Department of Teaching & Learning
Parent/Student Course Information

Electronics and Robotics Technology II
(VO8537)
Three Credits, One Year
Grades 11 or 12

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
In this two-year program, students receive instruction in robotic applications, power systems in robotics, the proper use of hand tools and test equipment, soldering techniques, interpretation of schematic diagrams, basic electronic theory, solid-state theory, communication theory, microcomputer and microprocessor theory and digital electronics. The course is broken into three distinct phases: lesson demonstration and/or discussions, lab activities and projects. The lesson demonstration and discussion phase provides students with a theoretical foundation of electronics and robotics. In the lab activity phase, students are challenged to solve electronic/robotic problems through the practical application of theoretical knowledge and the use of test equipment and trainers. During the student project phase, students will apply their acquired knowledge and skills to produce a working electronic/robotic device. Many of the projects constructed will be student designed. During this two-year program, students will prepare to achieve certification with the Electronics Technicians Association of America.

CERTIFICATION
Electronics Technicians Association (ETA) Student Electronics Technician Associate Certification
National Occupational Competency Testing Institute (NOCTI) Assessment: Electronics

STUDENT ORGANIZATION
SkillsUSA is a co-curricular organization for all students enrolled in trade and industrial education programs. SkillsUSA is a partnership of students, teachers and industry working together to ensure America has a skilled workforce. SkillsUSA helps students excel by providing educational programs, events and competitions that support career and technical education (CTE) in the nation's classrooms. Students are highly encouraged to participate.

PREREQUISITE
Electronics and Robotics Technology I
OPTIONS FOR NEXT COURSE
None
REQUIRED STUDENT TEXTBOOK
None

COMPETENCIES FOR ELECTRONICS AND ROBOTICS TECHNOLOGY II

Demonstrating 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 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 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.

Applying General Safety Standards (Core Safety)

39   Comply with federal, state, and local safety legal requirements.

40   Maintain a safe working environment.

41   Explain safe working practices around electrical hazards.

42   Identify emergency first-aid procedures.

43   Identify the types of fires and the methods used to extinguish them.

44   Identify personal protective equipment (PPE) requirements.

45   Inspect course-specific hand and power tools to visually identify defects.

46   Demonstrate lifting and carrying techniques.

47   Demonstrate safe laddering techniques.

48   Report personal injuries and environmental and equipment safety violations.

Working with Alternating Current (AC) Circuits

49   Analyze network theorems.

50   Use an oscilloscope.

51   Describe alternating voltage and current.

52   Determine characteristics of inductance.

53   Calculate inductive reactance.

54   Determine the characteristics of capacitance.

55   Demonstrate capacitive reactance.

56   Explain transformer operations.

57   Explain the operation of resistor-inductor (RL) and resistor-capacitor (RC) networks.

58   Determine current, voltage, and impedance in an RLC circuit.

59   Determine resonant frequencies in RLC circuits.

Working with Analog Circuits

60   Work with semiconductor devices.

61   Analyze power supplies.

62   Analyze amplifier circuits.

63   Discuss the differences between analog and digital circuits.

64   Analyze integrated circuits (IC).

65   Analyze oscillator circuits.

66   Identify modes of wireless communication.

Understanding Digital Logic Systems

67   Analyze digital integrated circuits.

68   Convert numbers to digital numbering systems.

69   Interpret logic gate symbols, Boolean expressions, and truth tables.

70   Describe microcontroller structure and architecture.

71   Construct a logic probe or logic pulser.

72   Troubleshoot a simple logic circuit.

73   Construct encoder and decoder circuits.

74   Describe timers.

75   Define electrical relays.

76   Describe sequential logic, register, and counter circuits.

77   Build a digital clock.

78   Construct arithmetic circuits.

79   Describe digital memory circuits.
80   Troubleshoot digital-to-analog and analog-to-digital converters.
Examining Energy Sources
81   Identify alternative power systems.
82   Explain the operation of a generator.
Understanding Power Systems in Electronics
83   Identify basic industrial components.
84   Differentiate between servo and non-servo electrical drive systems.
85   Describe motor control systems.

Local Competencies
Understanding Graphic Communication in Robotics
86   Interpret schematics, technical drawings and flowcharts.
87   Create schematics, technical drawings and flowcharts.
Using and Programming Robotic Equipment
88   Write programs to control robots.
89   Manipulate a robot, using a Teach pendant.
90   Manipulate a robot, using a PC host computer.
91   Program a robot, using a Teach pendant.
92   Program a robot, using a PC host computer.
93   Describe how robots can be interfaced to communicate across a network to function in a work cell.
Understanding Simple Machines and Mechanisms
94   Write a computer program to solve a physics problem.
95   Design a mechanical system, using the principles of simple machines.
Understanding Power Systems in Robotics
96   Differentiate between servo and non-servo electrical drive systems.
97   Perform a lab activity, using electrical motor control systems.
98   Describe motor control systems.
99   Demonstrate troubleshooting techniques for electrical motor control systems.
100   Explain the principles of fluid power.
101   Describe the use of a fluid power device in a robotic work cell.
102   Troubleshoot a fluid power system.
Understanding the Machine Shop
103   Describe the use of essential machines and basic measuring tools found in a machine shop.
104   Use a CNC controller to interface with a robot.
105   Produce a finished machine part within the given specifications.
106   Produce a part using a 3D printer.
Understanding the Welding Shop
107   Describe the use of equipment and tools in a welding shop.
108   Describe the various phases of a welding demonstration at a debriefing session.
Engineering Robotic Systems
109   Maintain an engineering notebook.
110   Design a robotic system to perform a specified task in a competitive event.
111   Explain the function of a sensor.
112   Design a robotic system that incorporates the use of sensors.

Aaron C. Spence, Ed.D., Superintendent
Virginia Beach City Public Schools
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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 (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 (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 Brandon.Martin@vbschools.com.

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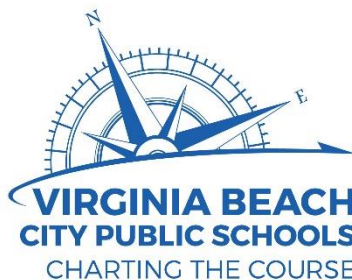
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