

Subject		§126. Technology Applications		
Course Title		§126.40. Robotics Programming and Design (One-Half to One Credit), Beginning with School Year 2012-2013		
TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(a) General Requirements.				
Students shall be awarded one-half to one credit for successful completion of this course. The prerequisite for this course is proficiency in the knowledge and skills relating to Technology Applications, Grades 6-8. This course is recommended for students in Grades 9-12.				
(b) Introduction.				
(1) The technology applications curriculum has six strands based on the National Educational Technology Standards for Students (NETS•S) and performance indicators developed by the International Society for Technology in Education (ISTE): creativity and innovation; communication and collaboration; research and information fluency; critical thinking, problem solving, and decision making; digital citizenship; and technology operations and concepts.				
(2) Robotics Programming and Design will foster students' creativity and innovation by presenting opportunities to design, implement, and present meaningful robotic programs through a variety of media. Students will collaborate with one another, their instructor, and various electronic communities to solve problems in designing and programming robots. Through data analysis, students will identify task requirements, plan search strategies, and use robotic concepts to access, analyze, and evaluate information needed to solve problems. By using robotic knowledge and skills that support the work of individuals and groups in solving problems, students will select the technology appropriate for the task, synthesize knowledge, create solutions, and evaluate the results. Students will learn digital citizenship by researching current laws and regulations and by practicing integrity and respect. Students will gain an understanding of the principles of robotics through the study of physics, robotics, automation, and engineering design concepts.				
(3) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.				
(c) Knowledge and Skills.				
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(A) produce a prototype			
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(B) present a prototype using a variety of media			
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(C) use the design process to construct a robot			

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(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(D) refine the design of a robot			
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(E) build robots of simple, moderate, and advanced complexity	(i) build robots of simple complexity		
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(E) build robots of simple, moderate, and advanced complexity	(ii) build robots of moderate complexity		
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(E) build robots of simple, moderate, and advanced complexity	(iii) build robots of advanced complexity		
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(F) improve a robot design to meet a specified need			
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(G) demonstrate an understanding of and create artificial intelligence in a robot	(i) demonstrate an understanding of artificial intelligence in a robot		
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(G) demonstrate an understanding of and create artificial intelligence in a robot	(ii) create artificial intelligence in a robot		

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TEKS (Knowledge and Skills)	Student Expectation	Breakout	Element	Subelement
(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:	(H) create behavior-based control algorithms			
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(A) demonstrate an understanding of and implement design teams	(i) demonstrate an understanding of design teams		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(A) demonstrate an understanding of and implement design teams	(ii) implement design teams		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(B) use design teams to solve problems			
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(C) serve as a team leader and a team member	(i) serve as a team leader		

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(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(C) serve as a team leader and a team member	(ii) serve as a team member		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(D) describe a problem and identify design specifications	(i) describe a problem		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(D) describe a problem and identify design specifications	(ii) identify design specifications		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(E) design a solution to a problem and share a solution through various media	(i) design a solution to a problem		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(E) design a solution to a problem and share a solution through various media	(ii) share a solution to a problem through various media		

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(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) document prototypes, adjustments, and corrections in the design process	(i) document prototypes in the design process		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) document prototypes, adjustments, and corrections in the design process	(ii) document adjustments in the design process		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(F) document prototypes, adjustments, and corrections in the design process	(iii) document corrections in the design process		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(G) document a final design and solution	(i) document a final design		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(G) document a final design and solution	(ii) document a solution		

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(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(H) present the final design, testing results, and solution	(i) present the final design		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(H) present the final design, testing results, and solution	(ii) present the testing results		
(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:	(H) present the final design, testing results, and solution	(iii) present the solution		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(A) test and evaluate a robot design	(i) test a robot design		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(A) test and evaluate a robot design	(ii) evaluate a robot design		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(B) implement position tracking to complete assigned robot tasks			

