Study programme(s): Mathematics (MD)	
Level: Ph.D.	
Course title: Semigroup Theory 1 (AL-10)	
Lecturer: Igor V. Dolinka	
Status: elective	
ECTS: 10	
Requirements: none	

Learning objectives

Introduction of the basic concepts, results and techniques of semigroup theory.

Learning outcomes

Upon completion of the course, the student should master the fundamental methods and notions which enable research work in the field of semigroup theory.

Syllabus

Basic notions of semigroup theory. Congruences, Rees congruences and ideals. Ideal extensions. Examples of semigroups: free semigroups, transformation semigroups. Semigroup presentations. Green's relations. The structure of D-classes. The Schützenberger group of a D-class. Regular D-classes. Regular semigroups. Simple and 0-simple semigroups. Principal factors. Completely simple and completely 0-simple semigroups, the Rees-Sushkevich theorem. Congruences of completely 0-simple semigroups. Completely regular semigroups. Semilattices of groups. Bands. Free bands.

Basics of semilattice decompositions and compositions. Archimedean semigroups and semilattices of Archimedean semigroups.

Basics of inverse semigroup theory. The natural order on inverse semigroups. Congruences of inverse semigroups. Munn's construction. Simple and bi-simple inverse semigroups E-unitary semigroups and McAlister's P-theorem. E-unitery covers. Factorisability in inverse semigroups. Free inverse monoids.

Literature

1. J.M.Howie, *Fundamentals of Semigroup Theory,* Oxford University Press, New York, 1995.

2. M.Petrich, *Introduction to Semigroups,* Merrill, Columbus, 1973.

3. M.Petrich, *Lectures in Semigroups,* Wiley, Now York, 1977.

4. A.H.Clifford, G.B.Preston, *The Algebraic Theory of Semigroups*, American Mathematical Society, Providence, 1961 (vol.I), 1967 (vol.II).

Weekly teaching load				Other: 0
Lectures: 2	Exercises 0	Other forms of teaching: 0	Student research: 6	

Teaching methodology

Lectures, with active participation of the students, discussion, etc.

Grading method (maximal number of points 100)			
Pre-exam obligations	**points**	**Final exam**	**points**
Colloquia	50	Oral exam	50