Course Syllabus

Course Title (in English)	Classical Integrable Systems
Course Title (in Russian)	Классические интегрируемые системы
Lead Instructor(s)	Krichever, Igor

Contact Person	Igor Krichever
Contact Person's E-mail	krichev@math.columbia.edu

Course Description

Course description: A self-contained introduction to the theory of soliton equations with an emphasis on their algebraic-geometrical integration theory. Topics include:

1. General features of the soliton systems.

2. Algebraic-geometrical integration theory.

3. Hamiltonian theory of soliton equations.

4. Perturbation theory of soliton equations and its applications to Topological Quantum Field Theories and Sieberg-Witten solutions of N=2 Supersymmetric Gauge Theiories

Course Prerequisites / Recommendations	Student should be familiar with basic of Hamiltonian mechanics and complex analysis
Course Academic Level	Master-level course suitable for PhD students
Number of ECTS credits	6

Topic	Summary of Topic	Lectures (# of hours)	Seminars (# of hours)	Labs (# of hours)
General features of the soliton systems.	Lax representation. Zero-curvature equations. Integrals of motion. Hierarchies of commuting flows. Discrete and finite-dimensional integrable systems.	4	4	4
Algebraic - geometrical integration theory.	Spectral transform. Spectral curves. Baker-Akhiezer functions. Theta-functional formulae.	4	4	4
Hamiltonian theory of soliton equations.	Universal symplectic form on the spaces of operators. Action-angle variables and the spectral transform.			
Perturbation theory of soliton equations.	Whitham equations. Generalized hodograph transform. Applications to Topological Quantum field theories, Seiberg-Witten solutions of N=2 SUSY			

Assignment Type	Assignment Summary
Homework	

Type of Assessment	Pass/Fail

Grade Structure

Activity Type	Activity weight, %
Class Participation	
Final Exam	

Attendance Requirements	Optional with Exceptions
Course Stream	Other

Course Term (in context of Academic Year)	Term 1 Term 2
Course Delivery Frequency	Every year

Students of Which Programs do You Recommend to Consider this Course as an Elective?

Masters Programs	PhD Programs
Mathematical and Theoretical Physics	

Course Tags	Math Physics