

## Chapter 130. Texas Essential Knowledge and Skills for Career and Technical Education

### Subchapter Q. Energy

*Statutory Authority: The provisions of this Subchapter Q issued under the Texas Education Code, §§7.102(c)(4); 28.002(a) and (c); and 28.025(a), unless otherwise noted.*

#### §130.485. Oil and Gas Production I (One Credit).

- (a) General requirements. This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.
- (b) Introduction.
  - (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
  - (2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.
  - (3) In Oil and Gas Production I, students will identify specific career opportunities and skills, abilities, tools, certification, and safety measures associated with each career. Students will also understand components, systems, equipment, and production and safety regulations associated with oil and gas wells. To prepare for careers in oil and gas production, students must attain academic skills and knowledge, acquire technical knowledge and skills related to oil and gas production and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.
  - (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
  - (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and skills.
  - (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:
    - (A) identify career development, education, and entrepreneurship opportunities in the oil and gas production field;
    - (B) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation;
    - (C) demonstrate knowledge of personal and occupational safety, environmental regulations, and first-aid policy in the workplace;
    - (D) analyze employers' expectations such as appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and
    - (E) demonstrate leadership skills to accomplish organizational goals and objectives.
  - (2) The student understands the history of and process for drilling a well. The student is expected to:
    - (A) describe the history of drilling for petroleum in the United States and abroad;
    - (B) describe and appraise routine drilling operations, offshore drilling, and new drilling technologies;

- (C) describe the tools and techniques for directional drilling;
  - (D) examine the differences between fishing, retrieving, and repairing pipe;
  - (E) describe the methods for completing a well in order for production to begin;
  - (F) assess fluid pressure;
  - (G) determine how the flow is initiated in a new well;
  - (H) differentiate between major components of a well and discuss the purpose, design, and operation of each component;
  - (I) describe activities associated with completing a well;
  - (J) describe the well completion processes and equipment;
  - (K) summarize the instruments and techniques used when logging and testing during the drilling and completion of a well;
  - (L) list the factors that are analyzed when studying a poorly producing well; and
  - (M) identify the responsibilities, characteristics, abilities, and work behaviors of personnel that are involved in well service.
- (3) The student discusses and identifies components, systems, equipment, production, and safety regulations associated with oil and gas wells. The student is expected to:
- (A) identify the major systems and equipment used in the production of oil and gas;
  - (B) identify and describe the wellhead equipment that controls fluid flow;
  - (C) trace the process flow through the oil and gas production systems and equipment;
  - (D) discuss the purpose of the wellhead and identify the major components;
  - (E) describe the purpose, design, and operation of each wellhead component;
  - (F) compare and contrast the major differences in wellhead construction;
  - (G) compare and contrast onshore and offshore facilities;
  - (H) compare and contrast oil and gas regions within the United States;
  - (I) describe the safety, health, and environmental concerns associated with working around a wellhead;
  - (J) explain how the wellhead system affects other production systems tied to the wellhead;
  - (K) describe the activities associated with monitoring and regulating well flow;
  - (L) describe the wellhead maintenance activities performed by the production technician;
  - (M) operate and troubleshoot a wellhead using a computer simulator, pilot plant, or tabletop unit; and
  - (N) identify the operating conditions that would warrant a manual or automatic shut-in of a well and steps involved in a manual shut-in of a well.
- (4) The student discusses safety issues related to the oil and gas industry. The student is expected to:
- (A) describe the safety, health, and environmental concerns associated with drilling, production, and maintenance; and
  - (B) research safety standards in the petroleum industry such as the Bureau of Safety and Environmental Enforcement (BSEE), United States Coast Guard (USCG), American Petroleum Institute (API), Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), American

Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), and others.

*Source: The provisions of this §130.485 adopted to be effective August 1, 2020, 45 TexReg 4190.*

