EVERETT PUBLIC SCHOOLS
HS ROBOTICS

Course: STEM Robotics Engineering		**Total Framework Hours up to:** 360
CIP Code: 150405	☐**Exploratory** ☒**Preparatory**	**Date Last Modified:** 07.2014
Career Cluster: Manufacturing		**Cluster Pathway:** Manufacturing Production Process Development

Industry-Recognized Certificates:

Work-Based Learning:

Course Information:
This HS Robotics Framework is aligned with the curriculum and resources from Carnegie Mellon University's Robotics Academy®, Tufts University, LEGO®, Pitsco®, and Intel Corp. The curricular content and teacher collaboration resources are being hosted by Portland State University's Ensemble STEM Robotics site. This is a STEM course which teaches Science, Technology, Engineering and Math concepts through the hardware and software of the LEGO® MINDSTORMS® NXT/EV3 as well as the Tetrix® hardware and RobotC software platforms. Leadership opportunities are present throughout the course and are aligned with *Technology Student Association* (TSA), *FIRST*® Tech Challenge (FTC) competition and For Inspiration and Recognition of Science and Technology

Units 1 – 13 / RobotC and Tetrix Basics
Units 1 through 13 utilize the *RobotC Curriculum for Tetrix® and LEGO® Mindstorms*® from the Carnegie Mellon Robotics Academy® which is available for free online or for purchase on DVD. These units are broken down into lessons, with each lesson containing an Overview, Objectives, Instructor's Guide, Primary Instructional Material and Formative/Summative Assessments. Lessons may also include Differentiated Instructional material and Additional Assessments. The structure, conventions and layout of HS Robotics 101 portion of this curriculum are summarized on this page.Programming lesson encompass the physical Terix® platform.

Units 14-23 / Advanced RobotC and Tetrix
Unit 14- 23 uses the PTC® software provided to FTC teams by *FIRST*® for Computer Aided Design (CAD).Units 22 & 23: adapt the resources from PMforCTE to the *FIRST*® FTC competition.

COMPONENTS AND ASSESSMENTS
Performance Assessments:
• Student will demonstrate knowledge and skills of Robotics lab safety.   • Student will present a plan to pursue a self-selected STEM career pathway
Leadership Alignment:
2.C.2 Analyze and evaluate major alternative points of view   2.C.3 Synthesize and make connections between information and arguments   3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)

1.A.1 Use a wide range of idea creation techniques (such as brainstorming)
1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
Produce Results
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results

Standards and Competencies

Unit: (Yr 1) Safety and STEM Career Awareness (covered as appropriate throughout course)
Describe health and safety procedures in a NXT/EV3 Robotics lab.
Identify STEM careers and pathways.

Industry Standards and/or Competencies	Total Learning Hours for Unit: 10

- Identify health and safety risks in a Tetrix Robotics lab
- Explain health and safety procedures which address risks in a Tetrix Robotics lab
- Describe the breadth of possible STEM careers
- Identify and explore a STEM career related to an area of student interest
- Explain the education pathway to a given STEM career

Aligned Common Core & Washington State Standards	
Art	4.5.1: Applies and analyzes how arts knowledge, skills, and work habits are needed and used in the world of work.
Educational Technology	1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning
English Language Arts	9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

	9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. S-MD 5: (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
Science	9-12 SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12 SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12 SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12 APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12 APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12 APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12 APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12 APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11 PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel. 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11 PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will create a research report on real and fictional robots.
- Student will demonstrate key attributes of NXT/EV3 components.

Leadership Alignment:
3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts

3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

Standards and Competencies

Unit: Introduction to Robotics
Describe characteristics of robots and explain/use NXT/EV3 components

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 15

- Identify characteristics of a robot
- Create a research report on important/iconic robotics, both real and fictional
- Describe how the functions and characteristics of a robot can been seen in the NXT/EV3 system
- Explain the sense and response systems of the NXT/EV3 system
- Document/describe key attributes of the NXT/EV3 electronic, mechanical and structural components

Aligned Common Core & Washington State Standards

Art	4.5.1: Applies and analyzes how arts knowledge, skills, and work habits are needed and used in the world of work.
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

	9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel. 9-11PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

