

Syllabus - General Relativity Seminar - Spring 2013

Details

Meets Monday, 1:15-4:15 PM

Science Center, Room 113 - Physics Seminar Room

Professor John Boccio, Science Center 127, x-8259

Textbook

GRAVITY

An Introduction to Einstein's General relativity - Hartle

Other Notes - On Website

GR Lectures - Amanda Peet

No Nonsense Notes - Carroll

GR Book - Carroll

Website

http://chaos.swarthmore.edu/courses/Physics130_2013/index.html

Schedule

Week #01

Readings: Hartle: Ch 1, Ch 2, Ch 3

Topics

1. Gravitational Physics
2. Geometry as Physics
3. Space, Time, and Gravity in Newtonian Physics

Week #02

Readings: Hartle: Ch 4, Ch 5

Topics

1. Principles of Special Relativity
2. Special Relativistic Mechanics

Week #03

Readings: Hartle: Ch 6, Ch 7-Sect 1-6

Topics

1. Gravity as Geometry
2. The Description of Curved Spacetime

Week #04

Readings: Hartle: Ch 7-Sects 6-9, Ch 8, Ch 8 Supplement (website)

Topics

1. The Description of Curved Spacetime
2. Geodesics
3. Derivation of Geodesic Equation

Week #05

Readings: Hartle: Ch 9

Topics

1. Geometry Outside Spherical Star

Week #06

Readings: Hartle: Ch 10, Ch 11

Topics

1. Solar System Tests of General Relativity
2. Relativistic Gravity in Action

Week #07**Readings:** Hartle: Ch 12**Topics**

1. Gravitational Collapse and Black Holes

Week #08**Readings:** Hartle: Ch 13, Ch 14, Ch 14 Supplement (website)**Topics**

1. Astrophysical Black Holes
2. A Little Rotation
3. The Construction of Freely Falling Frames

Week #09**Readings:** Hartle: Ch 15**Topics**

1. Curved Spacetimes in General Relativity

Week #10**Readings:** Hartle: Ch 20, Ch 21-Sect 1-4, Ch 21 Supplement(website)**Topics**

1. A Little More Math
2. Curvature and Einstein's Equation
3. Deriving the Equation of Geodesic Deviation and a Formula for the Riemann Tensor

Week #11**Readings:** Hartle: Ch 21-Sect 5, Ch 22, Ch 22 Supplement(on Website)**Topics**

1. Linearized Gravity
2. The Source of Curvature
3. Stress-Energy Tensor for Short-Wavelength, Linearized Gravitational Waves

Week #12**Readings:** Hartle: Ch 16, Ch 23, Ch 23 Supplement(website)**Topics**

1. Gravitational Waves
2. Gravitational Wave Emission
3. The Derivation of the Quadrupole Formula

Week #13

Readings: Hartle: Ch 24, Ch 17, Ch 18-Sect 1-2, Ch 24 Supplement(website)

Topics

1. Relativistic Stars
2. The Universe Observed
3. Cosmological Models
4. Energy Levels of a Free Particle in a Box

Week #14

Readings: Hartle: Ch 18- Sect 3-7, Ch 19, Ch 18 Supplement(website)

Topics

1. Cosmological Models
2. Which Universe and Why?
3. Derivation of Robertson-Walker Line Element