The Hashemite University
Faculty of Science
Department of Physics

Course Title:	Thermodynamics	**Course Number:**	110102341
Semester:	First	**Year:**	2018
Designation:	Compulsory	**Prerequisite(s):**	(110102141), (110102281),
Instructor:	Dr. Gassem Alzoubi	**Instructor's e-mail:** **Webpage :**	gassem@hu.edu.jo http://staff.hu.edu.jo/gassem
Office Hours:	Sunday, Tuesday, Thursday: 10–11 Am and 12-1 Pm, Physics Building, Room # 107		

Course Description (catalog): This course introduces students to topics in statistical thermodynamics and applications. Topics covered in this course include; **The Fist law**; Thermal Equilibrium, The Ideal Gas, Microscopic Model of an Ideal Gas, Equipartition of Energy, Heat and Work, Compression Work, Heat Capacities, Latent Heat; Enthalpy, **The second law**; Two-State Systems; The Two-State Paramagnet, The Einstein Model of a Solid, Interacting Systems, Large Systems; Stirling's; Approximation; Multiplicity of a Large Einstein Solid; Sharpness of the Multiplicity Function, Multiplicity of a Monatomic Ideal Gas; Interacting Ideal Gases, Entropy; Entropy of an Ideal Gas; Entropy of Mixing; Reversible and Irreversible Processes, Temperature, Entropy and Heat; Predicting Heat Capacities; Measuring Entropies; The Macroscopic View of Entropy, Paramagnetism; Numerical and Analytic Solutions, Mechanical Equilibrium and Pressure, Diffusive Equilibrium and Chemical Potential, Heat Engines; The Carnot Cycle, Refrigerators, Free Energy as Available Work; Electrolysis, Fuel Cells and Batteries, Thermodynamic Identities, Free Energy as a Force toward Equilibrium; Extensive and Intensive Quantities; Gibbs Free Energy and Chemical Potential, Phase Transformations of Pure Substances; Diamonds and Graphite; The Clausius-Clapeyron Relation; The van der Waals Model

Textbook(s) and/or Other Supplementary Materials:
An Introduction to Thermal Physics, First Edition by Daniel V. Schroeder (Addison-Wesley, 2000)

References:
Fundamentals of Thermodynamics, 8th edition by by Claus Borgnakke and Richard E. Sonntag (Wiley, 2012)

Major Topics Covered:

Topics	No. of Weeks	Contact hours*
Energy in Thermal Physics	4	12
The Second Law	3	9
Interactions and Implications	3	9
Engines and Refrigerators	2	6
Free Energy and Chemical Thermodynamics:	3	9
Total	**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[*])
CLO1.	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)
CLO2.	Use algebra, trigonometry, basic and advanced calculus, in solving problems in statistical thermodynamics	(a), (k)
CLO3.	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
	H = High, M = Medium, L = Low	

Grading Plan:

1ˢᵗ Exam	30 Points	**TBA**
2nd Exam	30 Points	**TBA**
Final exam	40 Points	**TBA**

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:** Sep, 13, 2018