Approved Innovative Course

- *Districts must have local board approval to implement innovative courses*
- *Innovative courses may meet state elective credit only*
- *CTE Innovative courses may not be the final course in a coherent sequence for an endorsement*
- *Course requirements must be met without modification*

Course: Introduction to Process Technology
PEIMS Code: N1300262
Abbreviation: INTRPT
Grade Level(s): 11-12
Number of Credits: 1.0

Course description:

Introduction to Process Technology will introduce students to process technology professions, including the different career opportunities available, and required certification/postsecondary education requirements for each.
Introduction to Process Technology is the first of two courses that provide a pathway for the student to learn core competencies, as identified by industries using process technology and postsecondary institutions. This course will provide instruction which can lead to degree programs that support employment in energy, oil and gas process and refining, and chemical manufacturing industries.

Essential knowledge and skills:

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(a) General requirements. This 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.

(3) In the 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 governmental [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 is able to identify and discuss 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 discuss 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 industry 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 math. 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, including unit rate, can be used to.

(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 mock up 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 through the use of 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.

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

Introducing this course at the high school level will provide students access to a career field option that is not currently identified in high school. By making students aware of the career options related to industries using process technology, developing the fundamentals required by industry, and providing incentive to follow up at the post-secondary level, this course will help fill the shortfall in skilled labor anticipated in the near future.

Major resources and materials:

Provide full citations in American Psychological Association (APA) format (https://owl.english.purdue.edu/owl/resource/560/01/).

Animation library, study-guides by topic, software with learning modules, Simtronics simulator, industry-level equipment such as pipes and valves.
Textbook:
Thomas, C. E. (2014). Process Technology and Systems (Fourth Edition). New York: Delmar, Cengage Learning.

Recommended course activities:

- Animation library
- Study-guides by topic
- Software with learning modules

- Simtronics simulator
  Industry-level equipment such as pipes and valves

Suggested methods for evaluating student outcomes:

Written papers, written tests, oral reports, lab reports, technology-based reports, results from simulator training

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: