Field Theory PHYS 822, Spring Semester 2014
Lecture MWF 11:00AM-12:15PM, Rm. 258 Phillips Hall

Professor: Louise Dolan
Department of Physics and Astronomy

Text: **An Introduction to Quantum Field Theory**,
by Michael Peskin and Daniel Schroeder, (Westview Press - Perseus, Boulder, 1995).

Course Requirements
Grading: Homework (80%) and Final Exam (20%). Homework consists of four problem sets, due Feb 4, 27, March 27, April 22. Homework will be assigned during lectures and turned in to be graded. The Final Exam is on Tuesday, April 29 at 12:00PM.

Spring Semester 2013 Lecture Schedule
Lectures begin Thursday, January 9. No lecture:March 11, 13. Last lecture:April 24.

Comments: In past years there has been a clear correlation between good performance on homework assignments and a successful understanding of the subject.

Prerequisite, Physics 722 (Quantum Mechanics). The course is targeted to graduate students learning quantum field theory. Course goals and objectives: students should develop a working knowledge of the first semester of quantum field theory.

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Here are the first few problems of Problem Set 1:
1. Derive the Euler-Lagrange equation of motion for the Klein-Gordon field, whose Lagrangian density is

$$\mathcal{L} = \frac{1}{2}\partial^\mu\phi\partial_\mu\phi - \frac{1}{2}m^2\phi^2.$$

2. a) Derive the energy-momentum tensor as a Noether current for the Klein-Gordon field. Show that the current is conserved on shell.

2. b) Identify the Hamiltonian and momentum components of the tensor in 2a), and show that classically the Hamilton equations of motion are consistent with the solution of problem #1.

3. When viewed as an equation for a quantum operator, show how the equation of motion in problem #1 implies the plane wave expansion of the quantum scalar field.