Social Studies	4.1.1: Analyzes a major historical event and how it is represented on timelines from different cultural perspectives.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will identify Tetrix components and best practices

Leadership Alignment:
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results

Standards and Competencies

Unit: Introduction to Tetrix Hardware
Identify Tetrix hardware components and their uses
Demonstrate knowledge of Tetrix safety and best building practices

Industry Standards and/or Competencies	Total Learning Hours for Unit: 10
- Identify Tetrix structure components and their uses - Identify Tetrix mechanical components and their uses - Identify Tetrix electronic components and their uses - Demonstrate proficiency with Tetrix safety guidelines - Demonstrate proficiency with Tetrix best building practices	

Aligned Common Core & Washington State Standards

Educational Technology	1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context.
Science	9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.

	9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.
	9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.
	9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will build a basic Tetrix robot

Leadership Alignment:

9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds

9.B.2 Respond open-mindedly to different ideas and values

1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

2.D.2 Identify and ask significant questions that clarify various points of view

Standards and Competencies

Unit: Tetrix First Build (2WD platform with sensors)

Construct a two-wheel drive Tetrix robot with all four basic sensors

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 15

- Build and test a Tetrix robot chassis
- Demonstrate proficiency with DC motor installation and wiring, including encoders
- Build and test a Tetrix robot with a 2WD drivetrain
- Build and test a Tetrix robot with sound, light, ultrasonic and touch sensors
- Test front-wheel-drive, rear-wheel-drive, and various idler wheel combinations

Aligned Common Core & Washington State Standards

Educational Technology	1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest

9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone.

11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.

9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

	11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will program Tetrix robots to move using both dead reckoning and odometry

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: Introduction to RobotC Programming (basic & precision movement)
Create RobotC programs for dead reckoning movement of Tetrix robots (time and power-based movement)
Create RobotC programs for odometery movement of Tetrix robots (encoder-based movement)

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 15

- Demonstrate proficient use of RobotC for Tetrix programming environment
- Configure RobotC for Tetrix DC motor operations
- Write, test and debug programs for Tetrix robot straight movement with dead reckoning
- Write, test and debug programs for Tetrix robot turning movement with dead reckoning
- Write, test and debug programs for Tetrix robot complex movement with dead reckoning
- Write, test and debug programs for Tetrix robot straight movement with odometry
- Write, test and debug programs for Tetrix robot turning movement with odemetry
- Write, test and debug programs for Tetrix robot complex movement with odometry

Aligned Common Core & Washington State Standards	
Educational Technology	1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone.

11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.

9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

	9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies.

| 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. |
| 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. |
| 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction. |
| 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). |
| 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. |
| 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. |

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will program Tetrix robots to use the four basic NXT/EV3 sensors

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: RobotC Sensors (Using basic NXT/EV3 / EV3 sensors)
Create RobotC programs using the touch, light, ultrasonic and sound sensors on Tetrix robots
Create RobotC programs for Tetrix robots using while, if/else, switch case and timer control constructs

| **Industry Standards and/or Competencies** | **Total Learning Hours for Unit:** 15 |

- Write, test and debug programs for Tetrix robots using the touch sensor
- Write, test and debug programs for Tetrix robots using the While loop
- Write, test and debug programs for Tetrix robots using the ultrasonic sensor
- Write, test and debug programs for Tetrix robots using the light sensor
- Write, test and debug programs for Tetrix robots using the If/Else
- Write, test and debug programs for Tetrix robots using the Switch-Case
- Write, test and debug programs for Tetrix robots using Timers
- Write, test and debug line following programs for Tetrix robots
- Write, test and debug programs for Tetrix robots using the sound sensor

Aligned Common Core & Washington State Standards	
Communications	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

	9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

	F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds.

	9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will program Tetrix robots to use servo motors

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: RobotC Manipulators (using servos)
Create RobotC programs for single servo operations on Tetrix robots
Create RobotC programs for multi-servo operations on Tetrix robots
Create RobotC programs for complex servo and movements operations on Tetrix robots

Industry Standards and/or Competencies	Total Learning Hours for Unit: 15
- Configure RobotC for Tetrix servo motor operations - Write, test and debug programs for Tetrix robot precision servo control - Write, test and debug programs for Tetrix robot precision multi-servo control - Write, test and debug programs for Tetrix robot coordinated movement and manipulator control - Write, test and debug programs for Tetrix robot coordinated movement and complex apparatus control	

Aligned Common Core & Washington State Standards

Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities.

