Skoltech

Идентификатор документа, задачи / ID: 489526 v.1, 466269
ДОКУМЕНТ ПОДПИСАН ПРОСТОЙ ЭЛЕКТРОННОЙ ПОДПИСЬЮ /
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Директор образовательной программы / The Director of the program
Литвинов Алексей Викторович / Litvinov Alexey Viktorovich
Дата подписания / Date of signing 28.10.2026

Course Syllabus

Course Title	Research Immersion
Course Title (in Russian)	Научно-исследовательская практика
Lead Instructor	Prokofev, Vadim

1. Annotation

Course Description

Research Immersion will take place in Skoltech as a part of Skoltech
International Summer School on Mathematical Physics.
The program of the school includes modern topics of mathematical physics such as Exact S-matrices in two-dimensional field theories.
No-hair theorem.
Study of the 6-vertex model
Discrete integrable equations.
Mirror symmetry. Batyrev and Berglund-Hubsch constructions.
Schramm-Loewner evolution, statistical physics and conformal field theory.
Discussion of each topic will be divided into talks of participants.
Preparation of the reviews of the subject of the talk, discussion of them with experts is an essential part of the school's work. After school, the participants will prepare a report based on the talk and further study.

The main goal of the Research Immersion is an expansion of the professional knowledge gained by students and developing practical skills for conducting independent scientific work. Students gain experience in the study of an actual scientific problem, as well as the selection of the necessary materials for the performance of qualifying work - the master's thesis.

Course Description (in Russian)

Научно-исследовательская практика пройдет в Сколтехе в рамках Международной летней школы по математической физике Сколтеха.
В программу школы включены современные темы математической физики, такие как
Точные S-матрицы в двумерных теориях поля.
Теорема об отсутствии волос.
Изучение 6-вершинной модели
Дискретные интегрируемые уравнения.
Зеркальная симметрия. Конструкции Батырева и Берглунда-Хубша.
Эволюция Шрамма–Левнера, статистическая физика и конформная теория поля.
Обсуждение каждой темы будет состоять из выступления участников.
Подготовка докладов по теме выступления, обсуждение тем с экспертами являются неотъемлемой частью работы. После школы участники
подготовят отчет по итогам выступления и дальнейшего изучения тем.

Основная цель Научно-исследовательской практики– расширение профессионального опыта, получение студентами знаний и развитие их навыков проведения самостоятельной научной работы. Студенты приобретают опыт изучения актуальной научной проблемы, а также подбор

необходимых материалов для выполнение квалификационной работы – магистерской диссертации.

2. Basic Information

Course Academic Level MSc PhD

Number of ECTS credits 12

Type of Assessment Pass/Fail

Mapping from grades to percentage:

Pass: 60

Term Summer Term

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

BSc Programs	Masters Programs	PhD Programs
	Mathematical and Theoretical Physics	

Maximum Number of Students

	Maximum Number of Students
Overall:	10
Per Group (for seminars and labs):	10

Course Stream Sector

3. Course Content

Topic	Summary of Topic	Contact Hours: Lectures	Contact Hours: Seminars	Contact Hours: Labs	Non-contact Hours: Student's Independent Study
Toric varieties, fans	Construction of toric varieties using fans, orbifolds.	5	10		20
Bethe ansatz for 6-vertex model	Construction of Bethe vectors and derivation of Bethe equation	5	10		40
Schramm-Loewner evolution	Complex analysis: Riemann theorem, Conformal mappings and hulls, hydrodynamic normalization, capacity of hulls	10	10		60

Topic	Summary of Topic	Contact Hours: Lectures	Contact Hours: Seminars	Contact Hours: Labs	Non-contact Hours: Student's Independent Study
SLE/CFT correspondence	Statistical martingale trick	20	20		64
No hair theorem	Derivation of Ernst equation from Einstein equation	10	10		30

4. Learning Outcomes

Skoltech Learning Outcomes are indicated as per Skoltech Learning Outcomes Framework.

1. FUNDAMENTAL KNOWLEDGE

1.1. KNOWLEDGE OF MATHEMATICS AND NATURAL SCIENCES

2.1. COGNITION AND MODES OF REASONING

2.1.2. System thinking

3.1. COMMUNICATIONS IN INTERNATIONAL ENVIRONMENTS

3.1.3. Oral presentation and discussion

3.1.4. Inquiry, listening and dialogue

3.2. TEAMWORK AND LEADERSHIP

3.2.2. Team operations and project management

5. Assignments and Grading

Physical Attendance Requirement (% of classes) 80

Assignment Type	Assignment Summary	% of Final Course Grade
Team Project	Review of certain scientific topic based on existing literature and a detailed analysis of a specific example should be prepared as a Plan of the talk.	30
Presentation	Talk based on the review.	30
Report	Report on the material mastered in school.	40

6. Assessment Criteria

Assignment 1 Type

Team Project

Sample of Assignment 1

Definition of modular forms. Definition of Eisenstein series and their Fourier series. Parabolic forms. Description of fundamental domain for SL(2, Z)

Assessment Criteria for Assignment 1

1. Relevance to the topic.
2. Amount of the material.
3. Good, detailed examples.
4. Use of scientific literature.
5. Preparation to possible questions from audience

Assignment 2 Type

Presentation

Sample of Assignment 2

Talk based on the topic for Assignment 1.

Assessment Criteria for Assignment 2

1. Relevance to the original plan.
2. Time distribution during the talk. Duration of the talk.
3. Answers for the questions.
4. Presentation skills: loudness of speech, clarity of letters, etc.).
5. Quality of the exposition (order of the statements and definitions, motivations, illustrative examples, etc.).

Assignment 3 Type

Report

Sample of Assignment 3

Algebra of pseudodifferential operators

Sample of Assignment 3

Assessment Criteria for Assignment 3

1. Relevance to the topic.
2. Motivation, possible applications of the topic.
3. Clarity and completeness of arguments.
4. Amount of the material.

Sample of Assignment 4

7. Textbooks and Internet Resources

You can request at most two required textbooks. Additionaly, you can suggest up to nine recommended textbooks.

Required Textbooks	ISBN-13 (or ISBN-10)
Markus Heusler “Black holes uniqueness theorems”	978-0521567350

Recommended Textbooks	ISBN-13 (or ISBN-10)
K. Hori et al. “Mirror Symmetry”	0-8218-2955-6

Papers	DOI or URL
M. Bauer and D. Bernard. 2D growth processes: SLE and Löwner chains. Physics reports, 432(3-4):115–221, 2006.	https://arxiv.org/abs/math-ph/0602049

8. Facilities

9. Additional Notes

Comments

In the first two weeks before school, students should select the topic. After all topics are distributed among students, they will be given 2 weeks to study materials and prepare plans for their talks. For the next 4 weeks of ongoing discussion with instructors, preparation for talks will continue. The school itself lasts a week, during which students give talks and attend talks by other participants. Students also participate in ongoing scientific discussions.

The proposed course 1) has explicit academic content and requirements for receiving credits, 2) is in alignment with the program's learning outcomes, 3) adheres to policies and Skoltech regulations.

Lead Instructor confirms

Skoltech

Идентификатор документа, задачи / ID: 380198 v.1, 304046
ДОКУМЕНТ ПОДПИСАН ПРОСТОЙ ЭЛЕКТРОННОЙ ПОДПИСЬЮ /
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Председатель Программного комитета / The Chair of the Doctoral Program Committee
Литвинов Алексей Викторович / Litvinov Alexey Viktorovich
Дата подписания / Date of signing 18.09.2025

Course Syllabus

Course Title	Research Seminar "Modern Problems of Mathematical Physics"
Course Title (in Russian)	Научно-исследовательский семинар "Современные проблемы математической физики"
Lead Instructor	Litvinov, Alexey
Co-Instructor	Marshakov, Andrey

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. Topics that were already covered, or can be covered in the future, are: classical integrable equations, complex curves and theta-functions, quantum integrable models (quantum-mechanical and field-theoretical), models of statistical physics, stochastic integrability, quantum/classical duality, supersymmetric gauge theories, cluster algebras etc.

Course Description (in Russian)

Курс "Современные задачи математической физики" это студенческий семинар, потому от участников ожидается, что они будут делать доклады на основе современных статей. Текущая тема семинара может время от времени меняться. Сюжеты, которые уже рассматривались, или могут быть рассмотрены в будущем: классические интегрируемые уравнения, комплексные кривые и тэта-функции, квантовые интегрируемые системы (квантово-механические и теоретико-полевые), модели статфизики,
стохастическая интегрируемость, квантово-классическая дуальность, суперсимметричные калибровочные теории, кластерные алгебры и т.п

2. Basic Information

Course Academic Level

MSc PhD

Number of ECTS credits

6

Course Prerequisites / Recommendations

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

Type of Assessment

Graded

Mapping from grades to percentage:

A: 86

B: 76

C: 66

D: 56

E: 46

F: 0

Term

Multiterm 1-4

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

BSc Programs	Masters Programs	PhD Programs
	Mathematical and Theoretical Physics	Mathematics and Mechanics

