Beyond LCDM – **Alessandra Silvestr**i (Leiden University, The Netherlands)

Lecture 1. **Introduction to Beyond LCDM: dark energy and modified gravity**. In this lecture I will briefly review the standard model of cosmology, LCDM, and its characteristic features at the level of structure formation. I will discuss the open questions and then focus on the one associated to cosmic acceleration. I will give an overview (with some historical perspective) of the alternatives to the cosmological constant.

Useful reading: https://arxiv.org/abs/0904.0024, https://arxiv.org/abs/1106.2476

Lecture 2. **f(R) gravity: background and structure formation**. In this lecture I will focus on a specific, and very popular, model of modified gravity, f(R) and use it as a powerful toy model to learn about implications of modified gravity for background cosmology and structure formation.

Useful reading: https://arxiv.org/abs/0709.0296,https://arxiv.org/abs/1002.4928

Lecture 3. **Model independent approaches to beyond LCDM**. In this lecture I will give an overview of model independent approaches to beyond LCDM, ranging from more phenomenological approaches designed for large scale structure, to more theory based ones, with the main focus being on how to test gravity on cosmological scales.

Useful reading:
https://arxiv.org/abs/1606.05339, https://arxiv.org/abs/1302.1193, https://arxiv.org/abs/1002.2382

Lecture 4. **Effective Field Theory of Dark Energy: theory and applications**. I will conclude this series of lectures, giving a more in depth presentation of the Effective Field Theory approach to Dark Energy and its applications to cosmological tests of LCDM and beyond.
Useful reading:
https://arxiv.org/abs/1312.5742, https://arxiv.org/abs/1702.06526, https://arxiv.org/abs/1304.4840, https://arxiv.org/pdf/1907.03150.pdf

General useful (but long) reading: https://arxiv.org/abs/1407.0059