Quantum Field Theory, continued (Physics 215C)
Spring 2019

Course times and locations: For times and locations of lectures and office hours please see the course webpage.

Use of the Web: The course web page is

http://physics.ucsd.edu/∼mcgreevy/w19/ .

Problem sets, solutions, lecture notes, handouts, announcements, *etc* will be distributed via this page. You should check it regularly (*e.g.* before each lecture) for new material. It will help to look at the relevant lecture notes *before* the lecture happens.

Content: Here's my initial plan: We will learn about anomalies and effects of topology in QFT. We will learn about the crucial notion of Effective Field Theory and many examples of it. We will learn about simplifications at large-N. We will learn about extended objects in field theory. Perhaps we will discuss lattice models from which QFT emerges. Perhaps we will discuss CFT in $d = 1 + 1$ and in $d > 1 + 1$. I welcome your input.

Texts: I do not plan to follow any textbook very closely. My posted lecture notes will be the main text. The textbook by Zee is wonderful and you should all keep it by your bedside. I will sometimes refer you to some relevant sections of the following books:

Quantum Field Theory in a Nutshell, by Anthony Zee (electronic version through UCSD library here).

Quantum field theory and the standard model, by Matthew D. Schwartz.

An Introduction to Quantum Field Theory, by Michael Peskin and Daniel Schroeder.

Quantum Field Theory of Many-Body Systems, by Xiao-Gang Wen.

Aspects of Symmetry, by Sidney Coleman.

Gauge Fields and Strings, by Alexander Polyakov.

Field Theories of Condensed Matter Systems, by Eduardo Fradkin.

Grading:

Grades will be determined by problem sets, class participation, and take-home final.

Problem sets:

Problem sets are a very important part of this course. Sitting down yourself and trying to reason your way through a problem not only helps you learn the material deeply, but also develops analytical tools fundamental to a successful career in science. I recognize that students also learn a great deal from talking to and working with each other. I encourage each student to make his/her own attempt on every problem and then, having done so, to discuss the problems with one another and collaborate on understanding them more fully. Such collaboration adds most to the understanding of those participants who have done the most by themselves first. The solutions you write up after any discussion and then submit must reflect your own work. They must not be transcriptions or reproductions of other people's work.

In doing the problems, you should feel free to use whatever computational software (*e.g. Mathematica*) you find useful; please make a note in your write-up when you do so.

Problem sets will be posted on the course web page

http://physics.ucsd.edu/∼mcgreevy/s19/hw.html .

They will generally be due at the beginning of lecture.

Miscellaneous unsolicited advice about how to do well in this class:

Come to lecture! I will post my lecture notes, but they are intended as a supplement to what is presented in lecture, not a substitute.

Keep up with the material. Review the lecture notes from previous lectures before the next one. The structure of this course is a bit of an experiment, and I am relying on all of you to follow its twists and turns. I will post the relevant reading assignments in advance; read ahead.

Start the homework problems as early as possible. Give yourself some time to think about them, and keep them in mind when you are reading and in lecture.

Ask lots of questions: in lecture, in office hours, in the hallway. The fact that you can ask questions is the point of having classes and not just having everyone go learn on their own.