

# PHYS/ASTR 428, ASTR/CSI 766: Relativity and Cosmology

## Lectures

Place: Robinson Hall, room B118

Time: Tuesday, Thursday 3:00 – 4:15 pm

Lecture notes on the web at [www.physics.gmu.edu/~joe/PHYS428.html](http://www.physics.gmu.edu/~joe/PHYS428.html)

## Instructor

Joe Weingartner (call me Joe)

Science and Technology I, room 317

[joe@physics.gmu.edu](mailto:joe@physics.gmu.edu)

Office hours: Tuesday 1:15–2:45, Thursday 4:30 – 5:00, or by appointment

## Course Textbook

Relativity: *Special, General, and Cosmological*, 2nd ed, W. Rindler (Oxford University Press)

## Recommended Supplemental Text

Introduction to Electrodynamics, 3rd ed, D. J. Griffiths (Prentice Hall)

## Evaluation

100% homework. You are encouraged to discuss the problems with one another, but the detailed solution that you submit must be your own, independent work. There will be approximately 8 assignments. Late homework will not be accepted.

## Course Outline

1. Motivation for Special Relativity
2. The Foundations of Special Relativity
3. Spacetime and 4-vectors
4. Relativistic Mechanics
5. Introduction to Tensors
6. Electrodynamics
7. Introduction to General Relativity
8. Geodesics in Curved Spacetime
9. Curvature and Einstein's Field Equations
10. The Schwarzschild Metric and Applications
11. Introduction to Cosmology

## Recommended Study Strategy

For each topic, lecture notes will be available on the course web site in pdf format. Before class, print out the notes and read the relevant sections in Rindler, as indicated on the course web site. At this point, you do not need to master the material in Rindler, but familiarity with it will help you to keep up with the lecture.

During the lectures, structure your own note taking around the printed course notes. The pace will be too quick for you to write down everything on your own. Focus on writing down clarifications and extra detail not contained in the printed notes.

Only part of the class time will be devoted to lectures. We will also spend a lot of time working sample problems and going over homework problems. Here, the pace will be much slower than in lectures, and you should plan to take detailed notes.

After class, carefully review your lecture notes and the worked problems. Reread the relevant sections of Rindler, this time making sure that you have mastered the material. Make note of anything you don't understand and ask me about it at my office or at the next class.

The homework assignments will be challenging. For many problems, you will probably need to make multiple attempts in order to achieve the full solution. For this reason, it is critical that you start working on the problem set shortly after it is assigned. Allow yourself plenty of time to seek help, both from me and from your classmates. I suggest that you form study groups and meet regularly to discuss the problems. But make sure that you've put in serious effort before meeting with your classmates!