

We have been studying Cosmological Perturbation Theory in this thesis. There was presented the Standard General Relativity in higher dimensions. Then we used the apparatus of so called GHP formalism and this is a generalization of the well-known NP-formalism. Scalar perturbations in $f(R)$ -cosmology in the late Universe is the final topic, which was a logical step how to proceed further and to continue in work where was shown that four-dimensional spacetimes are special. We get the potentials ϕ and ψ for the case of a box 150 Mpc. We used the so called mechanical approach for the case of a cosmological background. Our approach of getting these potentials is in observable Universe new. It is interesting also in the context of simulations in these, so called nonlinear theories.