



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	فيزياء المواد		Module Delivery
Module Type	BASIC		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	UOMU0103025		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester of Delivery	
Administering Department	UOMU0103	College	UOMU01
Module Leader	Muntadher Saleh Mahdi	e-mail	muntadher.saleh.mahdi@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	01/06/2023	Version Number	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Prosthetics and Biomaterials	Semester	7&8
Co-requisites module	Orthotics	Semester	6

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. Cite three criteria that are important in the materials selection process. 2. List the three primary classifications of solid materials. 3. Briefly describe ionic, covalent, metallic, hydrogen, and van der Waals bonds and note which materials exhibit each of these bonding types. 4. Draw unit cells for face-centered cubic, body-centered cubic, and hexagonal close-packed crystal structures. 5. Specify the Miller indices for a plane that has been drawn within a unit cell. 6. Define engineering stress and engineering strain. 7. State Hooke's law and note the conditions under which it is valid. 8. Given an engineering stress-strain diagram, determine (a) the modulus of elasticity, (b) the yield strength (0.002 strain offset), and (c) the tensile strength and (d) estimate the percentage elongation. 9. Given a binary phase diagram, the composition of an alloy, and its temperature; and assuming that the alloy is at equilibrium, determine the following: (a) what phase(s) is (are) present, (b) the composition(s) of the phase(s), and (c) the mass fraction(s) of the phase(s). 10. Name four different types of steels and cite compositional differences, distinctive properties, and typical uses for each. 11. Name different types of nonferrous alloys and cite the distinctive physical and mechanical characteristics and list at least three typical applications for each. 12. Cite the differences in behavior and molecular structure for thermoplastic and thermosetting polymers. 13. Name the four main divisions of composite materials and cite the distinguishing feature of each. <p>Describe/sketch the various stages in the elastic and plastic deformations of a semicrystalline (spherulitic) polymer.</p>
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> 1. Make ability for selecting the right material from the thousands. 2. An important reason to have an understanding of interatomic bonding in solids is that in some instances, the type of bond allows us to explain a material's properties.

	<ol style="list-style-type: none"> 3. Identify crystal structures because the properties of some materials are directly related to their crystal structures. 4. It is incumbent on engineers to understand how the various mechanical properties are measured and what these properties represent 5. The design of a component or structure often calls upon the engineer to minimize the possibility of failure. Thus, it is important to understand the mechanics of the various failure modes—fracture, fatigue, and creep. 6. There are several reasons why an engineer should know something about the characteristics, applications, and processing of polymeric materials because they are important in manufacturing of prosthetics and orthotics. it is possible to design materials with property combinations that are better than those found in any monolithic metal alloys, ceramics, and polymeric materials.
<p>Indicative Contents المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p><u>Part A - Introduction</u></p> <p>Classification of materials, types of bonding in materials include primary bonding and secondary bonding, crystal structures of materials, draw unit cells for face-centered cubic, body-centered cubic, and hexagonal close-packed crystal structures and Specify the Miller indices for a plane that has been drawn within a unit cell, ferrous and non-ferrous alloys, binary phase diagram, iron-carbon phase diagram. [15 hrs]</p> <p><u>Part B - Polymers</u></p> <p>Polymer structures, types of polymers, configuration of polymer, repeat unit, mechanical behavior, viscoelastic deformation, stress-strain behavior, and fracture of polymers. [15 hrs]</p> <p><u>Part C - Composite</u></p> <p>Introduction to composite materials, particles reinforcement, fiber reinforcement, metal matrix composite, ceramic matrix composite, polymer matrix composite, structural composite, and nano composite. [20 hrs]</p> <p><u>Part D – Mechanical behavior</u></p> <p>Engineering stress-strain curves for metals and alloys, hook’s law, screw dislocation, edge dislocation, point defects, poisson’s ratio, slip and twinning, recovery, recrystallization. [14 hrs]</p>

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Type something like: 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.
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Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3
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	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr.	10% (10)	7	LO # 1-7
	Final Exam	3hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to materials science – Atomic bonding in engineering materials
Week 2	Crystal structures – Crystallographic directions and planes
Week 3	Phase diagrams
Week 4	Polymers and Ceramics structures
Week 5	Material Properties
Week 6	Materials Applications in prosthetics and orthotics
Week 7	Mid-term Exam -- Introduction to Composite materials
Week 8	Types of reinforcements in Composite materials, Volume and weight fraction.
Week 9	Influence of Fiber Orientation and Concentration
Week 10	Composite Applications in prosthetics and orthotics
Week 11	Types of Matrices in Composite materials
Week 12	Structural composites
Week 13	Introduction to Failure - Fundamentals of Fracture
Week 14	Mechanical behavior of metals
Week 15	Mechanical behavior of polymers

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	W. D. Callister and D. G. Rethwisch, Materials science and engineering: an introduction. Wiley New York, 2018.	Yes
Recommended Texts	D. R. Askeland, P. P. Phulé, W. J. Wright, and D. Bhattacharya, "The science and engineering of materials," 2003. R. F. Gibson, Principles of composite material mechanics. CRC press, 2016.	No
Websites	Top Material Science Courses - Learn Material Science Online (coursera.org)	

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