This course is an introduction to the diverse engineering materials used in technology; specifically, ceramics, polymers (woods, plastics, etc.), and metals. Lecture and laboratory exercises will provide students with a comprehensive base of knowledge in relation to physical hands-on experience with materials, tools and machines. This course will also be the catalyst for future student endeavors that involve the use and production of engineering materials within a 6-12 technology education classroom (Freshman/Sophomore standing).

Course Purpose

Student will be able to describe primary and secondary methods of processing common engineering materials. Define and differentiate between different engineering materials. Define and describe different physical, mechanical, chemical, thermal, electrical, and other common properties. Analyze various properties through accepted, standardized tests. Use a variety of engineering design and process techniques to produce useful products. Identify the various systems techniques along with their advantages, disadvantages, and applications.
The Conceptual Framework in the Professional Education Unit (PEU) at Florida A&M University is an integrated approach to providing educational experiences that result in exemplary professional educators. The Framework is comprised of six themes with the mission of developing high quality classroom teachers, administrators and support personnel. The term “exemplary” refers to the kind of graduates the PEU strives to produce. The figure below provides a diagram of the Exemplary Professional Conceptual Framework.

**TECHNOLOGY**

• CF 2

Through this focal area, the FAMU professional education candidate will:

| CF: 2.1 (S) | Use of available technology and software to support student learning. | F: 4,12 | I: 6 |
| CF: 2.3 (K) | Know fundamental concepts in technology. | F: 12 | I: 1,6 |

**CRITICAL THINKING**

• CF4

Through this focal area, the FAMU professional education candidate will:

| CF: 4.1 (K) | Understand a variety of instructional/professional strategies to encourage student development of critical thinking and performance. | F:4,7 | I: 4 |
| CF: 4.2 (S) | Use a variety of instructional/professional strategies to encourage students’ development of critical thinking and performance. | F:2,7 | I: 4 |
| CF: 4.5 (S) | Demonstrate the use of higher order thinking skills. | F: 8 | I: 4 |

**PROFESSIONALISM**

• CF 5

Through this focal area, the FAMU professional education candidate will:

| CF: 5.3 (D) | Demonstrate commitment to professional growth & development. | F:3,7 | I: 9 |
| CF: 5.4 (K,S) | Use major concepts, principles, theories & research related to the development of children and adults. | F: 7 | I: 2 |
| CF: 5.5 (S) | Construct learning opportunities that support student development & acquisition of knowledge & motivation. | F: 7 | I: 5 |
Specific Behavioral Objectives

Matrix for Alignment with Standards and the
The Florida Agricultural and Mechanical University
College of Education Conceptual Framework

Standards with which the course is aligned:
- The Florida Agricultural and Mechanical University College of Education and Human Services Conceptual Framework (FAMU CF)
- Florida Educator Accomplished Practices (FEAP)
- Florida Subject Area Competencies (FSAC)
- International Technology and Engineering Education Association (ITEEA)
- Interstate New Teacher Assessment and Support Consortium (INTASC)

<table>
<thead>
<tr>
<th>Knowledge/Content</th>
<th>Objective</th>
<th>NCATE (N)</th>
<th>INTASC (I)</th>
<th>FSAC (FS)</th>
<th>ITEEA (I)</th>
<th>FAMU CF (CF)</th>
<th>FEAP (FE)</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Describe primary and secondary methods of processing common industrial materials.</td>
<td>4</td>
<td>FS: 9</td>
<td>I: 19</td>
<td>CF: 4.2, 4,5</td>
<td>FE: 2, 7, 8</td>
<td>• Industrial Materials Technology Learning Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Identify and differentiate between different engineering materials.</td>
<td>1</td>
<td>FS: 1.1, 1.2</td>
<td>I: 10, 13</td>
<td>CF: 4.1</td>
<td>FE: 4, 7</td>
<td>• Industrial Material Technology Learning Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Define and describe different physical, mechanical, chemical, thermal, electrical, and other common properties.</td>
<td>1, 6</td>
<td>FS: 3.3</td>
<td>I: 10</td>
<td>CF: 2.3</td>
<td>FE: 12</td>
<td>• Structure of Industrial Materials Technology Learning Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) Analyze various properties of engineering materials through accepted, standardized tests.</td>
<td>4</td>
<td>FS: 9</td>
<td>I: 19</td>
<td>CF: 4.2, 4.5</td>
<td>FE: 2, 7, 8</td>
<td>• Materials Testing Technology Learning Activity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Skills/Performance