**§130.486. Oil and Gas Production II (One Credit).**

- (a) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Oil and Gas Production I. Students shall be awarded one credit for successful completion of this course.
- (b) Introduction.
  - (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
  - (2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.
  - (3) In Oil and Gas Production II, students will gain knowledge of the specific requirements for entry into post-secondary education and employment in the petroleum industry; research and discuss petroleum economics; research and discuss the modes of transportation in the petroleum industry; research and discuss environmental, health, and safety concerns; research and discuss different energy sources; and prepare for industry certification. To prepare for careers in oil and gas production, students must attain academic skills and knowledge, acquire technical knowledge and skills related to oil and gas production and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.
  - (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
  - (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and skills.
  - (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:
    - (A) identify career development, education, and entrepreneurship opportunities in the oil and gas production field;
    - (B) identify careers in oil and gas production with required aptitudes in science, technology, engineering, mathematics, language arts, and/or social studies;
    - (C) apply technology skills to create an electronic portfolio of skills and abilities;
    - (D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation;
    - (E) demonstrate knowledge of personal and occupational safety, health, environmental regulations, and first-aid policy in the workplace; and
    - (F) analyze employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.
  - (2) The student researches and discusses the modes of transportation and environmental, health, and safety concerns. The student is expected to:
    - (A) describe evolution of transportation in the petroleum industry;
    - (B) research and access the various ground methods of transportation;

- (C) survey health and safety policies, procedures, regulations, and practices as they relate to transportation in the petroleum industry;
  - (D) research and discuss petroleum economics;
  - (E) compare marketing, sales, and distribution of petroleum products;
  - (F) identify supply chain businesses that create new supplies of oil and gas;
  - (G) identify supply creation companies and how they operate;
  - (H) discuss the factors in investment decision making; and
  - (I) calculate rates of return to evaluate prospects.
- (3) The student researches the different methods of disposing of oil and gas waste and methods of cleanup. The student is expected to:
- (A) discuss the disposal methods of exploration and production wastes;
  - (B) identify cleanup methods for blowouts and spills; and
  - (C) identify refining processes that minimize environmental impact.
- (4) The student researches and identifies the different energy sources and priorities for the oil and gas industry. The student is expected to:
- (A) research the petroleum industry to identify renewable energy sources;
  - (B) present the challenges and priorities of the petroleum industry;
  - (C) research the critical technologies needed in the future; and
  - (D) research the nontechnical solutions to energy needs.

*Source: The provisions of this §130.486 adopted to be effective August 1, 2020, 45 TexReg 4190.*

**§130.487. Oil and Gas Production III (One Credit).**

- (a) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisite: Oil and Gas Production II. Students shall be awarded one credit for successful completion of this course.
- (b) Introduction.
  - (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
  - (2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.
  - (3) In Oil and Gas Production III, students will gain knowledge of hydraulic and pneumatic systems and skill requirements to work in oil and gas and related industries. Students complete an advance core curriculum that includes hydraulic and pneumatic systems involved in oil and gas production. This program is designed to train students in all areas of down and mid-stream operation skills.
  - (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
  - (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and skills.
  - (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

- (A) identify career development, education, and entrepreneurship opportunities in the oil and gas production field;
  - (B) identify careers in oil and gas production with required aptitudes in science, technology, engineering, mathematics, language arts, and/or social studies;
  - (C) apply technology skills to create an electronic portfolio of skills and abilities;
  - (D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation;
  - (E) demonstrate knowledge of personal and occupational safety, health, environmental regulations, and first-aid policy in the workplace; and
  - (F) analyze employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.
- (2) The student identifies the importance of oil field hydraulics and its contributions to the oil and gas industry. The student is expected to:
- (A) identify companies that contributed to oil field hydraulics and fracturing and discuss those contributions;
  - (B) explain the history of hydraulic fracturing and its importance to the oil field industry and the process of producing wells in North America;
  - (C) describe the impact of hydraulics on energy in North America; and
  - (D) explain the impact on new oil and natural gas production in North America as it relates to technology.
- (3) The student demonstrates an understanding of pneumatics and hydraulics and their significance and application in the petroleum engineering industry. The student is expected to:
- (A) describe and define the basic functional components of the pneumatic system and the function of a pneumatic schematic;
  - (B) explain pneumatic pressure and identify its unit of measure during application procedures;
  - (C) explain the importance of a hydraulic system and identify the hydraulic system's five basic components (hydraulic pump, control valves, actuators, reservoir, and accumulators), including the hydraulic system's significance in the petroleum engineering industry; and
  - (D) define hydraulics and identify its unit of measure during application procedures.
- (4) The student explains and demonstrates the six pneumatic safety rules and the importance of the rules in the petroleum industry. The student is expected to:
- (A) explain the six pneumatic safety rules, including wearing safety glasses when building and operating pneumatics, keeping fingers clear of piston rods, never blowing compressed air at anyone, not turning the main air supply on until a circuit is connected, turning the air off if air is leaking from a joint, and turning the air off before altering a circuit;
  - (B) demonstrate safety precaution measures in pneumatics and discuss the importance of safety equipment during this process; and
  - (C) demonstrate and explain the importance of a pressure regulator in pneumatics, including the historical significance.
- (5) The student demonstrates an understanding of basic cylinder circuits and pneumatic cylinder circuits and their significance and applications in the petroleum engineering industry. The student is expected to:

