

# HEP-GR (2024-2025), Part I

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## 1. Textbook

*Landau-Lifshitz, Weinberg, and Wald.* A more geometrical approach can be found in *Carroll*, and *Misner-Thorn-Wheeler*.

## 2. Evaluation

There will be a homework set every week due at the beginning of the tutorial session. The final grade ( $G$ ) is determined from the final Exam ( $EX$ ) and Homework ( $HW$ ). Homework will only contribute positively:

$$\text{If } HW > EX \Rightarrow G = 0.6EX + 0.4HW, \quad \text{otherwise } G = EX,$$

## 3. Tentative Plan

1. Special Relativity, Electromagnetism
  - 1.1 Poincaré Symmetry
  - 1.2 Relativistic Kinematics
  - 1.3 Maxwell Theory, Variational Principle
  - 1.4 Symmetries and Conservation Laws, Noether Theorem
2. Relativistic Theory of Gravitation (Linear)
  - 2.1 Spin, Representation Theory of Poincaré Group
  - 2.2 Scalar Gravity
  - 2.3 Phenomenology of Scalar Gravity, and its Failure
  - 2.4 Spin-2 Gravity (Linearized)
  - 2.5 Gravitational Waves

### 3. Relativistic Theory of Gravitation (Nonlinear)

3.1 General Covariance

3.2 Einstein-Hilbert Action

3.3 Differential Geometry