Course Info
Black Holes and Quantum Gravity
PHYS 7661   Spring 2015

My info:
Tom Hartman
hartman@cornell.edu
Office: PSB 434
Office hours: TBD or by appointment

Website:
www.hartmanhep.net/topics2015

Lectures:
Tues/Thurs, 8:40am, Clark Learning Suite 294H

In the first half of the course, we will discuss:
- Hawking radiation and the information paradox
- Black hole thermodynamics
- Path integrals in quantum gravity
- Scattering from black holes

In the second half of the course, we will apply these methods to motivate and study the AdS/CFT correspondence, including topics like:
- Near-horizon limits
- Black hole phase transitions
- Applications to finite-temperature QFT
- Black holes in string theory (maybe)

Prereqs: 1-2 semesters of general relativity and 1-2 semesters of quantum field theory. Specifically, you should be familiar with the material in the first 6 chapters of Carroll's GR book (below) including classical black holes. In QFT, you should be familiar with Feynman diagrams and some path integral techniques (and ideally, but not necessarily, Yang-Mills theory).

Problem sessions: Instead of regularly scheduled office hours there will be problem sessions held every 1-2 weeks. Or, email me to setup an appointment.

Problem Sets: There will be problem sets every 1-2 weeks. There will be easy required problems and less easy optional problems. You are encouraged to work together.

Grading: This course is graded Satisfactory/Unsatisfactory. To get a "satisfactory" you must either complete most of the required problems, or do a final presentation. There are no exams.

Mathematica: You are strongly encouraged to use Mathematica, especially for GR. (One way to do this is to download the GREATER2 package on my website.)

Books: There is no book. For background info on GR, and some material relevant for the first part of the course, I recommend Carroll's *Spacetime and Geometry: An Introduction to General Relativity*. This book is (mostly) available for free on Carroll's website. For other material I will try to provide references/reviews that you can find online. If you find a good reference I didn't mention, let me know so that I can tell everyone.