The goal of the project is investigation on the role of crack closure effect on fatigue crack growth rate under mixed mode load in terms of energy including difference in material's ductility. That results in broadening the knowledge in the field of material fatigue behavior under mixed mode as well as about research methodology for mechanical fatigue under complex stress state.

There will be conducted tests and analysis of crack growth rate in terms of energy with emphasis on analysis of crack closure effect role. Research will be conducted for modes I+II, I+III and II+III. Additionally the research will be expanded by crack tip plastic deformation description using DIC method and microstructural analysis of the material in order to describe morphological characteristics referring to material's ductility.

Main motivational point for this thesis is lack of information about material behavior under multiaxial fatigue. On the contrary to the research on crack growth rate and other fatigue relevant investigations under single-axial load, there is no defined research norms for multiaxial stress state fatigue investigations. Additionally, there is lack of information regarding multiple effects present during fatigue which are known and well described under single-axial loading, but little during multiaxial loading. One of such effects is Crack Tip Opening/Crack Closure. An important fact is that multiaxial stress state is far more usual in existing constructions and elements than single-axial stress state. Fatigue resistance as well as fatigue crack growth are intuitively associated with plasticity and residual stresses in the material – what is well reflected by energy models. Description of the relation between plasticity parameters and results of low-cycle fatigue will allow to describe fatigue resistance of the construction element in whole range of fatigue resistance i.e. initiation and propagation phases.