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INTRODUCTION

In the tutorial, hydrodynamic theory of liquid and gas filtration in uniform and non-uniform porous media is given. The problems of stationary and non-stationary filtration, the main principles of calculating well's interference, flat problems of filtration theory, fundamentals of the theory of filtration of multiphase systems, and some other problems are considered.

The theory of the flow in underground structures underwent a significant development due to the needs of the economy. In the petroleum industry, the flow in underground structures theory forms the theoretical base for hydrocarbon fields' development.

The tutorial is intended for bachelors with major in «Oil and gas engineering» (21.03.01), special subject «Drilling of oil and gas wells».

The aim of this tutorial is to provide students with the means of forming the following competences:

- subject specific competence 24: ability to design and carry out the required experiments, process experiments' results by various tools including applied software, interpret experiments' results and draw conclusions;
- subject specific competence 25: ability to use physical and mathematical tools to solve computational and analytical problems in professional activity;
- subject specific competence 26: ability to select and apply appropriate methods for modeling physical, chemical and technological processes.

After learning the subject the student must:

know:

the laws of oil, gas and water filtration, dimension and physical meaning of the main filtration-volumetric parameters, calculation methods and main formulas to calculate one-dimensional steady-state oil and gas flow under linear and non-linear filtration laws, calculation methods and main formulas of theory of compaction drive, statement and solution of non-steady state gas flow problems, fundamentals and equations of two-phase flows;

be able to:

solve and analyze the following problems: steady-state and non-steady state liquid and gas flow under linear and non-linear filtration laws, compaction drive theory; use fundamentals and equations of multi-phase flows when solving problems of joint flow of two liquids (or liquid and gas).

master:

methods of filtration flow models building, methods of solving equations arising in underground fluid mechanics.