	وزارة التعليم العالي والبحث العلمي **جامعة المستقبل** كلية العلوم قسم الكيمياء الحياتية	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information **معلومات المادة الدراسية**			
Module Title	**Industrial Biochemistry**		**Module Delivery**
Module Type	**Basic**		• ☒ **Theory** • ☒ **Lecture** • ☐ **Lab** • ☐ **Tutorial** • ☐ **Practical** • ☐ **Seminar**
Module Code	UOMU036355		
ECTS Credits	4		
SWL (hr/sem)			
Module Level	3	**Semester of Delivery**	1
Administering Department	Department of BioChemistry	**College**	College of Science
Module Leader		**e-mail**	
Module Leader's Acad. Title		**Module Leader's Qualification**	
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date		**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	
Module Aims **أهداف المادة الدراسية**	• Introduce students to the principles and applications of biochemistry in industrial processes. • Understand the role of enzymes, microorganisms, and biochemical pathways in large-scale production. • Explore fermentation technology, bioreactor design, and downstream processing. • Develop knowledge on the production of industrially important biochemicals, pharmaceuticals, and food products using biochemical methods.
Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	By the end of the course, students will be able to: 1. Explain the role of biochemical processes in industrial applications. 2. Describe the industrial use of enzymes and microorganisms in production and processing. 3. Analyze the chemical and biochemical properties of food products, detergents, and petrochemical materials. 4. Apply analytical techniques relevant to industrial quality control. 5. Evaluate environmental and safety considerations in industrial biochemical processes. 6. Interpret case studies and propose biochemical solutions to industrial challenges. 7. Demonstrate communication skills through presentations and written reports related to industrial biochemistry.
Indicative Contents **المحتويات الإرشادية**	1. **Introduction to Industrial Biochemistry.** Scope and significance in biotechnology and manufacturing 2. **Microbial Metabolism in Industry.** Primary vs. secondary metabolites 3. **Enzymes in Industrial Applications.** Enzyme production, immobilization, and usage in processes 4. **Fermentation Technology.** Batch, fed-batch, and continuous

	fermentation 5. **Bioreactor Design and Operation.** Parameters affecting yield and efficiency 6. **Downstream Processing.** Cell harvesting, extraction, purification techniques 7. **Production of Alcohols and Organic Acids.** Ethanol, citric acid, lactic acid 8. **Industrial Production of Amino Acids and Vitamins** 9. **Biotechnological Production of Antibiotics and Hormones** 10. **Industrial Waste Treatment and Bioconversion**

Learning and Teaching Strategies **استراتيجيات التعلم والتعليم**	
Strategies	• Interactive lectures • Case study analysis • Group discussions and presentations • Optional industrial site visit • Use of multimedia and guest speakers from industry

Student Workload (SWL) **الحمل الدراسي للطالب**			
Structured SWL (h/sem) **الحمل الدراسي المنتظم للطالب خلال الفصل**	63	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	4.2
Unstructured SWL (h/sem) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	37	**Unstructured SWL (h/w)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	2.4
Total SWL (h/sem) **الحمل الدراسي الكلي للطالب خلال الفصل**	100		

Module Evaluation **تقييم المادة الدراسية**					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	1	5% (5)	2, 12	LO # 3, 4, 6 and 7
	Projects	1	5%(5)	-	
	Report	1	10% (10)	11	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8,13	LO # 1-7
	Final Exam	3hr	50% (50)	15	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) **المنهاج الاسبوعي النظري**	
	Material Covered
Week 1	Introduction to Industrial Biochemistry
Week 2	Biocatalysis and Industrial Enzymes
Week 3	Microbial Biotechnology in Industry
Week 4	Biochemical Production of Food Additives
Week 5	Food Chemistry: Components and Preservation
Week 6	Analytical Techniques in Food Industry
Week 7	Chemistry of Soaps and Detergents
Week 8	Role of Enzymes in Detergent Formulations
Week 9	Petrochemicals and Biochemical Applications
Week 10	Quality Control in Industrial Laboratories
Week 11	Environmental Safety in Industrial Biochemistry
Week 12	Case Studies: Food and Detergent Industries
Week 13	Industrial Standards: ISO, HACCP, GMP
Week 14	Student Presentations and Group Projects
Week 15	Course Review and Final Exam Preparation
Topics Covered	
Week 1	Overview of industrial biochemistry, scope, importance, and applications in various industries
Week 2	Types of enzymes, enzyme sources, mechanisms, and industrial uses
Week 3	Use of microorganisms in fermentation, enzyme production, and bioprocessing
Week 4	Vitamins, amino acids, organic acids, and their industrial production methods
Week 5	Macronutrients, food structure, preservation techniques, and spoilage prevention
Week 6	Methods for moisture, protein, fat, sugar, and contaminant analysis
Week 7	Chemical composition, types of surfactants, and soap manufacturing processes
Week 8	Application of enzymes like proteases, lipases in detergents and laundry products
Week 9	Bioconversion processes, biofuels, oil biodegradation, and environmental impact
Week 10	QC protocols, calibration, standard methods, and regulatory compliance
Week 11	Waste treatment, biodegradability, eco-friendly industrial processes
Week 12	Real-world examples, success stories, and challenges from local and international industries
Week 13	Overview of major industrial quality and safety standards
Week 14	Presentations on assigned industrial biochemistry topics and problem-solving
Week 15	Comprehensive review of course content and exam strategies

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Crueger, W., & Crueger, A. *Biotechnology: A Textbook of Industrial Microbiology*. • Bailey, J.E., & Ollis, D.F. *Biochemical Engineering Fundamentals*. • Varnam, A.H., & Sutherland, J.P. *Biotechnology of Food Ingredients*.	yes
Recommended Texts	• Belitz, H.-D., et al. *Food Chemistry*. • Broze, G. *Handbook of Detergents*. • Selected research articles and industrial case studies provided during the course.	
Websites	https://www.nthrys.com/industrial-biochemistry.html	

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 is 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.