EVERETT PUBLIC SCHOOLS ASTRONOMY AND ENGINEERING		
Course: Astronomy and Aerospace Engineering		**Total Framework Hours:** 180
CIP Code: 149998	☐**Exploratory** ☒**Preparatory**	**Date Last Modified:** 11/16/16
Career Cluster: STEM		**Cluster Pathway:** Science and Math

Industry-Recognized Certificates:

Work-Based Learning:

Course Information:

COMPONENTS AND ASSESSMENTS	
Performance Assessments: • Students will use models to illustrate the earth's rotation and revolution. • Students will communicate how technology has influenced the history of our understanding of the motions of the sky.	
Leadership Alignment: Students will collaborate with others to create and use models. Students will demonstrate the ability to communicate clearly through their group project presentation.	
Standards and Competencies	
Unit: Motions of the Sky – students explore the apparent and actual motion of the Sun, Earth and stars. They will construct and use tools to assist in identifying stars in the sky, learn to measure positions of objects using various historical and modern methods and be able to predict positions based on observations and measurements.	
Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 14
• ITEEA standards • 7 – Students will develop an understanding of Technology and Society. This includes learning about the influence of technology on history.	
Aligned Washington State Standards	
Educational Technology	EALR 1: Integration 1.1 Innovate = Demonstrate creative thinking, construct knowledge and develop innovative products and processes using 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 Collaborate = Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures. 1.3 Investigate and Think Critically = Research, manage and evaluate information and solve problems using digital tools and resources. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.

	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.
Science	HS – ESS1-1 Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

COMPONENTS AND ASSESSMENTS

Performance Assessments:

- Students will develop a model that illustrates the orbiting of the Sun, Earth, and Moon as a system.
- Develop their own Sun-Earth-Moon system model = given cardstock, 2 brads, paper plates – create a model that shows rotation of earth around sun and rotation of moon around earth. Use model to show different moon phases.
- Students will first learn about rotation and revolution and then create their model. Their model will be used to demonstrate different moon phases. The objective is to create a functional model that can be used to properly articulate the phases.

Leadership Alignment:

Students will demonstrate thinking and working creatively with others during the design phase of their projects.
Students will collaborate with others to build structures for each of their assigned projects.
Students will demonstrate the ability to communicate clearly through their group project presentations.

Standards and Competencies

Unit: Sun, Earth, Moon System – students will predict, create a model and observe the relationship between the Sun-Earth-Moon apparent and actual motion.

Industry Standards and/or Competencies | **Total Learning Hours for Unit:** 9

- ITEEA standards
- 11 – Students will develop abilities for a Technological Word. This includes being able to apply the design process.

Aligned Washington State Standards

Educational Technology	EALR 1: Integration 1.2 Collaborate = Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures. 1.3 Investigate and Think Critically = Research, manage and evaluate information and solve problems using digital tools and resources. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 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.
Science	HS – ESS1-1 Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

COMPONENTS AND ASSESSMENTS

Performance Assessments:

- Students will write an article that illustrates the role of society in the development and use of technology in understanding planets.
- *Note – students will learn about the science of flight in an effort to understand how technologies where designed to gather more data about planets*.
- Students will select a NASA spin-off product and create a poster that articulates how this product connects to and relates to their life.
- Students will use satellite images and data to learn about and identify planetary features. Data and emergent patterns from images will be applied to unknown images to determine planetary features.

- *Note - Data students acquire regarding planetary features will be used during the Mars Lander Project/Unit to identify where to land the rover and what mechanical features the lander will need in order to land safely.*

Leadership Alignment:
Students will demonstrate thinking and working creatively with others during the design phase of their projects.
Students will demonstrate the ability to communicate clearly through their group project presentations.

Standards and Competencies

Unit: Planets – While studying comparative planetology, students will investigate technologies used to explore planets and how those technologies have shaped our knowledge. NASA created lessons and materials such as: Blue Marble Matches, Planetary Geology, Atmosphere data, and Astrobiology will be used in this unit.

Industry Standards and/or Competencies | **Total Learning Hours for Unit:** 33

- ITEEA standards
- 3 – Students will develop an understanding of The Nature of Technology. This includes acquiring knowledge of the relationships among technologies and the connections between technology and other fields.
- 4 – Students will develop an understanding of Technology and Society. This includes learning about the cultural, social, economic, and political effects of technology.
- 6 – Students will develop an understanding of Technology and Society. This includes learning about the role of society in the development and use of technology.

Aligned Washington State Standards

Educational Technology	EALR 1: Integration 1.2 Collaborate = Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures. 1.3 Investigate and Think Critically = Research, manage and evaluate information and solve problems using digital tools and resources. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 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.
Science	HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

COMPONENTS AND ASSESSMENTS

Performance Assessments:

- Students will apply their knowledge of the science of flight and the engineering design process to research, design, and build a manned Mars Lander that safely lands cargo and crew.

Leadership Alignment:
Students will demonstrate thinking and working creatively with others during the design phase of their projects.
Students will collaborate with others to build structures for each of their assigned projects.
Students will demonstrate the ability to communicate clearly through their group project presentations.

Standards and Competencies

Unit: Mars Lander – Students will learn about the science of flight and the engineering design process. Students will then research, design and build manned lander for Mars.

Industry Standards and/or Competencies | **Total Learning Hours for Unit:** 12

- ITEEA standards

- 8 – Students will develop an understanding of Design. This includes knowing about the attributes of design.
- 9 – Students will develop an understanding of Design. This includes knowing about engineering design.
- 10 – Students will develop an understanding of Design. This includes knowing about the role of trouble shooting, research and development, invention and innovation, and experimentation in problem solving.
- 11 – Students will develop Abilities for a Technological World. This includes becoming able to apply the design process.

Aligned Washington State Standards

Educational Technology	EALR 1: Integration 1.1 Innovate = Demonstrate creative thinking, construct knowledge and develop innovative products and processes using 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 Collaborate = Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures. 1.3 Investigate and Think Critically = Research, manage and evaluate information and solve problems using digital tools and resources. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 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.
Science	HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

COMPONENTS AND ASSESSMENTS

Performance Assessments:

- Students will apply their knowledge of the science of flight and the engineering design process to research, build, and launch a rocket with a payload.

Leadership Alignment:

Students will demonstrate thinking and working creatively with others during the design phase of their projects.
Students will collaborate with others to build structures for each of their assigned projects.
Students will demonstrate the ability to communicate clearly through their group project presentations.

Standards and Competencies

Unit: Rocket Challenge – students will learn more about the science of flight and the engineering design process to research, design, build and launch rocket to carry payload.

Industry Standards and/or Competencies | **Total Learning Hours for Unit:** 21

- ITEEA standards
- 7 – Students will develop and understanding of Technology and Society. This includes learning about the influence of technology on history.
- 8 – Students will develop an understanding of Design. This includes knowing about the attributes of design.
- 9 – Students will develop an understanding of Design. This includes knowing about engineering design.
- 10 – Students will develop an understanding of Design. This includes knowing about the role of trouble shooting, research and development, invention and innovation, and experimentation in problem solving.

• 11 – Students will develop Abilities for a Technological World. This includes becoming able to apply the design process.	
Aligned Washington State Standards	
Educational Technology	EALR 1: Integration 1.1 Innovate = Demonstrate creative thinking, construct knowledge and develop innovative products and processes using 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 Collaborate = Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures. 1.3 Investigate and Think Critically = Research, manage and evaluate information and solve problems using digital tools and resources. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 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.
Science	HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

COMPONENTS AND ASSESSMENTS	
Performance Assessments: • Students will research, plan, and design a structure to collect orbiting debris.	
Leadership Alignment: Students will demonstrate thinking and working creatively with others during the design phase of their projects. Students will collaborate with others to build structures for each of their assigned projects. Students will demonstrate the ability to communicate clearly through their group project presentations.	
Standards and Competencies	
Unit: Space Debris Challenge – Students research and design a conceptual idea to gather space debris from Earth's orbit.	
Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 10
• ITEEA standards • 8 – Students will develop an understanding of Design. This includes knowing about the attributes of design. • 9 – Students will develop an understanding of Design. This includes knowing about engineering design. • 11 – Students will develop Abilities for a Technological World. This includes becoming able to apply the design process.	
Aligned Washington State Standards	
Educational Technology	EALR 1: Integration 1.2 Collaborate = Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.

	1.3 Investigate and Think Critically = Research, manage and evaluate information and solve problems using digital tools and resources. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 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.
Science	HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

COMPONENTS AND ASSESSMENTS

Unit 7 Performance Assessments:

- Students will apply their knowledge of the engineering design process to research, design, and build a processor to sort asteroid material.

Leadership Alignment:

Students will demonstrate thinking and working creatively with others during the design phase of their projects.
Students will collaborate with others to build structures for each of their assigned projects.
Students will demonstrate the ability to communicate clearly through their group project presentations.

Standards and Competencies

Unit: Asteroid Mining – Students research, design and build Asteroid mining processor to sort mined asteroid material.

