

SCHOOL OF TECHNOLOGY
EASTERN ILLINOIS UNIVERSITY

**REVISED COURSE PROPOSAL
SCIENTIFIC AWARENESS COMPONENT
INTEGRATED CORE**

1. Course Description

- A. Course Level: AET 2200G
- B. Title: Materials Science
- C. Credit: (3-0-3)
- D. Term Offered: (F, S, Su)
- E. Short Title: Material Science
- F. Course Description: Understanding the nature, properties, applications, and environmental effects of natural and synthetic materials. Study of recycling and reclaiming materials and the problems associated with waste.
- G. Prerequisites: None

2. Student Learning Objectives

- a. Literacy, critical thinking, responsible citizenship

Eastern Illinois University students will

- 1. identify the material resources that are used to construct our human-made world.
- 2. understand the basic structure of matter and how that structure relates to the properties and methods of classifying materials.
- 3. distinguish between renewable and nonrenewable resources.
- 4. solve problems related to the mechanical and physical properties of materials.
- 5. identify the issues related to reclaiming and recycling materials and understand the relationship between reclaiming/recycling and stewardship of the earth.

- b. Additional learning objectives

Eastern Illinois University students will

- 1. describe the latest research and development in the field of material science.
- 2. identify the use of state-of-the-art instruments used in the field of materials testing and inspecting, e.g., scanning electron microscope.
- 3. apply numerical and graphical analysis to understanding properties of materials.

3.	Course Outline	Weeks
		2
I.	Introduction	
	A. History, development, discovery and use of materials	
	B. Classifying materials	
	C. Standards and standards organizations	
	D. Criteria for selection	
	E. Recycling and reclaiming materials	
II.	Structure of Materials	1
	A. Atomic Structure	
	B. Atomic Bonding	
	1. Primary bonds	
	2. Secondary bonds	
	C. Microstructures	
	1. Crystalline	
	2. Polycrystalline	
	3. Amorphous	
III.	Properties of Materials	2
	A. Physical Properties	
	1. Thermal	
	2. Electrical	
	3. Optical	
	B. Mechanical Properties	
	1. Strength	
	2. Ductility	
	3. Rigidity	
	4. Toughness	
	5. Durability	
	C. Chemical Properties	
	1. Corrosion	
	2. Flammability	
IV.	Metals	2
	A. Ferrous	
	B. Nonferrous	
	C. Applications	
	D. Environmental issues and waste	
	E. Recycling and Reclaiming	
V.	Ceramics	2
	A. Crystalline	
	B. Non-crystalline	
	C. Applications	
	D. Environmental issues and	

	E. Recycling and reclaiming	
VI.	Polymers	2
	A. Thermoplastic	
	B. Thermosetting	
	C. Elastomers	
	D. Applications	
	E. Environmental	
	F. Recycling and reclaiming	
VII.	Composites	2
	A. Natural	
	B. Synthetic	
	C. Applications	
	D. Environmental	
	E. Recycling and reclaiming	
VIII.	Advanced Materials	2
	A. Future Needs	
	B. Current Research	
	C. Policies and standards for advanced materials	

4. **Evaluation and Student Learning:**

- a. Periodic exams, problems, midterm, final, research paper and article reviews. Twenty-five percent of the grade will be based on the writing component (research paper and article reviews).
- b. This is a writing active course. Students will be required to research a new advancement in materials science/technology and submit a written report describing its origin, development, properties, applications, and environmental concerns. Only primary research sources will be accepted. As a general policy, a minimum of ten pages excluding title and reference pages will be encouraged. Students will also be required to submit article reviews of current literature in materials science and technology.

5. **Rationale**

- a. Segment of Integrated Core: Scientific Awareness

Remarkable advances in materials science and technology have occurred during the past 25 years. Scientists and technologists have met the demands of the consumer, industry, medicine, and the military by developing new superior materials. Advanced ceramics and composites are examples of materials designed to have the properties required by a specific application.

Experts believe that advanced materials technologies will be a determining factor in the global competitiveness of the United States well into the 21st century. The markets for these new materials are predicted to increase significantly and as new and more efficient manufacturing methods develop, these materials will be used more extensively.

Materials and the processes used to manufacture them will impact the life of every citizen of the United States. An informed citizen should have a basic understanding of the materials used in the manufactured world surrounding them. Knowledge of origin, structure, manufacture, applications, economics, and environmental impact of materials should be a basic component of everyone's education.

This course will improve the scientific and technological literacy of students at Eastern Illinois University. This course requires written reports on advanced materials and article reviews of current research. Applications of principles, e.g., thermal properties, discussed and demonstrated will be used to promote critical thinking and inquiry.

Social Responsibility: A major emphasis of this course will be the impact of materials and their manufacture on the environment. The importance of recognizing the potential dangers to the environment that often occur from manufacture and disposal of materials will be emphasized.

- a. Level of course: This is a lower division course, therefore, no prerequisites are required.
- b. Similarity to existing course. None
- c. This course will not be required for any major or minor.

6. Implementation

- a. Faculty: School of Technology Faculty
- b. Textbooks:

Jacobs, J. A. & Kilduff, T. F. Engineering Materials Technology: Structure, Processing, Properties and Selection, third ed. Englewood Cliffs, NJ: Prentice Hall, 1997.

The Earth works Group. The Recycler's Handbook. Berkeley, CA: Earth Works Press, 1990.

- c. Additional Costs: none
- d. The revised course will become effective Spring 2001.

7. Community College Transfer:

A community college course may be judged equivalent to this course.

8. Date approved by the School of Technology: March 23, 2000
9. Date approved by the LCBAS Curriculum Committee: April 17, 2000
10. Date approved by the CAA: October 19, 2000

Departmental contact person: Dr. Mahyar Izadi **Campus Phone:** 581-3226