Department of Chemical Engineering
College of Engineering
University of the Philippines
Diliman, Quezon City

ChE 101

Fundamentals of Chemical Engineering

Course Description: Problem-solving techniques in solving chemical engineering problems; Mass and energy balances in unit operations and unit processes; Principles of phase equilibrium as applied to unit operations

Course Prerequisites: Chem 17, Math 53, ChE 100

Course Credit: 4.0 units (3 h lecture**,** 3 h laboratory)

Program Educational Objectives (BS Chemical Engineering)

The program aims to educate students such that three to five years from graduation, they:

1. take leadership roles in their respective fields and/or effectively work in or manage a team;
2. are equipped with the extensive knowledge and relevant skills necessary to succeed in their chosen careers and to become responsive citizens;
3. are able to demonstrate strong research & innovative capability as they recognize and address opportunities and challenges in their respective spheres of influence;
4. have shown strong commitment to the ethical practice of their profession; to health, safety and environment; and service to society.

Course Outcomes

At the end of the course, the student should be able to:

1. Apply mathematics, chemistry and physics principles to set up and solve mass and energy balance equations;
2. Analyze and interpret experimental data from chemical engineering literature;
3. Apply basic chemical engineering concepts and principles in solving problems related to other discipline (i.e., environmental, energy, biotechnology and food related disciplines);
4. Analyze and solve chemical engineering problems;
5. Communicate effectively through discussions and presentations of solutions to problems;
6. Acquire the basic chemical engineering knowledge essential for understanding the impact of chemical engineering solutions in the context of the needs of the society;
7. Recognize that mass and/or energy balances are the starting point of all chemical engineering work and are a component in life-long learning;
8. Make use of existing methods and tools to solve mass and energy balance problems; and
9. Appreciate the use of estimation and intelligent guess in solving problems

Student Outcomes Satisfied by Course Outcomes

[a] Ability to apply knowledge of mathematics and science to solve engineering problems
[e] Ability to identify, formulate, and solve engineering problems
[g] Ability to communicate effectively
[k] Ability to use the techniques, skills, and modern tools for engineering practice

Course Content

Week	Lecture	Lab
1	Process Definition Review of Process Variables Basis Mass and Volume Flow Rate Composition Pressure Temperature	Class Orientation, Syllabus Review: Units and Dimensions Process Data Representation and Analysis
2	Process Classification and Representation General Material Balance Equation Mixing; Inverse Lever Arm Rule (ILAR)	*Lab 01*: Process Variables I , Data Representation and Analysis
3	Types of Unit Operations Single-Unit Balances Tie Component Separations	*Lab 02*: Process Variables II Mixing and ILAR
4	Degree of Freedom (DOF) Analysis Multiple-Unit Balances	*Lab 03*: Unit Operations Single-Unit Balances
5	Recycle and Bypass	*Lab 04*: Multiple-Unit Balances
FIRST LONG EXAMINATION		
6	Chemical Reaction Stoichiometry	*Lab 05*: Recycle and Bypass
7	Conversion, Yield, and Selectivity Extent of Reaction Species Balances	*Lab 06*: Chemical Reaction Stoichiometry
8	Combustion Analysis	*Lab 07*: Material Balances for Reacting Systems
9	Combustion Analysis (cont.) Recycle, Bypass, and Purge	*Lab 08*: Combustion Analysis
10	Phase Diagram Gibbs Phase Rule Raoult's Law	*Lab 09*: Recycle, Bypass, and Purge
SECOND LONG EXAMINATION		
11	VLE Calculations Bubble, Dew, and Flash Calculations VLE Charts	*Lab 10*: Phase Diagram Gibbs Phase Rule
12	Henry's Law and GLE Psychrometric Charts	*Lab 11*: VLE Calculations VLE Charts
13	LLE and Ternary Diagrams.	*Lab 12*: Henry's Law and GLE Psychrometric Charts
14	First Law of Thermodynamics General Energy Balance Equation	*Lab 13*: LLE and Ternary Diagrams
THIRD LONG EXAMINATION		
15	Mechanical Energy Balance Calculation Paths: Sensible Heat	*Lab 14*: First Law of Thermodynamics
16	Sensible and Latent Heat Heats of Reaction Energy Balance on Reactive Systems I	*Lab 15*: Mechanical Energy Balance Sensible Heat
17		*Lab 16*: Energy Balance on Reactive and Nonreactive Systems
FOURTH LONG EXAMINATION		
FINAL EXAMINATION		

Course Assessment

Long Examinations (4)	50%
Class Work	30%
Finals	20%

Course Policies

1. Students must submit stapled sheets of colored pad paper (blue, green, and pink) at least one lecture class meeting before the long exam. The student's class number, student number, and section must be written on the upper-right corner of every sheet. Failure to comply with any of the mentioned rules will automatically result to a 10-point deduction in the exam.
2. Grievances regarding checked long exams shall be entertained only within three (3) days, excluding holidays and weekends, upon the return of papers or announcement of scores. All grievances (for any reason) will not affect the grades if they are raised after the 3-day grace period.
3. A student who misses an exam with a valid excuse must approach his/her instructor to discuss the options that can be taken. This should be done at most one week after the schedule of the missed long exam otherwise, a score of zero will be given for the missed exam.
4. Only one (1) valid missed long exam is allowed. For an exam to be counted as a valid missed exam, proper documentation (e.g., UHS health certificate) should be submitted to and approved by the lecture instructor as soon as the student returns to class.
5. There will be no make-up activity for missed class work, which includes computational laboratory exercises and homework.
6. University rules on absences (maximum of 6 and 3 absences in lecture and lab classes, respectively), cheating, dropping and LOA shall apply.
7. Anyone caught cheating in any class requirement will automatically merit a grade of 5 in the course, and will be subject to further disciplinary action.
8. The instructors reserve the right to change class policies when deemed necessary.

Grading System

1.00	1.25	1.50	1.75	2.00	2.25	2.5	2.75	3.00	5.00
[92,100]	[88,92)	[84,88)	[80,84)	[76,80)	[72,76)	[68,72)	[64,68)	[60,64)	[0,60)

List of Instructors

Dr. Maria Lourdes Dalida
Dr. Terence Tumolva
Dr. Analiza Rollon
Prof. Kristian July Yap
Prof. Jhud Mikhail Aberilla
Prof. Jonas Karl Christopher Agutaya
Engr. Bemboy Niño Subosa
Engr. Myron Alcanzare
Engr. Michael Sean Deang
Engr. Aldren Ribalde
Engr. Louie Arelvi Villanueva

References

1. Felder, R.M. and Rousseau, R.W., *Elementary Principles of Chemical Processes*, 3rd ed. John Wiley & Sons (2005)
2. Himmelblau, D.M. *Basic Principles and Calculations in Chemical Engineering*, 8th ed. Prentice-Hall (2012)
3. Jose, W.I., *Introductory Concepts in Chemical Engineering*
4. Lewis, W.K., et al, Industrial Stoichiometry, McGraw Hill (1954)