Industry Standards and/or Competencies | **Total Learning Hours for Unit: 12 hrs**

- ITEEA standards
- 5 – Students will develop an understanding of Technology and Society. This includes learning about the effects of technology on the environment.
- 8 – Students will develop an understanding of Design. This includes knowing about the attributes of design.
- 9 – Students will develop an understanding of Design. This includes knowing about engineering design.
- 10 – Students will develop an understanding of Design. This includes knowing about the role of trouble shooting, research and development, invention and innovation, and experimentation in problem solving.
- 11 Students will develop Abilities for a Technological World. This includes becoming able to apply the design process.

Aligned Washington State Standards

Educational Technology	EALR 1: Integration 1.1 Innovate = Demonstrate creative thinking, construct knowledge and develop innovative products and processes using 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 Collaborate = Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures. 1.3 Investigate and Think Critically = Research, manage and evaluate information and solve problems using digital tools and resources. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 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.
Science	HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

COMPONENTS AND ASSESSMENTS
Performance Assessments: • Students present how technology has influenced our changing knowledge of space. • Students will illustrate how science influences engineering/technology and with new technology, new science can be discovered.
Leadership Alignment: Students will demonstrate thinking and working creatively with others during the design phase of their projects. Students will demonstrate the ability to communicate clearly through their group project presentations.
Standards and Competencies
Unit: Spectroscopy and Technology – students will connect changing technology to our understanding of the modern universe.
Industry Standards and/or Competencies — **Total Learning Hours for Unit:** 15
• ITEEA standards • 1 – Students will develop an understanding of The Nature of Technology. This includes acquiring knowledge of the characteristic and scope of technology. • 2 – Students will develop an understanding of The Nature of Technology. This includes acquiring knowledge of the core concepts of technology. • 6 – Students will develop an understanding of Technology and Society. This includes learning about the role of society in the development and use of technology. • 7 – Students will develop an understanding of Technology and Society. This includes learning about the influence of technology on history.
Aligned Washington State Standards

Educational Technology	EALR 1: Integration 1.2 Collaborate = Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures. 1.3 Investigate and Think Critically = Research, manage and evaluate information and solve problems using digital tools and resources. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 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.
Science	HS-PS4-3 Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

COMPONENTS AND ASSESSMENTS
Performance Assessments: • Students will develop and use a 3D model of the life cycle of stars.

Leadership Alignment:
Students will demonstrate thinking and working creatively with others during the design phase of their projects.
Students will collaborate with others to build structures for each of their assigned projects.
Students will demonstrate the ability to communicate clearly through their group project presentations.

Standards and Competencies

Unit: Stars – students investigate the life cycle of stars to create a model that illustrates the steps.

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 27

- ITEEA standards
- 9 – Students will develop an understanding of Design. This includes knowing about engineering design.
- 10 – Students will develop an understanding of Design. This includes knowing about the role of trouble shooting, research and development, invention and innovation, and experimentation in problem solving.
- 11 Students will develop Abilities for a Technological World. This includes becoming able to apply the design process.

Aligned Washington State Standards

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Science	HS-ESS1-1 Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy in the form of radiation. HS-ESS1-3 Communicate scientific ideas about the way stars, over their life cycle, produce elements.

COMPONENTS AND ASSESSMENTS

Unit 10 Performance Assessments:

- Students will design a model of the universe.
- Students will design an infographic articulating the historical development of technology connected to the science of discovering the universe.

Leadership Alignment:
Students will demonstrate thinking and working creatively with others during the design phase of their projects.
Students will collaborate with others to build structures for each of their assigned projects.
Students will demonstrate the ability to communicate clearly through their group project presentations.

Standards and Competencies

Unit: The Universe – students will investigate the components of the universe as well as it's beginning and end.

Industry Standards and/or Competencies	**Total Learning Hours for Unit:** 27

- ITEEA standard
- 6 – Students will develop an understanding of Technology and Society. This includes learning about the role of society in the development and use of technology.
- 7 – Students will develop an understanding of Technology and Society. This includes learning about the influence of technology on history.
- 11 – Students will develop Abilities for a Technological World. This includes becoming able to apply the design process.

Aligned Washington State Standards	
Educational Technology	EALR 1: Integration 1.1 Innovate = Demonstrate creative thinking, construct knowledge and develop innovative products and processes using 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 Collaborate = Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures. 1.3 Investigate and Think Critically = Research, manage and evaluate information and solve problems using digital tools and resources. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 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.
Science	HS-ESS1-2 Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. HS-ESS1-4 Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

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 ☒**U**se 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 Adaptability** ☐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