127.785 Engineering Design and Problem Solving TEKS Overview
2024 Texas High School Aerospace Scholars Online Curriculum

Standard #	Standard	# of Activities
(d)(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:		
127.785.d1B	show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;	8
127.785.d1C	present written and oral communication in a clear, concise, and effective manner;	17
127.785.d1D	demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and	20
127.785.d1E	demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.	20
(d)(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:		
127.785.d2A	ask questions and define problems based on observations or information from text, phenomena, models, or investigations;	6
127.785.d2B	apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;	3
127.785.d2G	develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and	3
(d)(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:		
127.785.d3B	analyze data by identifying significant statistical features, patterns, sources of error, and limitations;	3
127.785.d3C	use mathematical calculations to assess quantitative relationships in data; and	1
127.785.d3D	evaluate experimental and engineering designs.	2
(d)(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:		
127.785.d4A	develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;	7
127.785.d4B	communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and	7
127.785.d5A	analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;	3
127.785.d5B	relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and	2
127.785.d5C	research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a STEM field.	3
(d)(6) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:		
127.785.d6A	communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials; and	5
127.785.d6B	(B) draw inferences based on data related to promotional materials for products and services.	5
(d)(7) The student applies knowledge of science and mathematics and the tools of technology to solve engineering design problems. The student is expected to:		
127.785.d7A	select appropriate mathematical models to develop solutions to engineering design problems;	1
127.785.d7B	integrate advanced mathematics and science skills as necessary to develop solutions to engineering design problems;	1
127.785.d7C	judge the reasonableness of mathematical models and solutions;	1

127.785.d7E	identify the inputs, processes, outputs, control, and feedback associated with open and closed systems;	1
127.785.d7F	describe the difference between open-loop and closed-loop control systems;	1
(d)(8) The student communicates through written documents, presentations, and graphic representations using the tools and techniques of professional engineers. The student is expected to:		
127.785.d8A	communicate visually by sketching and creating technical drawings using established engineering graphic tools, techniques, and standards;	3
127.785.d8B	read and comprehend technical documents, including specifications and procedures;	3
127.785.d8C	prepare written documents such as memorandums, emails, design proposals, procedural directions, letters, and technical reports using the formatting and terminology conventions of technical documentation;	4
127.785.d8D	organize information for visual display and analysis using appropriate formats for various audiences, including technical drawings, graphs, and tables such as file conversion and appropriate file types, in order to collaborate with a wider audience;	2
(d)(9) The student recognizes the history, development, and practices of the engineering professions. The student is expected to:		
127.785.d9A	identify and describe career options, working conditions, earnings, and educational requirements of various engineering disciplines such as those listed by the Texas Board of Professional Engineers;	1
(d)(10) The student creates justifiable solutions to open-ended real-world problems using engineering design practices and processes. The student is expected to:		
127.785.d10C	determine the design parameters associated with an engineering problem such as materials, personnel, resources, funding, manufacturability, feasibility, and time;	3
127.785.d10I	prepare a project report that clearly documents the designs, decisions, and activities during each phase of the engineering design process.	4
(d)(11) The student manages an engineering design project. The student is expected to:		
127.785.d11A	participate in the design and implementation of a real-world or simulated engineering project using project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;	3
127.785.d11E	identify and manage the resources needed to complete a project;	2
127.785.d11I	maintain an engineering notebook that chronicles work such as ideas, concepts, inventions, sketches, and experiments.	15

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Module One --- Establishing the Foundation		
Science Focus Questions	**Science Activity Objectives**	**TEKS:**
What are the rules, expectations, and timeline that must be met in this course?	Students will read and become familiar with all material pertaining to course norms, policies and schedules.	127.785 Engineering Design and Problem Solving (d)(1) (D,E)
How will students identify me on the team?	Students will update Canvas profile and biography.	127.785 Engineering Design and Problem Solving (d)(1) (D,E)
How will students interact with each other in the course?	Students will engage with peers through a discussion board and comment on each other's profiles as an Ice Breaker.	127.785 Engineering Design and Problem Solving (d)(1) (D,E)
Science Assignment Problem(s) or Overarching Question(s)	Science Assignment Objectives	TEKS:
Read and take a quiz over the course syllabus, expectations/course policies, academic integrity, grading policy, and course schedule.	Students will read and become familiar with all material pertaining to course norms, policies and schedules.	127.785 Engineering Design and Problem Solving (d)(1) (D,E)
Update Canvas Profile with name, city, and biography.	Students will update Canvas profile and biography.	127.785 Engineering Design and Problem Solving (d)(1) (D,E)
Post on the discussion board and respond to other classmates' threads.	Students will engage with peers through a discussion board and comment on each other's profiles as an Ice Breaker.	127.785 Engineering Design and Problem Solving (d)(1) (D,E)

Module One --- Establishing the Foundation		
Technology Focus Questions	Technology Activity Objectives	TEKS:
How can CAD software be used to create a 3D model of a Lego brick?	Students will create a 3D model of a Lego brick using CAD Software. Students will learn how to use CAD feature tools to transform their sketches into 3D models.	127.785 Engineering Design and Problem Solving (d)(1)(D,E) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Technology Assignment Problem(s) or Overarching Question(s)	Technology Assignment Objectives	TEKS:
Photo of sketch of Lego drawing with dimensions and CAD drawing of 3D Lego model	Students will create a 3D model of a Lego brick using CAD Software.	127.785 Engineering Design and Problem Solving (d)(1)(D,E) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Module One --- Establishing the Foundation		
Engineering Focus Questions	Engineering Activity Objectives	TEKS:
How are NASA Engineering Design Notebooks set up?	Students will set up a NASA Engineering Design Notebook based on the tutorial given.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(11)(I)

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How will the NASA Engineering Design Notebooks be used throughout the course?	Students will compile their designs, notes and research to put in EDN while completing each modular task and organize them in a meaningful way throughout the course.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Engineering Assignment Problem(s) or Overarching Question(s)	Engineering Assignment Objectives	TEKS:
Create an Engineering Design Notebook to be used for recording activities in the course.	Students will set up a NASA Engineering Design Notebook based on the tutorial given.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Create a 2-3 minute introductory video.	Students will explain, in a video, the ways in which they have used the engineering design process.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Module One --- Establishing the Foundation

Mathematics Focus Questions	Mathematics Activity Objectives	TEKS:
What are the fundamentals of coding? How can block-based programming be used in the Scratch environment?	Students will learn the fundamentals of coding using block-based programming in the Scratch environment.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(7)(E,F)
How can the Scratch environment be used to code a Mars Exploration game?	Students will code a Mars Exploration game using block-based programming language in Scratch.	127.785 Engineering Design and Problem Solving (d)(1)(D,E) 127.785 Engineering Design and Problem Solving (d)(7)(E,F)
Mathematics Assignment Problem(s) or Overarching Question(s)	Mathematics Assignment Objectives	TEKS:
Post on discussion board post , including a link to the created game. Play at least two other students' games. Write a response to the other two students' games played.	Students will learn the fundamentals of coding using block-based programming in the Scratch environment. Students will code a Mars Exploration game using block-based programming language in Scratch.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(7)(E,F)

Module Two --- Living Here "Looking In"

Science Focus Questions	Science Activity Objectives	TEKS:
How is the electromagnetic spectrum used by satellites to study the atmosphere of Earth?	Students will learn how different satellites collect light across the electromagnetic spectrum to study Earth's atmosphere.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A)

		127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(5)(C) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Science Assignment Problem(s) or Overarching Question(s)	Science Assignment Objectives	TEKS:
Option 1 -- Select a satellite for collecting data to answer a research question about Earth's changing climate. Option 2 - Select a space telescope for collecting data to answer a research question about the Universe.	Students will investigate a research question that could be answered using NASA satellite data or space telescope data. The research will include: Research question about either Earth's climate or the universe; Satellite or space telescope selection capable of providing data needed to answer your research question; Described data collected; Data or images from the satellite or space telescope with usage explanation; Other data sources determined that could be used to help interpret collected data or images; Who will benefit from the findings? Students will write a 250-500 word essay with no significant grammatical errors, correctly citing references using APA style.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(5)(C) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Module Two --- Living Here “Looking In”

Technology Focus Questions	Technology Activity Objectives	TEKS:
How has NASA technology changed the lives of people living on Earth?	Students will read various articles about NASA technology.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(5)(A,B,C) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(11)(I)
How has NASA technology changed the lives of people living on Earth?	Students will write an essay over what they have learned about NASA technology.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(5)(A,B,C) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(11)(I)

