The group SL(2,R) in geometry, analysis and physics

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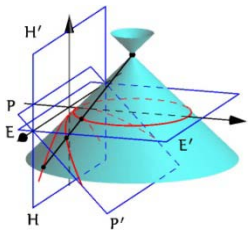
Overview



The Erlangen program of Felix Klein (influenced by Sophus Lie) defines geometry as a study of invariants under a certain group action. This approach has proved to be fruitful much beyond the traditional geometry. For example, special relativity is the study of invariants of Minkowski space-time under the Lorentz group action. Another example is complex analysis as study of objects invariant under the conformal maps. In this course we consider in details SL(2, R) group and corresponding geometrical and analytical invariants with their interrelations. The course has an interdisciplinary interface touching algebra, geometry, analysis and physics.

The course has applications in various areas from pure mathematics to computational geometry and non-linear equations. These will be indicated during lectures and example classes. Many aspects of the theory are still open questions and promising directions for further research will be presented as well. There are no prerequisites beyond a standard undergraduate curriculum: elements of group theory, linear algebra, real and complex analysis. Some knowledge of Lie groups and Hilbert spaces would be helpful but is not obligatory. Lectures will demonstrate numerous connections between various areas of mathematics and physics. The course therefore stands to benefit students aspiring to see their research area in a broad context and is intended towards engineers, scientists, mathematicians and physicists. Lectures will be delivered by internationally renowned faculties from abroad. The course is planned and offered as per the norms set by IIT Kharagpur for GIAN subject.

This course is organized into two modules that are encouraged to be taken together. The topics in Module A will expose the participants to the basic concepts of the group SL(2, R) and its associated geometry on the plane. In Module B, analytic function theory of (hyper) complex variables shall be introduced.

Course participants will learn these topics through lectures and tutorials. The study material and assignments will also be shared to stimulate research motivation of participants.

Modules	**A: Basic concepts of the group SL(2, R) and conformal geometry on the plane : December 12 - December 16, 2016** **B: Analytic functions of (hyper) complex variable, Covariant functional calculus and spectrum of operators, open problems in these areas : December 19 – December 23, 2016** **Number of participants for the course will be limited to sixty.**
You Should Attend If…	▪ you are a PhD research scholar or research associate in mathematics interested in learning the fundamental aspects of Erlangen Program, the group SL(2, R) and their various applications. ▪ you are a physicist or an engineer interested to learn applications of Erlangen Program in your area. ▪ you are a student or faculty from academic institution interested in learning how to do research on Erlangen Program or wish to work with Non-Euclidean geometry.
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $300** **Industry/ Research Organizations:** **Any of two modules: Rs. 10,000/-**

	All modules: Rs. 20,000/- **Academic Institutions:** **Teachers: All modules: Rs. 5,000/-** **Students: All modules: Rs. 2,000/-** The above fees shall include all instructional materials, computer use for tutorials and assignments, 24 x 7 free internet facility. Paid accommodation will be made available to participants.

The Faculty

Dr. Vladimir V Kisil is a Reader of Applied analysis at the Department of Pure mathematics, University of Leeds, UK. His research interests include Operator and C* - algebras with symmetries particulary algebra of convolutions and pseudodifferential operators on Lie groups and homogeneous spaces, Functional Calculus of operators and associated notions of (joint) spectrum of operators, Hilbert spaces of analytic functions with reproducing kernels arising from group representations in complex and Clifford analysis, applications of coherent states, wavelet transform and group representations in quantum mechanics, combinatorics, etc. He is also the author of the book titled " Geometry of Mobius Transformations: Elliptic, Parabolic and Hyperbolic Actions of SL(2, R)", Imperial College Press, 2012 and Software: Geometry of cycles http://moebinv.sourceforge.net/

Dr. Debapriya Biswas is an Assistant Professor at the Department of mathematics, Indian Institute of Technology, Kharagpur. Her research interests include Hilbert spaces of analytic functions, Lie groups, Lie algebras and their representation theory, homogeneous spaces, Functional analysis, Complex analysis, harmonic analysis.

Course Co-ordinator

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