Physics 6330
Working Outline Spring 2011
D. G. Ellis

PART I: Symmetry

- Unitary transformations and hermitian generators.
- Translation and momentum.
- Rotation and angular momentum.
- Rotation matrices and O(3).

Problem set #1: Due Friday 28 January

- Addition of angular momenta.
- Tensor operators.
- Mixed states and the density operator.

Problem set #2: Due Friday 11 February

PART II: Identical Particles and Atoms

- Quantum statistics.
- Quantum states and energy levels of helium.
- The exchange interaction.
- Fine structure and the spin-orbit interaction.

Problem set #3: Due Friday 25 February

MIDTERM EXAMINATION

SPRING BREAK

PART III: Approximation methods for bound states (Ch. 9)

- The variational method.
- The WKB method.

Problem set #4: Due Friday 25 March

PART IV: Electromagnetic Interactions (Ch. 10)

- The electromagnetic hamiltonian.
- Absorption and stimulated emission.
- The dipole approximation.
- Photoionization.
- Spontaneous emission.

Problem set #5: Due Monday 11 April

PART V: Scattering Theory (Ch. 11)

Problem set #6: Due Monday 25 April

Final Exam: Due Thursday 5 May