

Physics 305 Syllabus

Fall 2009

Lectures: Tuesdays and Thursdays, 11–12:20 pm, Jadwin A08

Problem Session: Tuesdays, 8 pm, Jadwin A08

Contact Information

Lecturer: Professor Christopher Herzog

cpherzog@princeton.edu

Jadwin 331, 258-4743

Office hours: Tuesdays 2–4 pm, drop by or email for other times

AI's: Silviu Pufu

spufu@princeton.edu

Jadwin 357, 258-4384

Office hours: Wednesdays 5–6 pm

Guilherme Pimentel

gpimente@princeton.edu

Jadwin 419, 258-0937

Office hours: Wednesdays 6–7 pm

Schedule

Week	Tuesday		Thursday	
1			Sept 17	Review of Phys 208, Gr1–4,6
2	Sept 22	Review of Phys 208, Gr1–4,6	Sept 24	Identical particles, Gr5, HW 1 due
3	Sept 29	Identical particles, Gr5	Oct 1	Identical particles, Gr5, HW 2 due
4	Oct 6	Identical particles, Gr5	Oct 8	Identical particles, Gr5, HW 3 due
5	Oct 13	Variational principle, Gr7	Oct 15	Variational principle, Gr7, HW 4 due
6	Oct 20	WKB, Gr8	Oct 22	WKB, Gr8, HW 5 due
7	Oct 27	Aharonov-Bohm, Gr10	Oct 29	in class midterm exam
8	Fall recess			
9	Nov 10	t dependent pert theory, Gr9	Nov 12	Pert theory, Gr9, HW 6 due
10	Nov 17	Pert theory, Gr9, BJ9	Nov 19	Pert theory, Gr9, BJ9, HW 7 due
11	Nov 24	Pert theory, Gr9, BJ9	Thanksgiving	
12	Dec 1	Scattering, Gr11	Dec 3	Scattering, Gr11, HW 8 due
13	Dec 8	Scattering, Gr11	Dec 10	Scattering, Gr11, HW 9 due
14	Dec 15	Quantum computation	Dec 17	Quantum computation, HW 10 due

There may be one or two additional lectures during reading period.

Textbooks

Gr \equiv Griffiths, *Introduction to Quantum Mechanics* (required)

BJ \equiv Bransden and Joachain, *Quantum Mechanics* (optional)

These books are on reserve in Fine Library. Note that solutions manuals to all the problems in Griffiths are on reserve as well.

Some other useful quantum mechanics text books are Shankar's *Principles of Quantum Mechanics*, Liboff's *Introductory Quantum Mechanics*, and the lengthy and very complete two volume *Quantum Mechanics* by Cohen-Tannoudji et al. This physicist's favorite quantum mechanics text book is the more advanced and aging *Mécanique quantique* of Albert Messiah.

Course Outline (Tentative)

1. Review of Physics 208 (two lectures)
2. Identical particles (five lectures)
 - Fermions and bosons
 - The helium atom
 - Free electron gas and band structure
 - Photon gas
3. Variational principle (two lectures)
 - The helium atom revisited
 - The hydrogen molecule
4. WKB (two lectures)
 - Connection formulae
 - Bohr-Sommerfeld quantization
 - Tunneling
5. Aharonov-Bohm effect (one lecture)
6. Time dependent perturbation theory (five lectures)
 - First order formalism — sudden, adiabatic, and periodic perturbations
 - Fermi's Golden Rule
 - Interaction with electromagnetic radiation
7. Scattering (four lectures)
 - Partial wave expansion
 - Born approximation
8. Quantum computation (two or three lectures)

Homework

There will be at least ten weekly homework assignments due in class on Thursdays. At the discretion of the lecturer and the AI's, late homework assignments may be accepted for partial credit. Homeworks will (hopefully) be posted on Blackboard at least ten days prior to their due date.

Grade Weighting

Homeworks	50%
Midterm	15%
Final	35%