MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Biochemistry			**Module Delivery**	
Module Type	Basic			✓ **Theory** ✓ **Lecture** ✓ **Lab** **Tutorial** **Practical** **Seminar**	
Module Code	UOMU0101043				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	UGII		**Semester of Delivery**	4	
Administering Department	Biomedical Engineering Dept.		**College**	College of Engineering	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Chemistry ER103	**Semester**	UGI 2
Co-requisites module	None	**Semester**	
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Aims أهداف المادة الدراسية	Module Aims: The aim of the "Biochemistry for BME" module is to		

	provide students with a comprehensive understanding of the fundamental principles of biochemistry and their application in the field of Biomedical Engineering. The module aims to equip students with the knowledge and skills necessary to analyze and apply biochemical concepts to solve biomedical engineering problems and design innovative solutions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: 1. Demonstrate a solid understanding of the fundamental principles and concepts of biochemistry. 2. Apply biochemical knowledge to analyze and solve biomedical engineering problems. 3. Explain the relevance of biochemistry in the context of biomedical engineering applications. 4. Evaluate and critically analyze scientific literature related to biochemistry and its applications in biomedical engineering. 5. Apply biochemistry principles to design and develop innovative biomedical engineering solutions.
Indicative Contents المحتويات الإرشادية	The following topics will be covered during the "Biochemistry for BME" module: 1. Introduction to Biochemistry: • Overview of the central themes and principles of biochemistry. • Structure and function of biological macromolecules (proteins, carbohydrates, lipids, nucleic acids). 2. Enzymes and Metabolism: • Enzyme structure, function, and regulation. • Metabolic pathways, including glycolysis, citric acid cycle, and oxidative phosphorylation. • Metabolic interconversions and energy production. 3. Biomolecular Structure and Function: • Protein structure and folding. • Enzyme kinetics and mechanisms. • Membrane structure and transport processes. 4. Biochemical Signaling and Communication: • Cell signaling pathways and signal transduction mechanisms. • Hormones and their role in physiological regulation. • Receptor-ligand interactions. 5. Biochemistry of Nucleic Acids: • DNA structure, replication, and repair. • RNA synthesis and processing. • Gene expression and regulation.

	6. Biochemistry of Metabolic Diseases: • Understanding the biochemical basis of metabolic disorders such as diabetes, obesity, and cardiovascular diseases. • Implications of metabolic disorders in the development and treatment of biomedical engineering solutions. 7. Biochemistry of Biomaterials and Tissue Engineering: • Interaction of biomaterials with biological systems. • Biochemical considerations in tissue engineering and regenerative medicine. • Designing bioactive materials for tissue regeneration. 8. Biochemistry of Drug Delivery and Pharmacology: • Principles of drug action and pharmacokinetics. • Drug metabolism and drug interactions. • Biochemical aspects of drug delivery systems and targeted therapies.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the classes, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	150	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2 times	10% (10)	3, 13	LO #1, 2, 10
	Oral	2 times	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects and presentations	1 time	10% (10)	9	LO # overall
Summative assessment	**Midterm Exam Thiorotical +lab**	1 time/2hr for theory ans 1 hr for lab	20% (20)	12	LO # 1-11
	Final Exam	1 time 3/hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Topic: Carbohydrates • Introduction to carbohydrates: structure and function • Carbohydrate metabolism and energy production Example for BME: The role of carbohydrates in bioactive materials for controlled drug release in cancer treatment. Designing carbohydrate-based nanoparticles to target cancer cells specifically.
Week 2	Topic: Proteins • Structure and function of proteins • Protein synthesis and folding Example for BME: Understanding the role of proteins in biomaterials for tissue engineering applications. Developing protein-based scaffolds to support cell growth and tissue regeneration.
Week 3	Lipids • Lipid structure and classification • Lipid metabolism and cellular signaling

