



Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Technical Engineering College Kirkuk
Department of Fuel and Energy
Engineering



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Material and Energy Balances		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Seminar
Module Code	FEK201		
ECTS Credits	9		
SWL (hr/sem)	225		
Module Level	2	Semester of Delivery	
Administering Department	FEK	College	Type College Code
Module Leader	Morad A. Radha	e-mail	Morad.a.radha@ntu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Aims أهداف المادة الدراسية</p>	<p>our objectives in studying this module are to be able to</p> <ol style="list-style-type: none"> 1. Develop a conceptual understanding of material balances 2. Understand the features of open, closed, steady-state, and unsteady-state systems 3. Express in words how to form the material balances for processes involving single or multiple components 4. Familiarize yourself with the strategy to assist you in solving material balance problems 5. Define or explain the following terms: energy, system, closed system, nonflow system, open system, flow system, surroundings, property, extensive property, intensive property, state, heat, work, kinetic energy, potential energy, internal energy, enthalpy, initial state, final state, state variable, cyclical process, path function, heat capacity 6. Select a system suitable for solving a problem, either closed or open, steady- or unsteady-state, and fix the system boundary 7. Convert energy in one set of units to another set 8. Understand each term in the general energy balance 9. Simplify the general energy balance for the specifics of a particular problem 10. Apply the general energy balance to open and closed systems, and to steady-state and unsteady-state systems
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<p>By the conclusion of this course, each student will be</p> <ul style="list-style-type: none"> • Understand each term in the general Mass and energy balances. • Conscious with types of material balances strategies. • Solve problems related to material and energy balances. • Quickly locate the source of property values from tables, charts and equations. • Define or explain the following terms: energy, system, closed system, nonflow system, open system, flow system, surroundings, property, extensive property, intensive property, state, heat, work, kinetic energy, potential energy, internal energy, enthalpy, initial state, final state, state variable, cyclical process, path function, heat capacity.

Indicative Contents المحتويات الإرشادية	<p>Indicative content includes the following.</p> <p><u>Part A – Balances on Nonreactive Process</u></p> <p>Elements of energy balances. Change in pressure at constant temperature, sensible heat, heat capacities, energy balance on single-phase systems, and energy balance on phase change systems.</p> <p><u>Part B – Simultaneous Balances</u></p> <p>Material and energy balances on steady state processes, Heats of solution and mixing, latent heat of vaporization, Enthalpy calculation. Concentration charts, Partial saturation and humidity, Psychometric charts. Heats of reaction, Heats of formation, heat of combustion, adiabatic systems. Multiple unit system involving reaction, recycle, and purge.</p> <p><u>Part C - Balances on Transient Process</u></p> <p>Differential balance, integral balance, unsteady state material balances on non-reactive systems, unsteady state energy balances on reactive systems.</p>
---	--

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	<p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, online lecture, seminar and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p>

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	97	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	128	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	225		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	10	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr + 1 hr lab	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Revision to Material Balances
Week 2	Material Balances for a Single Component and multi component process
Week 3	Balances on Nonreactive Process
Week 4	Balances on reactive Process
Week 5	Balances on Combustion Process
Week 6	Crystallization Process
Week 7	Processes Involving Multiple Reactions
Week 8	Recycle, Bypass and Purge process without chemical reaction
Week 9	Recycle, Bypass and Purge process with chemical reaction
Week 10	Energy forms and calculations
Week 11	Latent heat of vaporization, Enthalpy calculation.
Week 12	Heats of reaction.
Week 13	Heats of formation.
Week 14	humidity, Psychometric charts.
Week 15	Problems including material and energy balances
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. David Basic principles and calculation in chemical engineering.	Yes
Recommended Texts	2. Richard M. Felder. Elementary principle of chemical processes.	Yes
Websites		

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.