Maximum Number of Students

	Maximum Number of Students
Overall:	30
Per Group (for seminars and labs):	30

Course Stream

Research & MSc Thesis Project

3. Course Content

Topic	Summary of Topic	Contact Hours: Lectures	Contact Hours: Seminars	Contact Hours: Labs	Non-contact Hours: Student's Independent Study
Mirzazhani recursion relation	Moduli spaces of hyperbolic surfaces, Teichmuller theory, symplectification, combinatorial moduli space, Weil-Peterson volumes, Recursion formula, intersection theory	12	8		20
Introduction to Langlands correspondence	Local Langlands correspondence, Vertex algebras, Constructing central elements, Opers and the center for a general Lie algebra, Free field realization, Wakimoto modules	12	8		20
RG flows and non-invertible symmetries	Generalities on global symmetries, Ising model: topological lines in Ising CFT, bosonization and chiral symmetry, transverse-field Ising lattice model, Non-invertible versus higher-form symmetries, higher gauging and condensation defects	12	8		20
Introduction to quantum Hall effect	The Classical Hall Effect, Quantum Hall Effects, the Fractional Quantum Hall Effect: Laughlin States, Quasi-Holes and Quasi-Particles, Non-Abelian Quantum Hall States: The Moore-Read State, Non-Abelian Anyons, Chern-Simons Theories: The Integer Quantum Hall Effect, The Fractional Quantum Hall Effect	12	8		20

4. Learning Outcomes

Skoltech Learning Outcomes are indicated as per Skoltech Learning Outcomes Framework.

1. FUNDAMENTAL KNOWLEDGE

1.1. KNOWLEDGE OF MATHEMATICS AND NATURAL SCIENCES

5. Assignments and Grading

Physical Attendance Requirement (% of classes) 80

Assignment Type	Assignment Summary	% of Final Course Grade
Presentation	To give a talk on some mathematical physics topic	60
Project	To write an essay on the subject of seminar	30

Assignment Type	Assignment Summary	% of Final Course Grade
Class participation	To participate in the discussions during seminars, to understand what is going on	10

6. Assessment Criteria

Assignment 1 Type

Presentation

Sample of Assignment 1

Talk at a seminar

Assessment Criteria for Assignment 1

To make a presentation on a selected topic, or current research individual work - assessment depends on its level, analysis, obtained research results, their explanation

Assignment 2 Type

Class participation

Sample of Assignment 2

-

Assessment Criteria for Assignment 2

Knowledge of main facts, logical consistency, informativeness, knowledge of main trends

Assignment 3 Type

Projects

Sample of Assignment 3

Write an essay based on a talk presented at the seminar

Assessment Criteria for Assignment 3

An essay should be based on the talk presented at the seminar. It should be a fairly complete and pedagogical presentation of the material, accessible to readers.

7. Textbooks and Internet Resources

You can request at most two required textbooks. Additionaly, you can suggest up to nine recommended textbooks.

Required Textbooks	ISBN-13 (or ISBN-10)
LANGLANDS CORRESPONDENCE FOR LOOP GROUPS, EDWARD FRENKEL	9780521854436

Papers	DOI or URL
Moduli spaces of hyperbolic surfaces and their Weil-Petersson volumes, Norman Do, https://arxiv.org/abs/1103.4674	
What's Done Cannot Be Undone: TASI Lectures on Non-Invertible Symmetries, Shu-Heng Shao, https://arxiv.org/abs/2308.00747	
The Quantum Hall Effect, David Tong https://www.damtp.cam.ac.uk/user/tong/qhe/qhe.pdf	

8. Facilities

Labs for Education

Laboratory of integrable systems and turbulence

NRU HSE-Skoltech International Laboratory of Representation Theory and Mathematical Physics

9. Additional Notes

The proposed course 1) has explicit academic content and requirements for receiving credits, 2) is in alignment with the program's learning outcomes, 3) adheres to policies and Skoltech regulations.

Lead Instructor confirms

Course Syllabus

Skoltech

Идентификатор документа, задачи / ID: 481661 v.1, 453706

ДОКУМЕНТ ПОДПИСАН ПРОСТОЙ ЭЛЕКТРОННОЙ ПОДПИСЬЮ /
The document is signed with a simple electronic signature

Проректор по учебной работе / Dean of Education Столяров Денис Валерьевич / Stolyarov Denis Valerevich

Дата подписания / Date of signing 30.09.2026

Contact Person	Anastasia Tyagusova
Contact Person's E-mail	a.tyagusova@skoltech.ru
Course Title (in English)	Thesis Research Project
Course Title (in Russian)	Научно-исследовательская работа. Преддипломная практика
Lead Instructor	-

1. Annotation

Course Description

Thesis Research Project - is one of the compulsory educational elements for second-year MSc students while preparing their Thesis. As per curriculum plan Thesis Research Project is completed by the students during the second year of studies.
The aim of this educational element is to prepare a scientific project (Thesis), which is a program requirement.
The results of Thesis Research Project are demonstrated by the students on a consistent and regular basis when some parts of work are ready.
Apart from the regular reports sent by the students to their supervisors, the results of this educational element are: Thesis Title (in Russian and English), Status Report, MSc Thesis Draft, MSc Thesis Manuscript.

