

# PHYS 3700: Thermal Physics

Spring 2018

**Meeting Times:** Tu., Th., 9:00-10:15 a.m., ENGR 238

## Instructor

Maria J. Rodriguez  
Physics Department 236  
maria.rodriguez@usu.edu

## Teaching Assistant

Kenneth Zia  
kennethzia@gmail.com

**Office Hours:** Tu. –Th. 11-12 a.m., or by appointment, SER 236

## Overview

A survey of the physics of thermal systems focusing on deep puzzles concerning the relations between thermodynamics, statistical and quantum mechanics. Topics include: energy in thermal systems, the laws of thermodynamics, equilibrium, engines and refrigerators, free energy, chemical thermodynamics, Boltzmann Statistics, entropy and quantum statistic. Parallel issues arising in black hole thermodynamics will also be covered.

## Textbook

*An Introduction to Thermal Physics*, by D. Schroeder.

## Other references

- *Course Slides and Notes*, Maria J. Rodriguez on Thermal Physics Web-site
- *Thermal Physics*, C. Kittel and H. Kroemer (second edition W.H. Freeman and Company, New York)
- *Black Hole Thermodynamics*, S. Carlip, e-print:arXiv-1410.1486

## Grading

The grade will be based on the homework performance and the exams. Homework (40%) and two exams (60%). Grades for the subject will be based on a total of 500 points

Activity	Points
Midterm Exam (one hour)	100
Homework	200
Final Exam	200

## Homework

Home-work sets will be posted every two weeks.

## Examinations

Mid Exam: 3/01 (9:00 a.m. -10.15 a.m.) — Final Exam: 5/01 (9:30 a.m. - 11:20 a.m.)
--

**Prerequisite:** PHYS 2710 - Introductory Modern Physics

**Disability Resource Center:** Students with ADA-documented physical, sensory, emotional or medical impairments may be eligible for reasonable accommodations. Veterans may also be

eligible for services. All accommodations are coordinated through the Disability Resource Center (DRC) in Room 101 of the University Inn, (435) 797-2444. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print, digital, or audio) are available with advance notice.

## PHYS 3700: Thermal Physics

Spring 2018

### Calendar

Class#	Date	Class Topic	Homework
1	Jan 9	Temperature and Thermal Equilibrium	
2	Jan 11	Ideal Gas Part 1	
3	Jan 16	Mathematica for Thermal Physics Applications 1	
4	Jan 18	Heat and Work	HW1
5	Jan 23	Heat Capacities	
6	Jan 25	Interacting Systems	HW1 Due
7	Jan 30	Multiplicity of Solids	
8	Feb 1	Ideal Gas Part 2: Multiplicity of Gases	HW2
9	Feb 6	Entropy	
10	Feb 8	Entropy and Heat	HW2 Due
11	Feb 12	Paramagnets	
12	Feb 15	Pressure and Chemical Potential	HW3
13	Feb 20	NO CLASS (Monday schedule)	
14	Feb 22	Heat Engines	HW3 Due
15	Feb 27	Refrigerators	
17	Mar 1	MIDTERM EXAM	
<b>Mar 5-9 SPRING BREAK</b>			
17	Mar 13	Real Heat Engines and Refrigerators	HW4
18	Mar 15	Free Energy	
19	Mar 20	Phase Transitions of Pure Systems	HW4 Due
20	Mar 22	Phase Transitions of Mixtures	
21	Mar 27	Mathematica for Thermal Physics Applications 2	HW5
22	Mar 29	Solutions and Chemical Equilibrium	
23	Ap 3	Boltzmann Statistic	HW5 Due
24	Ap 5	Average Value	
25	Ap 10	Equipartition Theorem and Partition Functions	HW6
26	Ap 12	Ideal Gas Part 3: Partition Function	
27	Ap 17	Bosons and Fermions	HW6 Due
28	Ap 19	Blackbody radiation	HW7
29	Ap 24	Black Holes Thermodynamics	
30	Ap 26	Interacting Particles	HW7 Due
31	May 1	FINAL EXAM	