

## PHY 712 SYLLABUS

T TH 4:10—5:25

Text: *Principles of Quantum Mechanics* (2<sup>nd</sup> edition) by R. Shankar  
Supplementary text: *Essential Mathematical Methods for Physicists*  
by H. J. Weber and G. B. Arfken

Instructor: Professor Skinner

Office Hours: Open Office Policy (ie, all hours)

Course Objectives: See topics in syllabus

Grading: Homework, Midterm Exam, Final Exam

**SYLLABUS QM 712**  
**Spring 1998**

<b>Lecture</b>	<b>Notes</b>	<b>Text</b>	<b>Topics</b>
1	pp. 136-139	pp. 373-382	Ch. 14, Spin angular momentum; kinematics
2	pp. 140-143	pp. 383-389	Classical dynamics of magnetic moment in a magnetic field; connection with angular momentum
3	pp. 143-147	pp. 389-394	Quantum dynamics
4	pp. 148-151	pp. 397-401	Hydrogen atom in a magnetic field
5	Supplement		Example: $J$ -coupling in NMR
6	pp. 152-156	pp. 408-414	Ch. 15, Addition of angular momentum
7	pp. 157-160	pp. 416-420	Tensor operators; irreducible tensors
8	pp. 161-163	pp. 420-421	The Wigner-Eckart theorem; examples, applications
9	pp. 164-167	pp. 451-454	Ch. 17, Time-independent perturbation theory, 1 <sup>st</sup> and 2 <sup>nd</sup> order nondegenerate theory
10	pp. 168-169	pp. 454-457	Examples from nondegenerate perturbation theory
11	pp. 170-173	pp. 458-466	Selection rules for calculating matrix elements; degenerate perturbation theory;
12	pp. 174-177	pp. 466-471	The Stark effect; Fine structure corrections to the hydrogen atom energy levels

13	pp. 177-181	pp. 473-476	Fine structure corrections, spin-orbit interaction Ch. 18, time-dependent perturbation theory
14	pp. 182-186	pp. 477-483	Sudden perturbations; adiabatic perturbations; harmonic perturbations
15	pp. 186-189	pp. 484-488	The interaction representation
16	pp.190-193	pp. 488-491	The general perturbation expansion in the interaction representation; the Heisenberg representation
17	pp. 193-199	pp. 492-498	Interaction of radiation and matter; calculate absorption cross section for one-electron atom in an electromagnetic field
18	pp. 199-202	pp. 499-506	The photoelectric effect; higher order multipole terms
19	pp. 203-207	pp. 563-566	Ch. 20 The Dirac Equation
20	pp. 205-207	pp. 566-569	Spin angular momentum in the Dirac Eq.; Hand out and review take-home final exam