Аннотация

«Научно-исследовательская работа. Преддипломная практика» – один из обязательных учебных элементов в процессе подготовки выпускной квалификационной работы (ВКР) студентами второго года магистратуры. «Научно-исследовательская работа. Преддипломная практика.» выполняется студентами в течение второго года обучения.
Целью элемента «Научно-исследовательская работа. Преддипломная практика.» является подготовка научного проекта студента, необходимого для выполнения требований образовательной программы и написания магистерской диссертации. Результаты освоения преддипломной практики демонстрируются студентом последовательно на регулярной основе по мере выполнения отдельных частей исследовательской работы. Результатами помимо регулярных отчетов, предоставляемых студентом научному руководителю, являются: утверждение темы диссертации на русском и английском языках, первый проект текста ВКР (Status Report), проект текста ВКР (MSc Thesis Draft) и финальный текст ВКР (MSc Thesis Manuscript).

2. Basic Information

Course Academic Level	MSc

Number of ECTS credits 12

Course Prerequisites / Recommendations

Student should successfully pass IW, Early Research Project, Industrial Immersion

Type of Assessment Pass/Fail

Grading Scale

Pass: 60

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

BSc Programs	Masters Programs	PhD Programs
	AI and Financial Technologies AI Robotics Advanced Computational Science Advanced Manufacturing Technologies Applied Computational Mechanics Applied Photonics and Optical Information Systems Data Science Digital Electrical Energy Energy Systems Engineering Systems Internet of Things and Wireless Technologies Life Sciences Materials Science Mathematical and Theoretical Physics Next Generation Communication Technologies Petroleum Engineering Photonics and Quantum Materials Technological Entrepreneurship and Innovative Business Development	

Maximum Number of Students

	Maximum Number of Students
Overall:	400
Per Group (for seminars and labs):	400

3. Course Content

Course contains Industry-oriented elements?

No

ECTS Credit System – Reference Tool

Total Number of ast. Hours in Your Course	324
Maximum Contact Hours in Your Course	162

Topic	Summary of Topic	Contact Hours: Lectures	Contact Hours: Seminars	Contact Hours: Labs	Non-contact Hours: Student's Independent Study
Thesis Project	to prepare a scientific project (Thesis), which is a program requirement		40		41

4. Learning Outcomes

Please specify course intended learning outcomes using Skoltech Learning Outcomes Framework.

1. FUNDAMENTAL KNOWLEDGE

- 1.1. KNOWLEDGE OF MATHEMATICS AND NATURAL SCIENCES
- 1.2. KNOWLEDGE OF APPLIED SCIENCE AND ENGINEERING SCIENCE INCLUDING CONTEMPORARY METHODS AND TOOLS
- 1.3. KNOWLEDGE OF INNOVATION AND ENTREPRENEURSHIP

2. PERSONAL AND GENERAL PROFESSIONAL SKILLS AND ATTRIBUTES:

2.1. COGNITION AND MODES OF REASONING

- 2.1.1. Analytical reasoning and problem solving
- 2.1.2. System thinking
- 2.1.3. Creative thinking
- 2.1.5. Critical thinking and meta-cognition

2.2. ATTITUDES AND LEARNING PROCESS

- 2.2.1. Initiative and the willingness to take appropriate risks
- 2.2.2. Willingness to make decisions in the face of uncertainty

2.3. ETHICS, EQUITY AND OTHER RESPONSIBILITIES

- 2.3.5. Proactive vision and intention in life

	2.3.6. Commitment to social and professional behavior
3. INTERPERSONAL SKILLS	
3.1. COMMUNICATIONS IN INTERNATIONAL ENVIRONMENTS	3.1.3. Oral presentation and discussion
	3.1.6. Effective interaction in different cultural and international settings
3.2. TEAMWORK AND LEADERSHIP	3.2.2. Team operations and project management
4. LEADING THE INNOVATION PROCESS	
4.2. VISIONING — INVENTING NEW TECHNOLOGIES THROUGH RESEARCH	4.2.2. Basic research leading to new scientific discovery
	4.2.3. Research aimed at developing new technologies
	4.2.4. Imagining utility of new science and technology
4.3. VISIONING — CONCEIVING AND DESIGNING SUSTAINABLE SYSTEMS	4.3.1. Identifying stakeholders need and wants
	4.3.2. Identifying and formulating objectives and goals
	4.3.3. Conceiving and architecting products and services around new technologies and identifying their impact
	4.3.5. Understanding the technical context and ecosystem of the product or service
4.4. DELIVERING ON THE VISION — IMPLEMENTING AND OPERATING	4.4.1. Designing and optimizing sustainable and safe implementation and operations
	4.4.4. Implementation and operations management
4.5. DELIVERING ON THE VISION — ENTREPRENEURSHIP AND ENTERPRISE	4.5.7. Managing intellectual property and respecting the legal process

5. Assignments and Grading

In-person Attendance Requirement 100

Assignment Type	Assignment Summary	% of Final Course Grade
Report	Students report directly to their research advisors and submit related assignments: Thesis Proposal, Status Report, Thesis Draft, Final Manuscript	100

6. Assessment Criteria

Select Assignment 1 Type

Report

Input Sample of Assignment 1 or Share a Link to Assignment 1

for more information check Canvas page of the course.

