Certifications Related to Solar Car Challenge Professional Development

Below are the teaching certifications that can benefit from Solar Car Challenge professional development. These certifications are associated with courses that are taught within the following career clusters:
STEM Cluster - Renewable Energy & Engineering,
Manufacturing Cluster - Manufacturing Technology, Advanced Manufacturing Technology & Welding
Transportation Cluster – Automotive

Teaching Certifications
Agricultural Science and Technology: Grades 6-12
Industrial Arts
Industrial Technology
Legacy Master Mathematics Teacher: Grades 8-12
Mathematics
Mathematics: Grades 7-12
Mathematics: Grades 8-12
Mathematics/Physical Science/Engineering: Grades 6-12
Mathematics/Physical Science/Engineering: Grades 8-12
Physics
Physics/Mathematics: Grades 7-12
Physics/Mathematics: Grades 8-12
Physical Science: Grades 6-12
Physical Science: Grades 8-12
Science
Science, Composite
Science: 7-12
Science: 8-12
Technology Education: Grades 6-12
Trade and Industrial Education: Grades 6-12
Trade and Industrial Education: Grades 8-12
Trade and Industrial Workforce Training: Grades 6-12.

Courses that can be associated with a Solar Car project

Principles of Applied Engineering
Engineering Design & Presentation 1
Engineering Design & Presentation 2
Digital Electronics
Engineering Design & Problem Solving
Practicum in STEM
Scientific Research & Design
Foundations of Energy
Practicum in Energy
Introduction to Computer Aided Design
Automotive Basics
Advanced Transportation Systems Laboratory
Introduction to Renewable Energy
Energy & Natural Resources
Manufacturing Engineering Technology 1
Manufacturing Engineering Technology 2
Principles of Manufacturing
All Manufacturing and Welding
AC/DC Electronics
Solid State Electronics
Project-Based Research
Intermediate Computer Aided Design
Energy Power & Transportation

Courses Listed with Supporting TEKS for a Solar Car Project

The courses outlined below contain Sections from the Texas Essential Knowledge and Skills (TEKS) that support or directly relate to the Solar Car Challenge project. The courses are grouped in programs of study with in career clusters by TEA.

1. Renewable Energy Program of Study (STEM Cluster)

§127.746 AC/DC

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(4) The student develops skills for managing a project. The student is expected to:

(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) develop a project schedule and complete work according to established criteria;

(C) participate in the organization and operation of a real or simulated engineering project; and

(D) develop a plan for production of an individual product.

Section (c)(6) The student develops an understanding of basic direct current (DC) electricity principles.

(C) identify and apply the proper use of electronic schematics and symbols, including switches, voltage, current, ground, resistors, fuses, circuit breakers, volt meters, and amp meters;

(D) define and describe switches, voltage source, current source, ground, resistors, fuses, circuit breakers, volt meters, amp meters, voltage, current, and resistance;

(F) express Ohm's Law in three forms with appropriate symbols and units;

(G) express the Power Law in three forms with appropriate symbols and units;

(H) describe series, parallel, and combination circuits;

(I) apply Ohm's Law to calculate current, voltage drops, and resistance for each component in a multi-component series, parallel, and combination circuit;

(J) apply the Power Law to calculate current, voltage drops, resistance, and power for each component in a multicomponent series, parallel, and combination circuit; and

§127.747 Solid State Electronics

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(7) The student implements the concepts and skills that form advanced knowledge of electronics using project-based rubrics.

(A) apply Ohm's law, Kirchhoff's laws, and power laws to advanced circuit theory;

(B) demonstrate advanced knowledge of the theory of direct current, alternating current, digital circuits, and semiconductor circuits through Thevenin’s and Norton's theorems;

(C) apply knowledge of voltage regulation devices;

(D) apply knowledge of the design and use of diodes, transistors, and analog components with integrated circuits;

(E) implement knowledge of solid-state components and devices such as a power supply design;

(F) demonstrate knowledge of the similarities and differences in optoelectronic devices;
(G) implement knowledge of transmission theory;
(H) implement knowledge of microprocessor applications;
(I) apply electronic theory to generators, electric motors, power supplies, electronic amplifiers, electronic oscillators, communication circuits, and systems; and

Section (c)(10) The student builds a simulated or physical prototype using the appropriate tools, materials, and techniques. The student is expected to:
(A) identify and describe the steps needed to produce a prototype;
(B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype;
(C) present the prototype using a variety of media to a panel.

