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Course: Oil and Gas Production III
PEIMS Code: N1300256
Abbreviation: PRODSYS3
Grade Level(s): 11-12
Number of Credits: 1.0

Course description:

Oil and Gas Production III will provide students with the fundamentals of hydraulics and related systems. In this course, students will study well control practices applicable to drilling, completion and production. In this course, students will study well control practices, including well drilling and completion and oil production. This includes calculating and evaluating the characteristics of flowing and static fluids in various tubular and annular systems. This course may be taught with other aligned courses related to petroleum engineering technology to prepare students for the Offshore Drilling Technician certificate. Oil and Gas Production III provides a pathway for students to learn the industry based core competencies necessary for careers, certifications and/or degree programs relating to petroleum engineering technology. The courses in this high school program are aligned with postsecondary institutions’ courses making articulation and dual credit courses possible.

Essential knowledge and skills:

(a) General requirements. This course is recommended for students in grades 11-12. Prerequisite: Oil and Gas Production II.

(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 Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) In Oil and Gas Production III, students will gain knowledge of hydraulic and pneumatic systems and skill requirements to work as a Petroleum Engineering Technology Technician in the oil and gas and related industries. Students
complete an advance core curriculum which include 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 field of agriculture, food, and natural resources;
   (B) identify careers in agriculture, food, and natural resources 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 in agriculture, food, and natural resources;
   (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 develops a supervised agriculture experience program. The student is expected to:
   (A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;
   (B) apply proper record-keeping skills as they relate to the supervised agriculture experience;
   (C) participate in youth leadership opportunities to create a well-rounded experience program; and
   (D) produce and participate in a local program of activities using a strategic planning process.

(3) 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 who contributed to oil field hydraulics and fracturing and discuss those contributions;
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(B) explain the history of hydraulic fracturing, and its importance to the oil and 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.

(4) 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, accumulators) including the hydraulic system’s significance in the petroleum engineering industry;
(D) define hydraulics and identify its unit of measure during application procedures.

(5) 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 pneumatic, keeping fingers clear of piston rods, never blowing compressed air at anyone, not turning the main air supply on until circuit is connected, turning the air off if air is leaking from a joint, and turning the air off before altering a circuit;
(B) systems demonstrate safety precautions 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.

(6) 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 quick-connect fitting.

(7) The student will understand the impact of 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.

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.

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

Oil and Gas III builds on the knowledge and skills presented in Oil and Gas I and II. This course presents the relationship between hydraulics and well drilling and completion and oil production.

Major resources and materials:

- TI-30XA Calculator or equivalent

Recommended course activities:

On-Site visits to industry sites, industry speakers, industry tools and equipment, multi-media videos, internet and library research, written compositions and group projects, formal and informal assessments.
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**Suggested methods for evaluating student outcomes:**

The methods for evaluating student outcomes will include student portfolios, class and homework assignments, individual and group projects, quizzes and course exams.

**Teacher qualifications:**

The instructor will possess documented teaching and work experience in the Petroleum Engineering Technology industry and the appropriate certification(s) and postsecondary degree that enlists one or more of the following areas in the subject:

- Agriculture, Food, and Natural Resources: Grades 6-12.
- Agricultural Science and Technology: Grades 6-12.
- Any vocational agriculture certificate.
- Trade and Industrial Education: Grade 6-12. This assignment requires appropriate work approval.
- Trade and Industrial Education: Grade 68-12. This assignment requires appropriate work approval.

**Additional information:**

The Petroleum Engineering Technology courses were developed to provide educational opportunities for students in grades 11 and 12 by exposing them to the academic and technical demands of career and technical education (CTE). The Permian Basin program provides 9-12 grade students opportunities for dual credit in partnership with Midland College toward Energy Technology Certification and an Associate’s Degree in Energy Technology. The Offshore Drilling Technician Certificate Program was created in collaboration with Southwest Schools in Houston, Houston Community College (HCC) – Northeast Campus, community and industry leaders. Southwest Schools in Houston and West Texas schools were supported on this districtwide initiative by the following stakeholders:

- Dr. Madeline Burrillo, HCC Associate Vice Chancellor – Workforce and Division of Extended Learning
- Dr. Joanna Kile, Executive Director of HCC’s Energy Institute
- Dr. Freddie Wade, HCC Director of Workforce Program Initiatives
- Dr. Ronald Dewlen, HCC – Northeast Dean of Instruction
- Curt Pervier – Dean of Career and Technical Programs for Midland College
- Mark Horner – Sr. Manager for Warren Equipment Company