Physics 665: Statistical Mechanics II

Spring 2021 (665 section 1, 3 credits)

- Instructor: Jay Nadeau, 370 Science Research and Teaching Center, nadeau@pdx.edu, 503-725-8929
- Virtual Office Hours: by appointment.
- Course Website: https://d2l.pdx.edu/

Course Description

Applications of the Microcanonical Ensemble, Canonical Ensemble, and Grand Canonical Ensemble; magnetism; Ising model; thermodynamics and transport theory. Prerequisites: Ph 619 (Quantum Mechanics) (may be taken concurrently); Thermodynamics at the junior/senior level (PH 426 or equivalent); PH664 recommended but not required.

Lectures: Available from other sources, to be watched on your own time. Most are taken from the following playlists:

- Daniel Dougherty, PH413: https://www.youtube.com/channel/UCNN7d8cy9yKYlOufHGMebeQ/playlists (Slightly less advanced level than our textbook)
- https://ocw.mit.edu/courses/physics/8-333-statistical-mechanics-i-statistical-mechanics-of-particles-fall-2013/ (Slightly more advanced level. Kardar is great and I also recommend his books)

Structure:

Books

- The required textbook for this course is *Introduction to Statistical Mechanics* by John Dirk Walecka. There is a solutions manual for the problems also available.
- If you have taken PH664, we worked through Chapters 1-6.
- New material for 665 is Chapters 7 and 8 and Appendix A.
- Please note that this textbook is pretty terse and leaves a lot as an exercise for the reader. I will provide supplementary readings when necessary.
- To get credit for the course, work through any 4 of the "modules" as described below.
- If you have taken 664, you probably wish to work through modules 5-8. However, any combination of modules is allowed according to what your needs and desires may be. If you took 664 but want to revisit some of that material, please go ahead. Of course you may do more than 4!

Homework problems: There are 8 problem sets. Complete 4 of them to get full credit for the class. I will grade them as I receive them. I recommend turning them in every 2 weeks to stay on top of things, because there will be 2 exams, but there are no set due dates for each one. I just need to have everything before the final exam. Please feel free to work with others but even if you do, write out your own solution. I find that writing out solutions helps you think through the problem even if you have solved it.

Zoom meetings: Asynchronous. Just let me know if you want to meet and we can schedule a Zoom. I'm here for you.
Dates: Spring 2021 (03/29-06/06)
Exams: There will be one midterm exam and one final. This is to test the skill of solving problems quickly. They are the same as the homeworks except that you have only 2 hours to do them in. Otherwise it's open book and notes. You may take the exams at any time between 8 am and 6 pm of the exam day. When you're ready for your exam, email me, I will email you back, and you can get started. There will be a choice of problems to accommodate people working on different modules.

Exam dates
Midterm: week of April 26, date by mutual arrangement.
Final Exam: Issued 06/06 or by mutual arrangement during finals week, due 48 hours later. Comprehensive.

Grading
The grade of each exam and the course will follow this scale unless curving becomes necessary.
A: 89-110%
A-: 85-88%
B+: 82-84%
B: 75-81%
B-: 70-74%
C+: 67-69%
C: 60-66%
C-: 55-59%;
D: 40-54%
F <40%

Calculating grades
Grade is calculated as Homework (50%)+ midterm (20%) + final (30%).

POLICY STATEMENTS

Academic Honesty: "Academic honesty is a cornerstone of any meaningful education and a reflection of each student's maturity and integrity. The Code of Student Conduct and Responsibility, which applies to all students, prohibits all forms of academic cheating, fraud, and dishonesty. These acts include, but are not limited to: plagiarism, buying and selling of course assignments and research papers, performing academic assignments (including tests and examinations) for other persons, unauthorized disclosure and receipt of academic information, and other practices commonly understood to be academically dishonest" – Portland State University Bulletin, General Catalog Issue, Vol. 50, 2016-2017. Cheating during an exam (e.g., copying, working in teams, using additional resources such as cell phones) will result in an automatic zero and referral to the office of student affairs. A no tolerance policy will be enforced.

Title IX – Portland State is committed to providing an environment free of all forms of prohibited discrimination and sexual harassment (sexual assault, domestic and dating violence, and gender or sex-based harassment and stalking). If you have experienced any form of gender or sex-based discrimination or harassment, know that help and support are available. PSU has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and on-housing accommodations, helping with legal protective orders, and more. Information about PSU's support services on campus, including confidential services and reporting options, can be found on PSU's Sexual Misconduct Prevention and Response website at: http://www.pdx.edu/sexual-assault/get-help or you may call a confidential IPV Advocate at 503-725-5672. Please be aware that all PSU faculty members and instructors are required to report information of an incident that may constitute prohibited discrimination, including sexual harassment and sexual violence. This means that if you tell me about a situation of sexual harassment or sexual violence that may have violated university policy or student code of conduct, I have to share the information with my supervisor or the University's Title IX Coordinator or the Office of Affirmative Action. For more information about Title IX please complete the required student module Creating a Safe Campus in your D2L.

Disability Accommodations at PSU – PSU values diversity and inclusion; we are committed to fostering mutual respect and full participation for all students. My goal is to create a learning environment that is equitable, useable, inclusive, and welcoming. If any aspects of instruction or course design result in barriers to your inclusion or learning, please notify me. The Disability Resource Center (DRC) provides reasonable accommodations for students who encounter barriers in the learning environment. If you have, or think you may have, a disability that may affect your work in this class and feel you need accommodations, contact the Disability Resource Center to schedule an appointment and initiate a conversation about reasonable accommodations. The DRC is located in 116 Smith Memorial Student Union, 503-725-4150, drc@pdx.edu, https://www.pdx.edu/drc.