



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

***Production Technology Program***  
***Materials Technology II***

***(TE 8478)***

***Grades 10 - 12***

***One-half Credit, One Semester***

*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 enables students to continue exploration of materials and processes. They fabricate usable products and conduct advanced experiments. Learning experiences include analysis, testing and processes of wood, metal, plastics, polymers and composite materials. This course is recommended for students interested in STEM-related fields of chemistry, engineering and manufacturing. Students participate in project-based learning experiences utilizing the scientific method and the advanced application of materials in engineering design.

**CERTIFICATION**

None

**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**

Production or Construction Technology and/or Earth Science, Materials Technology I

**OPTIONS FOR NEXT COURSE**

Introduction to Engineering

**REQUIRED STUDENT TEXTBOOK**

*Industrial Materials*

## COMPETENCIES FOR MATERIALS TECHNOLOGY II

### **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 Careers and Professional Practices**

- 39 Implement a safety plan that includes safety rules and emergency procedures for lab work.
- 40 Research careers related to materials and processes.
- 41 Investigate local industry and technical resources related to materials and processes technology.
- 42 Identify organizations that develop product and testing standards.
- 43 Research the responsibilities of the members of a project team.
- 44 Participate in a project team.

### **Understanding Materials and Processes Technology Concepts**

- 45 Use measuring and layout tools.
- 46 List technological and societal developments related to materials and processes technology.
- 47 Explain the origin of various natural and synthetic materials.
- 48 Explain the life cycle of a given product and the materials and processes associated with it.
- 49 Explain the basic structure of atoms and ions.
- 50 Compare the structure of amorphous and crystalline materials.
- 51 Distinguish between materials.
- 52 Describe mechanical properties.
- 53 Perform material analysis using testing devices.
- 54 Compare chemical and physical properties of selected materials.
- 55 Research emerging technologies.

### **Working with Polymers**

- 56 Describe the characteristics and uses of thermoplastics and thermosetting plastics.
- 57 Select a polymer for a product, based on the properties of the material.
- 58 Produce polymer items through the use of selected combining techniques.
- 59 Use separating techniques on polymers.
- 60 Use forming techniques on polymers.
- 61 Produce finished surfaces on polymers.
- 62 Apply polymeric materials and processes to a problem, product design, or prototype.

### **Working with Metals**

- 63 Describe the basic structure of metals.
- 64 Compare typical properties of selected metals and alloys.
- 65 Perform basic metal-forming techniques.
- 66 Perform metal separation processes.
- 67 Perform metal combining techniques.
- 68 Perform metal finishing techniques.
- 69 Apply metal materials and processes to a problem, product design, or prototype.

### **Working with Wood**

- 70 Describe the nature and structure of wood and forest products.
- 71 Determine the physical, mechanical, and chemical properties of wood.
- 72 Use separating techniques on wood.
- 73 Use wood-combining methods.
- 74 Apply wood-conditioning materials.

75 Apply wood materials and processes to a problem, product design, or prototype.

### **Working with Ceramics**

76 Explain the origin, types, and uses of ceramics.

77 Classify ceramics, based on their properties.

78 Produce a ceramic part or item.

### **Working with Composites**

79 Identify types and applications of composite materials.

80 Produce a composite part or item.

### **Exploring Additive and Subtractive Manufacturing**

81 Identify computer-driven additive and subtractive manufacturing processes.

82 Generate models to be converted into machine-compatible digital files.

83 Create a product using computer-driven additive or subtractive processes.

### **Exploring Product Standards**

84 Identify services that accredit companies and labs to standard quality systems.

85 Explain how product standards shape the way raw materials and finished products are manufactured.

86 Explain how quality management systems (QMS) shape the way products are manufactured.

87 Explain how testing standards help verify product quality.

Aaron C. Spence, Ed.D., Superintendent  
Virginia Beach City Public Schools  
2512 George Mason Drive, Virginia Beach, VA 23456-0038

Produced by the Department of Teaching and Learning.  
For further information, please call (757) 263-1070.

### **Notice of Non-Discrimination Policy**

Virginia Beach City Public Schools does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation/gender identity, pregnancy, childbirth or related medical condition, disability, marital status, age, genetic information or veteran status in its programs, activities, employment, or enrollment, and provides equal access to the Boy Scouts and other designated youth groups. School Board policies and regulations (including, but not limited to, Policies 2-33, 4-4, 5-7, 5-19, 5-20, 5-44, 6-33, 6-7, 7-48, 7-49, 7-57 and Regulations 4-4.1, 4-4.2, 5-44.1, 7-11.1, 7-17.1 and 7-57.1) provide equal access to courses, programs, enrollment, counseling services, physical education and athletic, vocational education, instructional materials, extracurricular activities and employment.

Title IX Notice: Complaints or concerns regarding discrimination on the basis of sex or sexual harassment should be addressed to the Title IX Coordinator, at the VBCPS Office of Student Leadership, 641 Carriage Hill Road, Suite 200, Virginia Beach, 23452, (757) 263-2020, [Mary.Dees@vbschools.com](mailto:Mary.Dees@vbschools.com) (student complaints) or the VBCPS Department of School Leadership, 2512 George Mason Drive, Municipal Center, Building 6, Virginia Beach, Virginia, 23456 (757) 263-1088, [Elizabeth.Bryant@vbschools.com](mailto:Elizabeth.Bryant@vbschools.com) (employee complaints). Additional information regarding Virginia Beach City Public Schools' policies regarding discrimination on the basis of sex and sexual harassment, as well as the procedures for filing a formal complaint and related grievance processes, can be found in School Board Policy 5-44 and School Board Regulations 5-44.1 (students), School Board Policy 4-4 and School Board Regulation 4-4.3 (employees), and on the School Division's website at [Diversity, Equity and Inclusion/Title IX](#). 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, Plaza Annex/Family and Community Engagement Center, 641 Carriage Hill Road, Suite 200, Virginia Beach, VA 23452.

The School Division is committed to providing educational environments that are free of discrimination, harassment, and bullying. Students, staff, parents/guardians who have concerns about discrimination, harassment, or bullying should contact the school administration at their school. Promptly reporting concerns will allow the school to take appropriate actions to investigate and resolve issues. School Board Policy 5-7 addresses non-discrimination and anti-harassment, Policy 5-44 addresses sexual harassment and discrimination based on sex or gender. Policy 5-36 and its supporting regulations address other forms of harassment.

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).

**vbschools.com**  
your virtual link to Hampton Roads' largest school system



*No part of this publication may be produced or shared in any form without giving specific credit to Virginia Beach City Public Schools.*

August 2021