Assessment Criteria for Assignment 1

for assessment criteria check Canvas page of the course.

Select Assignment 2 Type

Other

Input Sample of Assignment 2 or Share a Link to Assignment 2

for more information related to Thesis Proposal, Status Report, MSc Thesis Draft, MSc Thesis Manuscript check Canvas page of the course.

Assessment Criteria for Assignment 2

for assessment criteria related to Thesis Proposal, Status Report, MSc Thesis Draft, MSc Thesis Manuscript check Canvas page of the course.

7. Textbooks and Internet Resources

You can request at most two required textbooks. Additionaly, you can suggest up to nine recommended textbooks.

Required Textbooks	ISBN-13 (or ISBN-10)
State Final Attestation Policy: https://lms.skoltech.ru/courses/2072/files/folder/2.%20MSc/Research/MSc%20Thesis%20Project?preview=28878	
anything recommended by the supervisor	

8. Facilities

9. Additional Notes

Is this syllabus complete?

Yes, the syllabus is a final draft waiting for approval by Education Department

The proposed course 1) has explicit academic content and requirements for receiving credits, 2) is in alignment with the program's learning outcomes, 3) adheres to policies and Skoltech regulations.

Lead Instructor confirms

Syllabus status

Approved by the Education Department

Skoltech

Идентификатор документа, задачи / ID: 490688 v.1, 467650

ДОКУМЕНТ ПОДПИСАН ПРОСТОЙ ЭЛЕКТРОННОЙ ПОДПИСЬЮ /
The document is signed with a simple electronic signature

Проректор по учебной работе / Dean of Education Столяров Денис Валерьевич / Stolyarov Denis Valerevich

Дата подписания / Date of signing 31.10.2026

Course Syllabus

Course Title	Early Research Project
Course Title (in Russian)	Научно-исследовательская работа. Учебная практика
Lead Instructor	-

1. Annotation

Course Description

"Early Research Project" is one of the mandatory educational elements during the preparation of the Thesis by MSc students.
"Early Research Project" is one or several scientific projects carried out by an MSc student under the guidance of academic stuff during Term 3 and 4 of the first academic year. It's a preparatory stage in the process of writing a Thesis.
This element is preceded by the preliminary assignment of a supervisor and the selection of a preliminary research topic in the field of the student's professional activity.
The purpose of "Early Research Project" is:

- to define the topic of the Thesis;
- to set the problems of the proposed research;
- to familiarize yourself with the requirements of the supervisor;
- to determine the student's role in the proposed research.

Course Description (in Russian)

"Научно-исследовательская работа. Учебная практика" - один из обязательных учебных элементов в процессе подготовки выпускной квалификационной работы (ВКР) студентами магистратуры.
Это один или несколько научных проектов, выполняемых студентом под руководством научно-педагогического работника (НПР), в течение 3 и 4 учебных модулей первого учебного года, которые являются подготовительным этапом к написанию выпускной квалификационной работы (ВКР).
Этому элементу предшествует предварительное закрепление научного руководителя и выбор предварительной темы исследования в области профессиональной деятельности студента.
Целью элемента "Научно-исследовательская работа. Учебная практика" является:

- определение темы будущего проекта магистерской диссертации;
- определение проблематики предполагаемого исследования;
- знакомство с требованиями научного руководителя;
- определение роли студента в предполагаемом исследовании.

2. Basic Information

Course Academic Level

MSc

Number of ECTS credits

6

Course Prerequisites / Recommendations

1) preliminary assignment of a supervisor;
2) the selection of a preliminary research topic in the field of the student's professional activity.

Type of Assessment

Graded

Mapping from grades to percentage:

A: 86

B: 76

C: 66

D: 56

E: 46

Term

Term 3 Term 4

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

BSc Programs	Masters Programs	PhD Programs
	AI in Robotics Advanced Computational Science Advanced Manufacturing Technologies Applied Computational Mechanics Applied Photonics and Optical Information Systems Data Science Energy Systems Engineering Systems Internet of Things and Wireless Technologies Life Sciences Materials Science Mathematical and Theoretical Physics Next Generation Communication Technologies Petroleum Engineering Photonics and Quantum Materials Technological Entrepreneurship and Innovative Business Development	

Maximum Number of Students

	Maximum Number of Students
Overall:	300
Per Group (for seminars and labs):	300

Course Stream

Research & MSc Thesis Project

3. Course Content

Topic	Summary of Topic	Contact Hours: Lectures	Contact Hours: Seminars	Contact Hours: Labs	Non-contact Hours: Student's Independent Study
Planning of the project	1) To find a research advisor 2) Confirm the project plan with research advisor		15		4
Project executions	Carrying out the project in accordance with the project plan		15	15	80
Reporting	1) Written report submitted in LMS (Canvas)		15		18

4. Learning Outcomes

Skoltech Learning Outcomes are indicated as per Skoltech Learning Outcomes Framework.

