

Engineering Science

At-A-Glance - Lamar CISD

Professional Standards/Employability Skills/Technical Skills			
Ongoing Skills Imbedded All Year	<p>ES 1(B) The student will show the ability to cooperate, contribute, and collaborate as a member of a group to achieve a positive collective outcome.</p> <p>ES 1(C) The student will present written and oral communication in a clear, concise, and effective manner.</p> <p>ES 1(D) The student will demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results.</p> <p>ES 2(B) The student will apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations, and use engineering practices to design solutions to problems.</p> <p>ES 2(C) The student will use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards.</p> <p>ES 5(A) The student will 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 which have been tested over a wide variety of conditions are incorporated into theories.</p> <p>ES 5(B) The student will know 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.</p> <p>ES 7(B) The student will create solutions to existing problems using a design process.</p>		
Ongoing Ways to Show	<p>ES 7(A) The student will solve design problems individually and in a team.</p> <p>ES 7(B) The student will create solutions to existing problems using a design process.</p> <p>ES 7(C) The student will use a design brief to identify problem specifications and establish project constraints.</p> <p>ES 7(D) The student will use communication to achieve a desired goal within a team.</p> <p>ES 7(E) The student will work as a member of a team to conduct research to develop a knowledge base, stimulate creative ideas, and make informed decisions.</p>		
Grading Period	Unit Name	Estimated Time Frame	TEKS
Grading Period 1 29 Days	Professional Standards & Safety	5 Days	1A, 1B, 1C, 1D, 1E, 2C
	<p>ES 1(A) The student will demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession.</p> <p>ES 1(B) The student will show the ability to cooperate, contribute, and collaborate as a member of a group to achieve a positive collective outcome.</p> <p>ES 1(C) The student will present written and oral communication in a clear, concise, and effective manner.</p> <p>ES 1(D) The student will demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results.</p> <p>ES 1(E) The student will demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.</p> <p>ES 2(C) The student will use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards.</p>		
	Scientific Method, Reasoning & Problem Solving	9 Days	2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 5A, 5B, 5C
<p>ES 2(A) The student will ask questions and define problems based on observations or information from text, phenomena, models, or investigations.</p> <p>ES 2(B) The student will apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations, and use engineering practices to design solutions to problems.</p> <p>ES 2(C) The student will use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards.</p> <p>ES 2(D) The student will use appropriate tools such as dial caliper, micrometer, protractor, compass, scale rulers, multimeter, and circuit components.</p> <p>ES 2(E) The student will collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence.</p> <p>ES 2(F) The student will organize qualitative and quantitative data using spreadsheets, engineering notebooks, graphs, and charts.</p> <p>ES 2(G) The student will develop and use models to represent phenomena, systems, processes, or solutions to engineering problems.</p> <p>ES 2(H) The student will distinguish between scientific hypotheses, theories, and laws.</p> <p>ES 5(A) The student will 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 students.</p> <p>ES 5(B) The student will 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.</p> <p>ES 5(C) The student will research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a STEM field.</p>			

	Mechanical Advantage, Simple Machines	15 Days	6A, 6B, 6C, 6D, 8A, 8B, 8C
	<p>ES 6(A) The student will differentiate between engineering and engineering technology.</p> <p>ES 6(B) The student will compare the roles or job descriptions for career opportunities in the fields of pure science, engineering, and engineering technology.</p> <p>ES 6(C) The student will identify and differentiate between different engineering disciplines.</p> <p>ES 6(D) The student will demonstrate appropriate oral, written, and visual forms of technical communication.</p> <p>ES 8(A) The student will explain the purpose and operation of components, including gears, sprockets, pulley systems, and simple machines.</p> <p>ES 8(B) The student will explain how components, including gears, sprockets, pulley systems, and simple machines, make up mechanisms.</p> <p>ES 8(C) The student will distinguish between the six simple machines and their attributes and components.</p>		
Grading Period 2 26 Days	Energy	15 Days	9A, 9B, 9C, 9D
	<p>ES 9(A) The student will identify and categorize energy sources as nonrenewable, renewable, or inexhaustible.</p> <p>ES 9(B) The student will define and calculate work and power in electrical systems.</p> <p>ES 9(C) The student will calculate and explain how power in a system converts energy from electrical to mechanical.</p> <p>ES 9(D) The student will define voltage, current, and resistance and calculate each quantity in series, parallel, and combination electrical circuits using Ohm's law.</p>		
	Energy Requirements & Sources	11 Days	10A, 10B, 10C, 10D, 10E, 10F, 10G
	<p>ES 10(A) The student will explain the purpose of energy management.</p> <p>ES 10(B) The student will evaluate system energy requirements in order to select the proper energy source.</p> <p>ES 10(C) The student will explain and design how multiple energy sources can be combined to convert energy into useful forms.</p> <p>ES 10(D) The student will describe how hydrogen fuel cells create electricity and heat and how solar cells create electricity.</p> <p>ES 10(E) The student will measure and analyze how thermal energy is transferred via convection, conduction, and radiation.</p> <p>ES 10(F) The student will analyze how thermal energy transfer is affected by conduction, thermal resistance values, convection, and radiation.</p> <p>ES 10(G) The student will calculate resistance, efficiency, and power transfer in power transmission and distribution applications for various material properties.</p>		
Grading Period 3 25 Days	Material Properties	15 Days	12A, 12B, 12C
	<p>ES 12(A) The student will conduct investigative non-destructive material property tests on selected common household products.</p> <p>Property testing conducted to identify continuity, ferrous metal, hardness, and flexure.</p> <p>ES 12(B) The student will calculate weight, volume, mass, density, and surface area of selected common household product.</p> <p>ES 12(C) The student will identify the manufacturing processes used to create the selected common household product.</p>		
	Material Testing	10 Days	13A, 13B, 13C, 13D, 13E
	<p>ES 13(A) The student will use a design process and mathematical formulas to solve and document design problems.</p> <p>ES 13(B) The student will obtain measurements of material samples such as length, width, height, and mass.</p> <p>ES 13(C) The student will use material testing to determine a product's reliability, safety, and predictability in function.</p> <p>ES 13(D) The student will identify and calculate test sample material properties using a stress strain curve.</p> <p>ES 13(E) The student will identify and compare measurements and calculations of sample material properties such as elastic range, proportional limit, modulus of elasticity, elastic limit, resilience, yield point, plastic deformation, ultimate strength, failure, and ductility using stress-strain data points.</p>		
Grading Period 4 32 Days	Forces & Structural Design	15 Days	11A, 11B, 11C, 11D, 11E, 11F, 11G, 11H, 11I, 11J
	<p>ES 11(A) The student will illustrate, calculate, and experimentally measure all forces acting upon a given body.</p> <p>ES 11(B) The student will locate the centroid of structural members mathematically or experimentally.</p> <p>ES 11(C) The student will calculate moment of inertia of structural members.</p> <p>ES 11(D) The student will define and calculate static equilibrium.</p> <p>ES 11(E) The student will differentiate between scalar and vector quantities.</p> <p>ES 11(F) The student will identify properties of a vector, including magnitude and direction.</p> <p>ES 11(G) The student will calculate the X and Y components given a vector.</p> <p>ES 11(H) The student will calculate moment forces given a specified axis.</p> <p>ES 11(I) The student will calculate unknown forces using equations of equilibrium.</p> <p>ES 11(J) The student will calculate external and internal forces in a statically determinate truss using translational and rotational equilibrium equations.</p>		

	Kinematics	17 Days	17A, 17B, 17C, 17D
	<p>ES 17(A) The student will calculate distance, displacement, speed, velocity, and acceleration from data.</p> <p>ES 17(B) The student will calculate experimentally the acceleration due to gravity given data from a free-fall device.</p> <p>ES 17(C) The student will calculate the X and Y components of an object in projectile motion.</p> <p>ES 17(D) The student will determine and test the angle needed to launch a projectile a specific range given the projectile's initial velocity.</p>		
Grading Period 5 32 Days	Fluid Control	12 Days	15A, 15B, 15C, 15D, 15E, 15F
	<p>ES 15(A) The student will identify and explain basic components and functions of fluid power devices.</p> <p>ES 15(B) The student will differentiate between pneumatic and hydraulic systems and between hydrodynamic and hydrostatic systems.</p> <p>ES 15(C) The student will use Pascal's Law to calculate values in a fluid power system.</p> <p>ES 15(D) The student will distinguish between gauge pressure and absolute pressure and between temperature and absolute temperature.</p> <p>ES 15(E) The student will calculate values in a pneumatic system using the ideal gas laws.</p> <p>ES 15(F) The student will calculate and experiment with flow rate, flow velocity, and mechanical advantage in a hydraulic system.</p>		
	Machine Control	20 Days	14A, 14B, 14C, 14D, 14E
	<p>ES 14(A) The student will create detailed flowcharts using a computer software application.</p> <p>ES 14(B) The student will create control system operating programs using computer software.</p> <p>ES 14(C) The student will create system control programs that use flowchart logic.</p> <p>ES 14(D) The student will select appropriate input and output devices based on the need of a technological system.</p> <p>ES 14(E) The student will judge between open- and closed-loop systems in order to select the most appropriate system for a given technological problem.</p>		
Grading Period 6 29 Days	Mechanisms	19 Days	8A, 8B, 8C, 8D, 8E, 8F, 8G
	<p>ES 8(A) The student will explain the purpose and operation of components, including gears, sprockets, pulley systems, and simple machines.</p> <p>ES 8(B) The student will explain how components, including gears, sprockets, pulley systems, and simple machines, make up mechanisms.</p> <p>ES 8(C) The student will distinguish between the six simple machines and their attributes and components.</p> <p>ES 8(D) The student will measure forces and distances related to a mechanism.</p> <p>ES 8(E) The student will calculate work and power in mechanical systems.</p> <p>ES 8(F) The student will determine experimentally the efficiency of mechanical systems.</p> <p>ES 8(G) The student will calculate mechanical advantage and drive ratios of mechanisms.</p>		
	Statistics	10 Days	16A, 16B, 16C, 16D, 16E, 16F, 16G, 16H
	<p>ES 16(A) The student will calculate the theoretical probability that an event will occur.</p> <p>ES 16(B) The student will calculate the experimental frequency distribution of an event occurring.</p> <p>ES 16(C) The student will apply the Bernoulli process to events that only have two distinct possible outcomes.</p> <p>ES 16(D) The student will apply AND, OR, and NOT logic to solve complex probability scenarios.</p> <p>ES 16(E) The student will apply Bayes' theorem to calculate the probability of multiple events occurring.</p> <p>ES 16(F) The student will calculate the central tendencies of a data array, including mean, median, and mode.</p> <p>ES 16(G) The student will calculate data variation, including range, standard deviation, and variance.</p> <p>ES 16(H) The student will create a histogram to illustrate frequency distribution.</p>		