



***Department of Teaching & Learning***  
***Parent/Student Course Information***

***Pre-Engineering Program***  
***Introduction to Engineering***  
***(TE 8450)***  
***Grades 10 - 12***  
***One Credit, One Year***

*Counselors are available to assist parents and students with course selections and career planning. Parents may arrange to meet with the counselor by calling the school's guidance department.*

**COURSE DESCRIPTION**

The courses in engineering and technology provide opportunities for students to acquire skills and knowledge necessary for technological literacy, entry-level careers and lifelong learning. Students learn Virginia's 22 Workplace Readiness Skills within the content area. Those who are completing a two-year sequence have the opportunity to verify their knowledge of the workplace readiness skills through an industry assessment. This course provides orientation to the careers and challenges of engineering. Students are actively involved with technology to develop engineering graphics and explore math/science principles through problem-solving, STEM-related, project-based experiences. Students investigate the various areas of engineering and utilize the design process to create solutions. Students also gain an understanding of ethics and professionalism in the engineering field.

**CERTIFICATION**

Students successfully completing this course in the Pre-Engineering program will be eligible to take the NOCTI Pre-Engineering and Engineering Technology assessment.

**STUDENT ORGANIZATION**

Technology Student Association (TSA) is a co-curricular organization for all students enrolled in engineering and technology courses. Students are encouraged to be active members of their youth organization to develop leadership and teamwork skills and to receive recognition for their participation in local, regional, state and national activities

**PREREQUISITE**

None

**OPTIONS FOR NEXT COURSE**

Engineering Technology I

**REQUIRED STUDENT TEXTBOOK**

None

## COMPETENCIES FOR INTRODUCTION TO ENGINEERING

### **Demonstrating Workplace Readiness Skills: Personal Qualities and Abilities**

- 1 Demonstrate creativity and innovation.
- 2 Demonstrate critical thinking and problem solving.
- 3 Demonstrate initiative and self-direction.
- 4 Demonstrate integrity.
- 5 Demonstrate work ethic.

### **Demonstrating Workplace Readiness Skills: Interpersonal Skills**

- 6 Demonstrate conflict-resolution skills.
- 7 Demonstrate listening and speaking skills.
- 8 Demonstrate respect for diversity.
- 9 Demonstrate customer service skills.
- 10 Collaborate with team members.

### **Demonstrating Workplace Readiness Skills: Professional Competencies**

- 11 Demonstrate big-picture thinking.
- 12 Demonstrate career- and life-management skills.
- 13 Demonstrate continuous learning and adaptability.
- 14 Manage time and resources.
- 15 Demonstrate information-literacy skills.
- 16 Demonstrate an understanding of information security.
- 17 Maintain working knowledge of current information-technology (IT) systems.
- 18 Demonstrate proficiency with technologies, tools, and machines common to a specific occupation.
- 19 Apply mathematical skills to job-specific tasks.
- 20 Demonstrate professionalism.
- 21 Demonstrate reading and writing skills.
- 22 Demonstrate workplace safety

### **Examining All Aspects of an Industry**

- 23 Examine aspects of planning within an industry/organization.
- 24 Examine aspects of management within an industry/organization.
- 25 Examine aspects of financial responsibility within an industry/organization.
- 26 Examine technical and production skills required of workers within an industry/organization.
- 27 Examine principles of technology that underlie an industry/organization.
- 28 Examine labor issues related to an industry/organization.
- 29 Examine community issues related to an industry/organization.
- 30 Examine health, safety and environmental issues related to an industry/organization.

### **Addressing Elements of Student Life**

- 31 Identify the purposes and goals of the student organization.
- 32 Explain the benefits and responsibilities of membership in the student organization as a student and in professional/civic organizations as an adult.
- 33 Demonstrate leadership skills through participation in student organization activities, such as meetings, programs and projects.
- 34 Identify Internet safety issues and procedures for complying with acceptable use standards.

### **Exploring Work-Based Learning**

- 35 Identify the types of work-based learning (WBL) opportunities.
- 36 Reflect on lessons learned during the WBL experience.
- 37 Explore career opportunities related to the WBL experience.
- 38 Participate in a WBL experience, when appropriate.

### **Examining the Engineering Profession**

- 39 Describe how engineering and technology have significantly influenced contemporary society and the environment.
- 40 Explore career opportunities for the engineering graduate, both within and outside the field of engineering.
- 41 Examine the breadth of topics within an engineering plan of study.
- 42 Explain application of ethics within the field of engineering.

### **Practicing Engineering Fundamentals**

- 43 Identify the benefits of a case study analysis.
- 44 Perform a case study analysis.
- 45 Apply measuring skills using instrumentation.
- 46 Demonstrate conversion techniques for units of measurement.
- 47 Demonstrate the use of engineering design graphics and descriptive geometry.
- 48 Demonstrate the techniques and benefits of sketching.
- 49 Sketch orthographic and isometric projections.
- 50 Demonstrate research techniques/strategies used by engineers.
- 51 Define risk and safety.
- 52 Describe the three types of accidents.
- 53 Identify major precursors of accidents.
- 54 Evaluate the safety of designs.
- 55 Reverse-engineer a product, process, or idea.
- 56 Define algorithm.
- 57 Create an algorithm to solve an engineering problem.
- 58 Explain the benefits of modeling and simulation.
- 59 Explain rapid prototyping to develop models.
- 60 Create a model or simulation for an engineering product, process, or idea.

### **Communicating Technical Information**

- 61 Write a business letter to request information or materials.
- 62 Present an oral technical report on an engineering project.
- 63 Participate in a mock interview.
- 64 Explain applications of mathematics in the engineering design process.
- 65 Explain applications of scientific principles.
- 66 Explain applications of investigative technology.

### **Exploring the Physics Concepts of Selected Energy Systems**

- 67 Identify the primary concepts and components of mechanical systems.
- 68 Identify the primary concepts and components of fluid energy systems.
- 69 Explore electrical systems.
- 70 Identify the primary concepts and components of thermodynamic systems.

### **Applying the Engineering Design Process**

- 71 Identify the need for a product or system.
- 72 Explain the validity of designing alternative solutions to an engineering design problem.
- 73 Design an engineering solution to a real-world problem.
- 74 Implement the design.
- 75 Iterate the design.
- 76 Maintain documentation.
- 77 Present a solution.

### **Demonstrating College Readiness Skills**

- 78 Evaluate study skills needed by an engineering student.
- 79 Demonstrate teamwork skills necessary for success when working in a technological team.

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For further information, please call (757) 263-1070.

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