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Technology Assignment Problem(s) or Overarching Question(s)	Technology Assignment Objectives	TEKS:
Using the NASA Facts Sheet and NASA @ Home and City: Determine examples of products that came from or were enhanced by Apollo technology that impact your life personally, and describe the personal, societal or community impact/influence of each product; Identify home products that have been created by NASA technology; Trace the diffusion of a NASA technologies into home, city and globally, and explain its affects and benefits; List and explain NASA influenced technologies that are used in your school; Explain how diffusion has led to globalization, and describe its applications in space and on Earth.	NASA technology has been adapted to meet the needs of the private sector, benefiting global competition and the economy; Diffusion is the spread of an idea or innovation from one place to another, and may occur on a local, regional or global scale.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(5)(A,B,C) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Module Two --- Living Here "Looking In"

Engineering Focus Questions	Engineering Activity Objectives	TEKS:
How can engineers use CAD skills to design a satellite?	Students will level up their CAD skills to design a model of a satellite.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(5)(A,B,C) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Engineering Assignment Problem(s) or Overarching Question(s)	Engineering Assignment Objectives	TEKS:
Part 1: Track your thinking in your EDN, specifically highlighting your brainstorming and design process. Consider the research question you made for your elevator pitch earlier in this module to secure more telescope/satellite time. Could you use that as inspiration for designing an improved version of the satellite selected in the previous assignment? Your completed EDN entry should: ○ Describe the four design features of your satellite. ○ Explain the relevance of CAD printing in the aerospace industry in both space and Earth applications. ○ Relate your design to your elevator pitch from Module 2, Task 3. Part 2: Your goal is to learn how to create CAD drawings using the tools of the CAD design software. Build on the skills you learned in Module 1 to design your own satellite! **Satellite Design Specifications:** Use any combination of basic shapes and/or sketches to represent the following four satellite components: ○ Power - energy source ○ Communication – how messages are conveyed/received	Students will level up their CAD skills to design a model of a satellite.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(5)(A,B,C) 127.785 Engineering Design and Problem Solving (d)(11)(I)

○ Guidance – navigation system ○ Scientific Instruments – dependent upon the mission		

Module Two --- Living Here "Looking In"

Mathematics Focus Questions	Mathematics Activity Objectives	TEKS:
How are binary numbers decoded and used to code?	Students will learn how to interpret binary signals to decode a message, then practice coding their own message in binary.	127.785 Engineering Design and Problem Solving (d)(1)(D,E) 127.785 Engineering Design and Problem Solving (d)(5)(A) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Mathematics Assignment Problem(s) or Overarching Question(s)	**Mathematics Assignment Objectives**	**TEKS:**
Code the Mars Perseverance Parachute, using binary numbers Code a message on a parachute, using binary numbers Binary Quiz	Students will learn how to read and de-code binary coding on the rover's parachute and other examples. They will then create their own inspirational quote and code and color a parachute. Students will share their colored parachute and slogan on the chat and comment positively on two other posts. Lastly, upload pictures of your EDN documenting the decoding and encoding.	127.785 Engineering Design and Problem Solving (d)(1)(D,E) 127.785 Engineering Design and Problem Solving (d)(5)(A) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Module Three --- Discovering There "Looking Out"

Science Focus Questions	Science Activity Objectives	TEKS:
Task 1 (Hubble Telescope) How has Hubble Space Telescope changed the way that we see the universe?	Students will explore an image taken by the Hubble telescope on date of their choice. Students will describe the photo and how it relates to knowledge learned thus far.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(4)(A,B)
Task 2 (Be an Astronaut) What are the qualifications necessary to become an astronaut?	Students will identify the criteria necessary to become a NASA astronaut.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(9)(A) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Task 3 (Exploring Places in Our Solar System) How do atmosphere and geological formations affect the choice of where to land and explore in the solar system?	Students will explain how a planet's atmosphere and geology affect the choice of where to land and explore.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(3)(B,D) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(8)(C) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Task 5 (Choosing a Space Base) Which location in the solar system (Mars, Titan, Europa, or the Asteroid Belt) is the	Students will analyze celestial bodies as a planetary geologist using NASA tools, compare their features, choose a location for a space base, and present their findings.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(3)(B,D) 127.785 Engineering Design and Problem Solving (d)(4)(A,B)

best location for a space base? What data supports this determination?		127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(8)(C) 127.785 Engineering Design and Problem Solving (d)(10)(I) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Science Assignment Problem(s) or Overarching Question(s)	Science Assignment Objectives	TEKS:
Task 1 (Hubble Telescope) Post your findings in the discussion board to include: • What date did you pick and why? • What do you see? Provide an insightful description of Hubble's discovery on your date of choice. • How does this relate to what you have learned in the HAS course? Make connections to course concepts that you have learned. • What were your thoughts when you first saw the photo? Share a thoughtful reaction to the photo. Comment on two other posts from your peers (see rubric below). • Can you elaborate on what you learned in the course based on their photo and what they've shared? • What were your initial thoughts about their photo compared to the one you discovered?	Students will explore an image taken by the Hubble telescope on date of their choice. Students will describe the photo and how it relates to knowledge learned thus far.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(4)(A,B)
Task 2 (Be an Astronaut) Answer the following questions in your Engineering Design Notebook (EDN) as you brainstorm for your discussion board post: • What do you think is the most important aspect in this selection of astronauts and why? • How is this next group of American Artemis space explorers inspirational to you? Post your final responses in the discussion board. Write a thoughtful response to at least two other scholars' posts.	Students will identify the criteria necessary to become a NASA astronaut.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(9)(A) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Task 3 (Exploring Places in Our Solar System) 1. Using data from the resources for Mars, Titan, Europa, and the Asteroid Belt, identify geological and atmospheric features at each location that would lend themselves to eventual human exploration. 2. Record your findings in your Engineering Design Notebook (EDN). This can be done in a detailed list, table, mind map, or other graphic organizer of your choosing.	Students will explain how a planet's atmosphere and geology affect the choice of	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(3)(B,D) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(8)(C) 127.785 Engineering Design and Problem Solving (d)(11)(I)

3. Based on your research, compare and contrast the geological and atmospheric conditions on the above locations and how they relate to potential human exploration. 4. Finally, draft a short paragraph describing how orbit plays a role in the efficiency of traveling to each location from Earth. 5. Post your findings in the discussion board. 6. Comment on two other posts from your peers.	where to land and explore.	
Task 5 (Choosing a Space Base) 1. Based on your research and discussion in Module 3, Activity 3, choose one location (Mars, Titan, Europa, or the Asteroid Belt) to research further for a space base. 2. In your Engineering Design Notebook, draft an outline explaining why you chose the location that you did. What factors did you consider? What made this site appealing to you? What drove you to choose your site over the other three? 3. Create a PowerPoint presentation to share your findings and choice of final destination. Include scans or photos of your EDN in your presentation. 4. Record a short video (no more than five minutes) of your presentation and share in the discussion board. Include your face. 5. Watch and provide commentary for at least one other scholars' presentation.	Students will analyze celestial bodies as a planetary geologist using NASA tools, compare their features, choose a location for a space base, and present their findings.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(3)(B,D) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(6)(A,B) 127.785 Engineering Design and Problem Solving (d)(8)(C) 127.785 Engineering Design and Problem Solving (d)(10)(I) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Module Three --- Discovering There "Looking Out"

Mathematics Focus Questions	Mathematics Activity Objectives	TEKS:
How do scientists use the Drake equation to locate habitable zones?	Students will use the Drake equation to identify the qualities of a habitable zone.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(3)(B,C) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(7)(A,B,C)
Mathematics Assignment Problem(s) or Overarching Question(s)	**Mathematics Assignment Objectives**	**TEKS:**
What distances (in AU) would represent the inner and outer boundary of the "habitable zone" for the sun? If you could genetically engineer a new extremophile by merging the traits of two different kinds of extremophiles, which two traits would you select if your extremophile were to live on Jupiter's moon Europa?	The Drake Equation is from astronomer Dr. Frank Drake, who suggested an organized framework for thinking about life in the galaxy; Physicist Enrico Fermi questioned: If a multitude of advanced extraterrestrial civilizations exists in the Milky Way, why is	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(A) 127.785 Engineering Design and Problem Solving (d)(3)(B,C) 127.785 Engineering Design and Problem Solving (d)(4)(A,B) 127.785 Engineering Design and Problem Solving (d)(7)(A,B,C)

For each of the terms in the Drake Equation, provide a value and justification: N* ; fp ; ne ; fl ; fi ; fc ; fL ; Solve the Drake Equation, and determine if your solution is more optimistic or conservative when it comes to thinking about extraterrestrial life with radio technology in the Milky Way galaxy; Explain if/how your solution would change if you were to consider additional galaxies. Could any of the terms in the Drake Equation be equal to zero? Select one of the arguments from the Fermi-Hart paradox and describe which term(s) it would affect in the Drake Equation.	there no evidence for them such as radio signals, spacecraft, colonies or probes? In 1975, Michael Hart wrote an article in which he detailed the many factors that could lead to such a cosmic silence, and this is sometimes called the Fermi-Hart Paradox; Bacteria and bacteria-like organisms living in places once considered extreme and uninhabitable are called extremophiles.	

Module Four --- Getting There "Extending Life"

Science Focus Questions	Science Activity Objective	TEKS:
Task 1 (Dart Mission) What evidence selected from current research supports my selected location?	Students will connect with current research on their mission location by completing a NASA activity specific to their chosen site.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E)
Task 2 (Planet Four: Fans & Blotches) How can citizen scientists help scientists study the Marian surface?	Students will write a lab summary outlining their Planet Four classification process.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(B) 127.785 Engineering Design and Problem Solving (d)(8)(D) 127.785 Engineering Design and Problem Solving (d)(10)(I) 127.785 Engineering Design and Problem Solving (d)(11)(A,I)

Science Assignment Problem(s) or Overarching Question(s)	Science Assignment Objectives	TEKS:
Task 1 (Dart Mission) 1. Choose the activity for your Module 3 location from the resources provided. While you are encouraged to participate in all four activities, you will only turn in your location's activity for points. 2. Take a screenshot illustrating the completion of the activity related to your location and submit. 3. In the submission notes, include a short reflection (2-4 sentences) on any thoughts, feelings, or questions raised by the activity.	Students will connect with current research on their mission location by completing a NASA activity specific to their chosen site.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E)
Task 2 (Planet Four: Fans & Blotches) 1. Define the 5 different terrains: spider, baby spider, Swiss cheese terrain, channel network, and craters. Use the Spotter's	Students will write a lab summary outlining their Planet Four classification process.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(B) 127.785 Engineering Design and Problem Solving (d)(8)(D) 127.785 Engineering Design and Problem Solving (d)(10)(I)

Guide in Resources below to review the different Martian terrains. 2. Describe Martian "fans" and "blotches." 3. Explain the difference between CTX and HiRISE. 4. How will NASA scientists benefit from this project? 5. Explain how citizen science projects work. 6. In addition to the copy of your EDN pages, include five or more screenshots of fans and/or blotches from your own classifications efforts support your conclusion(s) in your final submission.		127.785 Engineering Design and Problem Solving (d)(11)(A,I)

Module Four --- Getting There "Extending Life"

Technology Focus Questions	Technology Activity Objectives	TEKS:
How can criteria be used to recommend a base and landing site for a mission?	Students will explore the spheres of their planetary body and recommend a base and landing site based on select criteria.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(B) 127.785 Engineering Design and Problem Solving (d)(8)(C,D) 127.785 Engineering Design and Problem Solving (d)(10)(I) 127.785 Engineering Design and Problem Solving (d)(11)(A,E,I)

Technology Assignment Problem(s) or Overarching Question(s)	Technology Assignment Objectives	TEKS:
1. In your EDN, list the three sites you've chosen to research and create a pros and cons list for each location based on the site selection criteria below. Latitude and Longitude A. Average and extreme weather, temperatures, radiation and solar angle B. Geological and mineral resources for habitat C. In situ resources for life support and energy D. Safe landing area with proximity to base E. Ease of exploration in area(s) surrounding the base 2. Create a 5-7 slide presentation illustrating your use of the NASA resources, pros and cons for each location, and justification for your final choice of landing site. Integrate photos or scanned pages from your EDN into your presentation. 3. Submit a .PDF file of your presentation to the discussion board that matched your chosen destination. ○ Mars discussion board ○ Titan discussion board ○ Europa discussion board	Students will explore the spheres of their planetary body and recommend a base and landing site based on select criteria.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(B) 127.785 Engineering Design and Problem Solving (d)(8)(C,D) 127.785 Engineering Design and Problem Solving (d)(10)(I) 127.785 Engineering Design and Problem Solving (d)(11)(A,E,I)

○ Asteroid Belt discussion board 4. Comment on posts from at least two students- one researching the same location as you and one researching a different location.		

Module Four --- Getting There "Extending Life"

Engineering Focus Questions	Engineering Activity Objectives	TEKS:
How can current resources used on the International Space Station be used to understand how astronauts live in space?	Students will use the International Space Station as a platform to understand how astronauts utilize/recycle resources found in space.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(B) 127.785 Engineering Design and Problem Solving (d)(8)(C) 127.785 Engineering Design and Problem Solving (d)(10)(I) 127.785 Engineering Design and Problem Solving (d)(11)(A,E,I)
How do astronauts remain healthy and live safely in space for extended periods of time?	Students will explore the overall health and safety concerns from living in space for extended periods of time and apply to their chosen destination.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(B) 127.785 Engineering Design and Problem Solving (d)(8)(C) 127.785 Engineering Design and Problem Solving (d)(10)(I) 127.785 Engineering Design and Problem Solving (d)(11)(A,E,I)

Engineering Assignment Problem(s) or Overarching Question(s)	Engineering Assignment Objectives	TEKS:
1. In your Engineering Design Notebook (EDN), list the three major components of life support and the systems within them. Include a short (1-2 sentences) description of each component and system. 2. In your EDN, list the life support systems you will need on your future base to support life for up to 250 people. Be sure to include answers to the following questions: a. What existing systems will you use? b. What systems will you need to add, expand, or otherwise adapt? c. What specific life support challenges will your chosen location present? How will you overcome them? 3. Submit a scanned copy or high-quality photo of your list and explanations in your EDN to the discussion board. 4. Comment positively or ask questions on at least three posts from others from the same destination choice as your own.	Students will use the International Space Station as a platform to understand how astronauts utilize/recycle resources found in space. Students will explore the overall health and safety concerns from living in space for extended periods of time and apply to their chosen destination.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(B) 127.785 Engineering Design and Problem Solving (d)(8)(C) 127.785 Engineering Design and Problem Solving (d)(10)(I) 127.785 Engineering Design and Problem Solving (d)(11)(A,E,I)

Module Five --- Living and Working There "Sustaining Life

Science Focus Questions	Science Activity Objective	TEKS:
How can a habitable base be designed to sustain 100-250 people?	Students will research and design a habitable working base at their chosen destination.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(G) 127.785 Engineering Design and Problem Solving (d)(8)(A,B)

		127.785 Engineering Design and Problem Solving (d)(10)(C) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Science Assignment Problem(s) or Overarching Question(s)	Science Assignment Objectives	TEKS:
Design your base, considering: 1. What materials to use 2. How air, water, food will be supplied 3. How crew members will move around 4. How to protect crew from radiation, potential weather, meteors, etc. 5. How food and water will be supplied 6. What sources you will use to power your base 7. How to maintain crew's mental and physical health 8. Where crew members will live and play 9. How your crew will communicate with Earth 10. Any additional items or systems that may benefit your astronauts Post to the discussion board, including: ○ Destination of the base. ○ Rough draft drawing of the base in your EDN, to scale and annotated. ○ Ideas addressing the ten research topics above. Peer Interaction: ○ Respond to two posts of peers from the **same destination** who do NOT already have two replies. ○ Provide one positive comment and one suggestion for improvement on the science or base structure ideas.	Students will research and design a habitable working base at their chosen destination.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(G) 127.785 Engineering Design and Problem Solving (d)(8)(A,B) 127.785 Engineering Design and Problem Solving (d)(10)(C) 127.785 Engineering Design and Problem Solving (d)(11)(I)
Module Five --- Living and Working There "Sustaining Life		
Technology Focus Questions	Technology Activity Objectives	TEKS:
How can a habitable base be designed to sustain 100-250 people?	Students will create a CAD rendering of their habitat. Students will create and conduct a presentation over their CAD creation.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(G) 127.785 Engineering Design and Problem Solving (d)(8)(A,B) 127.785 Engineering Design and Problem Solving (d)(10)(C) 127.785 Engineering Design and Problem Solving (d)(11)(I)