<table>
<thead>
<tr>
<th>Objective</th>
<th>NCATE (N)</th>
<th>INTASC (I)</th>
<th>FSAC (FS)</th>
<th>ITEEA (I)</th>
<th>FAMU CF (CF)</th>
<th>FEAP (FE)</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5) Understand and utilize engineering design processes to design, build and assess products from engineering materials.</td>
<td>4</td>
<td>FS: 3</td>
<td>I: 9, 10</td>
<td>CF: 4.2</td>
<td>FE: 2, 7</td>
<td>• Final Project Documentation</td>
<td></td>
</tr>
<tr>
<td>6) Understand the role of materials testing and design and conduct a simple materials testing experiment.</td>
<td>4</td>
<td>FS: 3.1, 3.2</td>
<td>I: 10</td>
<td>CF: 4.2</td>
<td>FE: 2, 7</td>
<td>• Materials Testing Technology Learning Activity</td>
<td></td>
</tr>
<tr>
<td>7) Discuss the nature of manufacturing as it relates to primary processing, secondary processing, casting and molding, forming, separating, fabricating, conditioning, and finishing methods of processing common industrial materials.</td>
<td>4</td>
<td>FS: 9</td>
<td>I: 19</td>
<td>CF: 4.2, 4.5</td>
<td>FE: 2, 7, 8</td>
<td>• Sequencing Technology Learning Activity</td>
<td></td>
</tr>
<tr>
<td>8) Produce group and individual projects as related to engineering materials and local and state standards.</td>
<td>2</td>
<td>FS: 1.5, 1.6</td>
<td>I: 6</td>
<td>CF: 5.4</td>
<td>FE: 3, 4, 8, 7</td>
<td>• Class Presentation Rubric</td>
<td></td>
</tr>
<tr>
<td>9) Analyze technological trends and their relation to careers, the economy, and educational needs of society regarding engineering materials and testing.</td>
<td>2</td>
<td>FS: 1.5, 1.6</td>
<td>I: 6</td>
<td>CF: 5.4</td>
<td>FE: 3, 7</td>
<td>• Research Paper</td>
<td></td>
</tr>
</tbody>
</table>

Dispositions/Professionalism

<table>
<thead>
<tr>
<th>Objective</th>
<th>NCATE (N)</th>
<th>INTASC (I)</th>
<th>FSAC (FS)</th>
<th>ITEEA (I)</th>
<th>FAMU CF (CF)</th>
<th>FEAP (FE)</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>10) Produce documentation (design processes, lesson plans, etc.) that is aligned with current state and national technology standards.</td>
<td>5</td>
<td>FS: 12.6 &amp; 7</td>
<td>I: 3</td>
<td>CF: 5.5</td>
<td>FE: 4, 7, 8</td>
<td>• Final Project Documentation</td>
<td></td>
</tr>
<tr>
<td>11) Continue to develop safety habits and laboratory management techniques.</td>
<td>9</td>
<td>FS: 11</td>
<td>I: 2</td>
<td>CF: 5.3</td>
<td>FE: 3, 4, 7, 8</td>
<td>• Final Project Documentation</td>
<td></td>
</tr>
<tr>
<td>12) Continue to develop a professional portfolio</td>
<td>6, 9</td>
<td>FS: 14.5 &amp; 6</td>
<td>I: 4</td>
<td>CF: 2.1, 5.3</td>
<td>FE: 3, 4, 7, 12</td>
<td>• TaskStream Assessment Submission</td>
<td></td>
</tr>
</tbody>
</table>

Academic Learning Compact

This course falls under the courses offered in the Department of Workforce Education and Development and is thus covered by the associated Academic Learning Compacts (ALCs). ALCs answer three basic questions: What will students learn by the end of their academic programs? Have they learned what they have been taught by their professors? How do we measure these quantities? For details regarding the Department of Workforce Education and Development, ALCs, go to: http://www.famu.edu/assessment and click on Academic Learning Compacts.

