

# Syllabus for Physics 212A

Fall 2013, Physics Department, UCSD

INSTRUCTOR: Congjun Wu (5430 MH) Email: wucj@physics.ucsd.edu

Time/Place: 9:30 - 10:50am, TUTH, MYR-A 2623.

Office hour: Fri: 1:00 pm - 2:00 pm

TA: Michael Eldridge Email meldridg@physics.ucsd.edu:

TA office: 3571 MH, TA office hour: Wednesday 2:00 to 3:00pm

Discussion session: Monday 1:00 to 2:00pm at 5301 MH.

Books:

1. Baym *Lectures on Quantum Mechanics*, Westview Press, 1990
2. Sakurai *Modern Quantum Mechanics*, Publisher: Addison Wesley; Rev Sub edition (September 10, 1993).
3. L. D. Landau & E. M. Lifshitz, *Quantum Mechanics: Non-relativistic Theory*, Vol 3 of Landau's theoretical physics course, Butterworth-Heinemann; 3 edition (January 1, 1981).
4. L. I. Schiff, *Quantum Mechanics*, McGraw-Hill Companies; 3 edition (June 1968)

Grade:

We will decide the policy during the first class. Basically it will depend on your homework, midterm and the final project.

Homework Assignments:

Homework will be assigned every one or two weeks.

## Class Schedule

### 1. Fundamental concepts

Lect 1: Wavefunctions, the superposition principle

Lect 2: State vector space and dual space

Lect 3: Unitary transformations

Lect 4: Operators, eigen-equations, uncertainty principle

Lect 5: Equation of time-evolution and canonical quantization, Heisenberg, interaction pictures

Lect 6: Measurement Postulate, projection, decoherence

### 2. Simple systems

Lect 7: Harmonic oscillators, coherent states

Lect 8: Operators of angular momentum

Lect 9: Bound states in spherical potentials: Cavity, harmonics

Lect 10: Hydrogen atom

Lect 11: Spin, Stern-Gerlach, eigenstate in a general direction,

Lect 12: Dynamics: precession and Rabi oscillation

Lect 13: a general two-state system

Lect 14: Angular momentum addition

Lect 15: D-matrix

Lect 16: Approximation method: Variational methods

Lect 17: WKB

Lect 18: Time-independent perturbation theory

Lect 19: Perturbation theory for degenerate states

Lect 20: Discrete symmetries