127.785 Engineering Design and Problem Solving TEKS Overview
2024 Texas High School Aerospace Scholars Online Curriculum

Technology Assignment Problem(s) or Overarching Question(s)	Technology Assignment Objectives	TEKS:
1. CAD Model Creation: ○ Utilize the location criteria from Module 4 and findings for a landing spot and base locations. ○ Engineer a CAD model of the working space-base, ensuring accurate scaling and detailed representation. ○ Incorporate labels, brief descriptions, and materials/resources used for each feature/system. ○ Address features and systems: Structure and Materials, Life Support, Transportation, Radiation Protection, Food Production, Health and Safety, Energy/Power, Living Quarters, Recreation Areas, and Communication. 2. Presentation: ○ Create a 5–7-minute recorded presentation that elaborates on each feature and function of the base specific to the chosen destination. Include your face while presenting. ○ Include detailed explanations of how each feature/system addresses the challenges of the location's environment. ○ Discuss the resources and materials utilized in the design. ○ Emphasize the base's ability to support an initial crew of 100 with potential expansion to 250. ○ Include pictures of your Engineering Design Notebook that showcases both the steps for the research and the CAD design. 3. Submission: ○ Submit your final video for review. ○ Ensure that your EDN, CAD model, and presentation are well-integrated and complementary in conveying the design concept.	Students will create a CAD rendering of their habitat. Students will create and conduct a presentation over their CAD creation.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(G) 127.785 Engineering Design and Problem Solving (d)(8)(A,B) 127.785 Engineering Design and Problem Solving (d)(10)(C) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Module Five --- Living and Working There "Sustaining Life

Engineering Focus Questions	Engineering Activity Objectives	TEKS:
How can a multipurpose tool be designed to be used aboard space missions?	Students will create a multipurpose tool that is used aboard space missions. Students will explain the design purpose, material, and manufacturing process.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(G) 127.785 Engineering Design and Problem Solving (d)(8)(A,B) 127.785 Engineering Design and Problem Solving (d)(10)(C) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Engineering Assignment Problem(s) or Overarching Question(s)	Engineering Assignment Objectives	TEKS:

Create a tool that can be used in space, considering the following: 1. **For practicality:** ○ How will the tool be used? ○ Is it a sensible design? ○ Will it do its intended job? 2. **For creativity:** ○ How was the tool designed? ○ Is the design novel? ○ Does the design take full advantage of 3D printing? 3. **For efficiency:** ○ Is the operation of the tool addressed? ○ Does it make efficient use of materials? ○ Is the tool multipurpose?	Students will create a multipurpose tool that is used aboard space missions. Students will explain the design purpose, material, and manufacturing process.	127.785 Engineering Design and Problem Solving (d)(1)(C,D,E) 127.785 Engineering Design and Problem Solving (d)(2)(G) 127.785 Engineering Design and Problem Solving (d)(8)(A,B) 127.785 Engineering Design and Problem Solving (d)(10)(C) 127.785 Engineering Design and Problem Solving (d)(11)(I)

Module Five --- Living and Working There "Sustaining Life

Mathematics Focus Questions	Mathematics Activity Objectives	TEKS:
How can a rover game be used to simulate a mission to the selected landing site?	Students will enhance and expand their Rover Game from Module 1.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E)

Mathematics Assignment Problem(s) or Overarching Question(s)	Mathematics Assignment Objectives	TEKS:
Using the rover game previously created, change the landscape to your chosen landing site. Elevate the gaming experience by including: 1. **Core Features:** ○ **Arrows** for movement control. ○ A **score** system. ○ A ticking **timer**. ○ Clear **boundary lines**. ○ In-game **hazards** that challenge the player. 2. **New Enhancements:** ○ **Multiple Levels:** Your game should have at least two distinct levels, with each successive level presenting increased difficulty. ○ **Start Button:** Incorporate a start button to initiate the game. ○ **Background Changes:** Each level should feature a unique background corresponding to the new challenges and aesthetics of that stage. Create a thread with the title of your game and the location.	Students will enhance and expand their Rover Game from Module 1.	127.785 Engineering Design and Problem Solving (d)(1)(B,C,D,E)

○ Example: "Lighting Dust Rover" - Moon Play and comment on two other classmates' projects. Discuss aspects you like, had challenges while playing and/or suggestions for improvement.		