

High School Robotics - Year 3

Computational Thinking and Problem Solving

1 Students will analyze and utilize problem-solving strategies.

- 1 Utilize the engineering design process to solve problems of level-appropriate complexity [CSRB.Y3.1.1](#)
- 2 Analyze and utilize multiple representations of problem-solving logic used to solve problems of level-appropriate complexity, such as schematics and 3D modeling [CSRB.Y3.1.2](#)
- 3 Analyze and utilize collaborative methods in problem solving of level-appropriate complexity [CSRB.Y3.1.3](#)
- 4 Analyze and utilize level-appropriate troubleshooting strategies for hardware and software [CSRB.Y3.1.4](#)

2 Students will analyze and utilize connections between concepts of mathematics and computer science.

- 1 Continuation of this standard is not specifically included or excluded [CSRB.Y3.2.1](#)
 - 2 Utilize types of information that are stored in robotics systems including, but not limited to, 2D and 3D coordinate system and sensor data [CSRB.Y3.2.2](#)
 - 3 Continuation of this standard is not specifically included or excluded [CSRB.Y3.2.3](#)
 - 4 Continuation of this standard is not specifically included or excluded [CSRB.Y3.2.4](#)
 - 5 Continuation of this standard is not specifically included or excluded [CSRB.Y3.2.5](#)
 - 6 Continuation of this standard is not specifically included or excluded [CSRB.Y3.2.6](#)
 - 7 Apply concepts of mechanical engineering including, but not limited to, gear ratios, speed, stability, and torque [CSRB.Y3.2.7](#)
 - 8 Apply concepts of electrical engineering including, but not limited to, applying fundamental laws of electricity (e.g., Kirchhoff's Law, Ohm's Law), using a multimeter, and understanding electric motors as they relate to the implementation of robotics systems and subsystems [CSRB.Y3.2.8](#)
 - 9 Continuation of this standard is not specifically included or excluded [CSRB.Y3.2.9](#)
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Data, Information, and Security

3 Students will analyze and utilize data through the use of computing devices.

- 1 Create programs to store, access, and manipulate, with a high level of efficiency, level-appropriate robotics system data [CSRB.Y3.3.1](#)
 - 2 Analyze how quantitative and qualitative data are utilized in robotic systems [CSRB.Y3.3.2](#)
 - 3 Create and evaluate models and simulations to answer student-identified scenarios [CSRB.Y3.3.3](#)
 - 4 Analyze, utilize, and visually represent level-appropriate static and dynamic data, including, but not limited to, data collected through robotic sensors [CSRB.Y3.3.4](#)
 - 5 Perform level-appropriate data analysis using computing tools [CSRB.Y3.3.5](#)
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4 Students will analyze and utilize concepts of cybersecurity.

- 1 Continuation of this standard is not specifically included or excluded [CSRB.Y3.4.1](#)
 - 3 Continuation of this standard is not specifically included or excluded [CSRB.Y3.4.3](#)
 - 2 Continuation of this standard is not specifically included or excluded [CSRB.Y3.4.2](#)
 - 4 Continuation of this standard is not specifically included or excluded [CSRB.Y3.4.4](#)
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Algorithms and Programs

5 Students will create, evaluate, and modify algorithms.

- 1 Design and implement algorithms that solve student-identified problems [CSRB.Y3.5.1](#)
 - 2 Continuation of this standard is not specifically included or excluded [CSRB.Y3.5.2](#)
 - 3 Continuation of this standard is not specifically included or excluded [CSRB.Y3.5.3](#)
 - 4 Use a systematic approach to detect and resolve errors in a given algorithm [CSRB.Y3.5.](#)
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6 Students will create programs to solve problems.

