Approved Innovative Course

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Course: Petrochemical Safety, Health, and Environment
PEIMS Code: N1300264
Abbreviation: PSHAЕ
Grade Level(s): 11-12
Number of Credits: 1.0

Course description:

The Petrochemical Safety, Health, and Environment course is important to learn about environmentally sound work habits within the various process industries, including but not limited to, petrochemical plants, refineries, oil and gas production, and power generation. Emphasis will be placed on safety, health, and environmental considerations in the performance of all job tasks and regulatory compliance matters. Topics include components of industrial plant safety and environmental programs, and the role of a process technician in relation to safety, health, and environmental equipment uses. This course is recommended for students in grades 11-12.

The Petrochemical Safety, Health, and Environment course is one of two courses to prepare high school students for a career as a process technology operator/technician by learning the core competencies of safety, health, and environment within the industry.

Essential knowledge and skills:

(a) General requirements. The course is recommended for students in Grades 11-12. 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 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.
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(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 it relates 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;
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(D) determine types of administrative controls and permitting systems to ensure safe work practices, especially as the controls relate to confined spaces and lock-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), as well as labeling containers that contain hazardous chemicals, and Safety Data Sheets (SDS) for hazardous chemicals produced or imported;
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(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 hazards and work surface, 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.

Description of specific student needs this course is designed to meet:

This course will provide the student with a foundation of knowledge and skills about occupational safety and health, reinforce the attitudes required for safe and environmentally sound work.
practices, and prepare the student for future studies in the Process Technology Associates Degree Program, or related field such as Chemical (Lab) Technician Associates Degree Program, Safety/Environmental Technology Associates Degree Program, or a related Engineering or Engineering Technician Degree Program through an introduction to the process operator job responsibilities, safety awareness, and plant facilities.

**Major resources and materials:**


**Recommended course activities:**

The following list of learning outcomes are activities from the Chemical/Refining Process Technician skill standards developed by the Gulf Coast Process Technology Alliance (GCPTA), and recognized by the Texas Skill Standards Board (TSSB).

(a) Read text assignments and related supplemental materials
(b) Write answers to discussion questions about occupational safety and health and environmental issues
(c) Give an oral presentation on a current occupational safety and health topic and environmental topic
(d) Use critical thinking skills in the application of safety procedures
(e) Learn the importance of personal responsibility in following safety procedures to ensure the safety of themselves as well as coworkers
(f) Learn how to work with and support internal safety departments and how to participate in plant safety programs
(g) Use computer technology in the research and preparation of presentations
(h) Career interest inventories and career pathway planning
(i) On-line learning
(j) On-site visits to industry facilities
(k) College tours
(l) Interviews with industry personnel
(m) Guest speakers
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(n) Quizzes and written tests
(o) Job shadowing and/or internships
(p) Simulation lab experiences

Suggested methods for evaluating student outcomes:

Student outcomes may be evaluated through a variety of methods, including classroom assignments, research, individual and group projects, quizzes, tests and final exam. Students may create and maintain electronic portfolios of their work, including a resume.

Teacher qualifications:

(1) Agriculture, Food, and Natural Resources: Grades 6-12.
(2) Agricultural Science and Technology: Grades 6-12.
(3) Any vocational agriculture certificate.
(4) Secondary Industrial Arts (Grades 6-12).
(5) Secondary Industrial Technology (Grades 6-12).
(6) Technology Education: Grades 6-12.
(7) Trade and Industrial Education: Grades 6-12. This assignment requires appropriate work approval.
(8) Trade and Industrial Education: Grades 8-12. This assignment requires appropriate work approval.
(9) Vocational Trades and Industry. This assignment requires appropriate work approval.
(10) Mathematics/Physical Science/Engineering: Grades 8-12.

Additional information:

The initial innovative process technology courses were developed by Victoria Independent School District (VISD). The Essential Knowledge and Skills are the culmination of the collaboration of educators, business, community, and industry leaders. VISD has the support of the community and industry to develop the Safety, Health, and Environment curriculum for the process technology field, and incorporate these courses into the Career and Technical Education (CTE) programs of VISD. The district received letters of support from them when the initial application for the innovative course was submitted: