

Physics 161
Black Holes and Milky Way Galaxy

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Lecture Tuesday/Thursday 9:30 AM to 10:50 AM Ledden Auditorium (2250 HSS)
Discussion Section: Friday, 12-12:50 p.m., Pepper Canyon Hall 122

COURSE OUTLINE:

This is a course on introductory General Relativity, black holes, and relativistic astrophysics. We will talk about spacetime and the equivalence principle and we will learn how to think about, and calculate, relevant physical quantities in curved spacetime. Along the way we will have to develop some mathematical tools and concepts for handling geometric objects like vectors. I will assume that you have taken the Ph 2 sequence or its equivalent and that you have had a linear algebra course (this is essential). We will present some classic solutions for Einstein's field equations: the Schwarzschild solution for a spherically symmetric, static spacetime; and the Kerr family of metrics for axially symmetric, rotating spacetimes. Both of these are the foundation for understanding the astrophysics of black holes.

GRADING AND GENERAL REQUIREMENTS:

There will be (nearly) weekly homework assignments that will be graded and will count for 60% of the final grade. The other 40% of the grade will be based on a final paper and/or oral presentation (talk) on relevant subject matter. We will discuss appropriate project subject matter in class.

If you opt to write a final paper it must be at least 10 pages in length with appropriate references. If, instead, you opt for the oral presentation be prepared to give a (rigidly) timed 10 minute talk to the entire class and turn in a short paper (a few pages) summarizing the talk and giving relevant references.

In either the paper or the talk, you should plan on getting across the basic ideas in a concise and readable way. You will be graded on how well you have understood your topic, how effectively you have integrated into your paper/presentation basic tools and concepts from class, and how effectively you can communicate your ideas. I am requiring this because all scientists and engineers must learn these writing and communication skills - this is the sort of thing that you will be doing frequently in your professional lives.

All students must attend the sessions where we have the talks. This session will be arranged in discussion in class.