- (A) explain the functions of the operation of a double acting pneumatic cylinder and each of its functions;
  - (B) describe the operation of five-way three-position directional control valves (DCV);
  - (C) describe the function of a pneumatic quick-connect fitting; and
  - (D) demonstrate how to safely connect the pneumatic circuit with a quick-connect fitting.
- (6) The student understands the impact of a hydraulic schematic in oil field applications. The student is expected to:
- (A) describe ISO symbols and appropriately use them to draw a hydraulic schematic; and
  - (B) create a hydraulic schematic.
- (7) The student identifies the principles of hydraulic pressure and flow and discusses the basic hydraulic cylinder circuits and their application. The student is expected to:
- (A) calculate the force output of an extending cylinder and the retraction force of a cylinder;
  - (B) explain the relevance of Pascal's Law to hydraulics;
  - (C) identify and discuss hydraulic motors and pumps; and
  - (D) identify hydraulic cylinders and their impact on single and double acting circuits.

*Source: The provisions of this §130.487 adopted to be effective August 1, 2020, 45 TexReg 4190.*

**§130.488. Oil and Gas Production IV (One Credit).**

- (a) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisite: Oil and Gas Production III. Students shall be awarded one credit for successful completion of this course.
- (b) Introduction.
  - (1) Career and technical education instruction provides content alignment with challenging academic standards and relevant knowledge and skills for students to further their education and succeed in current or emerging professions.
  - (2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.
  - (3) Oil and Gas Production IV is designed to extend training for future petroleum engineering technicians in all areas of down and mid-stream operations. Students complete an intense core curriculum in areas that include hydrocarbon safety, drilling, petroleum geology, oil and gas exploration and production, reservoir operations, well head completions, petroleum data management operations and analysis, natural gas production, and economics. In conjunction with this course, students employ the latest computer software in engineering and petroleum, operations, data mining, and geological mapping.
  - (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
  - (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and skills.
  - (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:
    - (A) identify career development, education, and entrepreneurship opportunities in the oil and gas production field;

- (B) identify careers in oil and gas production with required aptitudes in science, technology, engineering, mathematics, language arts, and/or social studies;
  - (C) apply technology skills to create an electronic portfolio of skills and abilities;
  - (D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation;
  - (E) demonstrate knowledge of personal and occupational safety, health, environmental regulations, and first-aid policy in the workplace; and
  - (F) analyze employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.
- (2) The student explains the phases of well construction. The student is expected to:
- (A) describe the function of the well completion phase and the different hole tests used in well completions;
  - (B) design the completion of the reservoir using technology such as computer designing software;
  - (C) describe the open hole completion and sand control completion processes; and
  - (D) describe conventional completions and their components and how they relate to production tubing.
- (3) The student explains the concepts of safety in well completions and indicates tools and procedures for completing a drilled wellbore. The student is expected to:
- (A) research health and safety standards for the workplace and environment such as Standards and Wireline Operations and Procedures and Occupational Safety and Health Administration (OSHA) and standards provided by professional organizations in the oil and gas industry such as the American Chemical Society, American Institute of Chemical Engineers, Center for the Advancement of Process Technology, Gulf Coast Process Technology Alliance, and American Petroleum Institute (API);
  - (B) identify well completion tools and equipment and their use during each well completion phase; and
  - (C) analyze the cost of safety during well completions.
- (4) The student explains the concepts of hydraulic fracturing and its role during the well completion phase. The student is expected to:
- (A) describe how the generic well design and drilling mud systems impact drilling;
  - (B) interpret ways in which generic platform wells, cuttings disposal routes, and drilling fluid design impact the generic well design; and
  - (C) evaluate the significance of reservoir formations.
- (5) The student discusses the potential hazards and possible solutions of well and equipment testing. The student is expected to:
- (A) evaluate potential hazards and formulate a safety plan that covers safety guidelines and equipment, including first-aid and safety uniforms;
  - (B) describe and accurately measure the flow of oil, gas, and water in real time;
  - (C) ensure precautions and measures are considered during the surface well testing; and
  - (D) discuss the importance of knowing the surrounding environment when well testing.
- (6) The student researches the different types of coring and core analysis used in well completions and how they play an important role in well completion. The student is expected to:

- (A) describe the role of coring and core analysis in well completions;
- (B) identify the relationship between the factors such as core analysis and well logging that play an active role in well completions;
- (C) explain well logging and its importance in formation evaluation;
- (D) research different methods of formation testing by acquiring core samples;
- (E) research drill stem testing;
- (F) explain drill stem tests and their importance in measuring the flow of oil and gas in well completions; and
- (G) evaluate the cost of completion operations for well completion.

*Source: The provisions of this §130.488 adopted to be effective August 1, 2020, 45 TexReg 4190.*

**§130.489. Introduction to Process Technology (One Credit).**

- (a) General requirements. This course is recommended for students in Grades 11 and 12. Students shall be awarded one credit for successful completion of this course.
- (b) Introduction.
  - (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
  - (2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.
  - (3) In Introduction to Process Technology, students will learn the social significance and workforce impact of process technology in industry and the opportunities available at various levels of education and training in industries using process technology.
  - (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
  - (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and skills.
  - (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:
    - (A) demonstrate skills related to health and safety in the workplace as specified by appropriate government regulations;
    - (B) demonstrate the standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;
    - (C) collaborate with others to solve problems;
    - (D) identify employers' work expectations; and
    - (E) research, evaluate, and apply various time-management techniques to develop work schedules.
  - (2) The student understands common definitions, terminology, and the basic foundations related to process technology. The student is expected to:
    - (A) describe the types of industry utilizing process technology and identify fields related to process technology;



- (B) identify and describe the career opportunities in process technology, pathways to career development, and certification requirements of industries utilizing process technology, including job responsibilities, typical work schedules, and career opportunities;
  - (C) demonstrate the use of content such as technical concepts and vocabulary when analyzing information and following directions;
  - (D) identify currently emerging issues in process technology; and
  - (E) identify principles of instruments and instrument technology used in industrial process technology.
- (3) The student identifies and discusses types of industrial piping, valves, and basic process equipment. The student is expected to:
- (A) discuss the basics of piping, valves, and equipment used in industry; and
  - (B) demonstrate the ability to read and interpret the various types of industrial drawings, diagrams, and data sheets related to industrial piping, valves, and equipment.
- (4) The student identifies and discusses the types of industrial electrical equipment and instrumentation used in process technology. The student is expected to:
- (A) demonstrate the ability to read and interpret the various types of industrial drawings, diagrams, charts, and data sheets related to industrial electrical equipment;
  - (B) interpret industry standard circuit schematics;
  - (C) identify areas where quality, reliability, and safety can be integrated into a product; and
  - (D) describe the principles of electricity as applied in industrial process technology.
- (5) The student discusses safety issues related to industrial process technology. The student is expected to:
- (A) describe the safety, health, and environmental concerns and requirements for industries using process technology along with the history that led to modern standards;
  - (B) analyze and execute safety guidelines as described in various manuals, instructions, and regulations;
  - (C) describe the implications of negligent or improper maintenance;
  - (D) discuss and demonstrate how precision measuring instruments are used in industrial process technology; and
  - (E) research agencies that govern safety in industrial process technology, including their authority and requirements.
- (6) The student demonstrates understanding of basic industrial mathematics. The student is expected to:
- (A) perform common computations required in industrial process technology using mastered calculator skills;
  - (B) determine when to convert between fractions, decimals, whole numbers, and percentages mentally, on paper, or with a calculator when required in industrial process technology;
  - (C) identify and quantify causes and effects of uncertainties in measured data;
  - (D) demonstrate how exponents, symbols, and the order of operations are used to solve real world word problems commonly seen in process technology;
  - (E) determine appropriate formulas to compute cross sections, surface areas, and volumes of geometric figures such as circles, squares, and cylinders;

- (F) estimate measurements and solve application problems involving industry drawings and data sheets using consistent units for all measurements and computation;
  - (G) describe and discuss how to use scientific notation and International System (SI) units to gather and record data with accuracy and precision;
  - (H) organize and evaluate data and make inferences from data, including the use of tables, charts, and graphs;
  - (I) determine a dimension of an object given a scaled drawing having no dimensions; and
  - (J) represent and solve problems involving proportional relationships, including conversions between measurement systems using multiplication by a given constant factor such as unit rate.
- (7) The student applies concepts of critical thinking and problem solving. The student is expected to:
- (A) analyze elements of a problem to develop innovative solutions;
  - (B) critically analyze information to determine value to the problem-solving task;
  - (C) analyze a variety of problem-solving strategies and critical-thinking skills; and
  - (D) conduct technical research to gather information necessary for decision making.
- (8) The student applies comprehensive knowledge in a simulation environment to demonstrate the mastery of the concepts covered in this course. The student is expected to:
- (A) represent or simulate a portion of a process system by generating an appropriate drawing, diagram, or data sheet;
  - (B) demonstrate how to achieve a specific goal with the use of a simple mockup of a process system;
  - (C) execute a simple mockup of a process system to achieve a specified goal;
  - (D) demonstrate appropriate safety equipment selection for use in a variety of assigned tasks;
  - (E) identify and apply mathematical operations to complete calculations and specified computations, including unit conversions for a simulated process system;
  - (F) explain how visual depictions, data readouts, and trends in a computer-based process simulator relate to actual valves, piping, equipment, electrical gear, and instrumentation in a process system; and
  - (G) develop critical-thinking skills using simulations to identify and solve problems associated with process technology.
- (9) The student presents conclusions, research findings, and designs using a variety of media throughout the course. The student is expected to:
- (A) discuss and critique the validity of conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports; and
  - (B) record, express, and manipulate relationships among data using graphs, charts, and equations.

*Source: The provisions of this §130.489 adopted to be effective August 1, 2020, 45 TexReg 4190.*

**§130.490. Foundations of Energy (One Credit).**

- (a) General requirements This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of the course.
- (b) Introduction.

- (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and success in current or emerging energy professions.
  - (2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.
  - (3) In Foundations of Energy, students will conduct laboratory and field investigations, use scientific practices during investigations, and make informed decisions using critical thinking and scientific problem solving. Various systems will be described in terms of energy. Students will study a variety of topics that include energy transformation, the law of conservation of energy, energy efficiency, interrelationships among energy resources and society, and sources and flow of energy through the production, transmission, processing, and use of energy. Students will apply these concepts and perform investigations and experiments at least 40% of the time using safe practices.
  - (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
  - (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and skills.
- (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:
    - (A) evaluate the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession;
    - (B) 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 by prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results;
    - (E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed;
    - (F) discuss and exhibit teamwork and leadership skills necessary for the workplace;
    - (G) define and demonstrate effective problem-solving skills; and
    - (H) apply computer-based skills and other technologies relevant to the energy industry.
  - (2) The student analyzes current and future career opportunities in the energy sector, including oil and gas exploration and production, refining and chemical processing, and renewable energy. The student is expected to:
    - (A) evaluate energy systems and identify careers within those systems;
    - (B) examine past market and employment trends in the energy sector;
    - (C) discuss current issues in energy production and predict future needs and employment opportunities in this field;
    - (D) identify career development, education, credentialing, and entrepreneurship opportunities in the energy sector; and
    - (E) apply competencies related to resources, information, and systems of operation in the energy sector.
  - (3) The student conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:

- (A) demonstrate safe practices during laboratory and field investigations;
  - (B) use a wide variety of additional course apparatuses, equipment, techniques, and procedures as appropriate such as satellite imagery and other remote sensing data, Geographic Information Systems (GIS), Global Positioning System (GPS), scientific probes, microscopes, telescopes, modern video and image libraries, weather stations, fossil and rock kits, tectonic plate models, and planetary globes;
  - (C) engage in meaningful hands-on, minds-on conceptual activities in the areas of energy; and
  - (D) demonstrate an understanding of the use and conservation of resources and proper disposal or recycling of materials.
- (4) The student uses critical thinking and problem solving to make informed decisions within and outside the classroom. The student is expected to:
- (A) communicate and present valid conclusions from energy information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;
  - (B) explain the impacts of energy discoveries by a variety of historical and contemporary scientists and entrepreneurs on current societal attitudes;
  - (C) compare advantages and disadvantages in the use of the various energy sources; and
  - (D) distinguish between scientific decision making (scientific methods) and ethical and social decisions that involve science (the application of scientific information).
- (5) The student presents conclusions, research findings, and designs using a variety of media throughout the course. The student is expected to:
- (A) develop written and oral presentation skills related to energy issues and solutions by researching and describing the history of energy production in Texas and contributions of scientists and entrepreneurs; and
  - (B) develop data retrieval and analysis skills related to energy production and use by researching information about energy sources, including renewable and non-renewable sources, and energy efficiency and how each source is used to produce electrical energy.
- (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; and
  - (G) use basic calorimetry to determine the amount of energy stored in substances such as coal.
- (7) The student understands the basics of fluid mechanics related to energy discovery, production, and transportation. The student is expected to:

- (A) identify fluids used as fuels, including liquids and gases;
  - (B) identify fluids used in the discovery, production, and transportation of energy sources;
  - (C) explain capillary action and relate it to energy production; and
  - (D) explain, using formulas, how pressure and temperature affect the behavior of fluids.
- (8) The student understands how and where energy is produced and identifies Texas energy resources. The student is expected to:
- (A) research the location of energy resources and power production plants in Texas;
  - (B) compile information on the history of energy production in Texas and describe its past and current importance to the U.S. economy;
  - (C) investigate the role of technology in the future development of energy usage;
  - (D) identify ways to conserve energy;
  - (E) map the major sources of energy used in Texas;
  - (F) assess the impact of the various energy sources on the economy in Texas;
  - (G) analyze how supply and demand impacts Texas's economy in relation to energy; and
  - (H) compare and contrast the impact of energy sources and supply and demand in Texas with national and global data.
- (9) The student investigates how energy resources such as water, oil, and natural gas are stored underground in rock formations. The student is expected to:
- (A) assess the properties and geological histories of rocks and rock formations that enable energy storage;
  - (B) determine the physical properties of permeability and porosity of rock formations and relate these properties to the amount of water, oil, and natural gas held in these formations;
  - (C) explain how aquifers function and locate major aquifers in Texas; and
  - (D) investigate how innovations such as hydraulic fracturing and high-power transmission lines have made massive energy resources such as oil, gas, wind, and electricity available in Texas.
- (10) The student knows differences between renewable and non-renewable resources. The student is expected to:
- (A) identify and describe various renewable and non-renewable resources;
  - (B) describe and compare the energy efficiency of renewable and non-renewable energy derived from natural and alternative sources such as oil, natural gas, coal, nuclear, solar, geothermal, hydroelectric, and wind;
  - (C) examine the benefits and hazards of using renewable and non-renewable energy sources;
  - (D) research methods by which benefits can be increased and hazards reduced in the use of renewable and non-renewable energy sources;
  - (E) examine different viewpoints of an energy source regarding availability, cost, potential pollution, impact to plant and animal habitat, and sustainability;
  - (F) analyze an energy source's relative availability and renewability and discuss how these factors inform decision making regarding a source's use; and
  - (G) analyze changing social perspectives and how they can influence scientific practices.

- (11) The student knows how energy impacts the student's life and the role energy plays in international relations, the environment, standards of living, and the economy. The student is expected to:
- (A) analyze the impact energy has on the environment;
  - (B) research and discuss the ethical and social issues surrounding Earth's energy resources;
  - (C) analyze the advantages and disadvantages of an energy source's long-term use;
  - (D) explain the relationship between energy and quality of life;
  - (E) research and describe the connection between energy production, transmission, processing, and marketing; and
  - (F) analyze the impact and effectiveness of the measures taken by the United States and other countries to use energy to reduce greenhouse gases, improve water and air quality, and extend life expectancy.
- (12) The student investigates extended learning experiences such as career and technical student organizations and area energy museums and displays. The student is expected to:
- (A) identify a minimum of three energy professionals for potential speaking invitations either in person or via the Internet;
  - (B) research and describe an energy-related organization such as a museum or local business; and
  - (C) compare educational requirements for different energy industry jobs in Texas.

*Source: The provisions of this §130.490 adopted to be effective August 1, 2020, 45 TexReg 4190.*

**§130.491. Petrochemical Safety, Health, and Environment (One Credit).**

- (a) General requirements. The course is recommended for students in Grades 11 and 12. Students shall be awarded one credit for successful completion of this course.
- (b) Introduction.
- (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
  - (2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.
  - (3) Petrochemical Safety, Health, and Environment addresses the shortage of process technology operators/technicians by educating students on the safety rules, regulations, and operations of the petrochemical process technology operator. Students enrolled in this course will learn about the knowledge and skills required in occupational safety, health, and environment as well as the governing regulatory authorities and the legal aspects of the industry in order to maintain a safe work environment.
  - (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
  - (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and skills.
- (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:
    - (A) research the three major roles of safety, health, and environment as it pertains to process technology operators/technicians;

- (B) describe the role of process technicians in relation to safety, health, and environmental issues;
  - (C) identify the importance of safety, health, and environment as they relate to the performance of all job tasks and regulatory compliance issues within the industries, including, but not limited to, petrochemical plants, refineries, oil and gas production, and power generation; and
  - (D) explain the importance of interpreting the safety, health, and environmental procedures standards, requirements, and regulations as a process technology operator/technician.
- (2) The student examines compliance standards to ensure safe work practices as they relate to safety, health, and environmental regulations. The student is expected to:
- (A) identify the legal governing agencies and describe regulatory requirements as they apply to the petrochemical industry, its employees, and the community;
  - (B) identify specific state and federal regulations and the related specific tasks performed by process technology operators/technicians;
  - (C) identify safety programs used in the gulf coast area;
  - (D) determine types of administrative controls and permitting systems to ensure safe work practices, especially as the controls relate to confined spaces and log-out and tag-out (LOTO);
  - (E) demonstrate the proper usage of typical safety equipment and systems used in local plants;
  - (F) describe how engineering controls are designed to allow process technology operators/technicians to operate equipment with system safeguards;
  - (G) describe the different types of personal protective equipment (PPE), including fire resistant clothing (FRC), hard hats, safety shoes, hearing protection, safety glasses, and acid suits;
  - (H) evaluate the types of monitors that measure exposure ratings for noise, heat, and radiation;
  - (I) describe the different types of respiratory protection according to their levels of protection, including air purifying, air supply, escape packs, and self-contained breathing apparatus (SCBA); and
  - (J) identify the types of monitoring instruments that process operators/technicians use to monitor the atmosphere, oxygen content, explosive atmosphere, and toxicity.
- (3) The student summarizes the environmental requirements that are designed to safeguard society. The student is expected to:
- (A) describe the types of spills and releases and the environmental factors that can impact them;
  - (B) identify specific systems that are in place to mitigate or prevent hazards to the environment and to individuals, including safe disposal of hazardous materials;
  - (C) identify the regulatory governmental agencies, including Occupational Safety and Health Administration (OSHA), Mining Safety and Health Administration (MSHA), Texas Commission on Environmental Quality (TCEQ), and the Environmental Protection Agency (EPA), that protect our safety, health, and environment;
  - (D) identify the Hazard Communication (HAZCOM) program and its components, including written Emergency Response Plans (ERPs), labeling containers that contain hazardous chemicals, and Safety Data Sheets (SDS) for hazardous chemicals produced or imported;

- (E) describe the different types of hazards, including fire and explosions, ergonomic, biological, and blood borne pathogens; and
  - (F) describe the Maritime Security Act (MARSEC), which protects against terroristic threats.
- (4) The student describes equipment and energy and work surface hazards. The student is expected to:
- (A) define the types of equipment and energy and work surface hazards, including electrical, rotating equipment, thermal, elevation/heights/fall protection, chemical, slip and trips, and machine guarding;
  - (B) identify hazards as they pertain to construction, vehicles, weather, and security, and describe how to protect the point of access and the site, including contractors who might have limited safety knowledge, new equipment installation, traffic control, and training on heavy machinery; and
  - (C) determine how weather conditions can adversely impact safety at a petrochemical plant or other process industry, including heat stress, hurricanes, freeze precautions, adverse weather conditions, lightning, and wind.
- (5) The student identifies environmental pollutants as well as regulations to protect the environment. The student is expected to:
- (A) describe environmental pollutants, including toxic chemicals;
  - (B) identify the Material Safety Data Sheet (MSDS) manual list of the hazardous and toxic chemicals for process control sites;
  - (C) summarize the EPA petition process for approval of chemicals created by a plant;
  - (D) determine the permissions that must be acquired before site production begins, including a toxicology report such as a Chemical Inventory Management System (CIMS) for a local plant; and
  - (E) describe the types of environmental controls that are in place to protect the environment such as monitoring and air and water permits.

*Source: The provisions of this §130.491 adopted to be effective August 1, 2020, 45 TexReg 4190.*