

**Government and Public Administration Cluster
Aerospace Science: Exploring Space & Cyber 300
Course Number 28.01500**

Course Description:

Aerospace Science: Exploring Space Standards

The Science Georgia Standards of Excellence are designed to provide foundational knowledge and skills for all students to develop proficiency in science. The Project 2061’s Benchmarks for Science Literacy and the follow up work, A Framework for K-12 Science Education were used as the core of the standards to determine appropriate content and process skills for students. The Science Georgia Standards of Excellence focus on a limited number of core disciplinary ideas and crosscutting concepts which build from Kindergarten to high school. The standards are written with the core knowledge to be mastered integrated with the science and engineering practices needed to engage in scientific inquiry and engineering design. Crosscutting concepts are used to make connections across different science disciplines.

The Science Georgia Standards of Excellence drive instruction. Hands-on, student-centered, and inquiry-based approaches should be the emphasis of instruction. The standards are a required minimum set of expectations that show proficiency in science. However, instruction can extend beyond these minimum expectations to meet student needs.

Science consists of a way of thinking and investigating, as well a growing body of knowledge about the natural world. To become literate in science, students need to possess sufficient understanding of fundamental science content knowledge, the ability to engage in the science and engineering practices, and to use scientific and technological information correctly. Technology should be infused into the curriculum and the safety of the student should always be foremost in instruction.

The Aerospace Science: Exploring Space Georgia Standards of Excellence are designed to continue the student investigations of the sciences that began in grades K-8 and provide students the necessary skills to be proficient in Aerospace Science. These standards include more abstract concepts such as principles of astronomy, characteristics of the solar system, components for space exploration, human space flight physiology, history and future of space exploration, space robotics, orbital and space flight physics, and mechanics. Students investigate aerospace science concepts through experiences in laboratories and field work using the science and engineering practices of asking questions and defining problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information.

Course Standard 1

GPA-AFSESC-1

The following standard is included in all CTAE courses adopted for the Career Cluster/Pathways. Teachers should incorporate the elements of this standard into lesson plans during the course. The topics listed for each element of the standard may be addressed in differentiated instruction matching the content of each course. These elements may also be addressed with specific lessons from a variety of resources. This content is not to be treated as a unit or separate body of knowledge but rather integrated into class activities as applications of the concept.

Standard: Demonstrate employability skills required by business and industry.

The following elements should be integrated throughout the content of this course.

1.1 Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities.

Person-to-Person Etiquette	Telephone and Email Etiquette	Cell Phone and Internet Etiquette	Communicating At Work	Listening
Interacting with Your Boss	Telephone Conversations	Using Blogs	Improving Communication Skills	Reasons, Benefits, and Barriers
Interacting with Subordinates	Barriers to Phone conversations	Using Social Media	Effective Oral Communication	Listening Strategies

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Interacting with Co-workers	Making and Returning Calls		Effective Written Communication	Ways We Filter What We Hear
Interacting with Suppliers	Making Cold Calls		Effective Nonverbal Skills	Developing a Listening Attitude
	Handling Conference Calls		Effective Word Use	Show You Are Listening
	Handling Unsolicited Calls		Giving and Receiving Feedback	Asking Questions
				Obtaining Feedback
				Getting Others to Listen

Nonverbal Communication	Written Communication	Speaking	Applications and Effective Résumés
Communicating Nonverbally	Writing Documents	Using Language Carefully	Completing a Job Application
Reading Body Language and Mixed Messages	Constructive Criticism in Writing	One-on-One Conversations	Writing a Cover Letter
Matching Verbal and Nonverbal communication		Small Group Communication	Things to Include in a Résumé
Improving Nonverbal Indicators		Large Group Communication	Selling Yourself in a Résumé
Nonverbal Feedback		Making Speeches	Terms to Use in a Résumé
Showing Confidence Nonverbally		Involving the Audience	Describing Your Job Strengths
Showing Assertiveness		Answering Questions	Organizing Your Résumé
		Visual and Media Aids	Writing an Electronic Résumé
		Errors in Presentation	Dressing Up Your Résumé

1.2 Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.

