Astronomy - Course Overview

Content Area: **Science**
Course(s): **ASTRONOMY**
Time Period:
Length: **Semester Course**
Status: **Published**

Cover

EAST BRUNSWICK PUBLIC SCHOOLS

East Brunswick New Jersey

Superintendent of Schools

Dr. Victor P. Valeski

Science

Astronomy

Course Number: 1105

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Course Overview

Astronomy is a semester course designed to give students a basic understanding of the structure of the universe and the behavior of the objects that make it up. There is a detailed study of the planets, the sun and the moon. Modern observational and measurement methods used by astronomers are investigated. Lab activities are geared toward the level of student taking the class and give the students an understanding of the complexities within our universe. Students in grades 10-12 are eligible to take this course

Modifications

Each teacher, each student, each classroom is unique and adaptations are specific to each situation. Differentiating instruction and providing multiple ways to assess allows more flexibility for students to meet the standards and requirements of the class. Below are samples of the types of adaptations/modifications that may occur for students based on need including ELLs, students with a 504 Plan, Special Education, Basic Skills and Gifted and Talented students.

Adaptations/Modifications:

Input Adapt the way instruction is delivered to the learner. ***For example:*** • Use different visual aids, • Plan more concrete examples, • Provide hands-on activities, • Place students in cooperative groups.	**Output** Adapt how the learner can respond to instruction. ***For example:*** • Allow a verbal vs. written response, • Use a communication book for students, • Allow students to show knowledge with hands-on materials.	**Time** Adapt the time allotted and allowed for learning, task completion or testing. ***For example:*** • Individualize a timeline for completing a task, • Pace learning differently (increase or decrease) for some learners.
Difficulty Adapt the skill level, problem type, or the rules on how the learner may approach the work. ***For example:*** • Simplify task directions. • Use of calculator.	**Level of Support** Increase the amount of personal assistance with specific learner. ***For example:*** • Assign peer buddies, teaching assistants, peer tutors or cross-age tutors.	**Size** Adapt the number of items that the learner is expected to learn or complete. ***For example:*** • Reduce the number of vocabulary words a learner must learn at any one time.
Degree of Participation Adapt the extent to which a learner is actively involved in the task. ***For example:*** • Allow for small group/individual	**Alternate Goals** Adapt the goals or outcome expectations while using the same materials. ***For example:*** • Students in the same class are expected to either	**Substitute Curriculum** Provide differentiated instruction and materials to meet a learner's individual goals. ***For example:*** • Individualize a timeline for completing a task, pace

presentations vs. presentations to the whole class.	write a paragraph, write a bulleted response, or meet with the teacher to provide a verbal response.	learning differently (increase or decrease) for some learners, • Use of Learning Ally.

Materials and Resources

Horizions, Michael A. Seeds, Thomson Learning/Swestern, 2006

Content Specific Standards

SCI.HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
SCI.HS-ESS1-5	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
SCI.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 that eventually reaches Earth in the form of radiation.
SCI.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.
SCI.HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
SCI.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.
SCI.HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
SCI.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.

Interdisciplinary Standards

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.

MA.K-12.8	Look for and express regularity in repeated reasoning.
LA.RST.9-10.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RST.9-10.2	Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
LA.RST.9-10.3	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.
LA.RST.9-10.4	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.
LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
LA.RST.9-10.6	Determine 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.
LA.RST.9-10.7	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.
LA.RST.9-10.8	Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
LA.RST.9-10.9	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.
LA.WHST.9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence.
LA.WHST.9-10.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.9-10.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.WHST.9-10.5	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.
LA.WHST.9-10.6	Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
LA.WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
LA.WHST.9-10.9	Draw evidence from informational texts to support analysis, reflection, and research.

21st Century Life and Career Ready Practice Standards

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term

	consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP3.1	Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial well-being, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.

CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Technology Standards

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.

TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Pacing Guide

Sequential Unit Description:	MP Guide	Other Pacing Guide References	Proficiency (Summative) Assessments
Unit 1: Celestial Sphere • Motion of objects in the sky • Reason for the seasons • Constellations	1	10 days	Plotting the motion of the sun Lab Handy Tool Lab Constellation Lab Chapter Tests
Unit 2: The Moon and NASA • Origins of the Moon • Physical Features of the Moon • Tides, phases, eclipses • Missions from NASA	1	12 days	Scale Models Lab Modeling Phases Lab Making Craters Lab Unit Test

• Contributions from NASA			
Unit 3: Ancient to Modern Astronomy • Heliocentric versus geocentric universe • Origins of astronomy • Parallax Shift • Ptolemy, Copernicus, Brahe, Kepler, Newton	1	6 days	Keplers Third Law Lab Unit Test
Unit 4: The Planets, their formation, and debris • Properties of planets and comets, meteors, and asteroids • Origin of our solar system • Characteristics of other solar systems	1	18 days	Surface of Venus Lab Life the Planets Lab Shield Volcanoes Lab Scale Model of Solar System Lab Unit Test

Unit 5: Sun and Stars • Interior and Exterior characteristics of the sun • Classification of stars • Solar Cycle • Star Birth, Life, and Death	2	18 days	200 watt light bulb lab Graphing Sunspots Lab Supernova Explosions Lab Star project Unit Test
Unit 6: Galaxies and Cosmology • Shapes of galaxies • Anatomy of a galaxy • Active Galactic Nuclei	2	16 days	Build an active galaxy lab Galaxy Shapes lab Model a black hole lab

• Origin of the universe			Unit Test
Unit 7: Telescopes and the Nature of Life • Types of Telescopes • Locations of Telescopes • Relationship between telescopes and light	2	8 days	Building and Using a Telescope Investigating Mirrors Investigating pinholes and lenses Unit Test Final Exam

Formative and Summative Assessment

Teachers ultilize a variety of methods for assesment including:

	Unit Tests and Quizzes	**Labs, Projects & Classwork**	**Lab Assessments**	**Homework**
Category Criteria	Individual assessments based on specific or general content knowledge.	Any group work primarily completed in class to be checked and/or graded for completion.	Individual assessments based on group lab work. Lab data and other notes may sometimes be used.	Any work assigned to be completed outside of the classroom.

All students take a common Midterm and Final Exam.

Grading and Evaluation Guidelines

While assessments of proficiency levels must be valid and reliable they do not need be the same for all students.

In terms of proficiency level the East Brunswick grades equate to:

A	Excellent	Advanced Proficient
B	Good	Above Average Proficient

C	Fair	Proficient
D	Poor	Minimally proficient
F	Failing	Partially Proficient

Marking period grades for Astronomy will be determined using the following weighting:

55% Assessments: Tests and Quizzes

35% Articles, Projects, Labs

10% Homework

The final grade for the course astronomy will be based on the two marking period grades and a final exam. The marking period grades will each be worth 40% of the final grade and the final exam will be worth 20%.

Other Details

SCED 03004

ASTRONOMY

Astronomy courses offer students the opportunity to study the solar system, stars, galaxies, and interstellar bodies. These courses usually introduce and use astronomic instruments and typically explore theories regarding the origin and evolution of the universe, space, and time.