

Course Title (in English)	Research seminar "Modern problems of mathematical physics"
Course Title (in Russian)	Научно-исследовательский семинар "Современные проблемы математической физики"
Lead Instructor(s)	Marshakov, Andrei
Status of this Syllabus	The syllabus is a final draft waiting for form approval
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1. Annotation

Course Description

Course "Modern problems of mathematical physics" is a student seminar, so participants are expected to give talks based on the modern research papers. Current topic of the seminar can vary from time to time: now it is devoted to the study of $N=2$ supersymmetric gauge theory and its links with random matrix models, ABJM theory, localization, complex curves, and integrable systems. Other topics that were already covered, or can be covered in the future, are: classical integrable equations, complex curves and their theta-functions, quantum integrable models (quantum-mechanical and field-theoretical), models of statistical physics.

Course Prerequisites

Basic knowledge of classical/quantum mechanics and classical/quantum field theory: Lagrangian/Hamiltonian formalism, operator formalism in quantum mechanics, Gaussian integration.

2. Structure and Content

Course Academic Level

Master-level course suitable for PhD students

Number of ECTS credits

12

3. Assignments

Assignment Type	Assignment Summary
Report	Student chooses some subject that fits into the current topic of the seminar and gives a few talks.

4. Grading

Type of Assessment

Graded

Grade Structure

Activity Type	Activity weight, %
	30
Attendance	70

Grading Scale

A: 86

B: 76

C: 66

D: 56

E: 46

F: 0

Attendance Requirements

Mandatory with Exceptions

5. Basic Information

Maximum Number of Students

	Maximum Number of Students
Overall:	35
Per Group (for seminars and labs):	35

Course Stream Science, Technology and Engineering (STE)

Course Term (in context of Academic Year)
 Term 1
 Term 2
 Term 3
 Term 4

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

Masters Programs	PhD Programs
Mathematical and Theoretical Physics	Mathematics and Mechanics

Course Tags Math
 Physics

6. Textbooks and Internet Resources

Papers	DOI or URL
High Energy Physics - Theory Complex Geometry of Matrix Models L.Chekhov, A.Marshakov, A.Mironov, D.Vasiliev	https://arxiv.org/abs/hep-th/0506075
On certain aspects of string theory/gauge theory correspondence Sergey Shadchin	https://arxiv.org/abs/hep-th/0502180
Seiberg-Witten Theory and Random Partitions Nikita Nekrasov, Andrei Okounkov	https://arxiv.org/abs/hep-th/0306238
Lectures on localization and matrix models in supersymmetric Chern-Simons-matter theories Marcos Marino	https://arxiv.org/abs/1104.0783
Exact Results for Wilson Loops in Superconformal Chern-Simons Theories with Matter Anton Kapustin, Brian Willett, Itamar Yaakov	https://arxiv.org/abs/0909.4559
ABJM theory as a Fermi gas Marcos Marino, Pavel Putrov	https://arxiv.org/abs/1110.4066

7. Facilities

8. Learning Outcomes

Knowledge
Content of a part of talks presented at the seminar

Skill
Reading and understanding of research papers
Making scientific talks

Experience
Participation in the research seminar
Scientific presentations

9. Assessment Criteria

Input or Upload Example(s) of Assignment 1:

Select Assignment 1 Type Report

Input Example(s) of Assignment 1 (preferable) Talk on a given subject

Assessment Criteria for Assignment 1 Results of the research papers are understood and presented.

Input or Upload Example(s) of Assignment 2:

Select Assignment 2 Type Other

Input Example(s) of Assignment 2 (preferable) Participation in discussions

Assessment Criteria for Assignment 2 Student should be interested in some talks given by the other participants of the seminar.

Input or Upload Example(s) of Assignment 3:

Input or Upload Example(s) of Assignment 4:

Input or Upload Example(s) of Assignment 5:

10. Additional Notes