



**VIRGINIA BEACH CITY PUBLIC SCHOOLS**  
CHARTING THE COURSE

*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 21 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 high-tech devices, engineering graphics and math/scientific principles through problem-solving STEM-related experiences. Activities are provided in design briefs including descriptive geometry, materials science and technical systems.

**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 People Skills**

- 1 Demonstrate positive work ethic.
- 2 Demonstrate integrity.
- 3 Demonstrate teamwork skills.
- 4 Demonstrate self-representation skills.
- 5 Demonstrate diversity awareness.
- 6 Demonstrate conflict-resolution skills.
- 7 Demonstrate creativity and resourcefulness.

### **Demonstrating Workplace Readiness Skills: Professional Knowledge and Skills**

- 8 Demonstrate effective speaking and listening skills.
- 9 Demonstrate effective reading and writing skills.
- 10 Demonstrate critical-thinking and problem-solving skills.
- 11 Demonstrate healthy behaviors and safety skills.
- 12 Demonstrate an understanding of workplace organizations, systems and climates.
- 13 Demonstrate lifelong-learning skills.
- 14 Demonstrate job-acquisition and advancement skills.
- 15 Demonstrate time-, task- and resource-management skills.
- 16 Demonstrate job-specific mathematics skills.
- 17 Demonstrate customer-service skills.

### **Demonstrating Workplace Readiness Skills: Technology Knowledge and Skills**

- 18 Demonstrate proficiency with technologies common to a specific occupation.
- 19 Demonstrate information technology skills.
- 20 Demonstrate an understanding of Internet use and security issues.
- 21 Demonstrate telecommunications skills.

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

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

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

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

### **Examining Technology**

- 34 Describe the characteristics and scope of technology.
- 35 Identify the core concepts of technology.

- 36 Identify historical technology milestones and advancements.
- 37 Examine technological systems.
- 38 Explain impacts of technological systems.
- 39 Explain the purpose and functions of a technological team.
- 40 Comply with safety rules in laboratory activities.
- 41 Investigating the Contribution of Engineering in History
- 42 Define engineering.
- 43 Summarize the history of engineering.
- 44 Research an engineering achievement.
- 45 Present information pertaining to an engineering achievement.

### **Examining the Engineering Profession and Related Careers**

- 46 Summarize the traits of successful professional engineers.
- 47 Describe the principal fields for specialization in engineering.
- 48 Describe the procedures for becoming and functioning as a registered engineer.
- 49 Describe the education needed for specialty fields in engineering and technology.
- 50 Describe the managerial responsibilities of engineers.
- 51 Explain the importance of communications between engineers and their clients.
- 52 Summarize the National Society of Professional Engineers Code of Ethics.

### **Practicing Engineering Fundamentals**

- 53 Demonstrate measuring skills.
- 54 Demonstrate conversion techniques for units of measurement.
- 55 Interpret drawings that use different systems of measurement.
- 56 Demonstrate the use of engineering design graphics and descriptive geometry.
- 57 Describe the techniques and benefits of sketching.
- 58 Draw orthographic and isometric projections, using basic technical drawing instruments.
- 59 Demonstrate graphical vector analysis.
- 60 Explain rapid prototyping to develop models.
- 61 Write a proposal for an engineering challenge.
- 62 Present a proposal for an engineering challenge.
- 63 Demonstrate research techniques/strategies used by engineers.

### **Identify the steps of the engineering design process.**

- 64 Explain the validity of designing alternative solutions to an engineering design problem.
- 65 Define a feasibility study.
- 66 Identify a product or system for improvement.

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

- 67 Define an engineering design problem.
- 68 Identify the requirements and constraints of the design problem.
- 69 Research potential solutions to the design problem.
- 70 Generate (brainstorm) multiple solutions to the design problem.
- 71 Sketch the solutions to a design problem.
- 72 Evaluate the requirements and constraints of each solution to the design problem.
- 73 Justify an optimal solution to the design problem.
- 74 Create a model or prototype for the chosen solution to the design problem, using appropriate materials and processes (e.g., 3-D rapid prototyping).

**Determine the objectives for an engineering test of the solution to the design problem.**

- 75 Test the solution to the design problem, using mathematical, conceptual, and/or physical modeling, simulating and optimizing.
- 76 Evaluate the test results.
- 77 Formulate an alternate solution to the design problem, if needed.
- 78 Test the alternate solution, if needed.
- 79 Present the final project report.
- 80 Document the final project report.
- 81 Managing Real-World Problems
- 82 Research local problems that could benefit from engineering solutions.
- 83 Design an engineering solution to a local problem, using the engineering design process.

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

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To seek resolution of grievances resulting from alleged discrimination or to report violations of these policies, please contact the Title VI/Title IX Coordinator/Director of Student Leadership at (757) 263-2020, 1413 Laskin Road, Virginia Beach, Virginia, 23451 (for student complaints) or the Section 504/ADA Coordinator/Chief Human Resources Officer at (757) 263-1133, 2512 George Mason Drive, Municipal Center, Building 6, Virginia Beach, Virginia, 23456 (for employees or other citizens). Concerns about the application of Section 504 of the Rehabilitation Act should be addressed to the Section 504 Coordinator/ Executive Director of Student Support Services at (757) 263-1980,

2512 George Mason Drive, Virginia Beach, Virginia, 23456 or the Section 504 Coordinator at the student's school. For students who are eligible or suspected of being eligible for special education or related services under IDEA, please contact the Office of Programs for Exceptional Children at (757) 263-2400, Laskin Road Annex, 1413 Laskin Road, Virginia Beach, Virginia, 23451.

Alternative formats of this publication which may include taped, Braille, or large print materials are available upon request for individuals with disabilities. Call or write The Department of Teaching and Learning, Virginia Beach City Public Schools, 2512 George Mason Drive, P.O. Box 6038, Virginia Beach, VA 23456-0038. Telephone 263-1070 (voice); fax 263-1424; 263-1240 (TDD) or email at [Charles.Hurd@vbschools.com](mailto:Charles.Hurd@vbschools.com).

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