

**SHORE REGIONAL HIGH SCHOOL DISTRICT**

**A Regional Collaborative of the Communities Served by the Monmouth Beach, Oceanport, Shore Regional, and West Long Branch School Districts**

Aligned to the New Jersey Student Learning Standards as Applicable

**Course Title:** Robotics II

**Content Area:** Robotics II

**Grade Level:** 8

**Course Description:** Examine the emerging field of robotics in society as well as build and program robots.

**Curriculum Writer(s):** James Straley and Nick Cammarano

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**Date Approved by Board of Education:** August 2016/September 2017 (revisions to content standards only to reflect NJSL)

Unit 1-ROBOTICS IN TECHNOLOGY (7 weeks)

**Unit Summary:**

In this unit, students will investigate the use of robots in industry, medicine, and science.

**Interdisciplinary Connections/Content Area Integrations Including Technology:**

- Students will research and report on robots used today, their impact on society, and their implications for the future.

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<b>NJSLS Number</b>	<b>NJSLS Content</b>
CCSS.ELA-LITERACY.RI.7.1	<i>Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.</i>
CCSS.ELA-LITERACY.W.8.2	<i>Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.</i>
CCSS.ELA-LITERACY.W.8.2.D	<i>Use precise language and domain-specific vocabulary to inform about or explain the topic.</i>
CCSS.ELA-LITERACY.W.8.6	<i>Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.</i>

### **Summative Assessment:**

- Report and present on a robot or development in robotics from any field of technology: government (DARPA), medicine, industry, etc.
- Google presentation, screencast

### **Formative Assessments:**

- Electronic journal entries
- Article citations

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### Enduring Understandings:

- Students will use digital tools.
- Students will research and properly cite sources.
- Students will question progress in technologies and question ways to improve them.

### Essential Questions:

- What is robotics?
- How have robots changed our daily lives?

### Instructional Outcomes:

- Understand the use of robotics.
- Understand how robotics impacts society.
- Understand how robots help people with disabilities.
- Understand how robots make people's lives easier.

### Suggested Learning Activities:

- Explore robotics in different fields of technology. Use the site below to examine and write a reflection. Each student should choose one robot or development in robotics from the site to research further and write a report on their findings in Google classroom. Students will then respond to each other's presentations.

<http://spectrum.ieee.org/>

### Suggested Differentiation:

- Differentiation is based on reading level. Topics and reading materials chosen will be at or above reading level to help students understand and apply concepts.

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- Differentiation is based on expertise with application of technology. Students may choose to create a screencast, recording, slideshow, etc. to present and illustrate what they have learned.

### Curriculum Development Resources:

- Ebscohost
- Robotics Curriculum 2015 (Straley)

## Unit 2 - BASIC PROGRAMMING AND BUILDING THE EV3 (5 weeks)

### Unit Summary:

In this unit, students will work individually and collaboratively to build and program robots. They will review basic programming and complete challenges.

### Interdisciplinary Connections/Content Area Integrations Including Technology:

- Students will use digital tools and devices to enhance technological skills.

NJSLS Number	NJSLS Content
8.1	<i>Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.</i>

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8.1.5.A.1	<i>Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.</i>
8.1.P.C.1	<i>Collaborate with peers by participating in interactive digital games or activities.</i>
5.1.8.B.1	<i>Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.</i>

### **Summative Assessments:**

- Google sheets table of commands and input data required
- Google forms quiz of basic icons and commands to accomplish tasks

### **Formative Assessments:**

- Electronic journal entries

### **Essential Questions:**

- How do you build and program a robot?
- How do you make a robot do what you want it to do?
- How do you make a mental model and predict how it plays out?
- How do you break a big problem down into a number of smaller ones?
- How do you work as part of a team on building and programming a robot?

### **Instructional Outcomes:**

- Program the Lego EV3.
- Build robots using detailed instructions.

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- Learn the importance of effective communication with members of a group.

### **Suggested Learning Activities:**

- Review basics of programming the EV3: moving straight, turning, move until touch, move until near, turn for angle, move until color, loops, switches, and switch-loops.
- Follow step by step guided videos on Lego website that illustrate key concepts in programming the EV3.
- Build and program basic tankbot and collect data of how to perform specific movements and tasks.

### **Suggested Differentiation:**

- Differentiation is based on the group size and grade level.
- Students can work collaboratively or independently to solve challenges.

### **Curriculum Development Resources:**

- Robotics Curriculum 2015 (Straley)
- Lego EV3 website

## Unit 3 - ADVANCED PROGRAMMING AND BUILDING EV3 MODELS (20 weeks)

### **Unit Summary:**

In this unit, students will work individually and collaboratively to build and program robots. They will develop an understanding of more advanced programming.

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### Interdisciplinary Connections/Content Area Integrations Including Technology:

- Students will use digital tools and devices to enhance technological skills.
- Students will perform mathematical computations using geometry.
- Students will use the scientific method to problem solve.

NJSLS Number	NJSLS Content
8.1	<i>Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.</i>
8.1.5.A.1	<i>Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.</i>
8.1.8.A.3	<i>Use and/or develop a simulation that provides an environment to solve a real world problem or theory.</i>
8.1.P.C.1	<i>Collaborate with peers by participating in interactive digital games or activities.</i>
8.1.2.C.1	<i>Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media formats such as online collaborative tools, and social media.</i>
8.1.5.C.1	<i>Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings and present possible solutions, using digital tools and online resources for all steps.</i>
5.1.8.A.2	<i>Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.</i>

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5.1.8.B.1

*Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.*

### **Summative Assessments:**

- Electronic journals/Communication logs
- Modification plans and conclusions

### **Formative Assessments:**

- Electronic journal entries
- Self-assessment, Peer assessment
- LEGO EV3 website challenges

### **Essential Questions:**

- How do you work as part of a team on building and programming a robot?
- How do you write your own program?
- How do you organize data?
- How can you illustrate your findings?
- How can you communicate problems with others?
- How can you assess others and fix mistakes they have made?

### **Instructional Outcomes:**

- Program the Lego EV3.
- Build robots using detailed instructions.
- Work together to modify and manipulate robots to behave differently and perform different tasks.



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- Learn the importance of effective communication with members of a group.

### **Suggested Learning Activities:**

- Build and program different robots from LEGO EV3 site; <http://www.lego.com/en-us/mindstorms/build-a-rob>.
- Choose from EV3 home edition kit models including; track3r, spik3r, gripp3r, and more.
- Explore other model options on other websites.
- Keep detailed journal entries on progress and problems in building and programming the EV3.
- Complete specific robot challenges for different models.
- Reflect on construction and robot design to develop any modifications.
- Create a write-up of possible changes.
- Test the hypotheses and write a conclusion of findings.
- Disassemble robots.
- Organize pieces and complete an inventory sheet of any that are missing/broke.

### **Suggested Differentiation:**

- Differentiation is based on the group size and grade level.
- Students can work collaboratively or independently to solve challenges.
- Groups can choose from a number of different robot designs from EV3 site and other third party sites. Students can develop their own challenges and modify robots to accomplish them.

### **Curriculum Development Resources:**

- Lego EV3 website

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### Unit 4- Alternative Energy Sources (7 weeks)

#### Unit Summary:

In this unit, students will work individually and collaboratively to examine new technologies powering robots through the use of solar power, wind power, hydroelectric energy, and more. They will examine the global impact of fossil fuels and the endeavors of nations and businesses to explore new energy options.

#### Interdisciplinary Connections/Content Area Integrations Including Technology:

- Students will examine how energy is created.
- Students will calculate how much energy is being used and the resources necessary to satisfy human needs.

NJSLS Number	NJSLS Content
8.1.12.F.1	<i>Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.</i>
5.1.8.A.1	<i>Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.</i>
5.1.8.A.2	<i>Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.</i>
5.1.8.A.3	<i>Use scientific principles and models to frame and synthesize scientific arguments and pose theories.</i>

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### Summative Assessments:

- Report on alternative energy
- Reflection on course and experience

### Formative Assessments:

- Reading assignments
- Article summaries
- Google forms quizzes
- Pro/Con charts

### Enduring Understandings:

- Understand where energy comes from.
- Understand the importance of continual progress towards renewable energy.
- Understand negative impact from nonrenewable energy resources.
- Understand the importance of discovering new energy sources in the field of robotics, due to the vast amount required for them to function properly.

### Essential Questions:

- What is energy?
- Why do people need energy?
- Where does energy come from?
- How do we use energy?
- What impact does the use and development of fossil fuels have on Earth and its people?
- What new technologies have allowed batteries to become smaller and more powerful?

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### **Instructional Outcomes:**

- Understand the use of natural resources
- Understand the importance of investigating and using alternative energy sources
- Understand new breakthroughs in energy allowing electronics to become smaller and more powerful

### **Suggested Learning Activities:**

- Research and read articles related to renewable resources and new energy options.
- Summarize findings in Google classroom threads.
- Identify positives and negatives of new energy resources.
- Articulate new ideas in shared Google docs and presentations.

### **Suggested Differentiation:**

- Differentiation is based on the group size.
- Students may work alone or collaboratively with students in same class or through the online Google robotics classroom community.

### **Curriculum Development Resources:**

- Lego EV3 website