

Physics 305 Syllabus

Fall 2008

Lectures: Tuesdays and Thursdays, 11–12:20 pm, Jadwin A08
 Problem Session: Tuesdays, 7:30 pm, Jadwin A08

Contact Information

Lecturer: Professor Christopher Herzog
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 Jadwin 331, 258-4743
 Office hours: Tuesdays 2–4 pm, drop by or email for other times

AI's: Fiona Burnell
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 Office hours: Wednesdays 6–7 pm

(Optimistic) Schedule

Week	Tuesday		Thursday	
1			Sept 11	Review of Phys 208, Gr1–4,6
2	Sept 16	Review of Phys 208, Gr1–4,6	Sept 18	Identical particles, Gr5, HW 1 due
3	Sept 23	Identical particles, Gr5	Sept 25	Identical particles, Gr5, HW 2 due
4	Sept 30	Identical particles, Gr5	Oct 2	Identical particles, Gr5, HW 3 due
5	Oct 7	Variational principle, Gr7	Oct 9	Variational principle, Gr7, HW 4 due
6	Oct 14	WKB, Gr8	Oct 16	WKB, Gr8, HW 5 due
7	Oct 2	Path integral	Oct 23	in class midterm exam
8	Fall recess			
9	Nov 4	t dependent pert theory, Gr9	Nov 6	Pert theory, Gr9, HW 6 due
10	Nov 11	Pert theory, Gr9, BJ9	Nov 13	Pert theory, Gr9, BJ9, HW 7 due
11	Nov 18	Pert theory, Gr9, BJ9	Nov 20	Scattering, Gr11, HW 8 due
12	Nov 25	Scattering, Gr11	Thanksgiving	
13	Dec 2	Scattering, Gr11	Dec 4	Scattering, Gr11, HW 9 due
14	Dec 9	Quantum computation	Dec 11	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. The path integral (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%