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 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.

Applying General Safety Standards (Core Safety)
34   Comply with federal, state and local safety legal requirements, including OSHA, VOSHA and EPA.

35	Inspect and maintain a safe working environment.
36	Explain safe working practices around electrical hazards.
37	Identify emergency first aid procedures.
38	Identify the types of fires and the methods used to extinguish them.
39	Identify personal protective equipment (PPE) requirements.
40	Inspect course-specific hand and power tools to visually identify defects.
41	Demonstrate lifting and carrying techniques.
42	Demonstrate safe laddering techniques.
43	Report personal injuries, environmental and equipment safety violations to the appropriate authority.
44	Earn the general industry OSHA 10 card.

Working with AC Circuits
45	Analyze network theorems.
46	Identify, use, and maintain an oscilloscope.
47	Describe alternating voltage and current.
48	Determine characteristics of inductance.
49	Calculate inductive reactance.
50	Determine the characteristics of capacitance.
51	Demonstrate capacitive reactance.
52	Explain transformer operations.
53	Explain the operation of RL and RC networks.
54	Determine current, voltage, and impedance in an RLC circuit.
55	Determine resonant frequencies in RLC circuits.

Working with Analog Circuits
56	Work with semiconductor devices.
57	Analyze power supplies.
58	Analyze amplifier circuits.
59	Analyze integrated circuits.
60	Analyze oscillator circuits.
61	Identify modes of wireless communication.

Understanding Digital Logic Systems
62	Analyze digital integrated circuits.
63	Convert numbers to digital numbering systems.
64	Describe microcontroller structure and architecture.
65	Interpret logic gate symbols, Boolean expressions and truth tables.
66	Construct a logic probe or logic pulser.
67	Troubleshoot a simple logic circuit.
68	Construct encoder and decoder circuits.
69	Describe sequential logic, register and counter circuits.
70	Construct arithmetic circuits.
71	Describe digital memory circuits.
72	Troubleshoot digital-to-analog and analog-to-digital converters.

Examining Energy Sources
| 73 | Identify alternative power systems. |
| 74 | Explain the operation of a generator. |

Understanding Power Systems in Electronics
| 75 | Differentiate between servo and non-servo electrical drive systems. |

76 Describe motor control systems.

Local Competencies
DC Circuits
77 Construct series circuits.
78 Construct parallel circuits.
79 Construct series-parallel circuits.
80 Evaluate the difference in voltage between loaded and unloaded voltage divider circuits.
81 Examine magnetic properties of a circuit or component.
82 Construct circuits with (electro) magnetic properties.
83 Examine meter movement, using analog and digital multimeters.
84 Determine characteristics of inductance.
85 Determine characteristics of capacitance.

Identifying Computer Integration in Robotics
86 Explain basic computer architecture.
87 Use dedicated microcontrollers.
88 Connect peripheral devices to robotics equipment.
89 Operate dip switches and interface controls.

Understanding Graphic Communication in Robotics
90 Interpret schematics, technical drawings and flowcharts.
91 Create schematics, technical drawings and flowcharts.

Using and Programming Robotic Equipment
92 Write programs to control robots.
93 Manipulate a robot, using a Teach pendant.
94 Manipulate a robot, using a PC host computer.
95 Program a robot, using a Teach pendant.
96 Program a robot, using a PC host computer.
97 Describe how robots can be interfaced to communicate across a network to function in a work cell.

Understanding Simple Machines and Mechanisms
98 Write a computer program to solve a physics problem.
99 Design a mechanical system, using the principles of simple machines.

Understanding Power Systems in Robotics
100 Differentiate between servo and non-servo electrical drive systems.
101 Perform a lab activity, using electrical motor control systems.
102 Describe motor control systems.
103 Demonstrate troubleshooting techniques for electrical motor control systems.
104 Explain the principles of fluid power.
105 Describe the use of a fluid power device in a robotic work cell.
106 Troubleshoot a fluid power system.

Understanding the Machine Shop
107 Describe the use of essential machines and basic measuring tools found in a machine shop.
108 Use a CNC controller to interface with a robot.
109 Produce a finished machine part within the given specifications.
110 Produce a part using a 3D printer.

Understanding the Welding Shop
111   Describe the use of equipment and tools in a welding shop.
112   Describe the various phases of a welding demonstration at a debriefing session.

Engineering Robotic Systems
113   Maintain an engineering notebook.
114   Design a robotic system to perform a specified task in a competitive event.
115   Explain the function of a sensor.
116   Design a robotic system that incorporates the use of sensors.

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

Notice of Non-Discrimination Policy

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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 Brandon.Martin@vbschools.com.

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VIRGINIA BEACH CITY PUBLIC SCHOOLS
CHARTING THE COURSE

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