§127.748 Digital Electronics

Section (b)(3) Digital Electronics is the study of electronic circuits that are used to process and control digital signals. In contrast to analog electronics, where information is represented by a continuously varying voltage, digital signals are represented by two discreet voltages or logic levels. This distinction allows for greater signal speed and storage capabilities and has revolutionized the world of electronics. Digital electronics is the foundation of modern electronic devices such as cellular phones, digital audio players, laptop computers, digital cameras, and high-definition televisions. The primary focus of Digital Electronics is to expose students to the design process of combinational and sequential logic design, teamwork, communication methods, engineering standards, and technical documentation.

Section (b)(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Note: This course would lend itself to development of a telemetry system using Arduino and Raspberry Pi platforms for the data collection related to the solar car project.

§130.490 Foundations of Energy
Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(6) The student examines and explains concepts and procedures related to energy. The student is expected to:
(A) identify general purposes for energy, including transportation, light, cooking, heating or cooling, entertainment, and cleaning;
(B) explain and demonstrate transformations among various energy forms, including potential, kinetic, chemical, mechanical, electrical, and light energy;
(C) analyze the role of gravity in transforming energy;
(D) investigate and calculate the relationship between work, potential energy, and kinetic energy;

(E) examine various types of energy transfer mechanisms, determine the original form of energy and what form that energy is being transformed into, and use examples to analyze and calculate the relationships among work, kinetic energy, and potential energy;
(F) describe and apply the law of conservation of energy

§127.12 Project-Based Research

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(1) The student applies mathematics, science, English language arts, and social studies in an independent study. The student is expected to:

(A) select an original independent study project for personal enrichment and career development;
(B) use reading and research skills to investigate self-selected topics and compile a research portfolio;
(C) collaborate with an interdisciplinary team to develop a project;
(D) identify community, state, national, or international issues to select a project;
(E) conduct a project under the supervision of a mentor;
(F) use scientific methods of investigation;
(G) apply statistical concepts to analyze data, evaluate results, and draw conclusions;
(H) compare and contrast findings in a coherent and organized manner; and
(I) present the independent research project to an appropriate audience of experts in the field using a variety of technologies.

Section (c)(4) The student designs and develops a research project related to their career interests. The student is expected to:

(A) identify processes to be used in the independent research project; and
(B) use resources to complete a project.

§127.758 Scientific Research and Design

Section (b)(3) Scientific Research and Design is a broad-based course designed to allow districts and schools **considerable flexibility** to develop local curriculum to supplement any program of study or coherent sequence. The course has the components of any rigorous scientific or engineering program of study from the problem identification, investigation design, data collection, data analysis, formulation, and presentation of the conclusions. All of these components are integrated with the career and technical education emphasis of helping students gain entry-level employment in highskill, high-wage jobs and/or continue their education.

Section (b)(8) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(3) The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:

(E) plan and implement descriptive, comparative, and experimental investigative procedures, including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness;

(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools

(G) analyze, evaluate, make inferences, and predict trends from data;

(H) identify and quantify causes and effects of uncertainties in measured data;

(I) organize and evaluate data and make inferences from data, including the use of tables, charts, and graphs; and

(J) 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

Note: This course would lend itself to the data collection and data analysis related to the solar car project.

2. Engineering Program of Study (STEM Cluster)

§127.743 Principles of Applied Engineering

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(9) The student demonstrates the ability to function as a team member while completing a comprehensive project. The student is expected to:

(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.

Section (c)(10) The student demonstrates a knowledge of drafting by completing a series of drawings that can be published by various media. The student is expected to:

(A) set up, create, and modify drawings;

(B) store and retrieve geometry;

(C) demonstrate an understanding of the use of line-types in engineering drawings;

(D) draw 2-D single view objects;

(E) create multi-view working drawings using orthographic projection;

(F) dimension objects using current American National Standards Institute (ANSI) standards;

(G) draw single line 2-D pictorial representations;

(H) create working drawings that include section views; and

(I) demonstrate a knowledge of screw thread design per ANSI standards by drawing a hex head bolt with standard, square, and acme threads.

§127.751 Engineering Design and Presentation I

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(2) The student participates in team projects in various roles. The student is expected to:

(A) demonstrate an understanding of and discuss how teams function;

(B) apply teamwork to solve problems; and

(C) serve as a team leader and member and demonstrate appropriate attitudes while participating in team projects.

Section (c)(3) The student develops skills for managing a project. The student is expected to:

(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) develop a project schedule and complete projects according to established criteria;

(C) participate in the organization and operation of a real or simulated engineering project; and

(D) develop a plan for production of an individual product.

Section (c)(6) The student applies the concepts of sketching and skills associated with computer-aided drafting and design. The student is expected to:

(A) use single and multi-view projections;

(B) use orthographic and pictorial views;

(C) use auxiliary views;

(D) use section views;

(E) use advanced construction techniques;

(F) prepare and revise annotated multi-dimensional production drawings in computer-aided drafting and design to industry standards;

(G) demonstrate knowledge of effective file structure and management;

(H) use advanced dimensioning techniques;

(I) construct and use basic 3D parametric drawings; and

(J) develop and use prototype drawings for presentation.

§127.752 Engineering Design and Presentation II

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(2) The student participates in team projects in various roles. The student is expected to:

(A) demonstrate an understanding of and discuss how teams function;

(B) apply teamwork to solve problems; and

(C) serve as a team leader and member and demonstrate appropriate attitudes while participating in team projects.

Section (c)(3) The student develops skills for managing a project. The student is expected to:

(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) develop a project schedule and complete projects according to established criteria;

(C) participate in the organization and operation of a real or simulated engineering project; and

(D) develop a plan for production of an individual product.

Section (c)(5) The student applies the concepts and skills of computer-aided drafting and design software

§127.785 Engineering Design and Problem Solving

Section (c)(3) The Engineering Design and Problem Solving course is the creative process of solving problems by identifying needs and then devising solutions. The solution may be a product, technique, structure, or process depending on the problem. Science aims to understand the natural world, while engineering seeks to shape this world to meet human needs and wants. Engineering design takes into consideration limiting factors or "design under constraint." Various engineering disciplines address a broad spectrum of design problems using specific concepts from the sciences and mathematics to derive a solution. The design process and problem solving are inherent to all engineering disciplines.

Section (c)(4) Engineering Design and Problem Solving reinforces and integrates skills learned in previous mathematics and science courses. This course emphasizes solving problems, moving from well-defined toward more open-ended, with real-world application. Students will apply critical-thinking skills to justify a solution from multiple design options. Additionally, the course promotes interest in and understanding of career opportunities in engineering.

Section (c)(5) This course is intended to stimulate students' ingenuity, intellectual talents, and practical skills in devising solutions to engineering design problems. Students use the engineering design process cycle to investigate, design, plan, create, and evaluate solutions. At the same time, this course fosters awareness of the social and ethical implications of technological development.

Section (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:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

Section (d)(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats;

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

§127.760 Extended Practicum in Science, Technology, Engineering, and Mathematics

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to STEM;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, appreciation for diversity, customer service, work ethic, and adaptability with increased fluency;

(D) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(E) employ planning and time-management skills and tools such as prioritizing tasks, following schedules, and performing goal-relevant activities with increased fluency to enhance results and complete work tasks.

Note: Solar Car project can be used as an unpaid laboratory based application that educates students to credentials, licensures or degrees that may be attainable after graduation.

§127.760 Extended Practicum in Science, Technology, Engineering, and Mathematics

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to STEM;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, appreciation for diversity, customer service, work ethic, and adaptability with increased fluency;
(D) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and
(E) employ planning and time-management skills and tools such as prioritizing tasks, following schedules, and performing goal-relevant activities with increased fluency to enhance results and complete work tasks.

Note: Solar Car can be used as an unpaid laboratory based application that educates students to credentials, licensures or degrees that may be attainable after graduation.