	1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

	9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematic	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will design and build a robot that makes decisions based on sensory input

Leadership Alignment:
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best analysis
2.C.5 Reflect critically on learning experiences and processes
3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
3.A.2 Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.A.1 Know when it is appropriate to listen and when to speak
9.A.2 Conduct themselves in a respectable, professional manner
9.B.2 Respond open-mindedly to different ideas and values

9.B.3 Leverage social and cultural differences to create new ideas and increase both innovation and quality of work	
Standards and Competencies	
Unit: Decisions, Decisions (using switch blocks and advanced flow charts) Build robots that make binary decisions based on sensory input. Plan and develop branching programs with switch blocks nested inside loops.	
Industry Standards and/or Competencies	**Total Learning Hours for Unit: 15**

- Explain each parameter of the switch block configuration panel
- Program a robot to make decisions based on sensory input
- Explain how a fast switch block nested inside a loop improves detection behavior
- Build and program a robot to continuously detect objects
- Build and program a robot to follow a line
- Create a flow chart to design a hierarchical program
- Design, build and program a sumobot robot which pushes an opponent out of an arena

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	A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE4: For exponential models, express as a logarithm the solution to $abct = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.

	9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will design, build and program a robot that uses variable parameters, algebraic calculations and Boolean logic.

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values
3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
3.A.2 Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
3.A.4 Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
3.A.5 Communicate effectively in diverse environments (including multi-lingual

Standards and Competencies

Unit: Variables and Logic (using variables, math blocks and Boolean logic)
Build and program robots that override block data with parameters passed from a Variable Block.
Build and program robots that use algebraic combinations of multiple variables through Math Blocks.
Build and program robots that use Boolean logic to control program flow.

Industry Standards and/or Competencies	Total Learning Hours for Unit: 15

- Describe the purpose of a Variable Block in NXT/EV3
- Explain the parameters on the Variable Block
- Program a robot to write and read variables
- Program a robot to display variables on the NXT/EV3 screen
- Describe the purpose of a Math Block in NXT/EV3
- Explain the parameters on the Math Block
- Program a robot to respond to algebraic combinations of variables using Math Blocks
- Describe the Boolean logic data type and operators in NXT/EV3
- Explain the Boolean logic data plugs in various NXT/EV3 block
- Program a robot to respond to a logic-controlled Loop Block

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	9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.
	11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
	9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
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	9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
	11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
	9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
	11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
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	11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
	9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
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	N-Q2: Define appropriate quantities for the purpose of descriptive modeling.
	N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
	A-SSE1: Interpret expressions that represent a quantity in terms of its context.
	A-CED1: Create equations and inequalities in one variable and use them to solve problems.
	A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
	A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
	A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
	A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
	F-BF1: Write a function that describes a relationship between two quantities.
	F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions.
	F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

	F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.

	9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will program Tetrix robots using variables and functions

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: RobotC Functions (using variables, functions and debugging)
Create RobotC programs for Tetrix robots using variables to improve flexibility and efficiency
Create RobotC programs for Tetrix robots using functions to improve flexibility and efficiency

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 15
• Demonstrate proficiency with variables and data types in RobotC • Write, test and debug programs for Tetrix robots using variables and different data types • Write, test and debug programs for Tetrix robots using variables for While loop. If/Else and Switch-Case control constructs • Write, test and debug programs for Tetrix robots using functions	

- Write, test and debug programs for Tetrix robots using variables within functions

Aligned Common Core & Washington State Standards	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

	9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions.

	F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds.

	9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

Unit 11:

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will build Tetrix robots with active attachments

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit: Tetrix Manipulators (attachments using servo motors)
Build Tetrix robots with active attachments utilizing both Tetrix servo and NXT/EV3 motors

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 15
- Demonstrate proficiency with servo motor installation and wiring - Build and test an arm and gripper attachment - Build and test a harvester and transporter attachment - Build and test a dispenser attachment - Build and test a launcher attachment - Design, build and test a custom attachment	

Aligned Common Core & Washington State Standards	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities.

