



The Hashemite University  
Faculty of Science  
Department of Physics

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<b>Course Title:</b>	Physics of Materials and Heat	<b>Course Number:</b>	110102141
<b>Semester:</b>	First	<b>Year:</b>	2020
<b>Designation:</b>	Compulsory	<b>Prerequisite(s):</b>	(110102102),
<b>Instructor:</b>	Dr. Gassem Alzoubi	<b>Instructor's e-mail:</b>	<a href="mailto:gassem@hu.edu.jo">gassem@hu.edu.jo</a>
		<b>Webpage :</b>	<a href="http://staff.hu.edu.jo/gassem">http://staff.hu.edu.jo/gassem</a>
<b>Office Hours:</b>	Sunday, Tuesday, Thursday: 11–12 Am, Physics Building, Room # 107		

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**Course Description (catalog):** This course introduces students to basic concepts in thermal physics and material physics. Topics covered in this course include temperature, internal energy, heat, entropy, first and second laws of thermodynamics, kinetic theory of gases, energy transfer by conduction, convection, and radiation, atomic structure, electron configurations in atoms, periodic table, bonding in solids, types of primary and secondary interatomic bonds, crystalline solids, crystal structure and unit cell, simple three dimensional crystal structures (SC, BCC, and FCC), Miller indices, x-ray diffraction and Bragg's law

**Textbook(s) and/or Other Supplementary Materials:**

**Textbook(1):** Physics for Scientists and Engineers with Modern Physics, Raymond A. Serway and John W. Jewett, Thomson, BROOKS/COLE, 2014, 9<sup>th</sup> edition

**Textbook(2):** Materials Science and Engineering AN INTRODUCTION, W. D. Callister and D. G. Rethwisch, Thomson, BROOKS/COLE, 2014, 9<sup>th</sup> edition

**References:**

- (1): Fundamentals of Thermodynamics, 8th edition by by Claus Borgnakke and Richard E. Sonntag (Wiley, 2012)
- (2): An Introduction to Thermal Physics, First Edition by Daniel V. Schroeder (Addison-Wesley, 2000)
- (3): Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker, 10<sup>th</sup> 10<sup>th</sup> Edition, John Wiley and Sons, 2013.

**Major Topics Covered:**

Topics	Chapter in Text(1)	Sections	No. of Weeks	Contact hours*	Suggested Problems
Temperature	19	19.1-19.5	3	9	7,9,17,23,26,30,40
The first law of thermodynamics	20	20.1 - 20.7	2	6	4,13,15,25,27,28,30,34, 43,53
Kinetic theory of Gases	21	21.1 – 20.5	2	6	1,3,14,15,17,23,25,26,33,36, 37
The second law of thermodynamics and entropy, energy transfer by conduction, convection, and radiation	22	22.1 – 22.8	3	9	1,10,13,17,20,31,43,44,45, 49,50
	Chapter in Text(2)				
Atomic structure and Atomic bonding	2	2.1 – 2.7	2	6	6,8,9,11,13,14,15,16,17,18, 27
The structure of crystalline solids	3	3.1-3.5, 3.7, 3.9-3.10, 3.16	3	9	1,7,9,15,17,31, 35,46,47,69, 72,73
<b>Total</b>			15	45	

\*Contact hours include lectures and exams

**Specific Outcomes of Instruction (Course Learning Outcomes):**

After completing the course, the student will be able to:

Course Learning Outcomes (CLO)		(SO*)
<b>CLO1.</b>	Develop a clear understanding of basic and advanced physical phenomena in thermodynamics as an integral part of the student's overall education	(a), (k), (i)
<b>CLO2.</b>	Use algebra, trigonometry, basic and advanced calculus, in solving problems in statistical thermodynamics	(a), (k)
<b>CLO3.</b>	Provide detailed and accurate description of first and second laws of thermodynamics, thermal equilibrium, Reversible and Irreversible Processes, Heat Engines, microstates and macrostates, entropy and heat capacities, thermodynamics potentials and phase Transformations,	(a), (e), (k)

(SO\*) = Student Outcomes Addressed by the Course.

**Student Outcomes (SO) Addressed by the Course:**

#	Outcomes Description	Contribution
	Applied and Natural Sciences Student Outcomes	
(a)	an ability to apply knowledge of mathematics, science, and applied sciences	H
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to formulate or design a system, process or program to meet desired needs	
(d)	an ability to function on multidisciplinary teams	
(e)	an ability to identify and solve applied sciences problems	L
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of solutions in a global and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	
(j)	a knowledge of contemporary issues	
(k)	an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice.	M
<b>H = High, M = Medium, L = Low</b>		

<b>Grading Plan:</b>	1 <sup>st</sup> Exam	30 Points	<b>TBA</b>
	2nd Exam	30 Points	<b>TBA</b>
	Final exam	40 Points	<b>TBA</b>

**General Notes:** **Attendance Policy:** students are expected to attend every class and arrive on time in compliance with HU regulations. In case you find yourself in a situation that prevents you from attending class or exam, you have to inform your instructor. If you miss more than 6 classes, you cannot pass the course. Makeup excuses will be accepted only for very limited justified cases, such as illness and emergencies.

**Prepared by:** Dr. Gassem Alzoubi

**Date:** Oct, 11, 2020