



**UNIVERSITI TEKNOLOGI MARA**

**CMT435: MASS AND ENERGY BALANCE**

<b>Course Name (English)</b>	MASS AND ENERGY BALANCE <b>APPROVED</b>
<b>Course Code</b>	CMT435
<b>MQF Credit</b>	2
<b>Course Description</b>	This course introduces the students to the concepts of mass and energy balance. On the most obvious level, it prepares the student to formulate and solve mass and energy balances on chemical process systems and lays the foundation for subsequent courses in thermodynamics, unit operations, and kinetics. More fundamentally, it introduces the engineering approach to solving process-related problems: breaking a process down into its components, establishing the relations between known and unknown process variables, assembling the information needed to solve the unknowns using a combination of empiricism and the application of natural laws, and finally putting the pieces together to obtain the desired problem solution
<b>Transferable Skills</b>	Engineering calculation Conversion between engineering units Mass balance Energy balance
<b>Teaching Methodologies</b>	Lectures, Discussion
<b>CLO</b>	CLO1 Perform conversion units calculations for process variables CLO2 Perform material balance calculations for single and multiple unit processes for nonreactive processes CLO3 Solve material and energy balances for non-reactive and reactive processes CLO4 Apply simplified energy balances to solve specific problems involving closed systems
<b>Pre-Requisite Courses</b>	No course recommendations
<b>Topics</b>	
<b>1. 1. Introduction to Engineering Calculations</b> 1.1) 1.1. Units and Dimensions 1.2) 1.2. Conversion of Units and Conversion Factors. 1.3) 1.2.1. Systems of Units 1.4) 1.2.2. Force and Weight 1.5) 1.3. Dimensional Homogeneity and Dimensionless Quantities	
<b>2. 2. Process and Process Variables</b> 2.1) 2.1 Mass and Volume. 2.2) 2.2 Flow Rate. 2.3) 2.3 Chemical Composition. 2.4) 2.4 Pressure. 2.5) 2.5 Temperature.	
<b>3. 3. Material Balances Without Chemical Reaction</b> 3.1) 3.1 Process Classification. 3.2) 3.2 General Material Balance Equations. 3.3) 3.3 Material Balance Calculations-Non-reactive and steady state. 3.4) 3.4 Balances on Multiple Unit Processes. 3.5) 3.5 Recycle, Purging and Bypass.	
<b>4. 4. Material Balances With Chemical Reaction</b> 4.1) 4.1 Chemical Reaction Equation and Stoichiometry 4.2) 4.2 Balances on Reactive Processes 4.3) 4.3 Combustion Reactions	

**5. 5. Energy Balances**

- 5.1) 5.1 Forms of Energy: The First Law of Thermodynamics.
- 5.2) 5.2 Energy Balance on Closed System and Steady State.
- 5.3) 5.3 Energy Balance on Open System and Steady State.

**6. 6. Energy Balances on Nonreactive and Reactive Processes**

- 6.1) 6.1 Element of energy balance calculations.
- 6.2) 6.2 Changes in pressure at constant temperature.
- 6.3) 6.3 Changes in temperature.
- 6.4) 6.4 Heats of reaction.

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	20%	CLO3
	Online Quiz	n/a	20%	CLO4
	Test	test1	20%	CLO1

Reading List	Recommended Text	<ul style="list-style-type: none"> <li>Felder R.M. 2005, <i>Elementary Principles of Chemical Process</i>, 3rd ed. Ed., John Wiley &amp; Sons, Inc.</li> </ul>
	Reference Book Resources	<ul style="list-style-type: none"> <li>Himmelblau D. M. and Riggs J. B. 2004, <i>Basic Principles and Calculation in Chemical</i>, 7 Ed., , Prentice Hall, New Jersey [ISBN: ]</li> <li>Luyben, W.L., and L.A. Wenzen. 1988, <i>Chemical Process Analysis: Mass and Energy Ba</i>, Ed., , Prentice Hall, Englewood Cliffs, N.J. [ISBN: ]</li> <li>Reklaitis, E. V., and D. R. Schneider 1983, <i>Introduction to Material and Energy Balances</i>, Ed., , John Wiley, New York [ISBN: ]</li> <li>Shaheen, E.I. 1975, <i>Basic Practice of Chemical Engineering</i>, Ed., , Houghton Mifflin, Palo Alto, CA</li> </ul>
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	