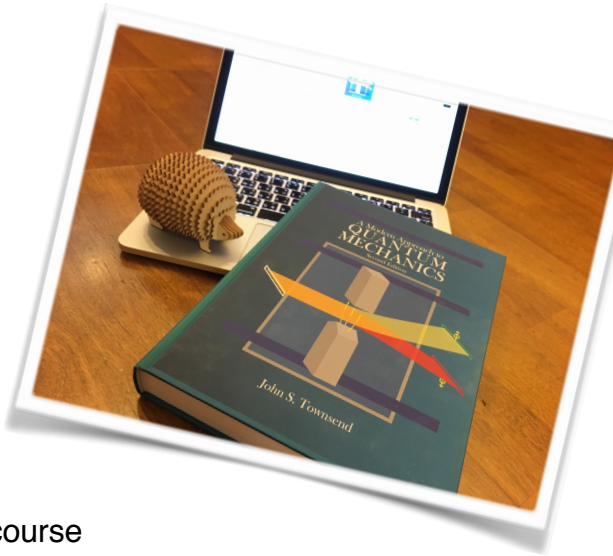
Quantum Physics I (Fall, 2016)



Lecturer: Prof. Hsiu-Hau LIN
Time: T1T2 (lectures) and F1 (discussions)
Location: Room 019 in Physics Building
Textbook: A Modern Approach to Quantum Mechanics (Second Edition) by Townsend

Course description

After reading many textbook, I have decided to base my course materials on Townsend's wonderful textbook. To some extent, it is an amiable version of Sakuria's classic textbook (graduate level) on quantum mechanics. I shall follow Townsend's textbook closely for Tuesday lectures. As explained below, we will have discussion sessions on Fridays. If no good questions pop out from you, I will fill in the gap with more advanced materials related to the weekly topics. Selected homework problems will be posted on the wikispace every week. Although you are not required to hand in the answers, you are strongly encouraged to finish all of the selected problems — solving problems is the necessary muscle-up.

I will try to make the course self-contained in either physics or mathematical aspects. However, basic knowledge of analytic mechanics and electromagnetism will be helpful to digest the course contents. Familiarity with linear algebra, partial differential equations and special functions is of course advantageous. But, it is more important to raise questions and to educate yourself through various means including mutual discussions.

Grades

- **Midterm (35%):** November 11 (Friday)
- **Final (35%):** January 10 (Tuesday)
- **Discussions (30%): Asking good questions and initiating discussions are core abilities in the fast-changing world.** Every student is required to form discussion groups. Each group can contain 3 students at most, named after some scientist (such as Newton, Einstein, Faraday, Darwin and so on). After the lectures on Tuesdays, each group can post a question on the wikispace before Wednesday. I would select five questions for discussions on Fridays. You are encouraged to answer these questions as well. The TAs will collect questions and answers from all groups for grade evaluation.

Schedule

Week 1
Sep 13 (Tue) **Stern-Gerlach Experiments** (Chap 1)
September 16 (Friday) Happy Moon Festival !!

Week 2
Sep 20 (Tue) **Quantum State Vector** (Chap 1)
Sep 23 (Fri) discussion session

Week 3
Sep 27 (Tue) **Matrix Mechanics** (Chap 2)
Sep 30 (Fri) discussion session

Week 4
Oct 4 (Tue) **Operators** (Chap 2)
Oct 7 (Fri) discussion session

Week 5
Oct 11 (Tue) **Expectation Values** (Chap 2)
Oct 14 (Fri) discussion session

Week 6
Oct 18 (Tue) **Angular Momentum** (Chap 3)
Oct 21 (Fri) discussion session

Week 7
Oct 25 (Tue) **Uncertainty Principles** (Chap 3)
Oct 28 (Fri) discussion session

Week 8
Nov 1 (Tue) **Schrodinger Equation** (Chap 4)
Nov 4 (Fri) discussion session

Week 9
Nov 8 (Tue) **Magnetic Resonance** (Chap 4)
November 11 (Friday) Midterm
Time: 08:00-10:00
Scope: Chaps 1-4

Week 10
Nov 15 (Tue) **Addition of Angular Momenta** (Chap 5)
Nov 18 (Fri) midterm discussions

Week 11
Nov 22 (Tue) **Einstein-Podolski-Rosen Paradox** (Chap 5)
Nov 25 (Fri) discussion session

Week 12
Nov 29 (Tue) **Density Matrix Operator (Chap 5)**
Dec 2 (Fri) discussion session

Week 13
Dec 6 (Tue) **Wave Mechanics in One Dimension** (Chap 6)
Dec 9 (Fri) discussion session

Week 14
Dec13 (Tue) **Momentum Operator** (Chap 6)
Dec 16 (Fri) discussion session

Week 15
Dec 20 (Tue) **Scattering in One Dimension** (Chap 6)
Dec 23 (Fri) discussion session

Week 16
Dec 27 (Tue) **One-Dimensional Harmonic Oscillator** (Chap 7)
Dec 30 (Fri) discussion session

Week 17
Jan 3 (Tue) **Coherent States** (Chap 7)
Jan 6 (Fri) discussion session

Week 18
January 10 (Tuesday) Final
Time: 08:00-10:00
Scope: Chaps 5-7
Jan 13 (Fri) final discussions