This is an advanced graduate-level cosmology course, knowledge of basics of isotropic and homogeneous cosmology, as given in the basic cosmology course, will be assumed. There will be some homework during the semester and you will be required to present and discuss a paper in the literature by the end of the semester.

Course Outline

1. Generation of Primordial Fluctuations
   - Brief review of GR: gravitational redshift, light deflection, perihelion precession, gravitational waves
   - Relativistic Perturbation Theory: Scalar, Vector, Tensor modes
   - Inflation: density perturbations, gravitational waves, primordial non-Gaussianity

2. Acceleration of the Universe
   - Observational Evidence
   - Dark Energy (DE) and large-scale Modifications of Gravity (MG)

3. Gravitational Lensing
   - Cosmic shear, convergence
   - $E$ and $B$ modes
   - Probing DE and MG with weak lensing

4. Cosmic Microwave Background (CMB) Fluctuations
   - Temperature and Polarization: tight coupling, acoustic oscillations
   - $E$ and $B$ modes, the quest for gravitational waves from inflation
   - Probing DE and MG with the CMB

5. Large-Scale Structure (LSS)
   - Galaxy clustering
   - Acoustic oscillation signatures at low redshift
   - Probing DE and MG with LSS