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(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(C) develop solution systems and implement systems analysis	(i) develop solution systems		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(C) develop solution systems and implement systems analysis	(ii) implement systems analysis		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(D) modify a robot to respond to a change in specifications			
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(E) implement a system to identify and track all components of a robot	(i) implement a system to identify all components of a robot		
(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:	(E) implement a system to identify and track all components of a robot	(ii) implement a system to track all components of a robot		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(A) develop algorithms to control a robot, including applying instructions, collecting sensor data, and performing simple tasks	(i) develop algorithms to control a robot, including applying instructions		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(A) develop algorithms to control a robot, including applying instructions, collecting sensor data, and performing simple tasks	(ii) develop algorithms to control a robot, including collecting sensor data		

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(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(A) develop algorithms to control a robot, including applying instructions, collecting sensor data, and performing simple tasks	(iii) develop algorithms to control a robot, including performing simple tasks		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(B) create maneuvering algorithms to physically move the location of a robot			
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(C) create algorithms that provide interaction with a robot			
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(D) demonstrate an understanding of and use output commands, variables, and sequence programming structure	(i) demonstrate an understanding of output commands		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(D) demonstrate an understanding of and use output commands, variables, and sequence programming structure	(ii) use output commands		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(D) demonstrate an understanding of and use output commands, variables, and sequence programming structure	(iii) demonstrate an understanding of variables		

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(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(D) demonstrate an understanding of and use output commands, variables, and sequence programming structure	(iv) use variables		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(D) demonstrate an understanding of and use output commands, variables, and sequence programming structure	(v) demonstrate an understanding of sequence programming structure		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(D) demonstrate an understanding of and use output commands, variables, and sequence programming structure	(vi) use sequence programming structure		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(E) demonstrate an understanding of and use jumps, loops, and selection programming structures	(i) demonstrate an understanding of jumps		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(E) demonstrate an understanding of and use jumps, loops, and selection programming structures	(ii) demonstrate an understanding of loops		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(E) demonstrate an understanding of and use jumps, loops, and selection programming structures	(iii) demonstrate an understanding of selection programming structures		

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(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(E) demonstrate an understanding of and use jumps, loops, and selection programming structures	(iv) use jumps		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(E) demonstrate an understanding of and use jumps, loops, and selection programming structures	(v) use loops		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(E) demonstrate an understanding of and use jumps, loops, and selection programming structures	(vi) use selection programming structures		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(F) demonstrate an understanding of and use subroutines, accessors, and modifiers	(i) demonstrate an understanding of subroutines		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(F) demonstrate an understanding of and use subroutines, accessors, and modifiers	(ii) use subroutines		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(F) demonstrate an understanding of and use subroutines, accessors, and modifiers	(iii) demonstrate an understanding of accessors		

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(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(F) demonstrate an understanding of and use subroutines, accessors, and modifiers	(iv) use accessors		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(F) demonstrate an understanding of and use subroutines, accessors, and modifiers	(v) demonstrate an understanding of modifiers		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(F) demonstrate an understanding of and use subroutines, accessors, and modifiers	(vi) use modifiers		
(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:	(G) apply decision-making strategies when developing solutions			
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(A) discuss intellectual property, privacy, sharing of information, copyright laws, and software licensing agreements	(i) discuss intellectual property		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(A) discuss intellectual property, privacy, sharing of information, copyright laws, and software licensing agreements	(ii) discuss privacy		

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(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(A) discuss intellectual property, privacy, sharing of information, copyright laws, and software licensing agreements	(iii) discuss sharing of information		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(A) discuss intellectual property, privacy, sharing of information, copyright laws, and software licensing agreements	(iv) discuss copyright laws		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(A) discuss intellectual property, privacy, sharing of information, copyright laws, and software licensing agreements	(v) discuss software licensing agreements		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(B) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies	(i) demonstrate proper digital etiquette		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(B) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies	(ii) demonstrate responsible use of software		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(B) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies	(iii) demonstrate knowledge of acceptable use policies		

