ChE211.1: Introduction to Chemical Engineering

Course Overview

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Why study Chemical Engineering?

- Chemical engineering involves conversion of raw materials into more economically viable products.
- Major employers are in
  - Oil and gas extraction, oil refining, nuclear and other power generation
  - Process industries (pharmaceuticals, fine and heavy chemicals and agrochemicals).
    - ✓ Fine chemicals are pure and complex, usually produced in small quantities. e.g. drugs, fragrances, and additives in food.
    - ✓ Bulk or heavy chemicals are made in huge quantities. E.g. ammonia, sulfuric acid, sodium hydroxide and gasoline

Why study Chemical Engineering?

- Major employers are in
  - Manufacturing industries (fibres and polymers; food and drink; plastic and metals; pulp and paper; toiletries, etc.)
  - Engineering consultancy and contracting firms.
  - Pollution control, environmental protection, energy conservation, recycling and alternative energy.
- Engineers are well equipped for business roles and may also go into careers in financial services, management or law.

Learning Objectives

- Have an overview of how Chemical Engineering evolved as a discipline
- Learn the diverse roles Chemical Engineers play in the society.
- Understand the main goals of chemical process engineering and the metrics used to quantify these goals
- Recognize different types of chemical processes
- Gain basic knowledge of safety practices as they relate to industrial settings.

Course Outline

- Introduction, definitions, brief history of Chemical Engineering (ChE), Careers in ChE; ChE and the society.
- Important Qualities for Chemical Engineers; Areas of focus in Chemical Engineering
- Techniques of Problem solving (Understand the problem, Formulate the options for solution, Consider the constraints, Execute the selected problem solving strategy, Evaluate the procedure and results, Computer Based tools, Spreadsheets)

Course Outline

- Units and Dimension (What are units and dimensions; how do they differ?, Conversion of units, Dimensional consistency, The mole unit and mole fraction)
- Fundamentals of chemical reaction calculations including stoichiometry, etc;
- Chemical processes – batch, semi-continuous, semi-batch, continuous; process flow diagram, and process variable description
- Introduction into mass balance without reactions as this is the basis of process analysis and design.
- Guest Lectures & Mini Project

Indicative Student Workload

- **The student workload is indicated below.**
  - Contact hours
    - ✓ Lectures: 8
    - ✓ Tutorials/In-class exercises: 12
    - ✓ Final Examination: 2
  - Private Study 10

- **Course Management**
  - Every student must have a functional email address. Course email address is myslqclass@gmail.com and the platform is Canvas.
  - Group allocation shall be done only during the class.
  - Only group members that were present when an assignment is given are eligible to submit the assignment. The links for submitting assignments will be provided on the Canvas Platform
  - See the Lecturer as a group if you have any concerns.

Assessment Plan

- This course is assessed both under exam conditions and on a continuous basis. Each student must complete these assignments individually. The weighting for each assessment is outlined below.

Assessment Title	Weighting %	
Assessment	60	(in class)
Mini Project	10	(Group)
Continuous Assessment	30	(own time)

Recommended Texts

- Chukwuma, F. and Kuye, A. 1995. Fundamentals of chemical process calculations, CAPIIC Publishers, Port Harcourt
- Felder, R. M. and Rousseau, R. W. 2000. Elementary Principles of Chemical Processes, 3rd ed. New York: John Wiley & Sons.
- Himmelblau, D. M. and Riggs, J. B. 2012. Basic Principles and Calculations in Chemical Engineering, 8th ed. Pearson Education, Inc. New Jersey
- Luyben, W. L., and Wentzel, L. A. 1988 Chemical Process Analysis: Mass and Energy Balances, Prentice Hall, Englewood Cliffs, New Jersey.
- Green, D. W. and Perry, R. H. 2008. Perry's Chemical Engineers Handbook, 6th ed. New York: McGraw-Hill.