Adam Mickiewicz University in Poznań

Doctoral School of Exact Sciences AMU

Riemann surfaces – geometric approach

Prof. dr hab. Wacław Marzantowicz

Scientific lectures, workshops

Field of science	Computer Science/Mathematics
Teaching method	Lectures
Language	English/Polish
Numbers of hours	20
Aims of the course	Compact Riemann surfaces are objects where several modern mathematical theories have their origin thus they are illustrative models of these ideas. In this course we would like to present some geometrical properties of surfaces which form a background of corresponding theories.
Course contents	Definition and basic properties of the compact Riemann surfaces. Orientability, fundamental group, homology groups, cohomology ring. Area of the fundamental region, coverings , branched coverings, Riemann-Hurwitz formula, Euler-Poincare characteristic. Basic information about homeomorphisms and diffeomorphisms of surfaces – homotopiy versus isotopy. Definition and basic properties of the mapping class group Mod(S_g) of oriented surface S_g of genus g. Derivation of Mod(S) for the sphere and torus. The set of generators of mapping class group and other properties. Representation of Mod(S_g) in Aut(H_1(S_g;Z)). Burkhardt's theorem about the epimorphism of Mod(S_g) onto the symplectic group $Sp(2g;Z)$ given by this representation. Automorphisms of compact surfaces. Schwartz and Hurwitz theorems and direct corollaries. The representation of automorphisms group in the space of differentials. Embedding of Aut(S_g) in Sp(2g, Z_n) for g≥2, n≥3. Nielsena-Thurston classification theorem.
Prerequisites and co-requisites	

Learning outcomes

On completion of the course PhD candidates will be able to:	Assessment mode
• understand basic notions and theorems of the course • describe general ideas used in proofs of main theorems • explaining the role of canonical Nielsen-Thurston form of homeomorphism for the classification of homeomorphisms of surfaces.	E_W01 E_W02 E_U01 E_U02 E_U05

Literature	Benson Farb, Dan Margalit „Primer in Mapping Classes" Hershel M. Farkas, Irwin Kra, „Riemann Surfaces"
Additional information	