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DEPARTMENT OF CHEMICAL ENGINEERING
College of Engineering
University of the Philippines Diliman, Quezon City

COURSE SYLLABUS
ChemE 136 Special Projects Laboratory

A. Course Catalogue Description

1. **Course Number:** ChemE 136
2. **Course Title:** Special Projects Laboratory
3. **Course Description:** Experimental design; practical study of the applications of mass transfer, separation processes, particle technology, reaction engineering, process control, and bioprocessing
4. **Prerequisite:** ChemE 133 Separation Processes II
   ChemE 134 Particle Technology
   ChemE 170 Introduction to Bioprocess Engineering and
   ChemE 182 Chemical Process Dynamics and Control
5. **Semester Offered:** Second Semester
6. **Course Credit:** 2u
7. **Number of Hours:** 6h
8. **Meeting Type:** laboratory
9. **Course Goals:** To enhance the students' learning on the different concepts of particle flow, process dynamics and control, and separation process design through simple and practical Do-It-Yourself chemical engineering experiments that simulate basic industrial processes and enhance their problem definition and problem-solving skills.

B. Rationale

This course employs a higher order test of learning where students can demonstrate- through experimental projects- their knowledge and competencies on unit operations, reaction engineering, process control and bioprocessing, which they must successfully develop prior to their practice of chemical engineering.

C. Course Outline

1. Course Outcomes (CO)

Upon completion of the course, students must be able to:

- **CO 1.** design collaborative investigative projects in process engineering based entirely on a given objective and available materials and equipment in the laboratory for implementation;
- **CO 2.** apply good laboratory practices with regards to health, safety, and environment when conducting experiments;
- **CO 3.** analyze experimental data using previously learned chemical engineering principles;
- **CO 4.** communicate the results of experiments in a written formal report and an effective oral presentation; and

CO 5. work in teams and evaluate the performance of the other group members.

Course Outcomes and Relationship to Program Learning Objectives

Course Outcomes	Program Learning Objectives*				
	A	**B**	**C**	**D**	**E**
Design collaborative investigative projects in process engineering based entirely on a given objective and available materials and equipment in the laboratory for implementation	■	■	■	■	
Apply good laboratory practices with regards to health, safety, and environment when conducting experiments					■
Analyze experimental data using previously learned chemical engineering principles	■				
Communicate the results of experiments in a written formal report and an effective oral presentation	■	■			
Work in teams and evaluate the performance of the other group members		■	■		

* **A** Equip students with strong technical education in chemical engineering necessary to succeed in their chosen careers and to become responsive citizens.
B Develop the students' ability to effectively communicate technical information to any audience.
C Train students to function in multidisciplinary teams, manage projects, and take leadership roles in their respective fields.
D Engage students in research, innovation, and life-long learning to identify opportunities, and address issues and challenges in their respective spheres of influence.
E Instill in students a strong commitment to the ethical practice of their profession; to health, safety, and environment; and to service to society.

2. Course Content

Sample Project Topics	No. of Hours
Project 1: Biodiesel production from crops 1. Size reduction 2. Sieving 3. Esterification and transesterification 4. Filtration 5. Waste storage, treatment and disposal	24
Project 2: Protein hydrolyzates production from animal parts 1. Size reduction 2. Base-catalyzed hydrolysis in a batch reactor 3. Centrifugation 4. Evaporation 5. Waste storage, treatment and disposal	24

Sample Project Topics	No. of Hours
Project 3: Dye removal by photocatalytic treatment 1. Photocatalysis 2. Fluid transport 3. Process optimization 4. Waste storage, treatment and disposal	24
Project 4: Performance testing of an improvised packing material for cooling towers 1. Simultaneous heat and mass transfer 2. Cooling Tower Operation 3. Process dynamics 4. Process instrumentation and control	24
Oral Presentation	
Total number of hours	**96**

3. Course Coverage

Week	CO	SAMPLE TOPIC	ESSENTIAL/ KEY QUESTIONS	Suggested Teaching and Learning Activities	Suggested Assessment Tools
1-4	1,2 3,4,5	**Project 1: Biodiesel production from crops** 1. Size reduction 2. Sieving 3. Esterification and transesterification 4. Filtration 5. Waste storage, treatment and disposal	What are the design principles demonstrated by this experiment? What are the possible sources of error in the experimental data? How can the product yield be optimized?	laboratory experiment	formal report, laboratory performance assessment report
5-8	1,2 3,4,5	**Project 2: Protein hydrolyzates production from animal parts** 1. Size reduction 2. Base-catalyzed hydrolysis in a batch reactor 3. Centrifugation 4. Evaporation 5. Waste storage, treatment and disposal	What are the design principles demonstrated by this experiment? What are the possible sources of error in the experimental data? How can the product yield be optimized?	laboratory experiment	formal report, laboratory performance assessment report
9-12	1,2 3,4,5	**Project 3: Dye removal by photocatalytic treatment** 1. Photocatalysis 2. Fluid transport 3. Process optimization 4. Waste storage, treatment and disposal	What are the design principles demonstrated by this experiment? What are the possible sources of error in the experimental data? How can the removal efficiency be optimized?	laboratory experiment	formal report, laboratory performance assessment report

Week	CO	SAMPLE TOPIC	ESSENTIAL/ KEY QUESTIONS	Suggested Teaching and Learning Activities	Suggested Assessment Tools
13-16	1,2 3,4,5	**Project 4: Performance testing of an improvised packing material for cooling towers** 1. Simultaneous heat and mass transfer 2. Cooling tower operation 3. Process dynamics 4. Process instrumentation and control	What are the design principles demonstrated by this experiment? What are the possible sources of error in the experimental data? How can the cooling efficiency be optimized?	laboratory experiment	formal report, laboratory performance assessment report
					Oral Presentation

4. Course Requirements

1. Formal report
2. Oral presentation
3. Laboratory performance assessment report

REFERENCES:

Casin, A., Cruz, F., and Ramos, S. L. R. (2017). Development and performance testing of laboratory experiments and equipment for the Chemical Engineering Laboratory (Undergraduate research). University of the Philippines Diliman.

Geankoplis, C. J., Hersel, A. H., and Lepek, D. H. (2018). *Transport Processes and Separation Process Principles* 5th Ed. London, UK: Pearson Higher Education.

Mopon, M. L. Jr., et al. (2017). Fabrication of an improvised cooling tower to determine packing material characteristics (Laboratory report). University of the Philippines Diliman.

Perez, J.V.D. (2012). Treatment of quick-service restaurant wastewater by electrocoagulation: effects of current density, electrolysis time, and charge loading on pollutant removal and energy consumption (Master's thesis). University of the Philippines Diliman.

Seader, J. D., Henley, E. J., and Roper, D. K. (2016). *Separation Process Principles* 4th Ed. NJ: John Wiley and Sons Inc.