The University of Jordan Faculty of Engineering & Technology



Department	Course Name	Course Number	Semester
Mechanical Engineering	Materials Science for Mechanical Engineers	0904275	

2019 Course Catalog Description

This course introduces the basic principles underlying the behavior of materials. Provide the scientific foundation for understanding of the relations among material properties, microstructure, macrostructure, and behavior of metals, polymers, and ceramics. Deals with atomic structure and bonding, structure of crystalline solids, imperfection in solid, dislocations and strengthening mechanisms, phase diagrams and alloys formation, ferrous metals and nonferrous metals and alloys.

metals	and non	ferrous m	etals and alloys.				
				Instructor	S		
	Nam	ie	E-mail	Sec -	Office Hours (online)	Lecture Time	
				Text Boo	alza		
				Text book		Text book 2	
Title			Materials science and engineering: an introduction			Class Handouts	
Author	r(s)		William D. Callister and David G. Rethwisch				
	ier, Year,	Edition	John Wiley & Sons, 2017, 1				
		•		Reference	S	·	
Books		Foundation	ns of Materials Science and E			Il Education, Sixth Edition	
Journa							
Interne	et links						
				Prerequisit	es		
Prereq	uisites by	topic -		-			
Prereq	Prerequisites by course General Chemistry I (0303101) + Strength of Materials I (093					34372)	
Prereq	uisite for	\$	Smart Structures (09145)	87), Rapid p	rototyping (0914530)		
			7	Topics Cove	red		
Week		Topics			Chapter in Text		
1	Introduction				Chapter 1		
2,3	Atomic Structure and Bonding				Chapter 2		
4,5	The Structure of Crystalline Solids				Chapter 3		
6	Imperfections in Solids				Chapter 4		
7	Diffusion				Chapter 5		
8	Mechanical Properties of Metals				Chapter 6		
9	Dislocations and Strengthening Mechanisms				Chapter 7		
10	Failure				Chapter 8		
11,12		Phase Diagrams			Chapter 9		
13	Phase Transformations: Development of Microstructure and Alteration of Mechanical Chapter 10 Properties					Chapter 10	
14	Applications and Processing of Metal Alloys Chapter 11			Chapter 11			
15			rties of Ceramics			Chapter 12	
16	Polymer Structures					Chapter 14	

lvia _.	pping of Cou	rse Outcomes	to ABET Stu	dent Outcom	es		
Course Outcomes							
1. Discuss/explain the importance of materials structure at different levels of structure.							
2. Understand the concepts of crystalline structure and its relations to physical and mechanical properties.							
3. Understand the mechanical behaviour of metallic materials.							
Understand and appreciate the diffusion				nary Phase Diagra	ams and	1	
		Evalua	ntion				
Assessment Tools	Expected Due				,	Weight	
Aidterm Exam/Course Project	_	Department's time	table)			30 %	
Class work (HW, Quizzes, etc.)	_					20 %	
Final Exam	TBA (as per I	Department's time	table)			50 %	
Cont	ribution of C	ourse to Meet	the Professio	onal Compone	nts		
The course contributes to build the	ne fundamental b	pasic concepts of d	design analysis o	f structures and b	asic machine co	omponents.	
	Rela	tionship to St	udent Outcor	nes			
SOs 1	2	3	4	5	6	7	
Availability X							
·	AB	ET Student O	outcomes (SO	s)		•	
1 An ability to identify, fo	rmulate, and so	lve complex en	gineering probl	lems by applyin	g principles of	f engineering	
science, and mathematics	science, and mathematics						
2 An ability to apply engin	eering design t	o produce soluti	ons that meet s	specified needs	with considera	tion of public	
health, safety, and welfar	health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors						
3 An ability to communica	te effectively w	ith a range of au	ıdiences				
An ability to recognize ethical and professional responsibilities in engineering situations and make informed							
judgments, which must	consider the in	npact of engine	eering solutions	s in global, eco	nomic, enviro	onmental, and	
societal contexts							
5 An ability to function eff	ectively on a te	am whose meml	bers together p	rovide leadershi	p, create a coll	aborative and	
inclusive environment, e	inclusive environment, establish goals, plan tasks, and meet objectives						
6 An ability to develop ar	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering						
judgment to draw conclu	sions						
7 An ability to acquire and	apply new kno	wledge as neede	ed, using appro	priate learning s	trategies		
	Upda	ted by ABET	Committee, 2	2024			
Prepared by: Dr. Moudar Zgoul,		ted by ABET	Committee, 2	2024			