- 1 Create programs that utilize robotic systems to solve problems of level-appropriate complexity [CSRB.Y3.6.1](#)
 - 2 Discuss and apply best practices of program design, user experience design, and format (e.g., descriptive names, documentation, indentation, whitespace) [CSRB.Y3.6.2](#)
 - 3 Continuation of this standard is not specifically included or excluded [CSRB.Y3.6.3](#)
 - 4 Create programs of level-appropriate complexity that leverage real-time sensory input to make decisions for completing physical tasks [CSRB.Y3.6.4](#)
 - 5 Use a systematic approach to detect logic, runtime, and syntax errors within a program [CSRB.Y3.6.5](#)
 - 6 Create programs that utilize various robotics system operations to solve real-world problems [CSRB.Y3.6.6](#)
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Computers and Communications

7 Students will analyze the utilization of computers within industry.

- 1 Utilize multiple hardware and software tools simultaneously to solve level-appropriate industry-based problems [CSRB.Y3.7.1](#)
 - 2 Research integration of multiple technologies (e.g., analytics, artificial intelligence, big data, end-of-arm tools, IoT machine learning, vision) to solve level-appropriate industry-based problems [CSRB.Y3.7.2](#)
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8 Students will analyze communication methods and systems used to transmit information among computing devices.

- 1 Continuation of this standard is not specifically included or excluded [CSRB.Y3.8.1](#)
 - 2 Utilize a network-connected robot [CSRB.Y3.8.2](#)
 - 3 Continuation of this standard is not specifically included or excluded [CSRB.Y3.8.3](#)
 - 4 Continuation of this standard is not specifically included or excluded [CSRB.Y3.8.4](#)
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9 Students will utilize appropriate hardware and software.

- 1 Continuation of this standard is not specifically included or excluded [CSRB.Y3.9.1](#)
 - 2 Use collaborative tools and processes to configure level-appropriate robotic hardware components [CSRB.Y3.9.2](#)
 - 3 Continuation of this standard is not specifically included or excluded [CSRB.Y3.9.3](#)
 - 4 Utilize robotic hardware components to create level-appropriate robotic systems and subsystems [CSRB.Y3.9.4](#)
 - 5 Apply autonomous and manual robotic control by coding in various robotic programming languages (e.g., C++, Karel, Python) [CSRB.Y3.9.5](#)
 - 6 Analyze different industry-relevant robotic systems and their various applications (e.g., 3-axis, 6-axis, AMR, cobot, delta, SCARA, T-700) [CSRB.Y3.9.6](#)
 - 7 Utilize breadboarding and prototyping in the creation of a level-appropriate closed-loop robot [CSRB.Y3.9.7](#)
 - 8 Utilize hardware diagnostic tools to design, test, and troubleshoot robotic systems and subsystems [CSRB.Y3.9.8](#)
 - 9 Analyze hardware and software requirements and limitations of various robotics systems [CSRB.Y3.9.9](#)
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Professionalism and Impacts of Computing

10 Students will analyze the impacts of technology and professionalism within the computing community.

- 1 Discuss etiquette and professionalism as related to communication in industry [CSRB.Y3.10.1](#)
- 2 Continuation of this standard is not specifically included or excluded [CSRB.Y3.10.2](#)
- 3 Continuation of this standard is not specifically included or excluded [CSRB.Y3.10.3](#)
- 4 Discuss ethical implications encountered in the robotics industry that relate to intellectual property, non-compete clauses, and non-disclosure agreements [CSRB.Y3.10.4](#)
- 5 Continuation of this standard is not specifically included or excluded [CSRB.Y3.10.5](#)
- 6 Continuation of this standard is not specifically included or excluded [CSRB.Y3.10.6](#)
- 7 Demonstrate industry-relevant technical and soft skills [CSRB.Y3.10.7](#)
- 8 Utilize and model effective professional project management [CSRB.Y3.10.8](#)
- 9 Evaluate the quality and impact of a professional digital portfolio [CSRB.Y3.10.9](#)
- 10 Create and maintain a professional digital portfolio comprised of self-created work [CSRB.Y3.10.10](#)

11 Students will demonstrate understanding of storytelling with data and appropriately communicate about technical information.

- 1 Communicate robotics concepts to diverse audiences including, but not limited to, non-technical audience members [CSRB.Y3.11.1](#)
- 2 Utilize level-appropriate robotic system data for storytelling [CSRB.Y3.11.2](#)
- 3 Continuation of this standard is not specifically included or excluded [CSRB.Y3.11.3](#)
- 4 Continuation of this standard is not specifically included or excluded [CSRB.Y3.11.4](#)
- 5 Continuation of this standard is not specifically included or excluded [CSRB.Y3.11.5](#)
- 6 Communicate conditions of a robotic system in terms of performance, diagnostics, troubleshooting, and repair [CSRB.Y3.11.6](#)