

Physics 701 – QUANTUM MECHANICS

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Class Meets: Tuesday and Thursday 10:00 - 11:15

Room: Math & Psychology 102

Office: Physics building 410, Office Hours: Tuesday 9:00-10:00 am (virtually or in-person)

Course overview and objective: Magnetic phenomena in QM, Time-dependent Hamiltonians, Symmetries, semiclassical theories, Wigner representation, Scattering, Indistinguishability, Multipartite phenomena, quantization of the electromagnetic field, Entanglement and Bell inequalities.

Upon successful completion of the course, you will know how to “use” quantum mechanics to understand and explain physical phenomena.

Course format & expectations: *Attendance* at lecture sessions (lectures and office hours) is highly encouraged.

Course Website: Information, grades, and course materials will be posted on the Blackboard System. If you have problems accessing the website, please let me know immediately.

Prerequisites: PHYS 601 Quantum Mechanics I.

Recommended Texts: *The course will follow the book:*

- [Quantum Mechanics. A modern development.](#) L.E. Ballentine

Homework policy: Homework will be assigned on approximately weekly basis and will be due the following week (upload to Blackboard). Homework will not be accepted after the due date. To solve some problems, you might need a working knowledge of MATLAB, Python, Mathematica or similar scientific computing software.

Exams: Mid-term test and the final exam will be completed in one sitting during class hours. Please contact me at least a week in advance if a potential conflict arises.

Grading: Midterm 1 20%, Midterm 2 20%, Final 35%, Homework 25%. 92.1 – 100 A, 84.1 – 92 A-, 76.1 – 84 B+, 68.1 – 76 B, 60.1 – 68 B-, with the pattern repeating for C and D grades; **60 or less is a failing grade.**

Academic Honesty: You are expected to abide by the provisions and the spirit of the [UMBC Values for Academic Integrity](#). You are encouraged to discuss homework problems with other students, but the actual work must be independent. Exact copies of results will be treated as plagiarism, which constitutes academic dishonesty.

Feedback: I highly value student feedback during the course. Please feel free to email me, post on Blackboard or drop a note in my mailbox in the Physics building, if you prefer anonymity. I will provide both individual and group feedback on HWs/exams through grading and in-class discussions.

NOTE: IF THERE ARE SPECIAL CONDITIONS THAT WILL AFFECT YOUR PERFORMANCE IN THIS COURSE, LET ME KNOW IMMEDIATELY.

Tentative schedule

Week	Topic
Jan 27- Feb 5	Magnetic phenomena: introduction to quantum Hall and Zeeman effects
Feb 10-17	Time dependence in QM
Feb 19-24	Inversion, parity and time reversal symmetries
Feb 26	Semiclassical approaches
Mar 3	Phase space and Wigner representation
Mar 5	Midterm 1 (Chapters 11 to 14)
Mar 17-19	Spring break – No class
Mar 24	Phase space and Wigner representation
Mar 26-Apr 2	Scattering
Apr 7-9	Indistinguishable particles
Apr 14-16	Multipartite systems
Apr 21	Quantization of the electromagnetic field
Apr 23	Midterm 2 (Chapter 15 to 18)
Apr 28-30	Quantization of the electromagnetic field
May 5-12	Entanglement and Bell inequalities
May 19	Final exam