



Course Number and Title: CPO 252 Chemical Process Tech II-Operations

Campus Location:

Stanton

Effective Date:

2019-51

Prerequisite:

CPO 151, ELC 101

Co-Requisites:

None

Course Credits and Hours:

4.00 credits

3.00 lecture hours/week

2.00 lab hours/week

Course Description:

This course provides an overview into the field of operations within the chemical process industry. Students use existing knowledge of equipment, systems, and instrumentation to understand the operation of an entire unit. Topics include typical duties performed by an operator in commissioning, startup, normal operations, shutdown, turnarounds, and abnormal situations within a generic operating unit. In addition, bioethanol production processes are highlighted. Laboratory exercises include the operation of two pilot plants.

Required Text(s):

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:

None

Schedule Type:

Classroom Course

Disclaimer:

None

Core Course Performance Objectives (CCPOs):

1. Describe the flows and major components in the utility, auxiliary, and process systems in a generic operating unit. (CCC 6; PGC 3, 4)
2. Perform the tasks required to start up the utility, auxiliary, and process systems in a generic operating unit. (CCC 2; PGC 3, 4)
3. Explain the duties of the control room and field operators during normal operations. (CCC 3; PGC 1, 2, 3, 4, 5, 6, 7)
4. Demonstrate the activities used to control a generic operating unit within standard operating conditions. (CCC 3; PGC 1, 4, 7)
5. Identify potential emergency operations, situations, and appropriate corrective action to bring the abnormal conditions under control. (CCC 3; PGC 1, 4)
6. Perform the tasks required to shut down the utility, auxiliary, and process systems in a generic operating unit. (CCC 2; PGC 3, 4)
7. Describe the steps required to prepare equipment for routine and turnaround maintenance. (CCC 6; PGC 6)
8. Perform all operating and maintenance tasks in compliance with safety, health, and environmental (SH&E) regulations. (CCC 4; PGC 1)
9. Communicate effectively in writing and verbally when requesting information and conveying instructions. (CCC 1; PGC 1, 2)
10. Describe bioethanol production process steps, equipment, and biomass feedstocks. (CCC 6; PGC 3, 4)
11. In a pilot plant and/or using a computer simulation, start up, operate, troubleshoot, and shutdown bioethanol production process and tabletop distillation units. (CCC 6; PGC 4, 7)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):

Upon completion of this course, the student will:

1. Describe the flows and major components in the utility, auxiliary, and process systems in a generic operating unit.
 1. Describe the key roles and responsibilities of a process operator in accordance with generally accepted industry profiles.
 2. Given a generic operating unit and supporting documentation, discuss the process flows and major equipment associated with the utility, auxiliary, and process systems in the unit.
2. Perform the tasks required to start up the utility, auxiliary, and process systems in a generic operating unit.
 1. Given a process scenario, develop a written initial plant startup or commissioning plan.
 2. Identify the basic steps involved when placing equipment into service and bringing a unit on line.

