Astr/Phys 571: Gravitation

Spring 2005

Tuesday – Thursday 2:00-3:15pm; LPL 312

- **Course Description**

In this course we will cover the foundations of geometric theories of gravity and their modern experimental tests, introduce general relativity as a classical field theory, and then discuss extensively the applications of the theory to many planetary and astrophysical settings, from GPS technology to black holes, gravitational lensing, and the early universe.

General relativity is rich in formalism and advanced mathematics, but we will concentrate on the physical ideas behind the theory and its applications. The only prerequisite for this class will be a good understanding of classical mechanics and electrodynamics.

- **Textbooks**

The recommended text for the course is **Gravity: An Introduction to Einstein's General Relativity** by J. Hartle; (Addison-Wesley & Benjamin Cummings; 1st edition, 2003) and we will supplement it with a lot of additional material.

The text **Spacetime and Geometry: An Introduction to General Relativity** by S. Carroll (Addison-Wesley & Benjamin Cummings; 1st edition, 2003) provides an in depth study of many of the topics that we will cover. A free, online version of the lecture notes that led to this book can be found at http://pancake.uchicago.edu/∼carroll/notes/.

- **Assignments**

I will assign 7 sets of homeworks, about once every two weeks. Each homework will be due at the beginning of class on a Thursday. I will review each of the homeworks, but will not grade them in detail. Instead, on the due date, I will ask you to solve one of the homework problems in class, during the first 15 minutes. I will drop the homework with the lowest grade, and the 6 best homeworks will count 5% of the grade, each (4% for the problem you solve in class and 1% for the homework you will turn in).

The course grade will be based mostly (70%) on a **term project**. Each student will have to complete, present in front of the class, and be able to answer questions on a project related to the course (see the course web page for suggestions). These projects will require reading a number of research articles, writing a review paper on the subject (of order 10-15 single-spaced pages, in a format suitable for publication to the Physical Review D or the Astrophysical Journal), and giving a 15 minute presentation (+5 minute for questions) in front of the class. The grade will be based on the understanding of the subject, the clarity of the paper, and the ability to give a lecture and answer questions during the talk. The term projects are due on the last day of classes (May 3).

The will be **no midterm or final exam** for this class.

Course Web Site: http://www.physics.arizona.edu/∼dpsaltis/Astr571

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