	1.2.1: Communicate and collaborate to learn with others.
	1.3.2: Locate and organize information from a variety of sources and media.
	1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions
	2.2.1: Develop skills to use technology effectively.
	2.2.2: Use a variety of hardware to support learning.
	2.3.1: Select and use common applications.
	2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
	11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
	9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
	11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
	9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
	11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
	9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
	11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone.
	11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.
	9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.
	11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
	9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
	11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
	11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
	9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
	11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

	9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
	11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
	9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
	11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
	9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
	11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
	9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
	9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
	9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
	11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
	N-Q2: Define appropriate quantities for the purpose of descriptive modeling.
	N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
	A-SSE1: Interpret expressions that represent a quantity in terms of its context.
	A-CED1: Create equations and inequalities in one variable and use them to solve problems.
	A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
	A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
	A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
	F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
	F-BF1: Write a function that describes a relationship between two quantities.
	F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions.
	F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
	F-LE5: Interpret the parameters in a linear or exponential function in terms of a context.
	G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
	G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
	G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
	S-ID9: Distinguish between correlation and causation.
	S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.
	9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.
	9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.
	9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge.
	9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.
	9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.
	9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.
	9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.
	9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies.
	9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.
	9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction.
	9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia).
	9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.
	9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will design, build and program a robot that uses advanced (third party) sensors and Bluetooth communications.

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette

10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values
3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
3.A.2 Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
3.A.4 Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
3.A.5 Communicate effectively in diverse environments (including multi-lingual

Standards and Competencies

Standard/Unit: Advanced NXT / EV3 Sensors (Bluetooth and third-party sensors)
Build and program robots that use Bluetooth communication
Build and program robots that use advanced third-party sensors

Industry Standards and/or Competencies	Total Learning Hours for Unit: 15

- Explain each parameter of the Bluetooth, Send Message and Receive Message blocks' configuration panel
- Program a robot to send and receive Bluetooth messages
- Design, build and program a robot that communicate to compete a group task
- Design, build and program a multi-NXT/EV3 brick robot
- Import and install NXT/EV3 blocks for third party sensors
- Explain each parameter of the third-party block configuration panel
- Design, build and program a robot using third party sensors

Aligned Common Core & Washington State Standards	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone.

11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.

9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to $abct = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

	S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will program Tetrix robots for Bluetooth wireless remote control

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view

2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: RobotC Teleop (Remote Control)
Create RobotC programs for Tetrix robot remote control movement through joystick commands
Create RobotC programs for Tetrix robot remote control manipulators through joystick button commands

Industry Standards and/or Competencies	**Total Learning Hours for Unit: 10**

- Demonstrate proficiency with establishing Bluetooth communication between PC and Tetrix robot
- Write, test and debug programs for Tetrix robot remote control of basic movement through joystick commands
- Write, test and debug programs for Tetrix robot remote control of optimized movement through joystick commands
- Write, test and debug programs for Tetrix robot remote control of manipulators and mechanical apparatus through joystick and button commands
- Write, test and debug programs for Tetrix robots combining remote control and sensor-based autonomous actions

Aligned Common Core & Washington State Standards	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone.

11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.

9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

	9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to $abct = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.

	9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.
	9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.
	9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge.
	9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.
	9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.
	9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.
	9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.
	9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies.
	9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.
	9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction.
	9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia).
	9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.
	9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
	9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds.
	9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will demonstrate knowledge and skills of Robotics lab safety.
- Student will present a plan to pursue a self-selected STEM career pathway

Leadership Alignment:
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
1.A.1 Use a wide range of idea creation techniques (such as brainstorming)
1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
Produce Results
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual

10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results

Standards and Competencies	
Unit: Safety and STEM Career Awareness (covered as appropriate throughout course) Describe health and safety procedures in a Tetrix Robotics lab. Identify STEM careers and pathways.	
Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 10
- Identify health and safety risks in a Tetrix Robotics lab - Explain health and safety procedures which address risks in a Tetrix Robotics lab - Describe the breadth of possible STEM careers - Identify and explore a STEM career related to an area of student interest - Explain the education pathway to a given STEM career	

