

**FIZ494E GENERAL RELATIVITY**

**SPRING2021**

**COURSE PLAN**

**Special Relativity:** Structure of space-time, inertial and non-inertial observers, 4-velocity 4-acceleration.

**Tensor Formalism:** Tensor algebra, tensor calculus.

**General Relativity:** Principles of general relativity; equivalence, general covariance, minimal coupling, correspondence principles.

**Field Equations of General Relativity:** Vacuum Einstein field equations, non-vacuum Einstein field equations; energy-momentum tensor of electromagnetic field.

**Solution of Einstein Field equations:** Static spherically symmetric vacuum solution: Schwarzschild solution, stationary solutions, isotropic coordinates, gravitational waves.

**Tests of General Relativity:** Advance of perihelion of Mercury, bending of light, time delay of light, gravitational red-shift, Eötvös experiment

**Cosmological Models:** Friedmann model, de Sitter model

**Textbooks:**

- 1) Gravity: An introduction to Einstein's general relativity, J.B. Hartle, Addison Wesley 2003
- 2) Introducing Einstein's relativity, R. d'Inverno, Oxford: Clarendon, c1992
- 3) Spacetime and geometry: an introduction to general relativity, Sean Carroll, San Francisco: Addison Wesley, c2004

**Other useful references:**

- 4) A first course in general relativity, B.F. Schutz, The Cambridge University Press, 1985
- 5) Einstein's General Theory of Relativity: With modern applications in cosmology, O. Grön, S. Hervik, Springer, 2007
- 6) The classical theory of Fields, L.D. Landau, Lifschitz, 1973
- 7) An introduction to general relativity, L.P. Hughston, K.P. Tod, Cambridge: Cambridge University, 1990

**Grading:**

|         |     |               |
|---------|-----|---------------|
| Quizzes | 25% | quantity: 4-6 |
| HW      | 30% | quantity: 6   |
| Midterm | 25% | quantity: 1   |
| Final   | 20% | quantity: 1   |

**GOOD LUCK**

**March 1, 2020**