

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mass Transfer 2		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code			
ECTS Credits	6		
SWL (hr/sem)	180		
Module Level	UGIII	Semester of Delivery	
Administering Department	Fuel and Energy Technologies Engineering	College	Shatt Al-Arab University College
Module Leader	Maha munadhil salman	e-mail	maha.munadhil.ali@sa-uc.edu.iq
Module Leader's Acad. Title	Assitance Lectrur	Module Leader's Qualification	M.Sc Chemistry
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date		Version Number	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mass transfer 1	Semester	five
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Aims</b> أهداف المادة الدراسية	To introduce the basic principles of chemical engineering separation processes and mass transfer and then proceed to study the design and operation of separation processes units operation such as distillation, gas-liquid absorption and stripping, liquid-liquid extraction, adsorption and crystallization.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	Gas absorption including application, different types of equipment in industry, process design of a column to find the height and diameter of the column, required solvent flow rate. The concepts and procedure for their calculation of the number of theoretical stages, height of theoretical stages, number of theoretical and height of theoretical units will be explained. Liquid-solvent extraction when the phases are immiscible, including application, different types of equipment in industry, solvent selection, process design of a column to find the height and the diameter of the column and the required solvent flow rate. The concepts and procedure for their calculation of number of theoretical stages, height of theoretical stages, number of theoretical and height of theoretical units will be explained. Liquid-solvent extraction when the phases are miscible, including application, different types of equipment in industry, solvent selection, process design of counter-current and cross flow stage wise operations to find the number of stages to meet operation constraints.
<b>Indicative Contents</b> المحتويات الإرشادية	<ol style="list-style-type: none"><li>1- Explain the physical phenomena, theoretical concepts and design aspects of mass transfer in separation processes, including distillation, gas-liquid absorption, gas-solid adsorption, liquid-liquid extraction and Drying.</li><li>2- Analyze the important separation processes of distillation, gas absorption, adsorption, liquid-liquid extraction and drying and carry out design calculations appropriately of the above processes.</li></ol> <p>Apply simplifying assumptions to complex problems in order to gain useful design information individually and in a team.</p>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	Assessment is based on hand-in assignments, written exam, Quizzes, reports, seminars, Practical testing and Online testing.
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## Student Workload (SWL)

### الحمل الدراسي للطالب

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	74	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	8
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	106	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	180		

## Module Evaluation

### تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	4	10% (10)	3,6,9,12	
	<b>Assignments</b>	2	10% (10)	7,13	
	<b>Seminar</b>	1	10% (10)	Continuous	
	<b>Report/ Lab.</b>	1	10% (10)	2,3,4,5,6,7	
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	7	
	<b>Final Exam</b>	3hr	50% (50)	16	
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Absorption of Gases: Introduction Two Film Theory
Week 2	Determination of transfer coefficients , number of stages in absorption column
Week 3	Design of Absorption Column using Height of Transfer Unit, Minimum Liquid Flow Rate
Week 4	Packed towers for gas absorption, plate towers for gas absorption
Week 5	Stripping: introduction
Week 6	Stripping Column, Height of Packed-bed and Number of Stages in Stripping Column
Week 7	Liquid-liquid Extraction, Ternary system of extraction,
Week 8	Extraction calculations of partial solubility and non-soluble liquids
Week 9	Design of co-current and counter-current extraction for miscible and immiscible liquids
Week 10	Drying. General principles
Week 11	Rate of drying, the mechanism of moisture movement during drying.
Week 12	Drying equipment specialised drying methods the drying of gases
Week 13	<b>Leaching</b> introduction mass transfer in leaching operations
Week 14	Countercurrent washing of solids, calculation of the number of stages
Week 15	<b>Preparatory week before the final Exam</b>

**Delivery Plan (Weekly Lab. Syllabus)**

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	

<b>Week 2</b>	
<b>Week 3</b>	
<b>Week 4</b>	
<b>Week 5</b>	
<b>Week 6</b>	
<b>Week 7</b>	

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>➤ T.K.Sherwood, R.L.Pigford and C.R.Wilke, Mass Transfer, McGrawHill,</li> <li>➤ Coulson &amp; Richardson's ,“Chemical Engineering” volume 2 , (2003)</li> </ul>	yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>➤ Binay K. Dutta “Principle of Mass Transfer and Separation Processes”</li> </ul> Treybal, R.E., ‘Mass Transfer Operations”, 3rd edition, 1980, McGraw Hill	no
<b>Websites</b>	<a href="https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A_Organic_Chemistry_Nomenclature_Workbook_(O'Donnell)">https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A_Organic_Chemistry_Nomenclature_Workbook_(O'Donnell)</a>	

## Grading Scheme

### مخطط الدرجات

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