Overall Goals of the Course

The overall goal of this course is to prepare candidates to become creative problem solvers and reflective practitioners within the content area of Technology Education provided within the course.
1. Introduction and Orientation
   A. Syllabus
   B. Topic Schedule and Calendar
   C. Policies and Procedures
   D. Safety Issues

2. Properties of Materials
   A. Material Science and Selection
   B. Chemical Basis for Materials and Properties
   C. Physical Properties
   D. Chemical Properties
   E. Mechanical Properties
   F. Thermal Properties
   G. Electrical Properties
   H. Other Factors

3. Types of Processing
   A. The Nature of Manufacturing
      a. Primary Processing
      b. Secondary Processing
      c. Casting and Molding
      d. Separating and Shaping
      e. Conditioning
      f. Assembling and Joining
      g. Finishing
   B. Selected Types of Engineering Materials
      a. Metals
      b. Natural Polymers
      c. Synthetic Polymers
      d. Ceramics
      e. Composites
      f. Other
   C. Summary

4. Casting and Molding
   A. Introduction
      a. Historical Background and Development
      b. Common Industrial Types
      c. Advantages and Disadvantages
      d. Details and Applications
   B. Casting Metals Using Consumable Molds
      a. Sand Casting
      b. Shell Mold Casting
      c. Investment Casting
      d. Other
   C. Casting Using Permanent Molds
      a. Slush Casting
      b. Die Casting
      c. Centrifugal Casting
      d. Other
   D. Casting and Molding Plastic Materials
      a. Gravity Casting
      b. Injection Molding
      c. Compression Molding
      d. Blow Molding
      e. Transfer Molding
      f. Rotational Molding
      g. Dip Casting
      h. Slush Casting
      i. Foaming
   E. Summary

5. Forming and Shaping
   A. Introduction
      a. Basic Techniques in Forming
      b. Common Devices
      c. Temperature as a Factor in Forming and Shaping
      d. Methods of Applying Force in Forming and Shaping
   B. Hot Forming Materials
      a. Advantages and Disadvantages
      b. Techniques
      c. Safety Concerns
   C. Cold Forming Materials
      a. Advantages and Disadvantages
      b. Techniques
      c. Safety Concerns
   D. Forming and Shaping Plastics
      a. Thermoforming
      b. Extrusion
      c. Blow Molding
      d. Calendaring
      e. Mechanical Forming
   E. Summary
6. Separating Materials
A. Introduction
   a. Process Development
   b. Elements and Techniques
   c. Machines and Motion
   d. Proper Selection, Support, and Safety
B. Turning and Related Operations
   a. Turning
   b. Facing
   c. Tapers
   d. Necking and Parting
   e. Threading
   f. Safety Concerns
C. Milling and Related Operations
   a. Milling
   b. Drilling, Boring, and Tapping
   c. Conventional and Climb Milling
   d. Safety Concerns
D. Sawing and Filing
E. Abrasive Operations
   a. Grinding
   b. Sanding
F. Thermal Machining
G. Shearing Techniques
H. Summary

7. Conditioning
A. Introduction
B. Thermal Conditioning
   a. Annealing
   b. Normalizing
   c. Hardening
   d. Tempering
   e. Work Hardening
   f. Case Hardening
   g. Other Techniques
C. Chemical Conditioning
   a. Catalytic Action
   b. Polymerization
D. Summary

8. Assembly and Joining
A. Introduction
   a. Mechanical Assembly
   b. Adhesive and Cohesive Processes
B. Welding
   a. Soldering and Brazing
   b. Oxy-acetylene Welding
   c. Shielded Metal Arc Welding
   d. Gas Metal Arc Welding
   e. Gas Tungsten Arc Welding
   f. Plasma Arc Welding
   g. Resistance Welding
   h. Other
C. Adhesive Bonding
   a. Adhesives
   b. Advantages and Disadvantages
D. Mechanical Fasteners
   a. Physical Structures
   b. Types and Techniques
E. Summary

9. Finishing
A. Introduction
B. Finishing Techniques
   a. Selection
   b. Preparation
   c. Application
C. Inorganic Coatings
   a. Conversion Process
   b. Coating Processes
D. Organic Coatings
   a. Types
   b. Application
   c. Curing
E. Summary

10. Testing of Materials
A. Introduction
B. Types of Tests
C. Data Collection
D. Proper Analysis of Data
E. Reporting Results

Teaching Methods
A variety of methods may be employed, including, but not limited to: lecture/discussion, field experience, guest speakers, audiovisual materials, computer applications, demonstrations, presentations and lab activities. This course will have a Blackboard component, and students must read relevant sections in current outside resources, including web-based documents and word- process assignments and have regularly available email, Internet and World Wide Web access. Documentation and artifacts for TaskStream are required.
Methods of Evaluation

1. Technology Learning Activities
2. Discussion Boards
3. Midterm and Final Examinations
4. Lab Projects
5. Project Documentation
6. Presentation Evaluation

