

# SystemsGo Introduction to Engineering

## (13040200) Principles of Applied Engineering - TEKS Alignment

(c) Knowledge and skills.

(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
	(A) demonstrate knowledge of how to dress, speak, and conduct oneself in a manner appropriate for the profession;				✓	✓		✓		✓	✓	✓	✓	✓	✓	✓					
	(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;	✓				✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(C) present written and oral communication in a clear, concise, and effective manner;	✓			✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓					
	(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and	✓			✓	✓	✓			✓	✓	✓	✓	✓	✓	✓			✓	✓	
	(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.	✓			✓	✓	✓			✓	✓	✓	✓	✓	✓	✓					
(2)	The student investigates the components of engineering and technology systems. The student is expected to:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
	(A) investigate and report on the history of engineering science;												✓								✓
	(B) identify the inputs, processes, and outputs associated with technological systems;									✓	✓	✓	✓	✓		✓	✓				
	(C) describe the difference between open and closed systems;										✓			✓							
	(D) describe how technological systems interact to achieve common goals;									✓	✓	✓	✓	✓	✓	✓	✓				
	(E) compare and contrast engineering, science, and technology careers				✓																
	(F) conduct and present research on emerging and innovative technology; and		✓								✓		✓	✓	✓	✓	✓				
	(G) demonstrate proficiency of the engineering design process.			✓							✓	✓	✓	✓	✓		✓				







# SystemsGo Introduction to Engineering

## (13040200) Principles of Applied Engineering - TEKS Alignment

		The student demonstrates the ability to function as a team member while completing a comprehensive project. The student is expected to:																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
(9)	(A)	apply the design process as a team participant;	✓								✓	✓	✓	✓	✓	✓	✓			
	(B)	assume different roles as a team member within the project;	✓				✓				✓	✓	✓	✓	✓		✓	✓	✓	
	(C)	maintain an engineering notebook for the project;	✓				✓				✓	✓	✓	✓	✓					
	(D)	develop and test the model for the project; and	✓								✓	✓	✓	✓	✓			✓		
	(E)	demonstrate communication skills by preparing and presenting the project.	✓								✓	✓	✓	✓	✓	✓				



**Engineering Design and Problem Solving**  
**Oberth Level - TEKS alignment**

**(c) Knowledge and skills.**

The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:		1. History of Space Flight	2. Ball Toss Activity	3. D&D Loop	4. Flight Profile Development/ NASA Review	5. Transonic Project
1	(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;	✓		✓	✓	
	(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;	✓	✓	✓	✓	✓
	(C) present written and oral communication in a clear, concise, and effective manner;	✓		✓	✓	✓
	(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and	✓		✓	✓	✓
	(E) demonstrate punctuality, dependability, reliability and responsibility in performing assigned tasks as directed.	✓		✓	✓	✓

The student, for at least 40% of instructional time, conducts engineering field and laboratory activities using safe, environmentally appropriate, and ethical practices. The student is expected to:		1. History of Space Flight	2. Ball Toss Activity	3. D&D Loop	4. Flight Profile Development/ NASA Review	5. Transonic Project
2	(A) demonstrate safe practices during engineering field and laboratory activities; and		✓	✓	✓	✓
	(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.		✓	✓	✓	✓

The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:		1. History of Space Flight	2. Ball Toss Activity	3. D&D Loop	4. Flight Profile Development/ NASA Review	5. Transonic Project
3	(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(6) of this section;		✓	✓	✓	✓
	(B) know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories;				✓	
	(C) know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;		✓	✓	✓	✓
	(D) distinguish between scientific hypotheses and scientific theories;			✓	✓	
	(E) plan and implement descriptive, comparative and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;		✓		✓	✓
	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micro pipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;		✓	✓	✓	✓
	(G) analyze, evaluate, make inferences and predict trends from data; and		✓	✓	✓	✓
	(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries oral reports, and technology-based reports.			✓	✓	✓

The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:		1. History of Space Flight	2. Ball Toss Activity	3. D&D Loop	4. Flight Profile Development/ NASA Review	5. Transonic Project
4	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;		✓	✓	✓	✓
	(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;			✓	✓	✓
	(C) draw inferences based on data related to promotional materials for products and services;			✓	✓	✓
	(D) evaluate the impact of scientific research on society and the environment;	✓				✓
	(E) evaluate models according to their limitations in representing biological objects or events; and					
	(F) research and describe the history of biology and contributions of scientists.					

