

**PHY 424: Quantum Mechanics II**  
Department of Physics, Lehigh University, Fall 2019

**Instructor:** Bitan Roy

**Office:** Lewis 414

**Email:** bitan.roy@lehigh.edu

**Lectures:** Monday and Wednesday 15:00-16:15 (Online lectures via Zoom)

**Office hours:** Friday 14:00-16:00 (Either via Zoom or in person, depending on students choice). Also extra office hours (in person or via Zoom) will be arranged, when requested (over email) by individual student.

**Textbooks:**

\*N. Zettili, *Quantum Mechanics: Concepts and Applications* (Wiley)

L. E. Ballentine, *Quantum Mechanics: A Modern Development* (World Scientific)

**Lecture notes:**

Scanned copy of hand written lecture notes will be delivered by email at least a day prior to the scheduled lectures.

**Topics:**

- Properties of the quantum world, Stern-Gerlach experiment and linear algebra
- Postulates of quantum mechanics and time evolution
- Density matrix, mixed states and entanglement
- Three pictures of quantum mechanics and path integral formulation
- Time-independent perturbation theory, variational method and WKB approximation
- Time-dependent perturbation theory
- Quantization of electro-magnetic fields and spontaneous emission
- Angular momentum: Addition of angular momentum, Wigner-Eckart theorem
- Scattering theory

**Grading:**

Homework assignments (tentatively 5-6): 40%

Midterm Exam: 20%

Final Exam: 40%

You are expected to turn in homework on time. Homework will be graded based on completeness, correctness of method. Solutions should be well-organized, all relevant steps should be shown, hand-writing should be readable. Same applies for the Midterm and Final exams. For homework assignments, you may use Latex to type the solutions.

Late assignment submission: penalty of 10% for each extra day after the due date. Weekend submission will be considered as Monday submission.

Passing grade: 30%

**Learning outcomes:**

In this course, you will be introduced to the basic and advanced tools of quantum mechanics. The materials we cover in this course have applications in different areas of physics, such as atomic and molecular, solid-state, nuclear, particle, and laser physics.

**Accommodations for Students with Disabilities:** Lehigh University is committed to maintaining an equitable and inclusive community and welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact Disability Support Services (DSS), provide documentation, and participate in an interactive review process. If the documentation supports a request for reasonable accommodations, DSS will provide students with a Letter of Accommodations. Students who are approved for accommodations at Lehigh should share this letter and discuss their accommodations and learning needs with instructors as early in the semester as possible. For more information or to request services, please contact Disability Support Services in person in Williams Hall, Suite 301, via phone at 610-758-4152, via email at [indss@lehigh.edu](mailto:indss@lehigh.edu), or online at <https://studentaffairs.lehigh.edu/disabilities>.

**The Principles of Our Equitable Community:** Lehigh University endorses The Principles of Our Equitable Community. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom. [http://www.lehigh.edu/inprv/initiatives/PrinciplesEquity\\_Sheet\\_v2\\_032212.pdf](http://www.lehigh.edu/inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf)

To meet the challenge of teaching and learning during the COVID-19 pandemic, Lehigh instructors and students will be adopting new forms of instruction and interaction; following new guidelines around classroom behaviors; enhancing communications; and doing our best to be patient, flexible, and accommodating with each other. In remote synchronous meetings, students are expected to attend just as they would any other Lehigh class. Zoom classes work best when all students come to class ready to participate and follow the instructor's guidelines regarding use of web-cameras. You may be asked to turn your camera on during active learning sessions in Zoom. If you have a strong preference not to do so, please contact your instructor to let them know. Students should respect the in-classroom privacy of their instructors and fellow students by not taking screenshots or recording class sessions. Some instructors will record Zoom sessions; however, any recorded live sessions will be shared only with students in the class and will be deleted at the end of the semester. In our physical classrooms, Lehigh has established a policy requiring everyone to wear face coverings when in public spaces inside buildings on our campus and to maintain social distance. This policy applies to our physical classroom. Thank you in advance for following this rule. Students who do not wear a face covering during in-class meetings will be reminded to put their face covering on. If they do not do so, they will be asked once again to do so or leave the classroom.