

Physics 5811: Quantum Mechanics and Quantum Statistical Mechanics II

Course Outline

Description: (From the course catalog) “The postulates of Quantum Mechanics, Matrix Mechanics, angular momentum coupling, scattering, perturbation theory, intrinsic spin, emission and absorption of radiation. Fermi-Dirac and Bose-Einstein statistics with applications in quantum theory.”

Learning Goals: After successful completion of this class, a student will

- 1) have analytical facility with the hydrogen atom and
- 2) be able to apply various methods of perturbation theory and
- 3) be able to setup and solve the Dirac equation in low dimensions (1+1 and 1+2).

Prerequisites: (From the course catalog) PHYS 3702 (Classical Mechanics 1), PHYS 3704 (Thermodynamics and Classical Statistical Mechanics Laboratory) and MATH 3705 (Differential Equations).

Textbook: *Principles of Quantum Mechanics*, by Ramamurti Shankar, Springer Verlag.

We will supplement the text for the later section of the course; we are likely to use either Ernest Abers “Quantum Mechanics” book and/or the Thermo+Stat Mech book (by M. C.) for the quantum statistical mechanics sections of the course.

Attendance: Although attendance will not be recorded, there will be no makeups for exams, quizzes, and in class work that counts towards your grade, and so it is imperative that you are in class and ready to participate fully. The class will meet ideally from 4:00pm - 4:50pm am each MWF in Ward Beecher Hall 2026.

Assignments:

Homework (about 6 problems per week) will be assigned, and returned for grading. See the last page for more details. As each homework due date passes a full answer key for each of the assigned problems will be posted (on the class website...see below). Many of these questions will be the basis of quiz and exam problems, and so it is imperative that you work the problems assigned *and ones like them in your book!*

I strongly encourage you all to work together on the homework; you will learn much from each other.

Chapter Quizzes: There will be chapter quizzes, typically a few days after we finish a chapter in lecture. It will be announced before hand and there will not be a quiz for every chapter. Each quiz will take about 30 minutes, and will test conceptual and analytical mastery of the chapter material. Answer keys will be made available immediately to you on the web site. The quiz problems and the assigned homework are likely to overlap significantly. There will be about 3 quizzes over the course of the semester.

There will be no make up quizzes. There will be no exceptions to this rule. You may miss one quiz before additional missed quizzes are counted in as zeroes.

Midterms: There will be three midterms; Each of these midterms will be a full class period long. They are all closed book, though you will be allowed one 8²-by-11¹ inch cheat sheet (both sides, no portion photocopied) that you will sign and hand in with you exam. The midterm dates are;

**Friday, Feb. 3, and
Wednesday, March 1,
Wednesday, Apr. 12**

There will be no make up exams. If you miss one for a valid excuse (which must be agreed upon with the professor *before* the exam) the average of your other two exams will count as the missed exam.

Final Exam: The final exam will be a comprehensive exam. It will be a two hour exam on **Wednesday, May 3, 8-10 am**

Grading policy: Each midterm is worth 100 points. The quizzes will be averaged to a 100 point score (thus they will be worth approximately 30 points each). The homework will also be averaged into a 400 point score. The final exam will count for 200, leading to a total of 1000 points.

The resulting grading scale will be

850+ A
750-850 B
600-750 C
500-600 D
500- F

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Office Hours: M: 10-11am, T:9-10am and 2-3pm, , W:11-12am, F: 2-3am but many other (day-time(s) by appointment!

Important Note: Prof. Crescimanno only reads his YSU MS360-mail infrequently, SO do not use YSU MS360-mail to communicate anything of any urgency to him! Use instead the e-mailing addresses above.

University Policies:

University policies can be found online and provide you guidance on your rights as a student in this course. The links below take you directly to a specific policy. Should you have any questions about a policy, please do not hesitate to contact me using the information at the top of the syllabus.

(Online at <https://ysu.edu/institute-teaching-and-learning/syllabus-university-policies>)

Statement of Non-Discrimination from the University

Academic Integrity/Honesty

Student Accessibility

Incomplete Grade Policy

Attendance