

مختصر توصيف المقرر

(Course Information)

معلومات المقرر \*

علم المواد	اسم المقرر:
4742 فيز	رقم المقرر:
3712 فيز	اسم ورقم المتطلب السابق:
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السابع	مستوى المقرر:
(0+0+3) 3	الساعات المعتمدة:
<b>Module Title:</b>	Materials Science
<b>Module ID:</b>	PHYS 4742
<b>Prerequisite (Co-requisite) :</b>	PHYS 3712
<b>Co-requisite :</b>	--
<b>Course Level:</b>	Seventh
<b>Credit Hours:</b>	3 (3+0+0)



Module Description

وصف المقرر :

States of matter (liquid, crystalline and vitreous); crystal structure of metals; Metallography (reflecting optical microscope, transmission electron microscope) specimen preparations; Mechanical testing (hardness & tensile test); Defects in crystals (point defects and dislocations); Diffusion in solids; (phase transformation and phase diagrams) strengthening mechanisms (alloying, cold work, precipitation & fiber strengthening); heat treatment of steel & T T T curves.
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Module Aims

أهداف المقرر :

1	Providing a connection between theory and practice for the principles introduced in solid state physics I course.	
2	Know the fundamental science and engineering principles relevant to materials.	
3	Know all different materials classifications and its properties.	

4	To be aware of the experimental part of materials science and how to relate it with the theoretical part to describe and predict the materials properties.	
5	Understand the relationship between nano/microstructure, characterization, properties and processing and design of materials.	
6	Have the experimental and computational skills for a professional career or graduate study in materials.	
7	Possess the knowledge of the significance of research, the value of continued learning and environmental/social, industrial issues surrounding materials.	
8	Be able to communicate effectively, to work in teams and to assume positions as leaders	

**Learning Outcomes:**

مخرجات التعليم:

<b>1</b>	<p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>• Know the main classifications of materials.</li> <li>• Be aware of the social, safety and environmental consequences of their work, and be able to engage in public debate regarding these issues.</li> <li>• Be able to apply core concepts in Materials Science to solve engineering problems.</li> <li>• Be knowledgeable of contemporary issues relevant to Materials Science and Engineering.</li> <li>• How to select materials for design and construction?</li> <li>• Understand the importance of life-long learning.</li> <li>• Understand the professional and ethical responsibilities of a materials scientist and engineer.</li> <li>• Possess the skills and techniques necessary for modern materials engineering practice.</li> </ul>	
<b>2</b>	<p><b>Cognitive Skills</b></p> <ul style="list-style-type: none"> <li>• Characterize and select materials for design by evaluating the linkages between material properties, microstructures and processing.</li> </ul>	

	<ul style="list-style-type: none"> <li>• Analyze materials engineering problems using a balance of mathematics, physics and chemistry including thermodynamics, mass, momentum and energy transport, kinetics and mechanics of materials.</li> <li>• Solve materials engineering problems. Identify and formulate problems, develop and apply analytical and experimental methods of investigation, identify contributing factors and generate, validate, and evaluate alternative solutions.</li> <li>• Design processes for the extraction, synthesis and processing of materials to meet technical, economic, environmental and ethical needs and constraints.</li> <li>• Communicate effectively in a professional environment through technical reports and presentations. Articulate and justify technical solutions to diverse audiences.</li> <li>• Recognize and evaluate the societal benefits of materials engineering. Appreciate and evaluate the environmental and societal impact of materials. Recognize the importance of professional and ethical responsibilities, the evolving nature of materials engineering and the importance of lifelong learning.</li> </ul>	
<p><b>3</b></p>	<p><b>Interpersonal Skills and Responsibility</b></p> <ul style="list-style-type: none"> <li>• The ability to interact professionally with others, to engage effectively in teamwork, and to function productively on multidisciplinary group projects.</li> <li>• To develop in each student, the good writing skills so that they are able to communicate effectively and clearly</li> <li>• To develop in each student good oral communication skills so that they are able to communicate effectively with others</li> <li>• The report is required to demonstrate proficient organizational skills and writing skills.</li> </ul>	
<p><b>4</b></p>	<p><b>Communication, Information Technology and Numerical Skills</b></p> <ul style="list-style-type: none"> <li>• To develop the team working skills necessary to perform effectively.</li> <li>• To develop the ability to argue scientifically with the instructor.</li> <li>• To know how to use the computer program to analyze the data, and make some simulation</li> </ul>	

	<ul style="list-style-type: none"> <li>To know how to search the web for any updated information concerning the assigned experiment.</li> <li>To analyze the data with good mathematics and theory.</li> </ul>	
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### Course Contents:

محتوى المقرر:

ساعات التدريس (Hours)	عدد الأسابيع (Weeks)	قائمة الموضوعات (Subjects)
3	1	Introduction
6	2	The Structure of Crystalline Solids
6	2	Imperfections in Solids
3	1	Diffusion
6	2	Mechanical Properties of Metals
3	1	Dislocations and Strengthening Mechanisms
6	2	Phase Diagrams
3	1	Phase Transformations
3	1	Applications and Processing of Metal Alloys

المقرر والمراجع المساندة:

### Textbook and References:

سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم الكتاب المقرر Textbook title
8 <sup>th</sup> Ed. (2009) ISBN: 978-0-470-41997-7	John Wiley and Sons, Inc.	W. D. Callister, Jr. & D. G. Rethwisch	Materials Science and Engineering, An Introduction
سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم المرجع Reference
5 <sup>th</sup> Ed. (2010) ISBN: 978-0-070-352924-0	McGraw Hill.	W.F. Smith & J. Hashemi	Foundations of Materials Science and Engineering

