

PLTW ROBOTICS & AUTOMATION	
CURRICULUM/CONTENT AREA	COURSE LENGTH
<i>ATE</i>	<i>45 Days</i>
GRADE LEVEL	DATE LAST REVIEWED
<i>7-8</i>	<i>2022</i>
PREREQUISITE(s) if applicable	BOARD APPROVAL DATE
<i>None</i>	<i>11/15/2022</i>
PRIMARY RESOURCE if applicable	
<i>PLTW Robotics and Automation</i>	
DESIRED RESULTS	
COURSE DESCRIPTION AND PURPOSE	
<p><i>Design, Build, and Program a Robot! Students use tools such as the engineering design process, an engineering notebook, and VEX Robotics® programming software to invent and innovate. Learn how creative thinking and problem solving can change your world! Automation and Robotics (AR) allows students to trace the history, development, and influence of automation and robotics as they learn about mechanical systems, energy transfer, machine automation, and computer control systems. Students use the VEX Robotics® platform to design, build, and program real-world objects such as traffic lights, toll booths, and robotic arms.</i></p>	
ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
<i>Students will understand that...</i>	<i>Students will keep considering...</i>
Creativity, innovation, and critical thinking are essential for success in a technologically advanced world.	Why is creativity and innovation important? How is creativity and innovation used in automation?
	What strategies and processes can I use to become a more effective creator, thinker and problem solver?
The ability to communicate and collaborate with people with diverse backgrounds and perspectives is key to participation in a global economic society.	Why is communication and collaboration important? How do positive work behaviors and personal qualities impact communication and collaboration?

	<p>What is effective teamwork? What strategies can I use/teams use to work better together? How can perspectives and experiences of a diverse group develop innovative solutions to a given problem?</p>
<p>Career and technical education provides pathways to high-demand, high-wage career opportunities, and personal fulfillment.</p>	<p>Why is career and life readiness important? What jobs and careers are available to meet individual and societal needs locally, regionally, and nationally?</p> <p>How might technical knowledge and skills influence one's employability and advancement opportunities within various work settings?</p> <p>What are employability skills? How do I prepare myself for a career that is in demand now and in 5, 10, or 20 years from now?</p>

PRIORITY CAREER & TECHNICAL STANDARDS

Students will be skilled at...

Creativity, Critical Thinking, Communication and Collaboration

4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.

- a: I develop effective resolutions for a given problem, decision or opportunity using available information.
- b: I develop and implement a resolution for a new situation using personal knowledge and experience.

Career Development

CD4: Students will identify and apply employability skills.

- a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.
- c: I identify and exhibit traits for retaining employment.
- d: I develop positive relationships with others.

PRIORITY CONTENT STANDARDS

Students will know...

Standard: BB1: Students will analyze the core concepts of technology.

Standard: ENG1: Students will analyze and demonstrate the attributes of design.

Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.

MECHANISMS			
STAGE 1: Desired Unit Results What will students understand as a result of the unit?		STAGE 2: Assessment Evidence By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?	
ESSENTIAL QUESTION (s) What thought-provoking questions will foster inquiry, understanding, and transfer of learning?		Success Criteria with Standards The criteria for evaluating performance on standards is constant.	
What strategies and processes can I use to become a more effective creator, thinker and problem solver?		CTE standards-based Rubric: Throughout the course, students and teachers use the rubric for communication of success criteria, reflection, goal setting, and feedback.	
What is effective teamwork? What strategies can I use/teams use to work better together? How can perspectives and experiences of a diverse group develop innovative solutions to a given problem?		In their portfolio/evidence journal, students will reflect on the essential questions through a quick write, constructed response.	
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		Performance Tasks Options/ Assessment Strategies by Standard Students may be given options to show their learning in varied ways.	
Creativity, Critical Thinking, Communication and Collaboration			
4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.			
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.5.m: I can analyze symptoms to identify the root cause of a problem. 4C2.a.6.m: I can develop multiple resolutions for a given problem, decision or opportunity. 4C2.a.7.m: I can identify problems that became worse due to poorly thought out or poorly informed solutions C2.a.8.m: I can explain how implementation of a solution or action may affect one or more corresponding systems. C2.a.9.m: I can explain how different resolutions may be appropriate under different circumstances. 4C2.a.10.m: I can explain the process for choosing an action or making a decision.	Students will work cooperatively in teams to create multiple mechanisms which will demonstrate knowledge of speed, force, torque, direction and types of motion.	
Career Development			
CD4: Students will identify and apply employability skills.			
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.3.m: I can demonstrate self discipline, self-worth, positive attitude and integrity. CD4.a.4.m: I can demonstrate flexibility and willingness to learn new knowledge and skills. CD4.a.5.m: I can identify positive work qualities typically desired in each of the career cluster's pathways.		Students will reflect in their portfolio/evidenced based journal: Think about your experience working in a team and what worked well or did not work well. From your experience, identify two rules for working effectively in a team. For example, "We will listen to each other without interrupting."
c: I identify and exhibit traits for retaining employment.	CD4.c.2.m: I can demonstrate the behavior and etiquette appropriate to interactions with adults.		

	CD4.c.3.m: I can distinguish between appropriate behaviors in a social vs. professional setting.	
d: I develop positive relationships with others.	CD4.d.3.m: I can interact with others in a respectful and non-judgmental manner.	
	CD4.d.4.m: I can use cooperative behavior in helping peers accomplish goals and tasks.	
PRIORITY CONTENT STANDARDS & Learning Targets		Performance Tasks Options/ Assessment Strategies by Standard
Standard: BB1: Students will analyze the core concepts of technology.	I can build, test and troubleshoot simple linear, rotary and compound mechanisms.	Students will work cooperatively in teams to create multiple mechanisms which will demonstrate knowledge of speed, force, torque, direction and types of motion.
Standard: ENG1: Students will analyze and demonstrate the attributes of design.	I can stay within the requirements for a design that are made up of criteria and constraints.	
Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	I can build, test, and accurately measure results to improve a design.	
Standard: ICT1: Students will analyze, select and use information and communication technologies.	I can comprehend and engage in communication methods to convey ideas, concepts and requirements to other individuals and teams.	
Standard: MNF1: Students will be able to select and use manufacturing technologies.	I can use tools, equipment and machines safely.	
Stage 3: Learning Activities		
A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unfold in a natural flow?		
GUIDING UNIT QUESTIONS	STRATEGIES/ACTIVITIES	RESOURCES/MATERIALS
Using Costas Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning	What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.	This includes an applicable textbooks, software, industry recognized certification software/tools, subscriptions (such asPLTW), etc.
How do robotics and automation significantly contribute to our lives today?		VexCode V5 and VexCode VR
What is the purpose of being able to change speed, force, torque, direction, and types of motion with a mechanism?	explicit instruction in L.A.U.N.C.H. cycle (design thinking)	L.A.U.N.C.H. Design Thinking by John Spencer resources
Describe some of the mechanisms you use in your daily life.		Defined Learning/Defined STEM
How does understanding gear ratios help designers build machines to accomplish specific tasks?		PLTW Robotics & Automation curriculum resources

Look around your classroom, school, and community to identify mechanisms in action. What does each mechanism do?		
What did you find easy and challenging about building the mechanism models?		

PROGRAMMING & AUTOMATION		
STAGE 1: Desired Unit Results What will students understand as a result of the unit?		STAGE 2: Assessment Evidence By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?
ESSENTIAL QUESTION (s) What thought-provoking questions will foster inquiry, understanding, and transfer of learning?		Success Criteria with Standards The criteria for evaluating performance on standards is constant.
Why is creativity and innovation important? How is creativity and innovation used in automation?		CTE standards-based Rubric: Throughout the course, students and teachers use the rubric for communication of success criteria, reflection, goal setting, and feedback.
How might technical knowledge and skills influence one's employability and advancement opportunities within various work settings?		In their portfolio/evidence journal, students will reflect on the essential questions through a quick write, constructed response.
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		Performance Tasks Options/ Assessment Strategies by Standard
Creativity, Critical Thinking, Communication and Collaboration 4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.		
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.5.m: I can analyze symptoms to identify the root cause of a problem.	Students will work cooperatively in teams to program multiple mechanisms which will demonstrate knowledge of speed, force, torque, direction and types of motion to complete automated tasks. Students will reflect in their portfolio/evidenced based journal: When wiring, configuring, and programming hardware components, how do you fix unexpected errors? What problems are you interested in that you might solve with automation? What steps should you follow to investigate and pursue potential solutions? How can you apply the skills you learned throughout this unit to investigate and pursue potential solutions?
	4C2.a.6.m: I can develop multiple resolutions for a given problem, decision or opportunity.	
	4C2.a.7.m: I can identify problems that became worse due to poorly thought out or poorly informed solutions	
	C2.a.8.m: I can explain how implementation of a solution or action may affect one or more corresponding systems.	
	C2.a.9.m: I can explain how different resolutions may be appropriate under different circumstances.	
	4C2.a.10.m: I can explain the process for choosing an action or making a decision.	
Career Development CD4: Students will identify and apply employability skills.		
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.3.m: I can demonstrate self discipline, self-worth, positive attitude and integrity.	Students will reflect in their portfolio/evidenced based journal: "How might you apply the skills of working on a team and effective communication in your daily life? How does having a diverse team lead to better solutions?"
	CD4.a.4.m: I can demonstrate flexibility and willingness to learn new knowledge and skills.	
	CD4.a.5.m: I can identify positive work qualities typically desired in each of the career cluster's pathways.	
c: I identify and exhibit traits for retaining employment.	CD4.c.2.m: I can demonstrate the behavior and etiquette appropriate to interactions with adults.	

