



Ministry of Higher Education and Scientific Research -
Iraq
Al-Mustaqbal University
College of Engineering
Department of Prosthetics and Orthotics Engineering



MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	الميكانيك الحيوي II		Module Delivery
Module Type	CORE		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	UOMU0103062		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	
Administering Department	UOMU0103	College	UOMU01
Module Leader	Mariam Ghassan Ghaffar	e-mail	mariam.ghassan.ghaffar@uomus.edu.iq
Module Leader's Acad. Title	Asst. Lect.	Module Leader's Qualification	MSc.
Module Tutor			
Peer Reviewer Name		e-mail	
Review Committee Approval	/ 2 /2026	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>	<ol style="list-style-type: none"> 1. To develop problem solving skills and understanding of biomechanics theory through the application of techniques. 2. Provide the student information about the basic concepts of the gait cycle, methods of finding its variables, and dynamic movement. 3. Developing students' knowledge skills to enable them to solve mathematical and engineering problems in the biomechanical field. 4. To understand the anthropometric human body segments . 5. To understand biosignals and extraction during human body motion. 6. To perform biomechanical analysis.
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> 1. Recognize how use the motion human body analysis at different anatomical movement. 2. List the various terms associated with biomechanics. Summarize what is meant by biomechanics dynamics of human Gait. 4. Discuss the top-down analysis of the gait. 5. Describe the Integration of Anthropometry, Displacements, and Ground Reaction Forces. 6. Define the periodicity of gait. 7. Identify the Body Segment Parameters. 8. Discuss the Centres of Gravity, Angular Kinematics, and Dynamics of Joints. 9. Discuss the Muscle Actions Revealed Through Electromyography. 10. Explain the instruments used in the extraction Electromyography signal. Identify the Phasic Behaviour of Muscles and Relationship Between 11. Different Muscles.
<p>Indicative Contents المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p><u>Part A – Dynamic Gait Cycle Theory</u> Fundamental concepts in dynamic gait cycle, Calculation of the human body's centre of mass position using anthropometric tables, Kinematics of linear motion, Position, displacement, velocity, and acceleration, Free fall and ballistic</p>

	<p>projectile motion. [15 hrs]</p> <p>Newton’s laws of mechanics, Ground reaction force in walking and running, Analysis of the centre of mass motion in walking, running, and jumping, Impulse and Momentum. [15 hrs]</p> <p>Work, Energy, and Power, Kinetic, Potential and Elastic energy of the human body, Energy fluctuation during walking and running. [10 hrs]</p> <p>Experimental methods for the analysis of kinematics and kinetics of human motion, Camera-based motion tracking, force plates and their applications for the analysis of walking, running, and jumping. [15 hrs]</p> <p>Revision problem classes [6 hrs]</p> <p><u>Part B – Motion Analysis Parameters</u></p> <p>Fundamentals moment of force and equilibrium of material objects, Experimental measurement of the centre of gravity position using the reaction board method, Joint moments, joint reaction forces, and muscle forces in equilibrium. [15 hrs]</p> <p>Prediction of segment mass, Prediction of segment moments of inertia, Use of markers, Marker placement for current model, Prediction of joint centres. [7 hrs]</p> <p>Introduction to Electromyography, Typical Half-Cell Potentials for Different Metals That Could Be Used for EMG Electrodes, Selection of sampling frequency, Surface versus indwelling electrodes, Signal processing methods, Phasic behaviour of muscles, Multidimensional scaling and muscle mapping, Clinical gait analysis a case study. [15 hrs]</p>
<p>Learning and Teaching Strategies</p> <p>استراتيجيات التعلم والتعليم</p>	
<p>Strategies</p>	<p>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 and by considering type of simple 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	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	In Search of the Homunculus, Top-Down Analysis of Gait, Measurements and the Inverse Approach.
Week 2	The Three-Dimensional and Cyclic Nature of Gait, Periodicity of Gait, Parameters of Gait.
Week 3	Integration of Anthropometry, Displacements, and Ground Reaction Forces, Body Segment Parameters.
Week 4	Linear Kinematics, Centres of Gravity, Angular Kinematics, Dynamics of Joints.
Week 5	Muscle Actions Revealed Through Electromyography, Back to Basics, Phasic Behaviour of Muscles.
Week 6	Relationship Between Different Muscles, Clinical Gait Analysis, Laws of Motion Snowflakes, Airborne Balls, Pendulums.
Week 7	Laws of Motion: A Historical Perspective, Addition and Subtraction of Vectors Time Derivatives of Vectors Position.
Week 8	Velocity, and Acceleration, Newton's Laws of Motion and Their Applications.

Week 9	Particles in Motion, Method of Lumped Masses and Jumping, Sit-Ups, Push-Ups, Conservation of Linear Momentum.
Week 10	Center of Mass and Its Motion, Multiplication of Vectors, Moment of a Force, Moment of Momentum About a Stationary Point.
Week 11	Moment of Momentum About the Center of Mass, Bodies in Planar Motion Jumping, Diving, Push-Ups, Back Curls.
Week 12	Planar Motion of a Slender Rod, Angular Velocity, Angular Acceleration, Angular Momentum.
Week 13	Conservation of Angular Momentum, Applications to Human Body Dynamics, Instantaneous Center of Rotation.
Week 14	Statics, Tug-of-War, Weight Lifting, Trusses, Cables, Beams, Equations of Static Equilibrium.
Week 15	Contact Forces in Static Equilibrium, Structural Stability and Redundance, Structures and Internal Forces, Distributed Forces.

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: The anthropometric measurements of the lower extremity
Week 3	Lab 3: prediction of body segment parameters (masses and moments of inertia).
Week 4	Lab 4: The marker system which define the position of the pelvis in 3-D space.
Week 5	Lab 5: Measurements the location of the centre of gravity of the right thigh, with the joint centres (hip and knee) and corresponding body segment parameters.
Week 6	Lab 6: Measurements Angular Kinematics (Anatomical Joint Angles, Segment Angular Velocities and Accelerations).
Week 7	Lab 7: Measurement of Ground Reaction Forces.
Week 8	Lab 8: Three-Dimensional Force Plate Information for Analysis motion.
Week 9	Lab 9: Measurements The flexion- extension moments (in newton-metres, N.m) at the right hip, knee, and ankle joints.
Week 10	Lab 10: Measurements Electromyography signals.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- Dynamics of Human Gait, Christopher L Vaughan, Brian L Davis, Jeremy C O.Connor, "Second dition" Winter, D. A. (2009) Biomechanics and Motor Control of Human Movement. 4th Ed. Chichester: Wiley & Son	Yes
Recommended Texts	Biomechanics Principles and Applications, Donald R. Peterson, Joseph D. Bronzino, "Second dition"	No
Websites		

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:

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.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي