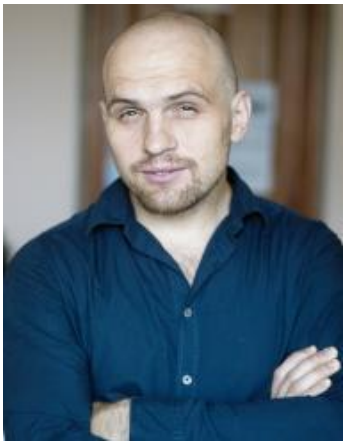
## APPLIED GEOPHYSICS



**Yaskevich Sergey**

Candidate of Physical and Mathematical Sciences, Senior Researcher at the Laboratory of Seismic Dynamics at the Trofimuk Institute of Petroleum Geology and Geophysics, Siberian Branch of the Russian Academy of Sciences, Senior Lecturer, Department of Geology and Geophysics, Novosibirsk State University, Senior Lecturer at Transbaikal State University.
Research Interests: Processing and interpretation of data from borehole microseismic monitoring including obtaining initial data, quality control, and seismic anisotropy in a medium caused by the geological section's local properties.

This course is about the geophysical methods used to map the physical properties beneath the surface and, more specifically, for the depth range related to near surface deposits. All geophysical methods that are used by geologists, hydrologists and reservoir, soils and geotechnical engineers to locate the features of the subsurface or to measure its properties that have economic, engineering or geologic importance will be presented.

### Course Goal

To increase knowledge, competencies, and skills received during the study of basic geological cycle courses. The discipline forms a system of knowledge on methods of applied geophysics. Geophysics, is the study of physical processes and properties within the Earth and mapping of the large scale internal constitution of the earth. There are many overlaps between classical geophysics and applied geophysics. Unfortunately, the physical properties mapped with geophysical methods are usually only indirectly related to the properties of interest to the geologist or subsurface engineer and need to be interpreted further.

In mineral exploration, rock type and mineral composition are of prime interest, in petroleum exploration porosity, permeability, and oil saturation are the main parameters of interest, and for the geotechnical engineer, water content, clay content, and mechanical properties may be required. The physical properties that can be mapped with applied geophysics are density, magnetic susceptibility, electrical conductivity, and seismic velocity. The measured properties are linked to the desired properties but the relationships are not unique. The basic problem is that a measured property, say density, depends on multiple properties of the rock. Density depends on porosity, mineral grain density, and fluid saturation none of which can be

extracted individually from the bulk density measurement. A fundamental aspect of applied geophysics is that a useful interpretation of the field data requires additional geological or geophysical information or realistic assumptions about the geologic settings.

**Course Objectives:**

- formation of basic knowledge on general geophysical observations;
- formation of basic knowledge on forward and inverse problems of geophysics and basic knowledge of main physical properties of objects influencing the observed data;
- formation of basic knowledge of main aspects of processing geophysical data;
- formation of basic knowledge on seismic interpretation.

Main conceptions, ideas, methods, and sections of modern Geophysics are discussed in the course. A fundamental aspect of applied geophysics is that a useful interpretation of the field data requires additional geological or geophysical information or realistic assumptions about the geologic settings.

**Course Units:**
- Introduction
- Basics of Geophysical Observations
- Basics of Forward and Inverse Problems
- Basics of General Data Analysis
- Methods of Seismic Research
- Methods of Gravity Research
- Methods of Magnetic Research
-Methods of Electromagnetic Research