Teamwork and Problem Solving	Meeting Etiquette
Thinking Creatively	Preparation and Participation in Meetings
Taking Risks	Conducting Two-Person or Large Group Meetings
Building Team Communication	Inviting and Introducing Speakers
	Facilitating Discussions and Closing
	Preparing Visual Aids
	Virtual Meetings

1.3 Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

Problem Solving	Customer Service	The Application Process	Interviewing Skills	Finding the Right Job
Transferable Job Skills	Gaining Trust and Interacting with Customers	Providing Information, Accuracy and Double Checking	Preparing for an Interview	Locating Jobs and Networking
Becoming a Problem Solver	Learning and Giving Customers What They Want	Online Application Process	Questions to Ask in an Interview	Job Shopping Online
Identifying a Problem	Keeping Customers Coming Back	Following Up After Submitting an Application	Things to Include in a Career Portfolio	Job Search Websites
Becoming a Critical Thinker	Seeing the Customer's Point	Effective Résumés:	Traits Employers are Seeking	Participation in Job Fairs
Managing	Selling Yourself and the Company	Matching Your Talents to a Job	Considerations Before Taking a Job	Searching the Classified Ads

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	Handling Customer Complaints	When a Résumé Should be Used		Using Employment Agencies
	Strategies for Customer Service			Landing an Internship
				Staying Motivated to Search

1.4 Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.

Workplace Ethics	Personal Characteristics	Employer Expectations	Business Etiquette	Communicating at Work
Demonstrating Good Work Ethic	Demonstrating a Good Attitude	Behaviors Employers Expect	Language and Behavior	Handling Anger
Behaving Appropriately	Gaining and Showing Respect	Objectionable Behaviors	Keeping Information Confidential	Dealing with Difficult Coworkers
Maintaining Honesty	Demonstrating Responsibility	Establishing Credibility	Avoiding Gossip	Dealing with a Difficult Boss
Playing Fair	Showing Dependability	Demonstrating Your Skills	Appropriate Work Email	Dealing with Difficult Customers
Using Ethical Language	Being Courteous	Building Work Relationships	Cell Phone Etiquette	Dealing with Conflict
Showing Responsibility	Gaining Coworkers' Trust		Appropriate Work Texting	
Reducing Harassment	Persevering		Understanding Copyright	
Respecting Diversity	Handling Criticism		Social Networking	
Making Truthfulness a Habit	Showing Professionalism			
Leaving a Job Ethically				

1.5 Apply the appropriate skill sets to be productive in a changing, technological, diverse workplace to be able to work independently and apply team work skills.

Expected Work Traits	Teamwork	Time Management
Demonstrating Responsibility	Teamwork Skills	Managing Time
Dealing with Information Overload	Reasons Companies Use Teams	Putting First Things First
Transferable Job Skills	Decisions Teams Make	Juggling Many Priorities
Managing Change	Team Responsibilities	Overcoming Procrastination
Adopting a New Technology	Problems That Affect Teams	Organizing Workspace and Tasks
	Expressing Yourself on a Team	Staying Organized
	Giving and Receiving Constructive Criticism	Finding More Time
		Managing Projects
		Prioritizing Personal and Work Life

1.6 Present a professional image through appearance, behavior and language.

On-the-Job Etiquette	Person-to-Person Etiquette	Communication Etiquette	Presenting Yourself
Using Professional Manners	Meeting Business Acquaintances	Creating a Good Impression	Looking Professional
Introducing People	Meeting People for the First Time	Keeping Phone Calls Professional	Dressing for Success
Appropriate Dress	Showing Politeness	Proper Use of Work Email	Showing a Professional Attitude
Business Meal Functions		Proper Use of Cell Phone	Using Good Posture
Behavior at Work Parties		Proper Use in Texting	Presenting Yourself to Associates

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Behavior at Conventions			Accepting Criticism
International Etiquette			Demonstrating Leadership
Cross-Cultural Etiquette			
Working in a Cubicle			

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence L9-10RST 1-10 and L9-10WHST 1-10

Georgia Standards of Excellence ELA/Literacy standards have been written specifically for technical subjects and have been adopted as part of the official standards for all CTAE courses.

Course Standard 2

GPA-AFSESC-2

Obtain, evaluate, and communicate information about the space environment.

- 2.1 Develop and use a model to explain the concept of a celestial sphere.
- 2.2 Develop and use models to explain the Greek Earth-centered, Ptolemy's, and Copernican models of planetary motion.
- 2.3 Construct an explanation based on evidence of the application of Kepler's laws of planetary motion.
- 2.4 Plan and carry out an investigation to gather evidence to identify the impact of Galileo's telescope observations.
- 2.5 Construct an explanation based on evidence of the application of Newton's laws of motion and gravity.
- 2.6 Construct an explanation based on evidence of the application of Einstein's General Theory of Relativity and Special Theory of Relativity.
- 2.7 Develop a model of the physical composition of Earth's layers using multiple types of evidence.
- 2.8 Plan and carry out investigations to describe the characteristics and origins of the moon.
- 2.9 Plan and carry out investigations to describe the characteristics of the terrestrial planets.
- 2.10 Plan and carry out investigations to describe the characteristics of the outer planets.
- 2.11 Construct an explanation of the characteristics of the solar system from scientific evidence including the composition, distribution and motion of other solar system objects. (Clarification statement: Dwarf planets, comets, asteroids, Oort cloud, and Kuiper belt objects should be studied as part of this element).
- 2.12 Construct an explanation based on evidence of the characteristics of the Milky Way Galaxy.
- 2.13 Construct an explanation based on evidence of the methods used for exoplanet detection. (Clarification statement: Direct observation/infrared companion, dust disks, pulsar companions, visual wobble, Doppler shift, stellar occultation, and gravitational microlensing should be studied as part of this element).
- 2.14 Construct an explanation of the characteristics of galaxies from scientific evidence.
- 2.15 Plan and carry out investigations to describe the characteristics of stars, nebulae, pulsars, black holes, quasars, and dark matter.
- 2.16 Construct an explanation of the big bang theory from scientific evidence.