	CD4.c.3.m: I can distinguish between appropriate behaviors in a social vs. professional setting.	
d: I develop positive relationships with others.	CD4.d.3.m: I can interact with others in a respectful and non-judgmental manner.	
	CD4.d.4.m: I can use cooperative behavior in helping peers accomplish goals and tasks.	
PRIORITY CONTENT STANDARDS & Learning Targets		Performance Tasks Options/ Assessment Strategies by Standard
Standard: BB1: Students will analyze the core concepts of technology.	I can build, test and troubleshoot simple linear, rotary and compound mechanisms.	Students will work cooperatively in teams to program multiple mechanisms which will demonstrate knowledge of speed, force, torque, direction and types of motion to complete automated tasks.
Standard: ENG1: Students will analyze and demonstrate the attributes of design.	I can stay within the requirements for a design that are made up of criteria and constraints.	
Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	I can build, test, and accurately measure results to improve a design.	
Standard: ICT1: Students will analyze, select and use information and communication technologies.	I can comprehend and engage in communication methods to convey ideas, concepts and requirements to other individuals and teams.	
Standard: MNF1: Students will be able to select and use manufacturing technologies.	I can use tools, equipment and machines safely.	
Stage 3: Learning Activities		
A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unfold in a natural flow?		
GUIDING UNIT QUESTIONS	STRATEGIES/ACTIVITIES	RESOURCES/MATERIALS
Using Costas Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning	What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.	This includes an applicable textbooks, software, industry recognized certification software/tools, subscriptions (such asPLTW), etc.
How does programming language, using proper structure and creating accurate comments aid in developing a program to perform specific tasks?		VexCode V5 and VexCode VR
When wiring, configuring, and programming hardware components, how do you fix unexpected errors?	explicit instruction in L.A.U.N.C.H. cycle (design thinking)	L.A.U.N.C.H. Design Thinking by John Spencer resources
What problems are you interested in that you might solve with automation?		Defined Learning/Defined STEM

What steps should you follow to investigate and pursue potential solutions?		PLTW Robotics & Automation curriculum resources
How can you apply the skills you learned throughout this unit to investigate and pursue potential solutions?		

MECHANISMS		
STAGE 1: Desired Unit Results <i>What will students understand as a result of the unit?</i>		STAGE 2: Assessment Evidence <i>By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?</i>
ESSENTIAL QUESTION (s) <i>What thought-provoking questions will foster inquiry, understanding, and transfer of learning?</i>		Success Criteria with Standards <i>The criteria for evaluating performance on standards is constant.</i>
Why is creativity and innovation important? How is creativity and innovation used in automation?		CTE standards-based Rubric: Throughout the course, students and teachers use the rubric for communication of success criteria, reflection, In their portfolio/evidence journal, students will reflect on the essential questions through a quick write, constructed response.
Why is career and life readiness important? What jobs and careers are available to meet individual and societal needs locally, regionally, and nationally in the area of Robotics & Automation?		
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		Performance Tasks Options/ Assessment Strategies by Standard <i>Students may be given options to show their learning in varied ways.</i>
Creativity, Critical Thinking, Communication and Collaboration		
4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.		
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.5.m: I can analyze symptoms to identify the root cause of a problem. 4C2.a.6.m: I can develop multiple resolutions for a given problem, decision or opportunity. 4C2.a.7.m: I can identify problems that became worse due to poorly thought out or poorly informed solutions C2.a.8.m: I can explain how implementation of a solution or action may affect one or more corresponding systems. C2.a.9.m: I can explain how different resolutions may be appropriate under different circumstances. 4C2.a.10.m: I can explain the process for choosing an action or making a decision.	Students will work cooperatively in teams to program multiple mechanisms which will demonstrate knowledge of speed, force, torque, direction and types of motion to complete design challenges.
Career Development		
CD4: Students will identify and apply employability skills.		
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.3.m: I can demonstrate self discipline, self-worth, positive attitude and integrity. CD4.a.4.m: I can demonstrate flexibility and willingness to learn new knowledge and skills. CD4.a.5.m: I can identify positive work qualities typically desired in each of the career cluster's pathways.	Students will reflect in their portfolio/evidenced based journal: "How might you apply the skills of working on a team and effective communication in your daily life? How does having a diverse team lead to better solutions?"
c: I identify and exhibit traits for retaining employment.	CD4.c.2.m: I can demonstrate the behavior and etiquette appropriate to interactions with adults. CD4.c.3.m: I can distinguish between appropriate behaviors in a social vs. professional setting.	