Aligned Common Core & Washington State Standards	
Art	4.5.1: Applies and analyzes how arts knowledge, skills, and work habits are needed and used in the world of work.
Educational Technology	1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning
English Language Arts	9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

	9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
	11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
	N-Q2: Define appropriate quantities for the purpose of descriptive modeling.
	N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
	A-SSE1: Interpret expressions that represent a quantity in terms of its context.
	S-MD 5: (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
Science	9-12 SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.
	9-12 SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.
	9-12 SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.
	9-12 APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.
	9-12 APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.
	9-12 APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies.
	9-12 APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.
	9-12 APPF: It is important for all citizens to apply science and technology to critical issues that influence society.
	9-11 PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel.
	9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.
	9-11 PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will design Tetrix robots in a 3-D CAD environment

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:

10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: CAD for Tetrix (Computer Aided Design of Tetrix Robots)
Design 3-D models of Tetrix robots with CAD tools
Manipulate and animate Tetrix robots in a 3-D CAD environment

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 20

- Demonstrate proficient use of 3-D CAD environment
- Design and manipulate Tetrix structural sub-assemblies with CAD
- Design, manipulate and animate Tetrix active mechanical sub-systems with CAD
- Design, manipulate and animate complete Tetrix robots with CAD

Aligned Common Core & Washington State Standards	
Communications	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

	11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling.

	N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED 2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-CO2: Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). G-CO3: Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. G-CO5: Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. G-CO12: Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-GPE7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies.

	9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. . 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will build Tetrix robots with advanced hardware

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: Tetrix Advanced Hardware (treads and chain/sprocket)
Build Tetrix robots with chain and sprocket assemblies
Build Tetrix robots with tank-tread assemblies

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 15
- Demonstrate proficiency with chain and sprocket assemblies - Build and test a Tetrix robot with chain and sprocket propulsion - Build and test a Tetrix robot with a chain and sprocket manipulator - Build and test a Tetrix robot with beveled gear assemblies - Demonstrate proficiency with tank-tread assemblies	

- Build and test a Tetrix robot with tank-tread propulsion
- Build and test a Tetrix robot with a tank tread manipulator

Aligned Common Core & Washington State Standards	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

	9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

	G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will build Tetrix robots with FTC-legal fabricated materials

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically

10.B.1.b Manage time and projects effectively

10.B.1.c Multi-task

10.B.1.d Participate actively, as well as be reliable and punctual

10.B.1.e Present oneself professionally and with proper etiquette

10.B.1.f Collaborate and cooperate effectively with teams

10.B.1.g Respect and appreciate team diversity

10.B.1.h Be accountable for results

3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams

3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds

9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: Tetrix Custom Hardware (plexiglass & aluminum fabrication)
Build Tetrix robots with fabricated plexiglass assemblies
Build Tetrix robots with fabricated aluminum assemblies

Industry Standards and/or Competencies	Total Learning Hours for Unit: 15

- Demonstrate proficiency and safety with plexiglass cutting, drilling and molding equipment
- Build and test a Tetrix robot with a fabricated plexiglass assembly
- Demonstrate proficiency and safety with aluminum cutting, drilling and manipulating equipment
- Build and test a Tetrix robot with a fabricated sheet aluminum assembly
- Build and test a Tetrix robot with a fabricated tube aluminum assembly

Aligned Common Core & Washington State Standards	
Educational Technology	1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

	9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. as in words in order to address a question or solve a problem. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

	N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-BF1: Write a function that describes a relationship between two quantities. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will program Tetrix robots using advanced third party sensors

Leadership Alignment:

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs

2.C.2 Analyze and evaluate major alternative points of view

2.C.3 Synthesize and make connections between information and arguments

2.C.4 Interpret information and draw conclusions based on the best an

1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

2.D.2 Identify and ask significant questions that clarify various points of view

2.C.5 Reflect critically on learning experiences and processes

10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:

10.B.1.a Work positively and ethically

10.B.1.b Manage time and projects effectively

10.B.1.c Multi-task

10.B.1.d Participate actively, as well as be reliable and punctual

10.B.1.e Present oneself professionally and with proper etiquette

10.B.1.f Collaborate and cooperate effectively with teams

10.B.1.g Respect and appreciate team diversity

10.B.1.h Be accountable for results

3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams

3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds

9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: RobotC Advanced Sensors (third party sensors)

Create RobotC programs for Tetrix robots using an advanced third-party sensor

Create RobotC programs for Tetrix robots using a sensor multiplexor and multiple sensors

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 15

- Demonstrate proficiency with installing third party sensor software
- Write, test and debug programs for Tetrix robots using a third-party sensor
- Write, test and debug programs for Tetrix robots using a third-party sensor multiplexor
- Write, test and debug programs for Tetrix robots using multiple sensors (LEGO and third party) and a third-party sensor multiplexor

Aligned Common Core & Washington State Standards	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.

