



Physics 570–Relativity
Fall 2011
Dr. F. Weber

Administrative Information

About the course: We will study one of the most elegant theories of physics, Einstein's Relativity. Part one of this course is a brief review of the concepts of space and time in Newtonian physics and of the essential elements of special relativity (invariance principle, space-time, time dilation, twin paradox, Lorentz boosts, four-vector notation, special relativistic kinematics and dynamics). Part two of this course concentrates on the curved space-times of general relativity and on Einstein's famous field equation. We will derive this equation in class and you will learn how to solve it for simple mass-energy distributions. Last but not least we will use Einstein's theory to explore the structure and stability of relativistic stars, the gravitational collapse of massive stars, gravitational wave emission from massive stellar systems, and to cosmological models of the Universe.

Instructor: Dr. Fridolin Weber

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Email: fweber@sciences.sdsu.edu

Office: P-142

Office hours: MF, 1:00 PM-2:30 PM

Lectures: MWF, 12:00-12:50 PM

Location: P 149

TA: Omair Zubairi

Email: ozman01@gmail.com

Location: P-343

Office hours: TTH, 2:00-3:00 PM

Text books: I will not follow any particular text book. However, most material covered in lecture (and more) can be found in any of these recommended resources:

- James B. Hartle, *Gravity: An Introduction to Einstein's General Relativity*, ISBN: 0805386629, Addison Wesley 2003 (required for this course),
- Bernard F. Schutz, *A First Course in General Relativity*, Cambridge University Press, Cambridge, 1986.

Grading: Your final grade will be calculated as follows:

- Homework: 20%
- Mini exams: 20%
- Midterm exams I & II: 20% each
- Final exam: 20%

The letter grade scale will be as follows:

A+ > 95%, A > 90%, A- > 85%,
B+ > 80%, B > 75%, B- > 70%,
C+ > 65%, C > 60%, C- > 55%,
D+ > 50%, D > 45%, D- > 40%,
F < 40%

Problem Sets: Problem sets are an essential part of this course. As with most of physics you will never have a chance to understand the material without doing problems. The problem sets will be assigned usually on Wednesdays, and are due at the start of class the following Wednesday. Because solutions will be posted, late homework will not be accepted. The homework solutions will be posted on the board outside of my office. The solutions may be borrowed briefly for copying.

Note: Homework must be written neatly. If I have difficulties reading or following your homework, I will not go to great lengths to decipher it and you will lose points.

Mini exams and regular Exams: Five mini exams will be given during lectures roughly every 3 weeks. The mini exams will consist of regular and/or multiple choice problems for you to work out. You will have around 15 to 20 minutes to work on the problems. The mini exam dates are:

Sept. 16, Oct. 19, Nov. 9, Nov. 30, and Dec. 7

The mini exams will cover material and problems discussed in the home assignments and lectures. There will be two midterm exams and a final exam. The midterm exams will be on

October 5 and November 16, from 12:00-12:50 in room P 149.

The final exam will be on

December 12, from 1:00-3:00 PM in room P 149.

There will be no makeup exams or makeup mini exams. All exams are closed book. The exams will consist of traditional and multiple choice problems. Exams and quizzes will be graded on a partial credit basis. In grading problems, emphasis will be put on using the correct concepts, methods and formulas appropriate for the problem, over actually plugging the correct numbers into your calculator. To enhance your partial credit, make sure that your work is written neatly and clearly explained so that I can follow it.