<p>d: I develop positive relationships with others.</p>	<p>CD4.d.3.m: I can interact with others in a respectful and non-judgmental manner.</p>	
	<p>CD4.d.4.m: I can use cooperative behavior in helping peers accomplish goals and tasks.</p>	
<p>PRIORITY CONTENT STANDARDS & Learning Targets</p>		<p>Performance Tasks Options/ Assessment Strategies by Standard <i>Students may be given options to show their learning in varied ways.</i></p>
<p>Standard: BB1: Students will analyze the core concepts of technology.</p>	<p>I can build, test and troubleshoot simple linear, rotary and compound mechanisms.</p>	<p><i>Students will work cooperatively in teams to program multiple mechanisms which will demonstrate knowledge of speed, force, torque, direction and types of motion to complete design challenges.</i></p>
<p>Standard: ENG1: Students will analyze and demonstrate the attributes of design.</p>	<p>I can stay within the requirements for a design that are made up of criteria and constraints.</p>	
<p>Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.</p>	<p>I can build, test, and accurately measure results to improve a design.</p>	
<p>Standard: ICT1: Students will analyze, select and use information and communication technologies.</p>	<p>I can comprehend and engage in communication methods to convey ideas, concepts and requirements to other individuals and teams.</p>	
<p>Standard: MNF1: Students will be able to select and use manufacturing technologies.</p>	<p>I can use tools, equipment and machines safely.</p>	
<p>Stage 3: Learning Activities <i>A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unfold in a natural flow?</i></p>		
<p>GUIDING UNIT QUESTIONS <i>Using Costas' Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning</i></p>	<p>STRATEGIES/ACTIVITIES <i>What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.</i></p>	<p>RESOURCES/MATERIALS <i>This includes an applicable textbooks, software, industry recognized certification software/tools, subscriptions (such asPLTW), etc.</i></p>
<p>What is the purpose of being able to change speed, force, torque, direction, and types of motion with a mechanism?</p>		<p>VexCode V5 and VexCode VR</p>
<p>How does programming language, using proper structure and creating accurate comments aid in developing a program to perform specific tasks?</p>	<p>explicit instruction in L.A.U.N.C.H. cycle (design thinking)</p>	<p>L.A.U.N.C.H. Design Thinking by John Spencer resources</p>
<p>What problems are you interested in that you might solve with automation?</p>		<p>Defined Learning/Defined STEM</p>
<p>What steps should you follow to investigate and pursue potential solutions?</p>		<p>PLTW Robotics & Automation curriculum resources</p>

How can you apply the skills you learned throughout this unit to investigate and pursue potential solutions?		

Priority Standards	Unit 1	Unit 2	Unit 3
<p>Creativity, Critical Thinking, Communication and Collaboration 4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills. a: I develop effective resolutions for a given problem, decision or opportunity using available information. b: I develop and implement a resolution for a new situation using personal knowledge and experience.</p>	x	x	x
<p>Career Development CD4: Students will identify and apply employability skills. a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable. b: I demonstrate skills related to seeking and applying for employment to find and obtain a desired job. c: I identify and exhibit traits for retaining employment. d: I develop positive relationships with others.</p>	x	x	x
<p>Information, Media, Technology IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives. a: I choose appropriate sources of data and information for a given purpose. b: I determine the relevance, validity and timeliness of data and information. c: I select relevant information necessary for making decisions and solving problems d: I apply data and information to communicate ideas and create new opportunities.</p>			
<p>Standard: BB1: Students will analyze the core concepts of technology.</p>	x	x	x
<p>Standard: ENG1: Students will analyze and demonstrate the attributes of design.</p>	x	x	x
<p>Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.</p>	x	x	x

Standard: ICT1: Students will analyze, select and use information and communication technologies.	x	x	x
Standard: MNF1: Students will be able to select and use manufacturing technologies.	x	x	x