English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
	11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
	9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
	11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
	9-10SL 4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
	11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
	9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
	11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone.
	11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.
	9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.
	11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
	9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
	11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
	11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
	9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
	11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
	9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
	11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
	9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
	11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

	9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to $abct = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

	G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will build Tetrix robots with third party and custom sensors

Leadership Alignment:

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs

2.C.2 Analyze and evaluate major alternative points of view

2.C.3 Synthesize and make connections between information and arguments

2.C.4 Interpret information and draw conclusions based on the best an

1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

2.D.2 Identify and ask significant questions that clarify various points of view

2.C.5 Reflect critically on learning experiences and processes

10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:

10.B.1.a Work positively and ethically

10.B.1.b Manage time and projects effectively

10.B.1.c Multi-task

10.B.1.d Participate actively, as well as be reliable and punctual

10.B.1.e Present oneself professionally and with proper etiquette

10.B.1.f Collaborate and cooperate effectively with teams

10.B.1.g Respect and appreciate team diversity

10.B.1.h Be accountable for results

3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams

3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds

9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: Tetrix Advanced Sensors (third party and custom sensors
Build Tetrix robots incorporating third party sensors

Industry Standards and/or Competencies	**Total Learning Hours for Unit: 15**
- Demonstrate proficiency with sensor multiplexor and third-party sensor installation - Build and test a Tetrix robot incorporating sensor multiplexors and third-party sensors - Demonstrate proficiency with custom sensor design and installation - Build and test a Tetrix robot incorporating a custom sensor design	

Aligned Common Core & Washington State Standards	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

	11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
	9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
	11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
	9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
	11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
	9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
	11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone.
	11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.
	9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.
	11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
	9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
	11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
	11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
	9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
	11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
	9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
	11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
	9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
	11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
	9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

	11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph off is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context.

	G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will develop and execute a mock project plan

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit: Introduction to Project Management
Initiate and develop a detailed project plan
Execute and monitor a detailed project plan

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 15

- Demonstrate proficiency with conventions and tools for project planning
- Initiate a project plan, including project analysis, scope, stakeholders and charter
- Develop a project plan, including work breakdown, budget, schedule, roles/responsibilities and communication plan
- Execute a project plan, including resource acquisition/allocation, deliverables and quality assurance
- Monitor a project plan, including performance measurement, risk management and adapting to change
- Close a project plan, including post-project review

Aligned Common Core & Washington State Standards	
Communications	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results

	1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

	11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. 9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP2: Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities and use this characterization to determine if they are independent.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.

| | 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.
9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.
9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge.
9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.
9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.
9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings.
9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.
9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.
9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.
9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies.
9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.
9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. |

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will develop and execute a detailed project plan for a *FIRST®* Tech Challenge competition

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit:

Initiate and develop a detailed project plan for a *FIRST*® Tech Challenge competition
Execute and monitor a detailed project plan a *FIRST*® Tech Challenge competition
Close out a project plans for a *FIRST*® Tech Challenge competition

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 30

- Initiate a FTC project plan, including detailed project analysis and stakeholder identification/buy-in
- Develop a FTC project plan, including work breakdown, budget, schedule, roles/responsibilities and communication plan
- Execute a FTC project plan, including resource acquisition/allocation, deliverables and quality assurance
- Monitor a FTC project plan, including performance measurement, risk management and adapting to change
- Close a FTC project plan, including post-project review and documentation of learning/best-known-methods

Aligned Common Core & Washington State Standards	
Communications	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone.

11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.