Course Standard 3

GPA-AFSESC-3

Obtain, evaluate, and communicate information about space exploration.

- 3.1 Construct an explanation based on evidence of the benefits of space exploration.
- 3.2 Plan and carry out investigations to describe the planning and components of a space mission.
- 3.3 Plan and carry out investigations to describe the selection and training of astronauts.
- 3.4 Plan and carry out investigations to describe the hazards of space travel on spacecraft. (Clarification statement: The role of radiation, impact damage, surface landings, and fire hazards should be studied as part of this element).
- 3.5 Plan and carry out investigations to describe the hazards of space travel on the human body. (Clarification statement: The role of microgravity, cardiovascular, somatosensory, vestibular, immune systems, fluid shift, and psychological effects should be studied as part of this element).

Course Standard 4

GPA-AFSESC-4

Obtain, evaluate, and communicate information about manned and unmanned spaceflight.

- 4.1 Plan and carry out investigations to describe the evolution and impacts of the US, Soviet/Russian, and other international manned and unmanned space programs.
- 4.2 Plan and carry out investigations to describe the development, accomplishments, and accidents of the Space Shuttle program.
- 4.3 Construct an argument supported by evidence of causes of the Challenger and Columbia accidents.
- 4.4 Plan and carry out investigations to describe the development and accomplishments of manned space stations.
- 4.5 Plan and carry out investigations to describe plans for manned Lunar and Martian exploration programs.
- 4.6 Plan and carry out investigations to describe unmanned exploration programs of the solar system.

Course Standard 5

GPA-AFSESC-5

Obtain, evaluate, and communicate information about space technology.

- 5.1 Develop and use models to explain orbits and the six classic orbital elements.
- 5.2 Plan and carry out investigations to describe the orbital elements and utilization of different orbits. (Clarification statement: geosynchronous, geostationary, polar, Sun-synchronous, low-Earth, medium-Earth, circular, and high-eccentricity orbits should be studied as part of this element).
- 5.3 Develop and use models to explain trajectories, maneuvering and navigation in space. (Clarification statement: Gravity-assist, Type 1 and Type 2 trajectories, hyperbolic, parabolic, and elliptical paths, spacecraft velocity, distance and angular measurements should be studied as part of this element).
- 5.4 Construct an explanation based on evidence using Newton's Laws of how forces affect the acceleration of a rocket in flight.
- 5.5 Explain and predict the motion of a body at rest and in flight in the absence of a force and when forces are applied using Newton's 1st Law (principle of inertia).
- 5.6 Calculate the acceleration for an object using Newton's 2nd Law, including situations where multiple forces act together.
- 5.7 Identify the pair of equal and opposite forces between two interacting bodies as they relate to rocket propulsion and relate their magnitudes and directions using Newton's 3rd Law.
- 5.8 Develop and use a model of a Free Body Diagram to represent the forces acting on a rocket in all phases of flight.
- 5.9 Use mathematical representations to calculate magnitudes and vector components for forces acting on a rocket during launch during all phases of flight.
- 5.10 Plan and carry out an investigation to gather evidence to identify total energy and the exchanges of potential versus kinetic energy of a rocket during all phases of flight.
- 5.11 Plan and carry out investigations to explain the differences between solid, liquid and hybrid rocket motors.
- 5.12 Plan and carry out investigations to describe different payload launch vehicles. (Clarification statement: Intercontinental Ballistic Missiles, Expendable Launch Vehicles, and Reusable Launch Vehicles should be studied as part of this element).
- 5.13 Plan and carry out an investigation to gather evidence to identify factors affecting rocket launch site location and launch window determination.
- 5.14 Plan and carry out investigations to describe the use of robotics in space exploration.
- 5.15 Plan and carry out investigations to describe private industry contributions to space exploration.
- 5.16 Construct arguments based on evidence about the applications, benefits, and problems of commercial space mining.
- 5.17 Develop and use models to explain the operation of the global positioning system.