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(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(C) explore the effects robots have on changing our culture and society	(i) explore the effects robots have on changing our culture		
(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:	(C) explore the effects robots have on changing our culture and society	(ii) explore the effects robots have on changing our society		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(A) use tools and laboratory equipment safely to construct and repair robots	(i) use tools safely to construct robots		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(A) use tools and laboratory equipment safely to construct and repair robots	(ii) use tools safely to repair robots		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(A) use tools and laboratory equipment safely to construct and repair robots	(iii) use laboratory equipment safely to construct robots		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(A) use tools and laboratory equipment safely to construct and repair robots	(iv) use laboratory equipment safely to repair robots		

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(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(B) identify and describe the steps needed to produce a prototype	(i) identify the steps needed to produce a prototype		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(B) identify and describe the steps needed to produce a prototype	(ii) describe the steps needed to produce a prototype		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(C) use software applications to simulate robotic behavior, present design concepts, and test solution strategies	(i) use software applications to simulate robotic behavior		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(C) use software applications to simulate robotic behavior, present design concepts, and test solution strategies	(ii) use software applications to present design concepts		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(C) use software applications to simulate robotic behavior, present design concepts, and test solution strategies	(iii) use software applications to test solution strategies		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(D) demonstrate the use of computers to manipulate a robot			

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(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(E) demonstrate knowledge of process control design factors			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(F) demonstrate knowledge of different types of sensors used in robotics			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(G) demonstrate knowledge and use of effectors	(i) demonstrate knowledge of effectors		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(G) demonstrate knowledge and use of effectors	(ii) demonstrate use of effectors		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(H) implement multiple sensors in a robot			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(I) interpret sensor feedback and calculate threshold values	(i) interpret sensor feedback		

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(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(I) interpret sensor feedback and calculate threshold values	(ii) calculate threshold values		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(J) demonstrate knowledge of motors, gears, and gear trains used in a robot	(i) demonstrate knowledge of motors used in a robot		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(J) demonstrate knowledge of motors, gears, and gear trains used in a robot	(ii) demonstrate knowledge of gears used in a robot		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(J) demonstrate knowledge of motors, gears, and gear trains used in a robot	(iii) demonstrate knowledge of gear trains used in a robot		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(K) implement infrared range sensing			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(L) apply measurement and geometry to calculate robot navigation	(i) apply measurement to calculate robot navigation		

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(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(L) apply measurement and geometry to calculate robot navigation	(ii) apply geometry to calculate robot navigation		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(M) implement movement control using shaft encoding			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(N) demonstrate robot navigation			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(O) implement path planning using geometry and multiple sensor feedback	(i) implement path planning using geometry		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(O) implement path planning using geometry and multiple sensor feedback	(ii) implement path planning using multiple sensor feedback		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(P) program a robot to perform simple tasks, including, following lines, moving objects, and avoiding obstacles	(i) program a robot to perform simple tasks, including following lines		

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(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(P) program a robot to perform simple tasks, including, following lines, moving objects, and avoiding obstacles	(ii) program a robot to perform simple tasks, including moving objects		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(P) program a robot to perform simple tasks, including, following lines, moving objects, and avoiding obstacles	(iii) program a robot to perform simple tasks, including avoiding obstacles		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(Q) demonstrate and implement a robotic task solution using robotic arm construction	(i) demonstrate a robotic task solution using robotic arm construction		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(Q) demonstrate and implement a robotic task solution using robotic arm construction	(ii) implement a robotic task solution using robotic arm construction		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(R) demonstrate knowledge of feedback control loops to provide information			
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(S) demonstrate knowledge of torque and power factors used in the operation of a robot servo	(i) demonstrate knowledge of torque used in the operation of a robot servo		

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(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(S) demonstrate knowledge of torque and power factors used in the operation of a robot servo	(ii) demonstrate knowledge of power factors used in the operation of a robot servo		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(T) troubleshoot and maintain robotic systems and subsystems	(i) troubleshoot robotic systems		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(T) troubleshoot and maintain robotic systems and subsystems	(ii) troubleshoot robotic subsystems		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(T) troubleshoot and maintain robotic systems and subsystems	(iii) maintain robotic systems		
(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:	(T) troubleshoot and maintain robotic systems and subsystems	(iv) maintain robotic subsystems		