



UNIVERSITI TEKNOLOGI MARA

CMT405: UNIT OPERATION IN CHEMICAL PROCESS

Course Name (English)	UNIT OPERATION IN CHEMICAL PROCESS APPROVED
Course Code	CMT405
MQF Credit	3
Course Description	This course introduces the students to one of the fundamental knowledge that the students must acquire in mass and energy transfer and unit operations. The topics covered include the concepts of mass and energy transfer and equipment design for distillation, gas absorption, extraction, and leaching. In addition, special topic(s) on mass transfer would also be introduced to the students.
Transferable Skills	Fundamental concept in chemical engineering calculations
Teaching Methodologies	Lectures, Discussion, Presentation
CLO	CLO1 Explain the fundamental of chemical engineering calculations in mass and energy balance CLO2 Discuss scientific data in oral related to unit operations CLO3 Relate the concept of various types of unit operations and its applications CLO4 Discuss scientific data in written report of assingment
Pre-Requisite Courses	No course recommendations
Topics	
1. Mass Balance 1.1) 1. Introduction to mass transfer 1.2) 2. General Mass Balance Equations 1.3) 3. Mass Balance Calculations-Non-Reactive Process 1.4) 4. Mass Balance on Multiple Unit Process 1.5) 5. Mass Balances Calculation	
2. Energy Balance 2.1) 1. Forms of Energy: The First Law of Thermodynamics. 2.2) 2. Energy Balance on Closed System and Steady State. 2.3) 3. Energy Balance on Open System and Steady State. 2.4) 4. Mechanical Energy Balance	
3. Distillation 3.1) Distillation 3.2) 1. Definition and general description of the process 3.3) 2. Physical concepts of distillation 3.4) 3. Vapour-liquid equilibrium relationship 3.5) 4. Relative volatility 3.6) 5. Batch distillation 3.7) 6. Continuous distillation 3.8) 7. Azeotropic distillation 3.9) 8. Multicomponent distillation (MCD)	
4. Gas Absorption 4.1) 1. Definition, applications, and notations used in gas absorption 4.2) 2. Gas-liquid equilibrium for the ideal solution according to Raoult's law 4.3) 3. Packed tower - description and design 4.4) 4. Multistage counter-current operation - graphical method to determine the number of theoretical stages 4.5) 5. Two film theory of gases-liquid system 4.6) 6. Determination of tower height	

5. Liquid - liquid Extraction

- 5.1) 1. Definition and application
- 5.2) 2. Solvent selectivity
- 5.3) 3. Phase diagrams
- 5.4) 4. Single-stage calculation
- 5.5) 5. Multi-stage counter current system
- 5.6) 6. Graphical method-mass balance
- 5.7) 7. Liquid-liquid extraction equipment

6. Special Topics

- 6.1) 1. Membrane separation
- 6.2) 2. Leaching
- 6.3) 3. Size reduction equipment
- 6.4) 4. Drying equipment and applications

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	n/a	10%	CLO4
	Presentation	n/a	10%	CLO2
	Test	n/a	15%	CLO1
	Test	n/a	25%	CLO3

Reading List	Recommended Text	<ul style="list-style-type: none"> • Helder, R.M., Rousseau, R. W., and Bullard, L. G., 2017, <i>Elementary Principles of Chemical Processes</i>, Global Edition Ed., Wiley • Seader, J. D and Henly, E. J., 2006, <i>Separation Process Principle</i>, John Wiley & Son • Geankoplis, C.J. 2003, <i>Transport Processes and Separation Process</i>, Prentice-Hall
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	