The student applies knowledge of science and mathematics and the tools of technology to solve engineering design problems. The student is expected to:		1. History of Space Flight	2. Ball Toss Activity	3. D&D Loop	4. Flight Profile Development/ NASA Review	5. Transonic Project
5	(A) apply scientific processes and concepts outlined in the Texas essential knowledge and skills (TEKS) for Biology, Chemistry, or Physics relevant to engineering design and problems;	✓	✓	✓	✓	✓
	(B) apply concepts, procedures, and functions outlined in the TEKS for Algebra I, Geometry, and Algebra II relevant to engineering design problems;	✓	✓	✓	✓	✓
	(C) select appropriate mathematical models to develop solution to engineering design problems;	✓	✓	✓	✓	✓
	(D) integrate advanced mathematics and science skills as necessary to develop solutions to engineering design problems;	✓	✓	✓	✓	✓
	(E) judge the reasonableness of mathematical models and solutions;	✓	✓	✓	✓	✓
	(F) investigate and apply relevant chemical, mechanical, biological, electrical, and physical properties of materials to engineering design problems;	✓	✓	✓		✓
	(G) identify the inputs, processes, outputs, control and feedback associated with open and closed systems;	✓		✓		✓
	(H) describe the differences between open-loop and closed-loop control systems;			✓	✓	✓
	(I) make measurements with accuracy and precision and specify tolerances;	✓		✓	✓	✓
	(J) use appropriate measurement systems, including customary and International System (SI) of units; and	✓	✓	✓	✓	✓
	(K) use conversions between measurement systems to solve real-world problems.	✓	✓	✓	✓	✓

The student communicates through written documents, presentations, and graphic representations using the tools and techniques of professional engineers. The student is expected to:		1. History of Space Flight	2. Ball Toss Activity	3. D&D Loop	4. Flight Profile Development/ NASA Review	5. Transonic Project
6	(A) communicate visually by sketching and creating technical drawing using established engineering graphic tools, techniques and standards;		✓	✓	✓	✓
	(B) read and comprehend technical documents including specifications and procedures;			✓	✓	✓
	(C) prepare written documents such as memorandums, emails, design proposals, procedural directions, letters, and technical reports using the formatting and terminology conventions of technical documentations;			✓	✓	✓
	(D) organize information for visual display and analysis using appropriate formats for various audiences, including graphs and tables;			✓	✓	✓
	(E) evaluate the equality and relevance of sources and cite appropriately; and			✓		✓
	(F) defend a design solution in a presentation.			✓	✓	✓

The student recognizes the history, development, and practices of the engineering professions. The student is expected to:		1. History of Space Flight	2. Ball Toss Activity	3. D&D Loop	4. Flight Profile Development/ NASA Review	5. Transonic Project
7	(A) 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;	✓				
	(B) recognize that engineers are guided by established codes emphasizing high ethical standards;	✓				
	(C) explore the differences, similarities, and interactions among engineers, scientists, and mathematicians;	✓				
	(D) describe how technology has evolved in the field of engineering and consider how it will continue to be a useful tool in solving engineering problems'	✓				
	(E) discuss the history and importance of engineering innovation in the U.S. economy and quality of life; and	✓				
	(F) describe the importance of patents and the protection of intellectual property rights.	✓				

The student creates justifiable solutions to open-ended problems using engineering design practices and processes. The student is expected to:		1. History of Space Flight	2. Ball Toss Activity	3. D&D Loop	4. Flight Profile Development/ NASA Review	5. Transonic Project
8	(A) identify and define an engineering problem;			✓	✓	✓
	(B) formulate goals, objectives, and requirements to solve an engineering problem;			✓	✓	✓
	(C) determine the design parameters associated with an engineering problem such as materials, personnel, resources, funding, manufacturability, feasibility, and time;			✓		✓
	(D) establish and evaluate constraints pertaining to a problem, including, but not limited to, health, safety, social, environmental, ethical, political, regulatory, and legal;			✓	✓	✓
	(E) identify or create alternative solutions to a problem using a variety of techniques such as brainstorming, reverse engineering, and researching engineered and natural solutions;		✓	✓	✓	✓
	(F) test and evaluate proposed solutions using methods such as models, prototypes, mock-ups, simulations, critical design review, statistical analysis, or experiments;		✓	✓	✓	✓
	(G) apply structured techniques to select and justify a preferred solution to a problem such as a decision tree, design matrix, or cost-benefit analysis;			✓		✓
	(H) predict performance, failure modes, and reliability of a design solution; and			✓	✓	✓
	(I) prepare a project report that clearly documents the designs, decisions, and activities during each phase of the engineering design process.			✓	✓	✓

The student manages an engineering design project. The student is expected to:		1. History of Space Flight	2. Ball Toss Activity	3. D&D Loop	4. Flight Profile Development/ NASA Review	5. Transonic Project
9	(A) participate in the design and implementation of a real or simulated engineering project;			✓	✓	✓
	(B) develop a plan and timeline for completion of a project;			✓	✓	✓
	(C) work in teams and share responsibilities, acknowledging, encouraging, and valuing contributions of all team members;		✓	✓	✓	✓
	(D) compare and contrast the roles of a team leader and other team responsibilities;			✓	✓	✓
	(E) identify and manage the resources needed to complete a project;			✓	✓	✓
	(F) use a budget to determine effective strategies to meet cost constraints;			✓		✓
	(G) create a risk assessment for an engineering design project;			✓		✓
	(H) analyze and critique the results of an engineering design project; and			✓		✓
	(I) maintain an engineering notebook that chronicles work such as ideas, concepts, inventions, sketches, and experiments.			✓	✓	✓

