

# Physics 5240: Introduction to the Theory of General Relativity, Spring 2022

## Basics:

Instructor: Julian Heeck  
Office: Physics 320  
Lectures: 9:00–9:50 a.m., MWF, Physics Bldg 218  
Office hours: TBD  
e-mail: heeck@virginia.edu  
Grader: TBD

Class Web Page: UVA Collab *22Sp PHYS 5240*

## Textbook:

- Bernard F. Schutz, *A First Course in General Relativity*.

## Other Books and References:

- Sean M. Carroll, *Spacetime and Geometry*  
A little more advanced than Schutz. Will use this frequently.
- Carroll, *Lecture Notes on General Relativity* (that the textbook was based on):  
<<<https://www.preposterousuniverse.com/grnotes/>>>.  
Try the 24-page *No-Nonsense Introduction to General Relativity!*
- Hartle, *Gravity*  
Similar level to Schutz, more on physics than maths.
- Misner, Thorne, and Wheeler, *Gravitation*  
1280 pages, useful as a reference book.
- Landau and Lifshitz, *The Classical Theory of Fields*  
Nice and concise.
- Weinberg, *Gravitation and Cosmology*  
Non-geometric, field-theory approach; cosmology part outdated and replaced by separate book.
- Wald, *General Relativity*  
Advanced and mathematical.
- Sauer, *Albert Einstein's 1916 Review Article on General Relativity*  
<<<https://arxiv.org/abs/physics/0405066>>>.  
Quick history of Einstein's path to the correct field equations.

**Attendance:** Attendance is not taken, but you are responsible for the material presented in class, turning in your homework on time, knowing problem assignments, and knowing any administrative announcements made, such as changes to the syllabus or changes to the scheduling of homework or exams.

**Exam Dates:**

MID-TERM EXAM: TBA

FINAL EXAM: Thursday, May 12th, 2:00–5:00 p.m.

**Grade weighting:**

40% Homework  
25% Midterm exam  
35% Final exam

**Topics to be covered**

Here is a tentative plan on what topics to be covered.

1. Special Relativity
2. Vector Analysis in Special Relativity
3. Tensor Analysis in Special Relativity
4. Curved Spacetime and Manifolds
5. Geodesics
6. Curvature
7. Gravitation
8. Black Holes
9. Experimental Tests of Relativity
10. Compact Stars
11. Gravitational Waves

**Finally... YOUR COMMENTS AND FEEDBACK ARE WELCOME!**