## Process Technology II - Systems (PTAC 2420)

**Credit:** 4 semester credit hours (3 hours lectures, 3 hours lab)

**Prerequisite/Co-requisite:** PTAC 1410, 1432/SCIT 1494, 1418

## Course Description

A study of various process systems including related scientific principles.

## Required Textbooks and Materials

1. *Process Technology: Equipment and Systems* by Charles E. Thomas, 2nd edition
    a. ISBN number: 1-4180-3067-8

2. Equipment (To be purchased by the student)
    a. hardhat
    b. safety glasses
    c. shoes (no open toes/sandals)

## Course Objectives

Upon completion of this course, the student will be able to:

1. Describe the purpose and function of common process systems;
2. Explain and demonstrate the operation of each process system.

## Course Outline

A. Boilers
    a. Boiler Applications and Basic Operations
    b. Fire Tube boilers
    c. Water Tube Boilers
    d. Boiler Operations
    e. Steam Systems
    f. Steam System Symbols

B. Furnaces
    a. Furnace Application and Theory of Operation
    b. Basic Components of a Furnace
    c. Furnace Types
    d. Cabin Furnace
    e. Box Furnace
    f. Common Furnace Problems and Solutions

C. Utility Systems
    a. Introduction to Process Systems
    b. Raw Water and Fire Water System
    c. Boiler Feed Water Treatment
    d. Cooling Water System

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e. Instrument Air and Nitrogen Systems
f. Gas Systems
g. Electrical Systems
h. Steam Systems
i. Industrial Sewer System
j. Refrigeration System
k. Relief and Flare Systems
l. Storage Systems

D. Reactor Systems
a. Introduction to Reactions
b. Continuous and Batch Reactors
c. Stirred reactors
d. Fixed Bed Reactors
e. Fluidized Bed Reactors
f. Tubular Reactors
g. Reaction Furnaces
h. General Reactor Design Considerations

E. Distillation systems
a. Overview of Distillation Systems
b. History of Distillation
c. Principles of Distillation
d. Two Distillation Examples
e. Plate Columns
f. Packed Columns
g. Plate Distillation System
h. Troubleshooting a Distillation System

F. Extraction and Other Separation Systems
a. Extraction
b. Absorption Columns
c. Stripping Columns
d. Adsorption
e. Scrubber
f. Water Treatment System
g. Crystallization
h. Solvent De-waxing

G. Plastics Systems
a. Key terms
b. Plastics
c. Granule storage and feed systems
d. Blending systems
e. Extruder
f. Product drying and storage system

## Grade Scale

| | |
|---|---|
| 90-100 | A |
| 80-89 | B |
| 70-79 | C |
| 60-69 | D |
| 0-59 | F |

## Course Evaluation

Final grades will be calculated according to the following criteria;

1. Unit tests 30%
2. Final exam 30%
3. Homework/quizzes 20%
4. Participation/lab 20%

## Course Requirements

1. Operate cooling tower and heat exchanger models
2. Line up pumps and exchangers in mechanical lab
3. Operate tabletop distillation unit
4. Draw and label components of the outside distillation unit
5. Trace the line-up of the outside distillation unit

## Attendance Policy

1. Missing more than 20% of classes will result in an automatic “F” for the course.
2. Absences are counted for unexcused, excused and coming to class late.
3. Missing more than 20% of a class period will count as an absence.
4. Being tardy 3 times equals 1 absence.

## Course Policies

1. No food, drinks, or use of tobacco products in class.
2. Beepers, telephones, headphones, and other electronic devices must be turned off while in class.
3. Do not bring children to class.
4. Assignments submitted late will be reduced 10 points each day.

5. If a test is missed due to an emergency situation, the student will have one week to make it up; otherwise a grade of 0 will be assigned. Students are responsible for scheduling the make-up date.
6. No cheating of any kind will be tolerated. Students caught cheating or helping someone to cheat can and will be removed from the class for the semester. Cheating can result in expulsion from LIT.
7. A student who wishes to drop a course is responsible for initiating and completing the drop process. A student who stops coming to class, and fails to drop the course, will earn an "F" in the course.

## Disabilities Statement

The American with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building.

## Course Schedule

| WEEK | TOPIC | REFERENCE |
|---|---|---|
| 1 | Course introduction and policies | Handouts |
| 2 | Boilers<br>• Lecture: Types of Boilers<br>• Lab: Film: Boiler Principles | Chap. 9 |
| 3 | Furnaces<br>• Lecture: Basic Components<br>• Lab: Film: Furnace Operations | Chap. 10 |
| 4 | Utility Systems<br>• Lecture: Introduction to Process Systems<br>• Lab: Film: Storage Tanks and Flares | Chap. 13 |
| 5 | TEST 1: Chapters 9-10-13 | |
| 6 | Reactor Systems<br>• Lecture: Introductions to Reactions<br>• Lab: Film: operate mechanical lab | Chap. 14 |
| 7 | Reactor Systems<br>• Lecture: Introductions to Reactions<br>• Lab: Film: Reactor Operations | Chap. 14 |
| 8 | Distillation Systems<br>• Lecture: History of Distillation<br>• Lab: Run tabletop units; Trace process lines of outside distillation unit | Chap. 15 |
| 9 | Distillation Systems | Chap. 15 |

| WEEK | TOPIC | REFERENCE |
|---|---|---|
| | • Lecture: History of Distillation<br>• Lab: Run tabletop units; Trace process lines of outside distillation unit | |
| 10 | TEST 2: Chapters 14-15 | |
| 11 | Extraction & Other Separation Systems<br>• Lecture:<br>• Lab: Film: Dexter Simulation | Chap. 16 |
| 12 | Extraction & Other Separation Systems<br>• Lecture:<br>• Lab: Dexter Simulation; trace process lines of outside distillation unit | Chap. 16 |
| 13 | Plastic Systems<br>• Lecture: Plastics<br>• Lab: Run tabletop units; Trace process lines of outside distillation unit | Chap. 17 |
| 14 | TEST 3: Chapters 16-17 | |
| 15 | Review for final exam<br>• Lab: Dexter Simulation; trace process lines of outside distillation unit | |
| 16 | COMPREHENSIVE FINAL EXAM | |
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## Contact Information

Contact information varies by instructor.