3. Identify potential unit personnel to communicate with prior to startup.
4. Perform all activities necessary to return equipment to service.
5. Describe the common inspections needed to assure mechanical integrity of the system.
6. Demonstrate the correct procedures to remove energy isolation devices according to OSHA regulations.
7. Given a process scenario, explain the tasks required to prepare utility and auxiliary systems prior to startup with 100 percent accuracy.
8. Given a process scenario, follow a unit startup procedure with 100 percent accuracy.
3. Explain the duties of the control room and field operators during normal operations.
 1. Identify critical process instrumentation used to monitor the process in the field.
 2. Identify normal and abnormal process conditions in the field using sensory perceptions and analytical measuring devices.
 3. Take appropriate corrective action given an alarm or abnormal trend to return the process to standard operating parameters.
 4. Collect samples from various process systems throughout the operating unit using a variety of sampling methods.
 5. Handle various raw materials and finished products.
 6. Given a piping and instrumentation diagram (P&ID) for a section of the operating unit, create a checklist for monitoring the normal operation of the section.
 7. Given a working process model, define the normal and abnormal process instrumentation readings within acceptable parameters.
 8. Take appropriate corrective action given an alarm or abnormal trend of process variables to return the process to standard operating conditions.
4. Demonstrate the activities used to control a generic operating unit within standard operating conditions.
 1. Explain the overall operation of the process control systems in normal operations.
 2. Write a normal operations procedure that ensures safety and environmental compliance with SH&E and OSHA regulations.
 3. Conduct an on-the-job training session on an operations related topic.
5. Identify potential emergency operations/situations and appropriate corrective action to bring the abnormal conditions under control.
 1. Identify potential emergency operations and emergency situations, and take corrective action to bring the condition to a safe and stable status.
 2. Given a potential emergency scenario, prepare a written emergency procedure that complies with SH&E and OSHA regulations.
 3. Demonstrate appropriate emergency response to an emergency operating situation in a practice drill.
6. Perform the tasks required to shut down the utility, auxiliary, and process systems in a generic operating unit.
 1. Describe the major steps performed in a normal shutdown, including safety and environmental requirements.
 2. Identify plant personnel to communicate with prior to shut down.
 3. Given a process scenario, prepare detailed checklists to use for shutting down auxiliary and utility equipment with 100 percent accuracy.
 4. Given a process scenario, follow a unit shutdown procedure with 100 percent accuracy.
7. Describe the steps required to prepare equipment for routine and turnaround maintenance.
 1. Describe the steps required to prepare equipment for routine maintenance.
 2. Analyze maintenance cost for a piece of equipment over a period of time.
 3. Explain the concept of work permit for allowing other groups to enter and work in a plant environment
 4. Create a work order and a maintenance schedule that include planning, tools, parts, equipment, people, and cleanup.
 5. Describe a lockout/tagout procedure for isolation equipment for maintenance.
 6. Demonstrate proficiency in the inspection and use of safety and environmental equipment.
 7. List major activities involved in pre-turnaround planning.
 8. Describe operating assistance that is provided during turnarounds.
8. Perform all operating and maintenance tasks in compliance with safety, health, and environmental (SH&E) regulations.
 1. Perform required procedures and tasks to maintain compliance with all SH&E regulations.
 2. Recognize risks or hazards in plant scenarios, and describe preventive action.
9. Communicate effectively in writing and verbally when requesting information and conveying instructions.
 1. Demonstrate effective verbal communication skills when requesting and conveying information or issuing instructions.
 2. Given a process scenario, describe the correct plant personnel to communicate with and the correct information that needs to be communicated.
 3. Given a process scenario, prepare a detailed checklist that contains all key elements of unit status.
 4. Communicate in writing all key elements of plant status to shift relief person.
10. Describe bioethanol production process steps, equipment, and biomass feedstocks.
 1. Characterize the biofuels production and use in the United States and internationally.
 2. Identify and order the eight steps of the bioethanol dry milling process, and explain the operation at each stage.
 3. Compare the different types of biomass that can be used as feedstock for the bioethanol production processes.
 4. Describe the function of the major equipment components found in a bioethanol production facility.
 5. Discuss the role that alpha amylase and gluco amylase enzymes play in bioethanol production process.
 6. Outline the parameters for optimal fermentation of monosaccharide sugar to bioethanol.
 7. Trace the path of the beer intermediate through the distillation and dehydration steps in the bioethanol process.
 8. Explain how the second generation cellulosic-ethanol process differs from the first generation corn-ethanol process.
11. In a pilot plant and/or using a computer simulation, start up, operate, troubleshoot, and shutdown bioethanol production process and tabletop distillation units.
 1. Prepare laboratory reports to document operation of the following units in the biofuels laboratory: bioethanol production process trainer and tabletop distillation unit.
 2. Prepare laboratory reports for the following computer process simulation modules: SPM 700 – Distillation; SPM 1000 – Air Cooler; SPM 1800 – pH Control; SPM 2000 – Batch Reactor; and SPM 2300 – Fixed Bed Reactor.

Evaluation Criteria/Policies:

Students must demonstrate proficiency on all CCPOs at a minimal 75 percent level to successfully complete the course. The grade will be determined using the Delaware Tech grading system:

92	-	100	=	A
83	-	91	=	B
75	-	82	=	C
0	-	74	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Summative: Test #1	10%
Summative: Test #2	10%
Summative: Test #3	10%
Summative: Test #4	10%
Summative: Final Exam	15%
Summative: Capstone Class Project	10%
Summative: Laboratory Work	25%
Formative: Homework Assignments	10%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Maintain safety, health, and environmental standards during simulation exercises or in a chemical plant.
2. Handle, store, and transport chemical materials according to all applicable federal, state, and local regulations.
3. Apply chemical process and quality systems in a chemical process environment or a chemical plant.
4. Operate, monitor, control, and troubleshoot batch and continuous chemical processes.
5. Analyze samples of raw materials, intermediates, and finished products in a simulated chemical process environment or a chemical plant.
6. Perform routine, predictive, and preventive maintenance and service to process equipment and instrumentation.
7. Use computers and computerized equipment for communications and chemical process control.

Disabilities Support Statement:

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.