Grading:
Grades will be determined using a percentage of total points. The grading scale, with minimum percentages for each grade is provided below. This grading scale will be applied to individual evaluated activities as well as to the student’s final grade.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Points</th>
<th>Percentage/Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Learning Activities (4)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Lab Projects and Documentation (4)</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Blackboard Discussion Boards (2)</td>
<td>50</td>
<td>90-100% A</td>
</tr>
<tr>
<td>Final Project</td>
<td>100</td>
<td>80-90% B</td>
</tr>
<tr>
<td>Final Project Portfolio</td>
<td>50</td>
<td>70-80% C</td>
</tr>
<tr>
<td>Class Presentation</td>
<td>75</td>
<td>60-70% D</td>
</tr>
<tr>
<td>Research Paper</td>
<td>75</td>
<td>Below 59% F</td>
</tr>
<tr>
<td>Midterm</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Final Exam</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1000 pts</td>
<td></td>
</tr>
</tbody>
</table>

Course Policies

Policy Statement on Non-Discrimination It is the policy of Florida Agricultural and Mechanical University to assure that each member of the University community be permitted to work or attend classes in an environment free from any form of discrimination including race, religion, color, age, disability, sex, marital status, national origin, veteran status and sexual harassment as prohibited by state and federal statutes. This shall include applicants for admission to the University and employment.

Academic Honor Policy The University’s Academic Honor Policy is located in the FANG Student Handbook, under the Student Code of Conduct- Regulation 2.012 section, beginning on page 55-56.

ADA Compliance To comply with the provisions of the Americans with Disabilities Act (ADA), please advise instructor of accommodations required to insure participation in this course. Documentation of disability is required and should be submitted to the Learning Development and Evaluation Center (LDEC). For additional information please contact the LDEC at (850) 599-3180.

Dispositions As a component of student assessment, the College of Education has instituted a system for monitoring the professional dispositions: Professionalism, Effective Communication, Respectful Behavior, Ethical Behavior, and Reflective Behavior. At the end of each semester each instructor will fill out an assessment instrument for each student which will be turned in to the department chair and kept in the student’s file. If a problem arises during the semester, a disposition feedback form may be completed by an instructor or school personnel and turned in to the student’s department chair. The severity of the behavioral deficiency will influence the chairperson’s handling of the situation. (See Assessment Instrument for Dispositions and Disposition Feedback Form for more detailed information. This policy includes provisions for professional dress, attendance, punctuality, use of cell phones, etc.)
Additional Course Requirements

1. Attendance: Attendance is required for all class meetings. It is the responsibility of the student to make up any work/assignments missed due to illness or personal excuses. The student’s final grade will be reduced one letter grade for each absence beyond two unexcused absences. All excused absences must be reported to and verified through the FAMU College of Education.

2. Quizzes: There are four quizzes throughout the semester worth approximately 20 points each. Tentative dates on which quizzes will be given will be posted on the class BlackBoard site. There will be no make-ups for missed quizzes without an acceptable excuse.

3. Final Exam: There will be a comprehensive exam at the end of the course. The final will be approximately equal in value to all of the quizzes.

4. Computer/Web/Email Applications: A variety of graded activities in this course will be conducted using email, the web and BlackBoard. Students are required to use their FAMU email/Blackboard account and to know how to use file attachment features. Also, students must use Microsoft© Word© for all word-processed files, must be able to prepare a Microsoft© PowerPoint© presentation, and must be able to use an Internet browser. Some web-based resources will be formatted as PDF files. Students should have access to and know how to use Adobe© Acrobat Reader©. Grades will be posted on BlackBoard. Computer access for students is provided at a number of locations on campus. Students may access their FAMU email from other email accounts or computer systems that are not on the FAMU campus. However, it is the student’s responsibility to make sure the email and other computer systems are operational.

5. Spelling: Correct spelling is required for all work. Spelling a word incorrectly on any graded item will result in a loss of one-half point for each time the word is misspelled.

6. Writing Assignments: Students will complete several writing assignments. Writing assignments must be word-processed using Microsoft© Word©.

7. Portfolio: Students are required to purchase a TaskStream account. Three assigned artifacts must be uploaded to your TaskStream portfolio to pass this class.

8. Professionalism: Students are expected to conduct themselves in a professional manner at all times while in class. Evaluation of the student’s professionalism will be an important part of the assessment program in this course.

9. Reading: Students are expected to read handouts, web pages, web-based documents, etc. to prepare for lectures, quizzes and tests; as well as prepare for research and writing activities through reference reading.

10. Research: Several evaluated activities require the student to conduct research. Under normal conditions, the University library resources will meet all the student’s research needs. Internet research activities will also be conducted.

11. Safety: It is the student’s responsibility to adhere to and practice proper safety procedures in the use and operation of the tools, materials, machines, and processes required in this course. Safety eyewear is required when working in any Technology Education laboratory without approved safety eyewear - no exceptions.

12. Laboratory: This class has an integrated lecture and lab. Some days may be all lectures or all labs or a combination of both depending on the class progress and activities.

13. Presentations: Students will prepare and deliver one presentation. Presentations must be supported by multimedia (typically PowerPoint). Students will also make several informal presentations during class as part of a group or as an individual.

14. Deadlines: All evaluated activities must be submitted on the deadlines identified. Ten percent (10%) will be deducted from the student’s grade for each day the activity is submitted late.

15. Plagiarism and Ethical Behavior: Students are expected to do their own work and act respectfully to each other and most importantly, the instructor. If student are caught cheating in any way, they may receive a failing grade for the course, dismissal from the program or dismissal from the University.

FAMU Technology Education Student Equity Statement:
Florida A&M University is committed to the human rights, dignity and social equity of all individuals; therefore, in accordance with University policy, the Technology Education Program will maintain a “no tolerance” policy with regard to behavior associated with: sexual connotations, physical gestures, inappropriate language or graphics on clothing. As potential future teachers, it is the expectation of the Technology Education Faculty that all Technology Education Majors and those who are enrolled in Technology Education classes reflect strong professional integrity and act in a manner worthy of the University and the Technology Education Program. The Technology Education Faculty will address any issues according to the University policy in order to create a safe and comfortable learning environment for all students.

- If a student feels that any misconduct as described above has occurred against them, witnesses, or is told of an incident of perceived misconduct then he/she should report the incident to the Equal Opportunity Programs Office. Reports of any incidents will be held in the strictest of confidence. Contact Info: Equal Opportunity Programs Office 676 Ardelia Court Tallahassee, FL 32307 (850) 599-3076/3219
Laboratory Projects and Assignments

Laboratory Projects
There will be five class laboratory projects throughout the semester, in addition to your final lab project. Each project is designed to provide with the basic technological skills that you will be using throughout your future courses within the Technology Education Program. Furthermore, each project will incorporate a standards based component that will assist you when designing your final project. The projects will be based on current Technology Education activities taught in contemporary classrooms. They include: Plastics: Picture Frames; Sequencing Project; Reverse Engineering Project for High School Students; Materials Testing Apparatus Project; and Trebuchets. A Lab reflection will accompany each project for assessment purposes.

All Course Objectives and Standards are Inherent in the Lab Projects

- Laboratory Safety
  You are expected to conduct yourself in a safe manner at all times when working in the Technology Education Labs. Failure to practice safety will result in removal from the lab and possible additional disciplinary action depending on the infraction.

  Course Objective 11: FAMU CF: 5.3; FEAPS: 3, 7; FSAC: 11; ITEEA 12, 13; INASC: 9

- Assignments

  Course Objective 10: FAMU CF: 5.5; FEAPS: 1, 7; FSAC: 12.6, 12.7; ITEEA: 3; INASC: 5

- Discussion Boards:
  You will have two discussion board assignments throughout the semester. Through discussion boards, you will identify and self-reflect with regard to your views and opinions regarding technology education issues such as standards, philosophies, and technology as it relates to different grade levels. Information will be provided related to discussion board topics: however, critical thinking on your part to express your opinions and views are essential. Furthermore you will demonstrate your professional skills by responding to your peer’s discussion board responses. The following topics will be on the discussion boards:

  Discussion Board 1: Modern Marvels - Engineering Disasters Video Questions: During the video write down 10 questions you might ask a Middle/High School class (you must identify which) that reflect key points within the video. Post your questions on Blackboard. Look at a least two of your classmate’s postings and answer their questions through the “reply” feature of the discussion board. **BE SURE TO BE PROFESSIONAL WITH YOUR COMMENTS!**

  Course Objective 10: FAMU CF: 5.5; FEAPS: 1, 7; FSAC: 12.6, 12.7; ITEEA: 3; INASC: 5

  Discussion Board 2 – Extreme Engineering Video: During the video write down 10 questions you might ask a High School class that reflect key points within the video. Post your questions on Blackboard. Look at a least two of your classmate’s postings and answer their questions through the “reply” feature of the discussion board. **BE SURE TO BE PROFESSIONAL WITH YOUR COMMENTS!**

  Course Objective 9: FAMU CF: 5.4; FEAPS: 1, 3, 7; FSAC: 1.5, 1.6; ITEEA: 3; INTASC: 2

- Technology Learning Activities - You will have four Technology Learning Activities throughout the semester. The Technology Learning Activities are designed to identify characteristics of a professional teacher and compare them to your individual characteristics in addition to relating them to professional certification requirements, organizations, standards and opportunities within technology education field.

  Technology Learning Activity 1 – Industrial Materials Technology Learning Activity. This Technology Learning Activity is designed to assess your basic understanding industrial materials and the types of industrial materials used in technology education classrooms. These include Polymers, Metals, and Ceramics, in addition to organic and inorganic materials. Your understanding of these material identifiers and definitions are a vital component to you becoming an effective and informed Technology Educator.

  Course Objective 1: FAMU CF: 4.2, 4.5; FEAPS: 2, 7, 8; FSAC: 9; ITEEA: 19; INTASC: 4
  Course Objective 2: FAMU CF: 4.1; FEAPS: 4, 7; FSAC: 1.1, 1.2; ITEEA: 10, 13; INTASC: 1

  Technology Learning Activity 2 – Sequencing Technology Learning Activity. Knowledge of how industrial materials are used to produce a product empowers Technology Educators to provide vital information to their students in terms of basic design principles and design processes. This Technology Learning Activity requires you to identify the components of a given product in terms of size, shape, and the number of parts and devise a production sequence that be the most efficient to produce the product.

  Course Objective 7: FAMU CF: 4.2, 4.5; FEAPS: 2, 7, 8; FSAC: 9; ITEEA: 19; INTASC: 4

  Technology Learning Activity 3 – Structure of Industrial Materials Technology Learning Activity. As you explore the aspects of different types of materials it is vital that you understand natural and chemical properties make up a particular material. This Technology Learning Activity allows you to explore the structural make-up of materials and these constructs could be aligned with STEM principles in a Technology Education Classroom.

  Course Objective 3: FAMU CF: 4.2, 4.5; FEAPS: 2, 7, 8; FSAC: 9; ITEEA: 19; INTASC: 4
Technology Learning Activity 4 – Materials Testing Technology Learning Activity. As you continue to explore the aspects of different types of materials it is vital that you understand how and why material properties can be tested for different types of strengths, hardness, conductivity, etc. This Technology Learning Activity allows you to continue to explore the structural make-up of materials and these constructs could be aligned with STEM principles in a Technology Education Classroom.

Course Objective 4: FAMU CF: 4.2, 4.5; FEAPS: 2, 7, 8; FSAC: 9; ITEEA: 19; INTASC: 4

- Research Paper:
  **Introduction:** research and write a paper about a specific industrial material, material process or project that focuses on a topic that is of interest to you. You will ultimately be using this research to assist you in your class presentation.
  **Details:**
  1. Identify a current, emerging, or future a specific industrial material, process or project of interest. Your topic must be pre-approved.
  2. Prepare a 3-page paper that covers the following topics:
     - **Material Structure** – What are the properties of the material? How is it produced? Research the material and determine its uses, products made from it, etc.
     - **Processes** – Identify at least two ways your topic can be tested. Additionally, identify any manufacturing processes involved with this topic.
     - **Classroom Equation** – Explain ways this material would be relevant in a Technology Education Classroom.
  The paper should be word-processed, 12 point type, Times or Arial regular font, .75-inch margins all around, line spacing of 1.5, and not exceed three pages. APA formatting is required with a minimum of five citations. Papers will be submitted to Blackboard and will be checked on TurnItIn.com, so do not plagiarize.

Course Objective 7: FAMU CF: 4.2, 4.5; FEAPS: 2, 7, 8; FSAC: 9; ITEEA: 19; INTASC: 4
Course Objective 9: FAMU CF: 5.4; FEAPS: 3, 7; FSAC: 1.5, 1.6; ITEEA: 3; INTASC: 2

- Final Project
  You and a classmate will collaborate by producing a Trebuchet. You will be provided several research sources to produce a trebuchet that will hurl a softball twenty-five yards. You will use industrial materials to produce your final project. Along with the physical project, you will produce a project portfolio with complete documentation. The portfolio must be typed and presented in a clear-bound folder. Neatness will count heavily on your portfolio presentation. The final project portfolio must include the following components:

  - **A Detailed Design Brief:**
    **The following should be included in your design brief:**
    Background and Rationale for the Project; A Problem Statement; Evidence of Research; Time Constraints and an Evaluation Summary.

Course Objective 5: FAMU CF: 2.3; FEAPS: 4, 5, 6, 7; FSAC: 1.1, 1.3; ITEEA 1, 4, 5, 6; INASC: 10
Course Objective 8: FAMU CF: 5.4; FEAPS: 3, 4, 7; FSAC: 1.5, 1.6; ITEEA: 3; INTASC: 2

- **Lesson Plan Outline:**
  For your final project portfolio, you will produce a lesson plan outline that will identify basic components that will assist in your potential students learning. This will be one you first experiences constructing a lesson plan; therefore, only basic information is required. You will be exposed to several different Technology Education lesson plans (available via Blackboard) and relate them to you’re your final project. You must include what standards will apply, an objective, materials needed, and an assessment instrument (quiz, test, Technology Learning Activity, etc.).

Course Objective 10: FAMU CF: 5.5; FEAPS: 7; FSAC: 12.6, 12.7; ITEEA: 3; INTASC: 5
Course Objective 11: FAMU CF: 5.3; FEAPS: 3, 7; FSAC: 11; ITEEA 12, 13; INASC: 9

- Visual Timeline
  Include a visual timeline that includes digital photographs and dates associated with the progression of your project.

Course Objective 10: FAMU CF: 5.5; FEAPS: 7; FSAC: 12.6, 12.7; ITEEA: 3; INTASC: 5

- **Class Presentation**
  **Presentation Criteria:** You will produce a class presentation that relates to your research paper. Your presentation should engage your audience in all aspects of your project. You should develop a quality presentation that you will be proud to use as a teaching aid in your future classroom. Additionally, this will help you to continue to develop the public speaking skills all educators need to teach. The format must be in PowerPoint, and you will make a presentation no longer than 15 minutes and no shorter than 10 minutes.

Course Objective 7: FAMU CF: 4.2, 4.5; FEAPS: 2, 7, 8; FSAC: 9; ITEEA: 19; INTASC: 4
Course Objective 8: FAMU CF: 5.4; FEAPS: 3, 7; FSAC: 1.5, 1.6; ITEEA: 3; INTASC: 2
<table>
<thead>
<tr>
<th>Week 1</th>
<th>Topics</th>
<th>Assignments/Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Course Syllabus; General Overview of the Course</td>
<td>Lab: Walk Through</td>
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<tr>
<td></td>
<td>Lecture: Safety in the FAMU Technology Education Laboratory</td>
<td>Review the PowerPoint: Plagiarism/APA. Be prepared to discuss this topic in class. PowerPoint available via Blackboard.</td>
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</table>

| Week 2 | Lecture: Plagiarism/APA  
Video: Modern Marvels - Engineering Disasters | Review the PowerPoint: Industrial Materials. Read Chapter 1 from the text. Be prepared to discuss these topics in class. PowerPoint available via Blackboard.  
Discussion Board 1  
Introduction to Research Paper* |
|-------|--------|-----------------|
|       | Lecture: Industrial Materials | Review the PowerPoint: Structure of Materials. Read Chapter 2 from the text. Be prepared to discuss these topics in class. PowerPoint available via Blackboard.  
Lab: Plastic Picture Frame  
Industrial Materials Technology Learning Activity |

| Week 3 | Lecture: Structure of Materials | Review the PowerPoint: Process Planning. Read Chapter 3 & 12 from the text. Be prepared to discuss these topics in class. PowerPoint available via Blackboard.  
Lab: Flow Process of a Product  
Sequencing Technology Learning Activity |
|-------|--------|-----------------|
|       | Lecture: Process Planning | Review the PowerPoint: Materials Processing/Technology Systems. Read Chapter 18 from the text. Be prepared to discuss these topics in class. PowerPoint available via Blackboard.  
Lab: Reverse Engineering Project for High School Student Portfolio*  
Structure of Industrial Materials Technology Learning Activity |

| Week 4 | Lecture: Materials Processing/Technology Systems | Review the PowerPoint: Testing of Industrial Materials. Read Chapter 19 from the text. Be prepared to discuss these topics in class. PowerPoint available via Blackboard.  
Lab: Reverse Engineering Project for High School Students |
|-------|--------|-----------------|
|       | Lecture: Testing of Industrial Materials  
Video: Extreme Engineering  
Review For Midterm | Discussion Board 2  
Lab: Reverse Engineering Project for High School Students |

