COURSE SYLLABUS STEM Ed Abroad Program

Course Title: Chemical Process Principles
Course Semester: Fall
University and Country: Adam Mickiewicz University, Poznan, Poland
Number of ECTS:
Course Designations for Transfer Credit: CHE205 (NCSU), CHEMENG210 (ISU)

Content: Chemical Process Principles prepares you to formulate and solve material and energy balances on chemical process systems and lays the foundation for subsequent courses in thermodynamics, unit operations, kinetics, and process dynamics and control. More fundamentally, it introduces the engineering approach to problem solving: breaking a process down into its components, establishing the relations between known and unknown process variables, assembling the information needed to solve for the unknowns, and finally obtaining the solution using appropriate computational methods.

Aims: By the end of the course, you should be able to do the following things:

- **Basic engineering calculations.** Convert quantities from one set of units to another quickly and accurately; define, calculate, and estimate properties of process materials including fluid density, flow rate, chemical composition variables (mass and mole fractions, concentrations), fluid pressure, and temperature.
- **Material and energy balance calculations**. Draw and label process flowcharts from verbal process descriptions; carry out degree-of-freedom analyses; write and solve material and energy balance equations for single-unit and multiple-unit processes, processes with recycle and bypass, and reactive processes.
- **Applied physical chemistry**. Perform pressure-volume-temperature calculations for ideal and non-ideal gases. Perform vapor-liquid equilibrium calculations for systems containing one condensable component and for ideal multi-component solutions. Calculate internal energy and enthalpy changes for process fluids undergoing specified changes in temperature, pressure, phase, and chemical composition. Incorporate the results of these calculations into process material and energy calculations.
- **Computation**. Use spreadsheets (EXCEL) to solve material and energy balance problems.
- **Safety** - Evaluate potential safety hazards in processes, in particular, chemical processes.

Prerequisities: C or better in Calculus II and Physics I ; C- or better in General Chemistry II or Organic Chemistry. This requirement is strictly enforced.

Recommended Books: R.M Felder, R.W. Rousseau, and L.G. Bullard, *Elementary Principles of Chemical Processes*, 4th Edition

Teaching Staff: TBA with consultation by Dr. Lisa Bullard from North Carolina State University.

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Grading System and Percentage Contribution:

Lecture assessment

Lecture participation	5%
Homework	12%
Problem Session participation	5%
Exam (3 @16% each)	48%
Final Exam, Cumulative	30%
Total	100%

AMU Grading system and scale

The grading system used at Adam Mickiewicz University, whose name is abbreviated as AMU or UAM, is as follows:

Tests, exams, homework assignments grading scale

5 100%-91%
4+ 90%-86%
4 85%-76%
3+ 75%-71%
3 70%-60%
2 59% and less

This translates into the following ECTS (European internationally recognized system) grading scale:

ECTS Grade	AMU grade	Definition
A	5.0	EXCELLENT – outstanding performance with only minor errors
B+	4+ / 4.5	VERY GOOD – above the average standard but with some errors
B	4.0	GOOD – generally sound work with a number of notable errors
C+	3+ / 3.5	SATISFACTORY – fair but with significant shortcomings
C	3.0	SUFFICIENT – performance meets the minimum criteria
F	2.0	FAIL – considerable further work is required

Hours: (Lecture / Tutorial / Practical courses)

(Dates are approximate and can be changed according to the Adam Mickiewicz Schedule)

DATE	**READ** (Chapters in FR&B)	SUBJECT	**DO**
Week 1 8/17-19	Syllabus, Course Policies, Chapters 1/2 *No problem session this week*	Introduction to engineering calculations; process data representation and analysis	

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Week 2 8/22-26	Chapter 3	Introduction to engineering calculations; process data representation and analysis	Biosketch & Academic Integrity Reflection, Due 8/26 Problem Set 1 Due 8/26
Week 3 8/29-9/2	Chapter 4.1 – 4.3	Processes and process variables	Problem Set 2 Due 9/2
Week 4 9/5-9	Chapters 4.4 - 4.5	Fundamentals of material balances	Problem Set 3 Due 9/9
Week 5 9/12-16	Chapter 4.6 – 4.7 *Problem session optional: test review*	Balances on multiple unit processes; chemical reaction stoichiometry	**9/16: TEST #1** **Through CH. 4.3**
Week 6 9/19-23	Chapter 4.8 – 4.10	Balances on reactive processes	Problem Set 4 Due 9/23
Week 7 9/26-9/30	Chapter 5	Single phase systems and non-ideal gases	Problem Set 5 Due 9/30
Week 8 10/3-7	Chapter 6 – 6.2	Single component gas-liquid Systems	
Week 9 10/10-14	Chapter 6.2-6.4 *(Note: Oct. 14 is last day to drop with a W or change to credit only)*	Multicomponent gas-liquid systems	Problem Set 6 Due 10/14
Week 10 10/17-21	Chapter 7 *Problem session optional: test review*	First Law of Thermodynamics Energy and energy balances	**10/21: TEST #2** **Through CH. 6.2**
Week 11 10/24-28	Chapter 8 – 8.3	Balances on non-reactive processes	Problem Set 7 Due 10/28
Week 12 11/2-6	Chapter 8.4 – 8.6	Balances on non-reactive processes	Problem Set 8 Due 11/6
Week 13	Chapter 9.1 – 9.2	Balances on reactive processes	Problem Set 9

11/7-11			Due 11/11
Week 14 11/14-18	Chapter 9.3 – 9.4 *Problem session optional: test review*	Heat of combustion and formation	**11/18: TEST #3** **Through CH. 8**
Week 15 11/21-22	Chapter 9.5 – 9.6 **THANKSGIVING HOLIDAYS** *No problem session*	Balances on reactive processes & combustion	
Week 16 11/28-12/2	Exam review	Review	Problem Set 10 Due 11/30
Exams	**FINAL EXAM** **8-11AM**		