1. FUNDAMENTAL KNOWLEDGE

1.1. KNOWLEDGE OF MATHEMATICS AND NATURAL SCIENCES

1.2. KNOWLEDGE OF APPLIED SCIENCE AND ENGINEERING SCIENCE INCLUDING CONTEMPORARY METHODS AND TOOLS

2.1. COGNITION AND MODES OF REASONING

2.1.1. Analytical reasoning and problem solving

2.1.2. System thinking

2.2. ATTITUDES AND LEARNING PROCESS

2.2.3. Responsibility, intensity, perseverance, urgency and will to deliver

2.2.5. Self-awareness and a commitment to self-improvement, lifelong learning and educating

2.3. ETHICS, EQUITY AND OTHER RESPONSIBILITIES

2.3.1. Ethical action, integrity and courage

2.3.5. Proactive vision and intention in life

2.3.6. Commitment to social and professional behavior

3.1. COMMUNICATIONS IN INTERNATIONAL ENVIRONMENTS

3.1.4. Inquiry, listening and dialogue

3.1.5. Communications in English in scientific, business and social settings

4.1. MAKING SENSE OF GLOBAL SOCIETAL ENVIRONMENTAL AND BUSINESS CONTEXT

4.1.3. Understanding the technical products, systems and infrastructure of the sector

4.2. VISIONING — INVENTING NEW TECHNOLOGIES THROUGH RESEARCH

4.2.1. The research process — hypothesis, evidence and defense

4.3. VISIONING — CONCEIVING AND DESIGNING SUSTAINABLE SYSTEMS

4.3.2. Identifying and formulating objectives and goals

4.3.5. Understanding the technical context and ecosystem of the product or service

5. Assignments and Grading

Physical Attendance Requirement (% of classes)	100

Assignment Type	Assignment Summary	% of Final Course Grade
Report	"Early Research Project" is resulted in a report on the completed work, which includes a description of: • project; • project goals; • alignment of the student's personal professional goals with the project content; • student's role; • achieved results; • problems encountered during the work on the project and ways of their overcoming; • general conclusions; • description of the reporting format which is provided by the student to the supervisor.	100

6. Assessment Criteria

Assignment 1 Type

Report

Sample of Assignment 1

Report is completed and submitted.

Report includes:
1) Student's name
2) Supervisor's name and his/her affiliation
3) Project title in Russian and in English
4) Description of the project
5) Alignment of the student's personal professional goals with the project content
6) Results achieved
7) Problems encountered during the work on the project and ways of their overcoming;
8) General conclusions;
9) Description of the reporting format which is provided by the student to the supervisor.

Assessment Criteria for Assignment 1

1. The general project goal and aims are clear and well defined.
2. The problems encountered during the work (organizational, research-related, etc.) are identified, and appropriate solutions are proposed.
3. All results are described and discussed correctly.
4. Conclusions reflect the goal and aims of the project.
5. The scientific report materials provided to the supervisor are submitted in LMS (Canvas) full and complete.

7. Textbooks and Internet Resources

You can request at most two required textbooks. Additionaly, you can suggest up to nine recommended textbooks.

Required Textbooks	ISBN-13 (or ISBN-10)
-	

8. Facilities

9. Additional Notes

Comments

The workload distributed between contact hours and student's independent study (non-contact hours) is advisory.

The proposed course 1) has explicit academic content and requirements for receiving credits, 2) is in alignment with the program's learning outcomes, 3) adheres to policies and Skoltech regulations.

Lead Instructor confirms

Skoltech

Идентификатор документа, задачи / ID: 489306 v.1, 466030

ДОКУМЕНТ ПОДПИСАН ПРОСТОЙ ЭЛЕКТРОННОЙ ПОДПИСЬЮ / The document is signed with a simple electronic signature

Проректор по учебной работе / Dean of Education Столяров Денис Валерьевич / Stolyarov Denis Valerevich

Дата подписания / Date of signing 27.10.2026

Course Syllabus

Course Title	Additional Thesis Research
Course Title (in Russian)	Исследовательский семинар
Lead Instructor	-

1. Annotation

Course Description

Additional Thesis Research is one of educational elements of Stream 5. "Options" of MSc curriculum. Depending on the Program, this element might be a compulsory or elective one.

This is a practical oriented course.

During Additional Thesis Research students are expected to work on a research project related to Thesis. In case students would like to work on research project not related to Thesis, they should register for another educational element - Short-Term Project.

By the end of the course, students should submit a report on completed work and supervisor should grade it.

This educational element is for MSc-2 students, who can take it in Terms 5, 6, 7 and 8.

Course Description (in Russian)

Исследовательский семинар - это один из учебных элементов Модуля 5. "Индивидуальное обучение студента" учебного плана магистратуры.
В зависимости от программы этот учебный элемент может быть обязательным или элективным.

Этот курс является практиориентированным.

Исследовательский семинар подразумевает работу студентов над исследовательским проектом, связанную с темой ВКР. Для исследовательских проектов, не связанных с темой ВКР, студентам необходимо регистрироваться на иной учебный элемент - Исследовательский проект.

По завершении работы студенты представляют отчет о проделанной работе, который оценивает научный руководитель студента.

Этот учебный элемент могут взять магистры второго года обучения в учебных семестрах 5, 6, 7, 8.

2. Basic Information

Course Academic Level MSc

Number of ECTS credits 3

Course Prerequisites / Recommendations

-

Type of Assessment Pass/Fail

Mapping from grades to percentage:

Pass: 60

Term Terms 5, 6, 7 and 8

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

BSc Programs	Masters Programs	PhD Programs
	All Master Programs	

Maximum Number of Students

	Maximum Number of Students
Overall:	300
Per Group (for seminars and labs):	300

3. Course Content

Topic	Summary of Topic	Contact Hours: Lectures	Contact Hours: Seminars	Contact Hours: Labs	Non-contact Hours: Student's Independent Study
Research planning	Students plan their work on additional thesis research.		3		9
Work on research (related to Thesis)	Students work on scientific project/research.			24	31
Preparation of report / project defense	Students prepare written report / presentation on completed work.		4		10

4. Learning Outcomes

Skoltech Learning Outcomes are indicated as per Skoltech Learning Outcomes Framework.

1. FUNDAMENTAL KNOWLEDGE

1.2. KNOWLEDGE OF APPLIED SCIENCE AND ENGINEERING SCIENCE INCLUDING CONTEMPORARY METHODS AND TOOLS

2.1. COGNITION AND MODES OF REASONING

2.1.1. Analytical reasoning and problem solving

2.3. ETHICS, EQUITY AND OTHER RESPONSIBILITIES

2.3.1. Ethical action, integrity and courage

3.1. COMMUNICATIONS IN INTERNATIONAL ENVIRONMENTS

3.1.4. Inquiry, listening and dialogue

3.1.5. Communications in English in scientific, business and social settings

4.2. VISIONING — INVENTING NEW TECHNOLOGIES THROUGH RESEARCH

4.2.1. The research process — hypothesis, evidence and defense

5. Assignments and Grading

Physical Attendance Requirement (% of classes) 100

Assignment Type	Assignment Summary	% of Final Course Grade
Report	Research planning, research execution and report on completed work submitted via Canvas. Recommended format of defense is presentation.	100

6. Assessment Criteria

Assignment 1 Type Report

Sample of Assignment 1

Research report - a file in a free form (it can be any result of your project: a presentation, an article, etc.) Discuss with your supervisor a form of report.

Assessment Criteria for Assignment 1

1 - The student identifies the goal within a context, develops and justifies the focus on the area of interactions and provides a coherent account how to achieve this goal. The development of the project is totally consistent with the description.
2 - The student selects and applies appropriate techniques and methods correctly for the project and analyzing novel situations.
3 - The student draws relevant, valid, appropriate and critically evaluated conclusions

reflected the aim and all tasks of the project.
4 - The student identifies the goal within a context, develops and justifies the focus on the area of interactions and provides a coherent account how to achieve this goal. The development of the project is totally consistent with the description.

7. Textbooks and Internet Resources

You can request at most two required textbooks. Additionaly, you can suggest up to nine recommended textbooks.

Required Textbooks	ISBN-13 (or ISBN-10)
-	

8. Facilities

9. Additional Notes

Comments

If you have any questions regarding any of the points above, please send your inquiries to Education Helpdesk (Jira):
- Educational Process (Links to an external site.) - Research Projects: MSc - for short-term research/ E&I projects questions (not connected to Thesis);
- MSc Thesis Project (Links to an external site.) - for Thesis-related questions (Thesis proposal, Thesis titles...).

*) in clause 3 "Course content" we've provided hours for a 3-credit course. If a student takes a 6-credit course, his/her workload is doubled respectively, and so on.

The proposed course 1) has explicit academic content and requirements for receiving credits, 2) is in alignment with the program's learning outcomes, 3) adheres to policies and Skoltech regulations.

Lead Instructor confirms

Skoltech

Идентификатор документа, задачи / ID: 489306 v.1, 466030

ДОКУМЕНТ ПОДПИСАН ПРОСТОЙ ЭЛЕКТРОННОЙ ПОДПИСЬЮ / The document is signed with a simple electronic signature

Проректор по учебной работе / Dean of Education Столяров Денис Валерьевич / Stolyarov Denis Valerevich

Дата подписания / Date of signing 27.10.2026

Course Syllabus

Course Title	Short-Term Project
Course Title (in Russian)	Исследовательский проект
Lead Instructor	-

1. Annotation

Course Description

Short-Term Project is one of educational elements of Stream 5. "Options" of MSc curriculum. Depending on the Program, this element might be a compulsory or elective one. This is a practical oriented course.

During Short-Term Project students are expected to work on a research project not related to Thesis. In case students would like to work on research project related to Thesis, they should register for another educational element - Additional Thesis Research.

By the end of the course, students should submit a report on completed work and Research Supervisor should grade it.

1st-year MSc students can register for this course in exceptional cases only. This should be confirmed with both Program Director and Research Supervisor.

2nd-year MSc students can register for this course in Terms 5, 6 & 7 themselves without any additional approval. In Term 8 students can not register for this course, as they should be mainly concentrated on their Thesis defense.

Course Description (in Russian)

Исследовательский проект - это один из учебных элементов Модуля 5. "Индивидуальное обучение студента" учебного плана магистратуры. В зависимости от программы этот учебный элемент может быть обязательным или элективным. Этот курс является практиориентированным.

Исследовательский проект подразумевает работу студентов над исследовательским проектом, не связанным с темой ВКР. Для исследовательских проектов, связанных с темой ВКР, студентам необходимо регистрироваться на иной учебный элемент - Исследовательский семинар.

По завершении работы студенты представляют отчет о проделанной работе, который оценивает научный руководитель студента.

Студенты магистратуры первого года обучения могут зарегистрироваться на Исследовательский проект в исключительных случаях по согласованию с Директором программы и научным руководителем.

Студенты магистратуры второго года обучения могут зарегистрироваться на Исследовательский проект без дополнительного согласования в учебных семестрах 5, 6 и 7. В 8 учебном семестре брать данный курс не разрешается, поскольку студенты должны быть полностью сконцентрированы на подготовке к защите ВКР.

2. Basic Information

Course Academic Level MSc

Number of ECTS credits 3/ 6/ 9

Course Prerequisites / Recommendations

-

Type of Assessment Pass/Fail

Mapping from grades to percentage:

Pass: 60

Term Terms 5, 6 & 7

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

BSc Programs	Masters Programs	PhD Programs
	All Master Programs	

Maximum Number of Students

	Maximum Number of Students
Overall:	
Per Group (for seminars and labs):	300

3. Course Content

Topic	Summary of Topic	Contact Hours: Lectures	Contact Hours: Seminars	Contact Hours: Labs	Non-contact Hours: Student's Independent Study
Project planning	Students plan a project.		3		9
Project execution	Students work on scientific project.			24	31
Preparation of report + project defense	Students prepare written report and presentation on completed work.		4		10

4. Learning Outcomes

Skoltech Learning Outcomes are indicated as per Skoltech Learning Outcomes Framework.

1. FUNDAMENTAL KNOWLEDGE

1.2. KNOWLEDGE OF APPLIED SCIENCE AND ENGINEERING SCIENCE INCLUDING CONTEMPORARY METHODS AND TOOLS

1.3. KNOWLEDGE OF INNOVATION AND ENTREPRENEURSHIP

2.1. COGNITION AND MODES OF REASONING

2.1.2. System thinking

2.1.5. Critical thinking and meta-cognition

4.2. VISIONING — INVENTING NEW TECHNOLOGIES THROUGH RESEARCH

4.2.2. Basic research leading to new scientific discovery

4.2.3. Research aimed at developing new technologies

5. Assignments and Grading

Physical Attendance Requirement (% of classes) 100

Assignment Type	Assignment Summary	% of Final Course Grade
Report	Project planning, project execution and project report on completed work submitted via Canvas. Recommended format of defense is presentation.	100

6. Assessment Criteria

Assignment 1 Type Report

Sample of Assignment 1

Project report - a file in a free form (it can be any result of your project: a presentation, an article, etc.) Discuss with your supervisor a form of report.

Assessment Criteria for Assignment 1

1 - The student identifies the goal within a context, develops and justifies the focus on the area of interactions and provides a coherent account how to achieve this goal. The development of the project is totally consistent with the description.
2 - The student selects and applies appropriate techniques and methods correctly for the project and analyzing novel situations.
3 - The student draws relevant, valid, appropriate and critically evaluated conclusions reflected the aim and all tasks of the project.
4 - The student identifies the goal within a context, develops and justifies the focus on the area of interactions and provides a coherent account how to achieve this goal. The development of the project is totally consistent with the description.

7. Textbooks and Internet Resources

You can request at most two required textbooks. Additionaly, you can suggest up to nine recommended

textbooks.

Required Textbooks	ISBN-13 (or ISBN-10)
-	

8. Facilities

9. Additional Notes

Comments

If you have any questions regarding any of the points above, please send your inquiries to Education Helpdesk (Jira):
- Educational Process (Links to an external site.) - Research Projects: MSc - for short-term research/E&I projects questions (not connected to Thesis);
- MSc Thesis Project (Links to an external site.) - for Thesis-related questions (Thesis proposal, Thesis titles...).

*) in clause 3 "Course content" we've provided hours for a 3-credit course. If a student takes a 6-credit course, his/her workload is doubled respectively, and so on.

The proposed course 1) has explicit academic content and requirements for receiving credits, 2) is in alignment with the program's learning outcomes, 3) adheres to policies and Skoltech regulations.

Lead Instructor confirms