| Week 5 | Midterm  
Introduction to Class Presentation* | Lab: Ball Bearing Game |
|-------|--------|-----------------|
|       | Lecture: Elements of Design/Documenting a Design | Lab: Ball Bearing Game  
Materials Testing Technology Learning Activity (worksheet)* |

| Week 6 | Lecture: Product Development | Lab: Testing Apparatus Project (HS or MS)  
Research Paper Due |
|-------|--------|-----------------|
|       | No Lecture | Lab: Testing Apparatus Project (HS or MS)  
Lab: Introduction to Final Project - Trebuchets |

| Week 7 | No Lecture | Lab: Final Project – Trebuchets cont.  
Lab: Final Project – Trebuchets cont. |
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<tbody>
<tr>
<td></td>
<td>No Lecture</td>
<td>Lab: Trebuchet Challenge</td>
</tr>
</tbody>
</table>

| Week 8 | Review for Final Exam  
Class Presentations | ALL WORK DUE |
|-------|--------|-----------------|
|       | Final Exam | All Lab and Assignment Criteria Available via Blackboard  
* Denotes TaskStream Artifact Submission |
Syllabus Reference Materials:

- California University of Pennsylvania (http://www.cup.edu)
- Florida Department of Education Website (http://www.fldoe.org)
- Florida Technology Education Association Website (http://www.ftea.com)
- Illinois State University (http://www.ilstu.edu)
- International Technology Education Association (http://www.ITEEAconnect.org)
- The Ohio State University (http://www.osu.edu)

References:


Candidate’s Name: ___________________ Student ID: ___________ Program Area: ______________

<table>
<thead>
<tr>
<th>Criteria for rating</th>
<th>Favorable</th>
<th>Acceptable</th>
<th>Marginal</th>
<th>Unacceptable</th>
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<tbody>
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<td></td>
<td>4</td>
<td>3</td>
<td>2</td>
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</table>

- The candidate **consistently** and **thoroughly** demonstrates indicators of performance. (90–100 %)
- The candidate **usually** and **extensively** demonstrates indicators of performance. (89-80%)
- The candidate **sometimes** and **adequately** demonstrates indicators of performance. (79-70%)
- The candidate **rarely or never** and **inappropriately or superficially** demonstrates indicators of performance.

**Professionalism:** The Teacher Candidate demonstrates professionalism
(Please use a ✓ to indicate level of performance.)

**Outcome**
- F (4)
- A (3)
- M (2)
- U (1)

**Punctuality**
- Does not exceed three unexcused absences, per university catalog 2009-2010
- In class at or before specified time, per Registrar
- Attends class, field experiences, meetings
- Appropriate dress and grooming
- Completes assignments on or before due date

**Emotional Management**
- Handles feeling appropriately
- Reacts reasonably to situations
- Finds a healthy balance between emotions

- Demonstrates the appropriate use of personal technology during class
- Follows established protocol and procedures
- Follows established procedures and policies

**Effective Communication:** The Teacher Candidate demonstrates effective communication skills
(Please use a ✓ to indicate level of performance.)

- Uses standard English language in various settings
- Uses appropriate tone of voice for the setting
- Clearly articulates concepts (avoids words such as you know, um, uh-uh, and okay)
- Models appropriate respectful communication that is not demeaning or harmful (avoids loud outbursts and profanity)
- Avoids confrontational behavior

**Outcome**
- F (4)
- A (3)
- M (2)
- U (1)
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<tr>
<td></td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Respectful Behavior: The Teacher Candidate demonstrates respectful behavior</td>
<td>Considers opinions of others with an open mind (respects diversity)</td>
<td>Listens to others in a variety of settings</td>
<td>Provides equitable learning opportunities for all</td>
<td>Considers background interests and attitudes</td>
</tr>
<tr>
<td>Ethical Behavior: The Teacher Candidate demonstrates ethical behavior</td>
<td>Demonstrates academic honesty</td>
<td>Avoids plagiarizing</td>
<td>Demonstrates honesty inside and outside of the classroom</td>
<td>Demonstrates trustworthiness</td>
</tr>
<tr>
<td>Reflective Behavior: The Teacher Candidate demonstrates reflective behavior</td>
<td>Accepts feedback and suggestions, and incorporates in subsequent practice in various settings</td>
<td>Demonstrates accurate self-analysis regarding ones strengths and weaknesses</td>
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