3. Automotive Program of Study (Transportation Cluster)

§130.447 Automotive Basics

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(6) The student applies technical knowledge and skills in simulated or actual work situations. The student is expected to:

(A) demonstrate the procedures for ordering and locating parts;
(C) identify brake system components, including drum, disc, power assist, and anti-lock braking system (ABS);
(D) demonstrate an understanding of basic concepts related to hydraulic brakes systems, including Pascal's Theory of Hydraulics;
(E) demonstrate an understanding of basic concepts related to electrical and electronic systems such as Ohm's law, voltage drop, resistance, amperage, voltage, and wiring diagram symbols;
(G) inspect and identify chassis and power train components and systems;
(I) identify steering and suspension components, including power steering;
(J) identify and interpret tire sidewall data information such as Department of Transportation (DOT) production date information, tire load capacity, inflation pressures, sizing description, and speed rating;
(K) compare the preventative maintenance schedules for a variety of vehicles based on their use;
(L) perform a preventative maintenance inspection;

§130.460 Energy and Power of Transportation Systems

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(5) The student uses academic skills to document the requirements of the energy and power of transportation systems. The student is expected to:

(A) demonstrate communication skills related to working with customers, technicians, and others;

(C) read and interpret appropriate documents such as schematics, charts, diagrams, graphs, parts catalogs, and service-repair manuals and bulletins;

(D) perform precision measurements and use industry specifications to diagnose component shape and alignment issues and determine necessary repair;

(E) use critical-thinking skills to diagnose vehicular system malfunctions, solve problems, and make decisions; and

(F) demonstrate knowledge of regulations that govern the construction, maintenance, and service of energy and power of transportation systems.

§130.451 Advanced Transportation Systems Laboratory

Section (b)(3) Advanced Transportation Systems Laboratory provides the opportunity to extend knowledge of the major transportation systems and the principles of diagnosing and servicing these systems. **Topics in this course may include alternative fuels** such as hybrid, bio diesel, hydrogen, compressed natural gas (CNG), liquidized natural gas(LNG), propane, and **solar; total electric vehicles** and power trains; advanced transportation systems such as collision avoidance, telematics, vehicle stability control, navigation, vehicle-to-vehicle communications; and other technologies.
This study will allow students to have an increased understanding of science, technology, engineering, and mathematics in all aspects of these systems. This will reinforce, apply, and transfer academic knowledge and skills to a variety of relevant activities, problems, and settings.

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(2) The student demonstrates an understanding of the technical knowledge and skills that form the core of knowledge of transportation services. The student is expected to:

(A) extend knowledge of new and emerging transportation technologies related to the course and its industry such as hybrid, avionics, unmanned aerial systems, collision avoidance, and light duty diesel systems;

(B) demonstrate advanced technical skills related to the course and its industry;

(C) demonstrate an understanding of the use of advanced tools and equipment; and

(D) demonstrate an understanding of research and development in the transportation industry of the course.

4. Manufacturing Tech & Adv. Manufacturing Program of Study (Manufacturing Cluster)

§130.355 Manufacturing Engineering Technology I

Section (b)(3) In Manufacturing Engineering Technology I, students will gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. Students will prepare for success in the global economy. The study of manufacturing engineering will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings in a manufacturing setting.

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(2) The student applies software skills to manufacturing. The student is expected to:

(A) use computer-aided design (CAD) software to complete a design;

(B) analyze the results of product testing in a simulated modeling environment; and

(C) fabricate a prototype design of a mechanical part.

§130.356 Manufacturing Engineering Technology II

Section (b)(3) In Manufacturing Engineering Technology II, students will gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. The study of Manufacturing Engineering Technology II will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings.

Section (b)(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Section (c)(3) The student applies design skills to manufacturing. The student is expected to:

(A) use computer-aided design (CAD) software to complete a design;

(B) analyze the results of product testing in a simulated modeling environment;

(C) fabricate a prototype design of a mechanical part; and

(D) use computer-integrated manufacturing techniques to simulate a manufacturing process.

§130.352 Principles of Manufacturing

Section (b)(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(4) The student manufactures products using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:

(A) analyze the processes needed to complete a project such as initiate, plan, execute, monitor and control, and close; and

(B) use a variety of tools and equipment to produce an item.

§130.366 Practicum in Manufacturing

Section (b)(3) The Practicum in Manufacturing course is designed to give students supervised practical application of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(5) The student demonstrates technical knowledge and skills required to pursue a career in the manufacturing cluster. The student is expected to:

(A) use information literacy skills such as accessing, evaluating, and disseminating information;

(B) describe information management;

(C) maintain records to facilitate ongoing business operations;

(D) develop goals;

(E) prioritize tasks;

(F) develop timelines using time-management skills;

(G) use project-management skills such as initiate, plan, execute, monitor and control, and close to improve workflow;

(H) evaluate proficiencies in technical skills; and

(I) accept critical feedback provided by the supervisor.

§130.367 Extended Practicum in Manufacturing

Section (b)(3) The Extended Practicum in Manufacturing course is designed to give students supervised practical application of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to manufacturing;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment

Note: Solar Car can be used as an unpaid laboratory based application that educates students to credentials, licensures or degrees that may be attainable after graduation.

5. Welding Program of Study (Manufacturing Cluster)

§130.362 Introduction to Welding

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(6) The student applies the concepts and skills of welding projects. The student is expected to:

(C) work independently to fabricate a variety of welded projects with minimal assistance; and

(D) work collaboratively with other students.

§130.363 Welding I

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Section (c)(3) The student applies academic skills to the requirements of welding. The student is expected to:

(A) demonstrate effective communication skills with individuals from varied cultures such as fellow workers, management, and customers;

(B) demonstrate mathematical skills to estimate costs;
(C) demonstrate technical writing skills related to work orders;
(D) apply accurate readings of measuring devices;
(E) use appropriate tools to make accurate measurements;
(F) compute measurements such as area, surface area, volume, and perimeter;
(G) solve problems using whole numbers, fractions, mixed numbers, and decimals;
(H) use various methods, including a calculator, to perform computations;
(I) perform conversions between fractions and decimals;
(J) perform conversions between standards units and metric units;
(K) calculate and apply the functions of angles such as using the Pythagorean Theorem; and
(L) diagram the parts of a circle.

Section (c)(10) The student analyzes gas metal arc welding principles and practices. The student is expected to:

(F) determine appropriate filler metal for base metal in gas metal arc welding; and
(G) perform fillet and groove welds in all positions.

Section (c)(11) The student analyzes flux cored arc welding principles and practices on metals. The student is expected to:

(G) perform fillet and groove welds in all positions.

Section (c)(12) The student analyzes gas tungsten arc welding on metals. The student is expected to:

(E) perform fillet and groove welds in all positions; and
(F) perform welds on metals such as carbon steel, stainless steel, and aluminum.

§130.364 Welding II

Section (c)(9) The student analyzes gas metal arc welding principles and practices. The student is expected to:

(F) determine appropriate filler metal for base metal in gas metal arc welding; and
(G) perform fillet and groove welds in all positions.

Section (c)(10) The student analyzes flux cored arc welding principles and practices on metals. The student is expected to:

(G) perform fillet and groove welds in all positions.

Section (c)(11) The student analyzes gas tungsten arc welding on metals. The student is expected to:

(E) perform fillet and groove welds in all positions; and
(F) perform welds on metals such as carbon steel, stainless steel, and aluminum.

6. Courses that will be available beginning with the 2024-2025 school year. These courses are currently assigned to the STEM Cluster, but have not been assigned to a program of study.

§127.786 Introduction to Computer-Aided Design and Drafting

Section (b)(3) Introduction to Computer-Aided Design and Drafting (CADD) allows students to acquire knowledge and skills needed to use design software, including an introduction to CADD equipment and software selection and interfaces. Students gain skills in setting up a CADD workstation; upgrading a computer to run advanced CADD software; working with storage devices; storing, retrieving, backing-up, and sharing databases, file servers, and local area networks (LANs); and transferring drawing files over the internet.

Section (b)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Note: This entire course directly lends itself to a solar car project. The entire TEKS for this course are available in the file labeled Texas Essential Knowledge and Skills.

§127.787 Intermediate Computer-Aided Design and Drafting

Section (c)(3) In Intermediate Computer-Aided Design and Drafting (CADD), students develop practices and techniques used in computer-aided drafting, emphasizing the development and use of prototype drawings, construction of pictorial drawings, construction of three-dimensional drawings, interfacing two-dimensional and three-dimensional environments, and extracting data. Basic rendering techniques will also be developed. Emphasis is placed on drawing set-up; creating and modifying geometry; storing and retrieving predefined shapes; placing, rotating, and scaling objects; adding text and dimensions; using layers and coordinating systems, as well as using input and output devices.

Section (c)(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

Note: This entire course directly lends itself to a solar car project. The entire TEKS for this course are available in the file labeled Texas Essential Knowledge and Skills.