20-H05 Course description	
Name of the course	***Principles and application of chemistry in engineering profession* (6 ECTS)** ***- teacher: Kapor, F.***
Goals of the course	- Display theory of electrolytic aqueous solutions - Display the activity of aqueous solutions and explain its calculation - Display physical, chemical and biochemical composition of water and purification methods - Display of the chemical composition and methods of environmental analysis
Expected learning outcome (level 8.2)	After completion of the learning process the doctoral student will be able to: - Relate electrolytic nature of water with its properties (1 ECTS) - Recommend a method of water treatment regarding the pollution (1 ECTS) - Recommend the chemical and analytical methods of analysis of the sample with respect to the amount of analyte (1 ECTS) - Recommend a way of neutralizing or removing contaminants from the environment (1 ECTS) - Evaluate the type of corrosion process and suggest adequate protection (1 ECTS) - Predict the selection of materials with respect to the chemical composition of the electrolyte in Petroleum Engineering (1 ECTS)
Course content	The electrolytic nature of water solutions, application of the Debye – Hueckel theory to ionic strength and behaviour of water solutions. Influence of pH, Eh and pT conditions of open and closed water pools on the stability and balance of water solutions, especially carbonate balance (1). The relationship (connection) between enthalpy and free Gibbs' energy and theory influence on the creation of water solutions. Metallic – organic complexes in water solutions (2). Quality standard (3). Radioactivity. Natural radioactivity and artificial radioactivity. Impurities that affect health (4). Pollution processes caused by the human activity and the chemism of pollutants and characterization. Waste and pollutants produced by mining engineering, industry and households (5). Storing, destruction and utilization of solid, liquid and gaseous waste matter. Chemical processes in waste disposal dumps (6). Emission of pollutants into the environment and environmental interaction. Registration and control of the pollutant emission (7). Devices and measuring techniques. Accidental situations in gaining and refinement of mineral resources. Choosing the best method and machinery for the disposal of various waste materials (8). Corrosion processes on metal equipment in drilling, production and transport of oil and gas. Types of corrosion processes, general corrosion, localized corrosion: pitting and crevice, galvanic corrosion, microbiological corrosion, metallurgic influenced corrosion, mechanically assisted degradation, internally and environmentally induced cracking (9). Designing to minimize corrosion. Causes of corrosion: presence of carbon dioxide, hydrogen sulphide, polysulphides, organic acids, oxygen contaminated fluids introduced as drilling mud, water, brines, hydrochloric acid injected to aid formation permeability (10). Some of these fluids are inherently corrosive, others are potentially corrosive when contaminated with oxygen (11). Corrosion control methods, selection of corrosion resistant alloys, protective coatings, application of cathodic protection to oil field equipment (12).
Teaching methods (ECTS-a)	*Teaching will be conducted through lectures (1 ECTS), a project task that includes laboratory tests (4 ECTS) and preparation of material for publishing a scientific article (1 ECTS).*
Evaluation	project assignment 70% final exam 30%