# Engineering Design and Problem Solving

## Oberth Level - TEKS alignment

### Transonic Project

#### (c) Knowledge and skills.

		Problem Statement	Research	Design Calculations	Drawings	Materials Testing	Decision Making	CDR	Material Acquisition	Fabrication	FRR/TRR	Launch	PMA	Presentation	
1		The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:													
	(A)	demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;													
	(B)	member of a group in an effort to achieve a positive collective outcome;													
	(C)	present written and oral communication in a clear, concise, and effective manner;													
	(D)	demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and													
	(E)	demonstrate punctuality, dependability, reliability and responsibility in performing assigned tasks as directed.													

		Prob	Res	Calcs	Dwgs	Mat Test	Dec	CDR	Mat Aq	Fab	F/TRR	Lnch	PMA	Pres.	
2		The student, for at least 40% of instructional time, conducts engineering field and laboratory activities using safe, environmentally appropriate, and ethical practices. The student is expected to:													
	(A)	demonstrate safe practices during engineering field and laboratory activities; and													
	(B)	demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.													





5	The student applies knowledge of science and mathematics and the tools of technology to solve engineering design problems. The student is expected to:		Prob	Res	Calcs	Dwgs	Mat Test	Dec	CDR	Mat Aq	Fab	F/TRR	Lnch	PMA	Pres.	
	(A)	apply scientific processes and concepts outlined in the Texas essential knowledge and skills (TEKS) for Biology, Chemistry, or Physics relevant to engineering design and problems;			✓	✓	✓		✓		✓	✓		✓	✓	
	(B)	apply concepts, procedures, and functions outlined in the TEKS for Algebra I, Geometry, and Algebra II relevant to engineering design problems;	✓		✓	✓	✓		✓		✓	✓		✓	✓	
	(C)	select appropriate mathematical models to develop solution to engineering design problems;			✓		✓		✓		✓			✓	✓	
	(D)	integrate advanced mathematics and science skills as necessary to develop solutions to engineering design problems;			✓		✓		✓					✓	✓	
	(E)	judge the reasonableness of mathematical models and solutions;		✓	✓	✓	✓		✓							
	(F)	investigate and apply relevant chemical, mechanical, biological, electrical, and physical properties of materials to engineering design problems;			✓	✓	✓		✓	✓	✓				✓	
	(G)	identify the inputs, processes, outputs, control and feedback associated with open and closed systems;							✓		✓	✓			✓	
	(H)	describe the differences between open-loop and closed-loop control systems;														
	(I)	make measurements with accuracy and precision and specify tolerances;			✓	✓	✓		✓		✓	✓			✓	
	(J)	use appropriate measurement systems, including customary and International System (SI) of units; and	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
(K)	use conversions between measurement systems to solve real-world problems.	✓	✓	✓	✓	✓		✓		✓	✓			✓		

The student communicates through written documents, presentations, and graphic representations using the tools and techniques of professional engineers. The student is expected to:		Prob	Res	Calcs	Dwgs	Mat Test	Dec	CDR	Mat Aq	Fab	F/TRR	Lnch	PMA	Pres.
--	--	------	-----	-------	------	----------	-----	-----	--------	-----	-------	------	-----	-------

6	(A)	communicate visually by sketching and creating technical drawing using established engineering graphic tools, techniques and standards;				✓	✓		✓					✓	✓
	(B)	read and comprehend technical documents including specifications and procedures;		✓			✓	✓	✓		✓	✓		✓	
	(C)	prepare written documents such as memorandums, emails, design proposals, procedural directions, letters, and technical reports using the formatting and terminology conventions of technical documentations;	✓				✓	✓	✓		✓			✓	✓
	(D)	organize information for visual display and analysis using appropriate formats for various audiences, including graphs and tables;			✓	✓	✓	✓	✓					✓	✓
	(E)	evaluate the equality and relevance of sources and cite appropriately; and		✓										✓	✓
	(F)	defend a design solution in a presentation.					✓		✓					✓	✓
7	The student recognizes the history, development, and practices of the engineering professions. The student is expected to:		Prob	Res	Calcs	Dwgs	Mat Test	Dec	CDR	Mat Aq	Fab	F/TRR	Lnch	PMA	Pres.
	(A)	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;													
	(B)	recognize that engineers are guided by established codes emphasizing high ethical standards;													
	(C)	explore the differences, similarities, and interactions among engineers, scientists, and mathematicians;													
	(D)	describe how technology has evolved in the field of engineering a and consider how it will continue to be a useful tool in solving engineering problems'		✓			✓								
	(E)	discuss the history and importance eon engineering innovation in the U.S. economy and quality of life; and		✓			✓								
	(F)	describe the importance of patents and the protection of intellectual property rights.						✓	✓	✓					