	Example for BME: Investigating the impact of lipids on the biocompatibility and stability of implanted medical devices, such as pacemakers or stents.
Week 4	Nucleic Acids • DNA and RNA structure and function • DNA replication and transcription Example for BME: Utilizing nucleic acid amplification techniques, such as polymerase chain reaction (PCR), for the detection of infectious diseases in point-of-care diagnostics.
Week 5	Enzymes and Enzyme Kinetics • Introduction to enzymes and their role in biological reactions • Enzyme kinetics and enzyme inhibition Example for BME: Exploring the use of enzymes in biosensors for rapid and sensitive detection of biomarkers in medical diagnostics.
Week 6	Metabolic Pathways and Regulation • Overview of major metabolic pathways (glycolysis, Krebs cycle, etc.) • Regulation of metabolic pathways Example for BME: Investigating the metabolic changes associated with neurodegenerative diseases and designing metabolic-based therapies for neurological disorders.
Week 7	Bioenergetics and ATP • Energy metabolism and ATP synthesis • Mitochondrial function and oxidative phosphorylation Example for BME: Understanding the bioenergetics of muscle contraction and designing bioelectricity-based therapies for neuromuscular disorders.
Week 8	Biochemical Signaling and Communication • Introduction to cell signaling pathways • Signal transduction and second messengers Example for BME: Investigating the role of biochemical signaling in tissue engineering approaches for organ regeneration, such as signaling factors to stimulate tissue growth.
Week 9	Biochemistry of Connective Tissues • Composition and function of extracellular matrix components • Collagen synthesis and tissue remodeling Example for BME: Exploring the role of biochemical cues in designing bioactive materials for cartilage tissue engineering and regeneration.
Week 10	Biochemistry of Bone and Teeth • Structure and composition of bone and teeth • Bone remodeling and mineralization Example for BME: Investigating the biochemical aspects of bone healing and designing

	biomaterials for bone tissue engineering, such as bioactive scaffolds to promote bone regeneration.
Week 11	Biochemistry of the Nervous System • Neurotransmitters and neuronal signaling • Neurodegenerative diseases and neurotransmitter imbalances Example for BME: Understanding the role of neurotransmitters in neural interfaces and brain-computer interfaces for neuroprosthetics and rehabilitation.
Week 12	Med term exam
Week 13	Biochemistry of the Immune System • Immunoglobulins and immune response • Inflammation and immune disorders Example for BME: Exploring the biochemical basis of immune responses to implanted medical devices and designing materials to minimize immune reactions.
Week 14	Biochemistry of Drug Metabolism • Drug absorption, distribution,
Week 15	Biochemistry of Bone and Teeth • Structure and composition of bone and teeth • Bone remodeling and mineralization Example for BME: Understanding the biochemical processes involved in bone regeneration
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to Biochemistry Laboratory • Laboratory safety protocols and guidelines • Introduction to laboratory equipment and techniques
Week 2	Molisch Test, Selivanoff Test
Week 3	Bial Test, Aniline Test

Week 4	Fehling Test, Benedict Test
Week 5	Barfoed Test, Osazone Formation
Week 6	Iodine Test, Separate of three main types of lipids
Week 7	Unsaturation test, Acrolein Test
Week 8	Reactions of Soap, Tests For Cholesterol
Week 9	Salkowski Test, Liebermann – Burchard Test
Week 10	Solubility of Amino Acids, Ninhydrin reaction
Week 11	Xanthoproteic Reaction,
Week 12	Rosenheim Reaction
Week 13	Hopkins- Cole Test
Week 14	Millon Reaction
Week 15	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Required Texts for "Biochemistry for BME": 1. "Biochemistry" by Jeremy M. Berg, John L. Tymoczko, and Gregory J. Gatto Jr. 2. "Lehninger Principles of Biochemistry" by David L. Nelson and Michael M. Cox. 3. "Biochemistry: Concepts and Connections" by Dean R. Appling, Spencer J. Anthony-Cahill, and Christopher K. Mathews. 4. "Biochemistry" by Lubert Stryer. Reference Books: 1. "Biochemistry" by Donald Voet, Judith G. Voet, and	No

	Charlotte W. Pratt. 2. "Biochemistry" by Mary K. Campbell and Shawn O. Farrell. 3. "Harper's Illustrated Biochemistry" by Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, and P. Anthony Weil. 4. "Biochemistry and Molecular Biology" by William H. Elliott and Daphne C. Elliott. 5. "Principles of Medical Biochemistry" by Gerhard Meisenberg and William H. Simmons. Websites: 1. National Center for Biotechnology Information (NCBI) - www.ncbi.nlm.nih.gov 2. Biochemical Society - www.biochemistry.org 3. American Society for Biochemistry and Molecular Biology (ASBMB) - www.asbmb.org 4. Khan Academy - www.khanacademy.org (for interactive biochemistry tutorials) 5. ScienceDirect - www.sciencedirect.com (for accessing biochemistry research articles)	
Recommended Texts		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.