

# Quantum Mechanics II

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## **Contact Information:**

Office Hours: Tuesday 11:-12:00 am, Thursday 11:00-12:00am, or any other time as convenient.

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The course is held on Tuesday and Thursdays 9:30 am to 11:00 am in room 108. The grade for the course is based on the homeworks (30%) closed book mid-term (30%) and final exam (40%). The homeworks are due at the start of a scheduled class held on the 7th day after the homework has been assigned (except in the event of the scheduled class following on a holiday, in which case the homeworks should be placed in my mailbox on the first day after the holiday.)

Topics include:

## **Approximate Methods**

The WKB Approximation, The Variational Principle, Time-Independent Perturbation Theory, Time-Dependent Perturbation Theory, The Born-Oppenheimer Approximation.

## **Identical Particles and Symmetry**

Permutation Symmetry, Spin and Statistics, The Hartree-Fock Approximation, Bose-Einstein Condensation.

## **Addition of Angular Momentum**

Multiplets and Spin Orbit Interactions

## **Emission and Absorption of Radiation by Charged Particles**

The Interaction Hamiltonian, Paramagnetic and Diamagnetic Interactions, Gauge Invariance, Electric-Dipole Transitions and Polarization, Selection Rules, Intensities and Sum Rules, Electric-Quadrupole and Magnetic-Dipole Transitions.

## **Scattering Theory**

Asymptotic Freedom, Moller Operators, Scattering Cross-section, The Optical Theorem, The T-matrix, The Lippmann-Schwinger Equation, The Born Series, Stationary Scattering States, The Cross-section (revisited), Partial Wave Analysis, Resonant Scattering, Causality, Multiple-Scattering and the Refractive Index.

## **Quantum Statistical Mechanics**

Statistical Averages, The Density Matrix, Equations of Motion, Correlations, Fluctuation-Dissipation Theorem.

## **Measurement and Interpretation**

Bell's Theorem, The Einstein-Podulsky-Rosen Experiment, The No Clone Theorem