9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

	9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP2: Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities and use this characterization to determine if they are independent.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will build Tetrix robots for competition in the *FIRST*® Tech Challenge

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: Hardware Design for Competition (FIRST® Tech Challenge)
Build Tetrix robot for autonomous and teleop operations in the *FIRST*® Tech Challenge

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 20

- Demonstrate proficiency with the setup and use of the FTC Samantha module
- Demonstrate proficiency with the setup and use of the FTC Field Control System
- Demonstrate proficiency with use of the FTC competition hardware checklist
- Design, build and test Tetrix robot for FTC autonomous mode scenarios
- Design, build and test Tetrix robot for FTC teleop mode operations
- Demonstrate proficiency with competitive hardware management techniques, including risk management, redundancy, fault tolerance, quality/reliability controls

Aligned Common Core & Washington State Standards	
Communications	
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools.
	1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities.
	1.2.1: Communicate and collaborate to learn with others.
	1.3.2: Locate and organize information from a variety of sources and media.
	1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results
	1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions
	2.2.1: Develop skills to use technology effectively.

	2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

	9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
	11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
	9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
	11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
	9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
	11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
	9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
	9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
	9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
	11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
	9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
	N-Q2: Define appropriate quantities for the purpose of descriptive modeling.
	N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
	A-SSE1: Interpret expressions that represent a quantity in terms of its context.
	A-CED1: Create equations and inequalities in one variable and use them to solve problems.
	A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
	A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
	A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
	F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
	F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
	F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
	F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
	F-BF1: Write a function that describes a relationship between two quantities.
	F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions.
	F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

	F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-GPE7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). S-CP2: Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities and use this characterization to determine if they are independent.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQA: Scientists generate and evaluate questions to investigate the natural world. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies.

9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.

9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society.

9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction.

9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction.

9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia)

9-11 PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel.

9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.

9-11PS2A: Atoms are composed of protons, neutrons, and electrons. The nucleus of an atom takes up very little of the atom's volume but makes up almost all of the mass. The nucleus contains protons and neutrons, which are much more massive than the electrons surrounding the nucleus. Protons have a positive charge, electrons are negative in charge, and neutrons have no net charge.

9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.

9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds.

9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
- Student will program Tetrix robots for competition in the *FIRST*® Tech Challenge

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results

3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Unit: Software Design for Competition (FIRST® Tech Challenge)
Create autonomous RobotC programs for Tetrix robots competing in the FIRST® Tech Challenge
Create teleop RobotC programs for Tetrix robots competing in the FIRST® Tech Challenge

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 25

- Demonstrate proficiency with the setup and use of the FTC Samantha module
- Demonstrate proficiency with the setup and use of the FTC Field Control System
- Demonstrate proficiency with use of the FTC competition software templates
- Demonstrate proficiency with use of the FTC competition software checklist
- Write, test and debug programs for multiple FTC autonomous mode scenarios
- Write, test and debug programs for FTC teleop mode operations
- Demonstrate proficiency with software management techniques, including revision, backup, quality and reliability controls

Aligned Common Core & Washington State Standards

English Language Arts	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications.

2.4.1: Formulate and synthesize new knowledge.

9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone.

11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.

9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

	11-12WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-GPE7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

	S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). S-CP2: Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities and use this characterization to determine if they are independent.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel. 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

21st Century Skills

Check those that students will demonstrate in this course:

LEARNING & INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS
Creativity and Innovation ☒Think Creatively ☒Work Creatively with Others ☐Implement Innovations **Critical Thinking and Problem Solving** ☒Reason Effectively ☒Use Systems Thinking ☒Make Judgments and Decisions ☒Solve Problems **Communication and Collaboration** ☒Communicate Clearly ☒Collaborate with Others	**Information Literacy** ☒Access and /evaluate Information ☒Use and Manage Information **Media Literacy** ☐Analyze Media ☒Create Media Products **Information, Communications and Technology (ICT Literacy)** ☒Apply Technology Effectively	**Flexibility and Adaptablity** ☒Adapt to Change ☒Be Flexible **Initiative and Self-Direction** ☒Manage Goals and Time ☒Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☒Interact Effectively with Others ☒Work Effectively in Diverse Teams **Productivity and Accountability** ☒Manage Projects ☒Produce Results **Leadership and Responsibility** ☒Guide and Lead Others ☒Be Responsible to Others