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9/21/06

DEPARTMENT OF PHYSICS AND ASTRONOMY

<p>SPRING TERM, 2006-07 (2074) SPECIAL TOPICS COURSE – PHYSICS 3102 (CRN: 11427)* Instructor: Dr. David Snoke Days/Time: Tuesday and Thursday 1pm-2:15pm: ROOM 103 Allen Hall</p>

Course Title: *"Condensates, Superfluids, and Superconductors"*

Course Textbook: *There will be no textbook required. The instructor will give out handouts in class.*

Course Description:

This course will survey the basic theory and experimental aspects of the broad class of systems which can be called spontaneously coherent systems. These include liquid helium, atomic condensates in optical traps, superconductors, and exotic condensates such as the exciton condensate and condensates of nuclear particles. Emphasis will be on the unifying aspects of all these systems and other coherent states such as lasers. Theory will include coherent state formalism, Bogoliubov model, condensate in a harmonic potential, Cooper pairing, Ginzburg-Landau theory, quantitative measures of coherence, magnetic effects of superconductors, Josephson junctions, nonequilibrium dynamics, two-dimensional systems, and other topics. The details of high-temperature superconductors will only be briefly discussed.

It is assumed the student is familiar with quantum mechanics at the level of creation and destruction operators and Fermi's golden rule. Familiarity with a plotting program like Mathematica is also desirable.

Grades will be based on a small amount of homework and two tests.

*Special Permission Slips available in Room 100 Allen Hall, see Michele, Leyla or Judy.