

<b>Study programmes:</b> PhD – Mathematics				
<b>Course name:</b> Representations of Lie groups and algebras				
<b>Lecturers:</b> Zoran P. Rakić, Srđan N. Vukmirović i Mirjana Đ. Đorić				
<b>Status:</b> Optional				
<b>ECTS:</b> 9				
<b>Attendance prerequisites:</b> Groups in geometry A, Groups in geometry B				
<b>Course aims:</b> Acquisition of general and specific knowledge about representations of Lie groups and algebras. Preparing student for individual scientific work: studying of literature from this theory and gradually including student for individual research work.				
<b>Course outcome:</b> Upon completion of the course, the student has necessary knowledge about: Lie groups and algebras, semisimple and simple Lie algebras, universal enveloping algebras, weights and maximal vectors, cyclic and finite dimensional modules, Verma module, Casimir element, characters and Harish-Chandra's theorem, Weyl's formula, Chevalley algebras and groups, Chevalley basis. Student is qualified to individual understanding basic examples and solving problems from this area. Also, student is qualified for individual studying of scientific papers from this area.				
<b>Course content:</b> Lie groups and algebras. Semisimple Lie algebras. Root systems. Universal enveloping algebras. The Poincare-Birkhoff-Witt theorem. The Serre theorem. Simple algebras. Weights and maximal vectors. Cyclic modules. Finite dimensional modules. Verma modules. Casimir's elements. Freudenthal formula. Characters. Harish-Chandra's theorem. Formulas of Weyl, Kostant, and Steinberg. Chevalley algebras and groups. Chevalley basis. Kostant's theorem.				
<b>Literature:</b>				
<ol style="list-style-type: none"> <li>1. Hall B.C., Lie Groups, Lie Algebras, and Representations, 2003, Springer-Verlag, New York-Heidelberg-Berlin, GTM, Vol. 222</li> <li>2. J. E. Humphreys, Introduction to Lie Algebras and Representation Theory, 1972, Springer-Verlag, New York-Heidelberg-Berlin</li> <li>3. W. Fulton &amp; J. Harris, Representation Theory: a first course, 1991, Springer-Verlag New York</li> <li>4. S. Sternberg, Lie algebras, 2004, free web draft.</li> <li>5. A. A. Kirilov, Representations of Lie groups and algebras, 1985, Akademiai Kiado, Budapest.</li> </ol>				
<b>Number of hours: 10</b>	<b>Lectures: 4</b>	<b>Tutorials: -</b>	<b>Laboratory: -</b>	<b>Research: 6</b>
<b>Teaching and learning methods:</b> Lectures/ Tutorials				
<b>Assessment (maximal 100 points)</b>				
<b>Course assignments</b>	<b>points</b>	<b>Final exam</b>	<b>points</b>	
Lectures	-	Written exam	-	
Exercises / Tutorials	20	Oral exam	60	
Colloquia	-	Written-oral exam	-	
Essay / Project	20			