



Ministry of Higher Education and
Scientific Research - Iraq
Al-Mustaqbal University
College for engineering and technology
Department of Biomedical Engineering



MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	INTRODUCTION TO BME		Module Delivery
Module Type	CORE		✓ Theory ✓ Lecture Lab Tutorial Practical Seminar
Module Code	BME102		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UGx11 1	Semester of Delivery	
Administering Department	Biomedical Engineering Dept.	College	College of Engineering
Module Leader		e-mail	
Module Leader's Acad. Title	Lecturer	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	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	<ol style="list-style-type: none"> 1. To introduce students to the field of Biomedical Engineering (BME) and its interdisciplinary nature. 2. To provide students with an overview of the fundamental principles and applications of BME. 3. To familiarize students with the ethical and societal considerations associated with BME. 4. To develop students' critical thinking and problem-solving skills in the context of BME. 		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p>By the end of this module, students should be able to:</p> <ol style="list-style-type: none"> 1. Describe the interdisciplinary nature of BME and its relationship with other fields. 2. Explain the fundamental principles and concepts in BME, such as biomaterials, biomechanics, bioinstrumentation etc.. 3. Identify and discuss the various applications of BME in healthcare, rehabilitation, and research. 4. Analyze and evaluate ethical issues related to BME, including privacy, informed consent, and responsible use of technology. 5. Apply critical thinking and problem-solving skills to address challenges in BME through case studies and practical examples. 		
Indicative Contents المحتويات الإرشادية	<ol style="list-style-type: none"> 1. Introduction to Biomedical Engineering: <ul style="list-style-type: none"> • Definition and scope of BME. • Interdisciplinary nature and collaboration with other fields (medicine, biology, engineering, etc.). • Historical developments and major milestones in BME. 2. Fundamental Principles in BME: <ul style="list-style-type: none"> • Biomaterials: properties, biocompatibility, and applications. • Biomechanics: principles of forces, stresses, and strains in biological systems. • Bioinstrumentation: measurement techniques and devices used in BME. 3. Applications of BME: <ul style="list-style-type: none"> • Medical imaging and diagnostics. • Prosthetics and assistive devices. 		

	<ul style="list-style-type: none"> • Biomedical sensors and monitoring systems. • Tissue engineering and regenerative medicine. <p>4. Ethical and Societal Considerations in BME:</p> <ul style="list-style-type: none"> • Ethical principles and codes of conduct in BME. • Privacy and data security in healthcare. • Informed consent and patient autonomy. • Social impact and accessibility of BME technologies. <p>5. Case Studies and Problem-Solving:</p> <ul style="list-style-type: none"> • Analyzing real-life BME applications and challenges. • Applying critical thinking and problem-solving skills to propose solutions. • Group discussions and presentations on selected topics
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	<p>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.</p>

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	6.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

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	1 time	5% (5)	2, 12	LO # 3, 4, 6 and 7
	Duties in the college	1time	5% (5)	9	LO # overall
	Presentations	1 time	10% (10)		
Summative assessment	Midterm Exam	1 time/1hr	10% (10)	7	LO # 1-7
	Final Exam	1 time /hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	<p>Introduction to Biomedical Engineering</p> <ul style="list-style-type: none"> • Definition and scope of BME • Interdisciplinary nature of BME • Collaboration with other fields • Application in BME: Overview of how bio systems, biomechanics, bioinstrumentation, biomaterials, bio signals etc. contribute to the field.
Week 2	<p>The first Disciplines of Biomedical Engineering (Bio systems)</p> <ul style="list-style-type: none"> • Overview of human physiological systems • Cellular and molecular biology in BME • Homeostasis and biological control systems
Week 3	<ul style="list-style-type: none"> • Application of bio systems in BME: Understanding the functioning of bio systems to develop medical interventions, diagnostics, and therapies such as cellular transport mechanisms and Bioreactor using in BME
Week 4	<p>The Second Discipline of Biomedical Engineering (Biomechanics)</p> <ul style="list-style-type: none"> • Introduction to biomechanics • Forces, stresses, and strains in biological systems • Biomechanical analysis and modeling

Week 5	<ul style="list-style-type: none"> • The Muscular System • The Role of the Brain • Energy Sources For Muscle Contraction
Week 6	<ul style="list-style-type: none"> • The Skeletal System • Functions Of The Skeleton • The differences between cartilages, tendons and ligaments
Week 7	<ul style="list-style-type: none"> • Med term exam
Week 8	<ul style="list-style-type: none"> • Biomechanics of Soft Tissues <p>The function of collagen and elastin in movements</p>
Week 9	Application in BME: Designing and optimizing prosthetics, orthotics, and rehabilitation devices based on biomechanical principles.
Week 10	<p>The Third Discipline of Biomedical Engineering (Bioinstrumentation)</p> <ul style="list-style-type: none"> • Introduction to bioinstrumentation • Measurement techniques in BME
Week 11	<ul style="list-style-type: none"> • Sensors and transducers in biomedical applications • Application in BME: Developing and utilizing instrumentation for monitoring physiological parameters, diagnosing diseases, and conducting medical research.
Week 12	<p>The Fourth Discipline of Biomedical Engineering (Biosignals)</p> <ul style="list-style-type: none"> • Acquisition and processing of biosignals • Physiological Signals and Transducers • Sources of Physiological Signals depending on the source of energy
Week 13	<ul style="list-style-type: none"> • Signal analysis and interpretation <p>Application in BME: Using biosignals for diagnosing medical conditions, monitoring patient health, and developing brain-computer interfaces</p>
Week 14	<p>The fourth Discipline of Biomedical Engineering (Biomaterials)</p> <p>Properties and classifications of biomaterials</p> <p>Biocompatibility and biodegradability</p>
Week 15	<p>Applications of biomaterials in BME</p> <p>Application in BME: Designing and fabricating biomaterials for tissue engineering and medical implants.</p>
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<p>Reference Books:</p> <ol style="list-style-type: none">1. "Introduction to Biomedical Engineering" by John Enderle, Joseph Bronzino, and Susan Blanchard2. "Biomedical Engineering: Bridging Medicine and Technology" by W. Mark Saltzman3. "Principles of Biomedical Instrumentation and Measurement" by Richard Aston4. "Biomaterials Science: An Introduction to Materials in Medicine" by Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, and Jack E. Lemons5. "Biomechanics: Concepts and Computation" by Cees Oomens, Marcel Brekelmans, Frank Baaijens, and Rob Peerlings	No

	<p>6. "Bioengineering Fundamentals" by Ann Saterbak, Ka-Yiu San, Larry V. McIntire, and Joseph D. Bronzino</p> <p>7. "Medical Instrumentation: Application and Design" by John G. Webster</p> <p>8. "Biomedical Signals, Imaging, and Informatics" by Joseph D. Bronzino, Donald R. Peterson, and Donald Christiansen</p> <p>9. "Introduction to Biomedical Engineering Technology" by Laurence J. Street</p> <p>10. "Ethics, Technology, and Engineering: An Introduction" by Ibo van de Poel and Lambèr Royakkers</p> <p>Websites:</p> <p>1. National Institute of Biomedical Imaging and Bioengineering (NIBIB) - https://www.nibib.nih.gov/</p> <p>2. Biomedical Engineering Society (BMES) - https://www.bmes.org/</p> <p>3. IEEE Engineering in Medicine and Biology Society (EMBS) - https://www.embs.org/</p> <p>4. Open Biomedical Engineering Journal - https://benthamopen.com/TOBEJ/home/</p> <p>5. ScienceDirect - Biomedical Engineering Journals - https://www.sciencedirect.com/browse/journals-and-books/engineering/biomedical-engineering</p> <p>6. MIT OpenCourseWare - Biomedical Engineering Courses - https://ocw.mit.edu/courses/biological-engineering/</p> <p>7. Biomedical Engineering Online Journal - https://biomedical-engineering-online.biomedcentral.com/</p> <p>8. National Center for Biotechnology Information (NCBI) - https://www.ncbi.nlm.nih.gov/</p> <p>9. World Health Organization (WHO) - Biomedical Engineering - https://www.who.int/medical_devices/en/</p> <p>10. ResearchGate - Biomedical Engineering Publications - https://www.researchgate.net/topic/Biomedical-Engineering</p>	
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.

