



## Physics 521

### Quantum Mechanics I

Tuesday and Thursday, 12:40 to 1:55PM, T R



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210 South College  
Office Hours: TBD  
(865) 867-5309

#### Course Description: .

1. *Fundamental Concepts.* Quantum mechanical way of thinking. Mathematical background and notation. Measurements, observables and the uncertainty relationship. Position, momentum and translations. Wave functions in position and momentum space.
2. *Quantum Dynamics.* Time evolution and the Schrödinger's equation. The Schrödinger versus the Heisenberg picture. Harmonic Oscillator. Schrödinger's wave equation. Elementary solutions to Schrödinger's wave equation. The Wentzel-Kramers-Brillouin (WKB) approximation. Propagators and Feynman path integrals. Potentials and gauge transformations.
3. *Theory of Angular Momentum* Rotations and angular-momentum commutation relations. Spin 1/2 systems and finite rotations.  $SO(3)$ ,  $SU(2)$  and Euler rotations. Density operators and pure versus mixed ensembles. Eigenvalues and eigenstates of angular momentum. Orbital angular momentum. Addition of angular momenta. Tensor operators. Spin correlation measurements and Bell's inequality. Entanglement.
4. *Symmetry in Quantum Mechanics.* Symmetries, conservation laws and degeneracies. Discrete symmetries. Lattice translation as a discrete symmetry. The time reversal discrete symmetry.

**Note(s):** A minimum grade of C is required in this course to progress to Physics 522.

**Credit Hours:** 3

**Texts:** *Modern Quantum Mechanics*, 2<sup>nd</sup> Edition, J. J. Sakurai and Jim J. Napolitano **ISBN:** 978-93-325-1900-8. *Quantum Mechanics*, 2<sup>nd</sup> Edition, Claude Cohen-Tannoudji and Bernard Diu Franck Laloë, **ISBN:** 2-7056-5834-3.

#### Grade Distribution:

Homework	30%
Midterm Exam	30%
Final Exam	40%

## Course Policies:

- **General**

- Computers are not to be used unless instructed to do so.
- Quizzes and exams are closed book, closed notes.
- **No makeup quizzes or exams will be given.**

- **Grades**

- Grades in the **C** range represent performance that **meets expectations**; Grades in the **B** range represent performance that is **substantially better** than the expectations; Grades in the **A** range represent work that is **excellent**.
- Students are responsible for tracking their progress by referring to the online gradebook.

- **Assignments**

- Students are expected to work independently. **Offering** and **accepting** solutions from others is an act of **plagiarism**, which is a serious offense and **all involved parties will be penalized according to the Academic Honesty Policy**. Discussion amongst students is encouraged, but when in doubt, direct your questions to the professor, tutor, or lab assistant.
- **No late assignments will be accepted under any circumstances.**