE AT JACKSONVILLE

## COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER: ETI 1420

COURSE TITLE: Engineering Materials and Processes

PREREQUISITE(S): None

COREQUISITE(S): None

CREDIT HOURS: 3

CONTACT HOURS/WEEK: 3

CONTACT HOUR BREAKDOWN:

Lecture/Discussion: 3

Laboratory: Total of 3 - Demonstration

Other \_\_\_\_\_:

FACULTY WORKLOAD POINTS: 3

STANDARDIZED CLASS SIZE ALLOCATION: 30

## CATALOG COURSE DESCRIPTION:

This course is a study of the leading materials used in engineering and building construction. It examines the materials in terms of their properties, forming processes, and applications.

SUGGESTED TEXT(S): Budinski, Kenneth G. Engineering Materials: Properties and Selection 7th edition. Reston, VA. Virginia: Reston Publishing Co., Inc., 1983.

IMPLEMENTATION DATE: April 9, 1984

REVIEW OR MODIFICATION DATE: Fall Term, 1994 (951)  
Fall Term, 2002 (20031)

## COURSE TOPICS

Rationale: The course examines the properties of engineering materials currently used in the manufacturing industries and construction together with the methods used to process these materials. Emphasis is placed on the ferrous metals, non-ferrous metals, engineering ceramics, concrete, industrial plastics, composite materials, and wood.

Intent: The intent is to develop an understanding of the properties of engineering materials, the applications in which these materials can be used as a function of properties, the basic processing methods used, and the terminology used to describe and evaluate these materials.

Suggested Distribution:

	<u>CONTACT HOURS PER TOPIC</u>
I. Physical and Chemical Properties of Materials	7
A. Fundamentals	
1. Mechanical Properties	
2. Thermal Properties	
3. Electro-Magnetic Properties	
4. Chemical Properties	
5. Physical Properties	
B. Atomic Structure and Bond	
C. Structure of Engineering Materials	
II. Ferrous Metals	6
A. Production of Iron	
1. Pig Iron	
2. Wrought Iron	
3. Cast Iron	
B. Production of Steel	
1. Open-Hearth Process	
2. Basic-Oxygen Process	
3. Electric Furnace Process	
C. Products	
1. Castings	
2. Steel Mill Products	
3. Stainless Steels	
D. Heat Treatment of Steels	
III. Non-Ferrous Metals: Production, Composition, Properties, and Uses	6
A. Aluminum	
B. Copper	
C. Nickel	

## COURSE TOPICS (CONTINUED)

CONTACT HOURS  
PER TOPIC

D. Zinc	
E. Magnesium	
F. Titanium	
G. Refractory Metals	
H. Processes: Extrusion, Die-Casting, Powder Metallurgy	
IV. Corrosion: Nature, Types, and Control	3
V. Engineering Ceramics	3
VI. Concrete	3
A. Types of Concrete	
B. Proportioning Materials for Concrete	
C. Testing of Concrete	
D. Reinforcement	
E. Applications	
VII. Industrial Plastics and Composites	6
A. Structure and Property Relationships	
B. Processing	
C. Reinforced Plastics	
D. Composites	
E. Recent Developments and trends	
F. Applications	
VIII. Exams, Review, and Summaries	5
IX. Masonry	3
A. Brick	
B. Concrete Block	
C. Reinforcement	
X. Wood	3
A. Grading	
B. Treatments	
C. Prefabricated	

PROGRAM TITLE: Civil Engineering Technology  
 COURSE TITLE: Engineering Materials and Processes  
 CIP NUMBER: 0715.020101

LIST PERFORMANCE STANDARDS ADDRESSED:

NUMBER(S): TITLES(S):

09.0 SOLVE TYPICAL ENGINEERING STRENGTH OF MATERIALS PROBLEMS -- The student will be able to:

- 09.01 Calculate forces, and stresses in various structural members as determined by the material(s) used.
- 09.02 Calculate the stresses in bolts and rivets and determine the number needed in different types of connections.
- 09.03 Determine the centroid location of different cross-sectional shapes.
- 09-04 Calculate a) moments of inertia, b) radius of gyration, and c) bending moments of beams.
- 09.05 Understand the appropriate engineering vocabulary and terminology.
- 09.06 Have a basic knowledge of the strengths of various engineering materials used in the design of machines and structures.
- 09.07 Understand the use of the universal testing machine.

10.0 RECOGNIZE THE USE OF THE VARIOUS MATERIALS IN THE CONSTRUCTION INDUSTRY -- The student will be able to:

- 10.01 Write trip tickets, prepare delivery logs, and measure in-place materials.
- 10.02 Inspect placement and testing of storm sewer drainage pipe and gravity sewer pipe.
- 10.03 Inspect placement and test pressure pipe systems.
- 10.04 Run standard ASTM test of deformed steel bars and compute results.
- 10.05 Run standard ASTM test for flat stock and compute results.
- 10.06 Run standard ASTM test for standard 505 samples and compute results.
- 10.07 Run standard Rockwell hardness test.
- 10.08 Run standard ASTM test for shear and compute results.
- 10.09 Run standard ASTM test for compressive strength and compute results.
- 10.10 Run standard ASTM test for air entrainment.
- 10.11 Run standard ASTM test for volume.

12.0 RECOGNIZE THE USE OF THE VARIOUS MATERIALS OF SELECTED INDUSTRIES -- The student will be able to:

- 12.01 Identify clay pipe and give use.
- 12.02 Identify PVC pipe and give use.
- 12.03 Identify cast iron pipe and give use.
- 12.04 Identify steel structural members and give use.
- 12.05 Identify reinforcing steel and give use.
- 12.06 Identify concrete structures.
- 12.07 Identify asphalt types and uses.
- 12.08 Identify corrosion preventing coatings.

LIST PERFORMANCE STANDARDS ADDRESSED: (CONTINUED)

NUMBER(S):            TITLES(S):

12.09 Identify concrete (RCP) pipe and give use.

12.10 Identify pre stressed concrete cylinder pipe and give use.

15.0 ANALYZE PHYSICAL AND MECHANICAL PROPERTIES OF SOIL AND CONCRETE -- The student will be able to:

15.01 Run standard ASTM soil test and compute results for the following:

- a. gradation analysis.
- b. liquid limit.
- c. plastic limit.
- d. modified proctor.
- e. moisture content-oven and/or speedy.
- f. nuclear

15.02 Make a trial batch and run a standard ASTM concrete test and compute results for the following:

- a. slump
- b. air entrainment.
- c. compressive strength.