

Study program: Chemistry				
Type and level of studies: PhD				
<b>Course unit:</b> Chemistry of aqueous solutions				
<b>Teacher in charge :</b> Živadin D. Bugarčić				
english				
ECTS:10				
Prerequisites: Entered the second year of doctoral studies				
Semester Winter Semester				
<b>Course unit objective</b> The aim of this subject is that students learn, understand and master the material of the lessons they have been taught. It is necessary to acquire a certain theoretical and practical knowledge, which they will use in later work. Mastering the subject of this class will enable them to understand the process in aqueous solution				
<b>Learning outcomes of Course unit</b> Through the subject, students will be trained theoretically and will gain experimental skills and the ability to independently carry out different reactions. They will be able to determine the constants of hydrolysis of metal ions and constants for the reaction of metal ion complexation with the appropriate ligands. Students will gain knowledge and skills to independently perform complexation reactions using various modern spectroscopic methods.				
<b>Course unit contents</b>  Hydration of metal ions. The structure of water. Models of structures of water. Testing geometry of hydrate metal ions with different methods: X-ray, IR, NMR spectroscopy, computer methods (ab initio, Monte Carlo). The hydrolysis of metal ions. The theory of specific interactions solvent-solute. Acid-base balance in the solutions. Determination of constants of hydrolysis (potentiometric and spectroscopic methods). Complexation. Stability constants. Methods for determining the composition and stability of the complex. The change of enthalpy, entropy and Gibbs energy. Measurement of speed of water exchanges by <sup>18</sup> O NMR method. The kinetics of the substitution reaction of water exchanges. Eigen-Wilkins mechanism. Reactivity of the hydroxo and aqua transition metal ions complex compounds. Scale of nucleophilicity. The theory of hard and soft acids and bases.  Seminar papers:  Students work one seminar in the field of hydration and hydrolysis of metal ions and the other from complexation of the metal ions				
<b>Literature</b> 1. Richens, D. T.: The Chemistry of Aqua Ions, John Wiley and Sons Ltd, England, 1997. 2. Housecroft, C. E. и Sharpe, A. G.: Inorganic Chemistry, Person Education Limited, Esseh, England, 2001.				
<b>Number of active teaching hours</b>				<b>Other classes</b>
Lectures: 5	Practice:	Other forms of classes: <i>(for example: mentoring system)</i>	Independent work:	
<b>Teaching methods</b>				

<b>Examination methods ( maximum 100 points)</b>			
<b>Exam prerequisites</b>	<b>No. of points:</b>	<b>Final exam</b>	<b>No. of points:</b>
Student's activity during lectures	<b>10</b>	oral examination	40
practical classes/tests		written examination	20
Seminars/homework	<b>30</b>	.....	
Project			
Other			
<b>Grading system</b>			
<i>(додати систем оцењивања у складу са правилником Факултета)</i>			
<b>Grade</b>	<b>No. of points</b>	<b>Description</b>	
<b>10</b>	91-100	Excellent	
<b>9</b>	81-90	Exceptionally good	
<b>8</b>	71-80	Very good	
<b>7</b>	61-70	Good	
<b>6</b>	51-60	Passing	
<b>5</b>	....	Failing	

**(Table 5.2) Course unit description**