

Physics 370: Thermal Physics

Fall 2018

Meeting: Trexler 272 Time: MWF 10.50 – 11.50a Instructor: Matthew C. Fleenor Office: Trexler 266D email: fleenor@roanoke.edu Office Hours: M 2.15–3.30p webspace: <http://faculty.roanoke.edu/fleenor/> RF 2.15–4.30p

Required Textbook: Thermal Physics, Ralph Baierlein ISBN 0-521-65838-1 Required
Prerequisites: Physics 202

I. Components of Learning

There are several factors that make a course “good” (by good, I mean a healthy combination of the intellectual and the affective). Good courses are also clear about their essential components. Below is an attempt to be clear about how will I operate within PHYS 370, as well as my expectations of a student who is enrolled in PHYS 370.

Descriptions

Aspiration: Perhaps no other field has so many inroads into our daily lives, from drinking a cup of coffee to the weather, than thermal physics. Traffic, magnetism, nuclear power plants, and stellar evolution all depend on the methods of thermal physics. I hope you will find that enticing. I hope you will commit to learning the basic principles of thermal physics in order that you may apply them in specific instances in your future learning trajectory. I look forward to the journey.

Expected Learning Objectives: Below is a broad list of intended course objectives for PHYS 370. These objectives are associated with each chapter, class, and assignment. At the end of the course, successful students will:

- (1) Identify underlying thermodynamic phenomena related to foundational applications in thermal physics.
- (2) Attach and manipulate units as a viable source of knowledge about the physical world.
- (3) Construct organized problem solutions that demonstrate logically connected steps of thought.
- (4) Synthesize numerical information, physical assumptions, and previous concepts to correctly solve problems in classical thermodynamics and statistical mechanics.
- (5) Analyze the historical application of some aspect of thermal physics to better understand the process of science.

Attendance: Although roll will not be taken, daily attendance is expected. Due to the mathematically rigorous nature of the course, you may not miss more than *three* classes without a legal excuse (court, hospital, police, etc.). Late arrivals greater than 15 minutes will constitute an official absence. The fourth absence for which there is no legitimate excuse will constitute your (forced) withdrawal from the course.

Office Hours: Please take advantage of the office hours prescribed above, or make an appointment with me. Drop-ins are at the total mercy of my daily schedule.

Inquire (NQR): The information found within the NQR environment is an essential component to the course itself. Announcements, assignments (and *solutions*), links, and course documents will all be placed within the course NQR. Notes will be placed on NQR ahead of time with the hope that you will look at them before class. Looking at the notes ahead of time provides an opportunity to focus on what is most important for you, the class members. Please do NOT forget to check NQR before you come to class or if you have a question about previous assignments.

Academic Integrity: I want to foster a mutual respect for the classroom hours that we have together. Please remember to turn off cell phones, PDAs, etc. during the class and come prepared. Refer to the "Academic Integrity" page on the RC website- http://roanoke.edu/A-Z_Index/Registrar/Policies_and_Information/Academic_Integrity.htm Included here is an explanation of how violations of the College's academic integrity policy are handled.

Grades: For better and for worse, you will receive a letter grade for this course. Basic letter grades (A-F) are assigned according to the following scale: "A"(91-100), "B+"(88-90), "B"(83-87), "B-"(80-82), "C+"(78-79), "C"(74-77), "C-"(70-73), "D"(60-69), "F"(< 60).

II. Modes of Learning

Rubric

Your grade is determined according to the following distribution:

Exams (3)	30%	Problem Sets	30%	Quiz (weekly)	10%
Final	20%	History/Bio	5%	Participation	5%

Descriptions

Exams: Due to the nature of the material covered in the course, there are in-class and takehome portions for each exam (exc. Final). All in-class exams are designed for completion within the class hour. However, one take-home problem with each exam will allow you a longer time period to work out a meaningful solution.

For the in-class portions, I will arrive on test days ASAP to administer the test, hopefully arriving before the stated class start time. Make-up exams will only be allowed as a result of a discussion with me **beforehand** or a note related to the emergency (death, hospitalization, misdemeanor, etc.) *signed* by a governing official (medical doctor, parent, law enforcer, etc.). All accommodations will be handled in conjunction with the stated policies of the College. Please make me aware of any personal accommodations you are afforded.

The out of class portions will have a more relaxed time limit of approximately 3 hours. You will need to find an unhindered block of time to complete the exam problem. Specific instructions will follow for each take home portion of the exam.

11-DEC Final Cumulative Exam, 8.30 – 11.30 am

Problem Sets & Problem-of-the-Day: Un-/assigned problems are "**when and where**" you will learn the course material. Due to the nature of problem solving, I expect that you will work together *toward* a solution. However, I also expect that you will create an original solution to each assigned problem.

Substitutions and simplifications should **NOT** be “left to the reader” (that’s me) to figure out (i.e., you should not ass-u-me that I will understand or intuit what is your intended meaning). If necessary, words and phrases need to be properly placed so that I can follow your train of thought. (I try to set a good example of the kind of work I expect from you in the problems I’ve placed on NQR. If you need more examples, please let me know and I will provide them.) Submitted problems are your final draft essays and/or compositions that display the fruit of your higher-level critical thinking skills, so you need to view them in that light.

Because it is my experience that students often wait until the last possible moment to turn in assignments, I have arranged the course so you will have one problem due (almost) every class period. This “problem-of-the-day” (see far RHS of the Course Outline) is a problem of mid-range difficulty from the pertinent section covered. Its purpose is to introduce you to the material in a timely manner. NOTE: the submitted problems are EQUAL in weight to the three mid-term exams.

Life (and therefore, this course) is **NOT** about obtaining the correct answer. The questions that need answering are ‘Do you understand how the answer was/is obtained?’ and ‘Are you able to apply the answer to other questions and applications and within other contexts?’ For these reasons, I am as interested in your thought process, how able you are to account for that thought process, and your improvement in thinking over the course of the semester. Your grade will reflect these more holistic measures and not just the bottom-line correctness of the answer provided.

Quizzes: Bi-/weekly quizzes (FRIs) are completed individually in class and graded. These are test-prep opportunities. The quiz will consist of a portion of a problem that highlights a particular concept(s). You will not have to solve an entire problem in the allotted quiz time (~ 15 min).

History/Bio: Thermal Physics has a significant history with tie-ins into many other scientific fields (biology, astronomy, chemistry, economics) and philosophical thought (relativity, empiricism, pacifism). You will choose a particular personality, historical event, or issue related to the physical principles/phenomena that the course covers. I will list some potential personalities within the NQR pages, OR you may suggest one to me. Each student will complete a written report (~2 pages) discussing your personality (or historical event). Science is not discovered (nor learned) through a sequential, logical, or totally predictable path (*a priori*). Conflict, assumption, intuition, and imagination all play an important role in the development of science, and I want you to receive a dose from the course.

Participation: There are lots of opportunities to participate within the course. Your attendance in class, your collaboration during group assignments, and your responsiveness during discussion are all forms of “participation”. The completion of *three* Conversation summaries (or a similar talk) is also a form of participation. Please don’t miss your chance to learn.

III. Daily Course Outline

In what follows, you will see the plan for each course meeting that provides a section(s) of the text, a conceptual topic, and a homework problem(s) to reinforce the topic. Quizzes and Exams are also marked on the course outline, so please refer to it often. If there are deviations from the following outline, I will certainly draw your attention to them.