Course Syllabus

Please find the new course syllabus form below.

You can complete the online form in one sitting or in several sessions (after filling in the initial data fields marked with a red asterisk). To return to the form, scroll down to the bottom and hit "Submit". You will then receive an automatic email with a link for further editing.

Also, you are able to share this same link with others (e.g. a co-instructor or colleague) for assistance or filling in particular data fields.

Some users report problems with the form on Internet Explorer 11. You might want to use Google Chrome, Firefox, Safari or Microsoft Edge instead.

Should you have any questions, please contact us at b.kheyfets@skoltech.ru.

Contact Person: Mikhail Bershtein
Contact Person's E-mail: M.Bershtein@skoltech.ru
Course Title (in English): Research Immersion
Course Title (in Russian): Научно-исследовательская практика
Lead Instructor(s): Bershtein, Mikhail
Here’s a structure of the form below:

1. Annotation
2. Structure and Content
3. Assignments
4. Grading
5. Basic Information
6. Textbooks and Internet Resources
7. Facilities
8. Learning Outcomes
9. Assessment Criteria
10. Additional Notes

1. Annotation

Course Description
Research Immersion will take place in Skoltech and Dubna as a part of Skoltech International Summer School on Mathematical Physics. The program of the school includes modern topics of mathematical physics such as Topological strings, integrability, Schur-Weyl duality, Ising model, sigma models, Affine Grassmannian, Stochastic vertex models. 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 Academic Level
Master-level

2. Structure and Content
Please note the number of ECTS credits for your course. You can reference the appropriate curriculum plan:

Masters Programs:

1. Advanced Manufacturing and Materials
2. Biotechnology
3. Computational Science and Engineering
4. Data Science
5. Energy Systems
6. Materials Science
7. Mathematical and Theoretical Physics
8. Petroleum Engineering
9. Photonics and Quantum Materials
10. Space and Engineering Systems

PhD Programs: (in progress)

1. Computational and Data Science and Engineering
2. Engineering Systems
3. Life Sciences
4. Materials Science and Engineering
5. Mathematics and Mechanics
6. Petroleum Engineering
7. Physics

Number of ECTS credits

12

ECTS Credit System – Reference Tool

Total Number of ast. Hours in Your Course

324

(1 ECTS credit is equal to 27 ast. hours of workload: contact + noncontact)

(recommended to be no more than 50% of the course)

(recommended to be no less than 30% of the course)
Contact hours consist of lectures, labs and seminars:

(strongly recommended to be no more that 30% of the contact hours)

Please distribute lecture, lab and seminar hours among topics, using the reference tool (grey box above) for guidance. The remaining hours will be calculated toward student’s independent study (non-contact hours).
3. Assignments

<table>
<thead>
<tr>
<th>Assignment Type</th>
<th>Assignment Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other 1</td>
<td>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.</td>
</tr>
<tr>
<td>Talk</td>
<td>Talk based on the review.</td>
</tr>
<tr>
<td>Report</td>
<td>Report on the material mastered in school.</td>
</tr>
</tbody>
</table>

4. Grading

Type of Assessment  
Pass/Fail

Grade Structure

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Activity weight, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other 1</td>
<td>30</td>
</tr>
<tr>
<td>Talk</td>
<td>30</td>
</tr>
<tr>
<td>Report</td>
<td>40</td>
</tr>
</tbody>
</table>

Grading Scale

Grading scale used at Skoltech is A-E (A – the highest, E – the lowest). F – fail. Alternative scale – Pass/Fail.

The work examined is outstanding and provides evidence of excellent performance demonstrating a superior understanding of the subject matter, a foundation of extensive knowledge, and a skillful use of concepts and/or materials. All Learning Outcomes are satisfied at a high level.
The work is of high standard and provides evidence of comprehensive knowledge and good performance demonstrating capacity to use the appropriate concepts, a good understanding of the subject matter, and an ability to handle the problems and materials encountered in the subject. All Learning Outcomes are satisfied and a majority satisfied at a high level.

Satisfactory

The work examined is generally satisfactory and provides evidence of adequate performance demonstrating a sufficient understanding of the subject matter however with notable shortcomings. Majority of the learning outcomes are satisfied at an appropriate level.

The work examined is poor and provides evidence of very limited familiarity with the subject matter, insufficient knowledge and significant shortcomings. The evidence shows that only some of the learning outcomes were satisfied at an appropriate level.

Minimally acceptable performance. The work examined is very poor, demonstrates serious deficiencies and provides little evidence of knowledge, understanding, and/or skills and poor familiarity with the subject matter. Very few (if any) of the learning outcomes are satisfied at an appropriate level.

The work examined is unacceptable and provides minimum (if any) evidence of knowledge and understanding of the subject matter. The evidence fails to show that any of the Learning Outcomes are satisfied at an appropriate level.

The universal scale are percents. Please customize mapping from letter grades to percentage below, or just accept the defaults.
5. Basic Information

Course Stream  Sector (Summer Term)

Course Term (in context of Academic Year)  Summer Term

In the next question we ask you to define general categories of the course. What does your course teaches in broad terms?

Course Tags  Math  Physics

6. Textbooks and Internet Resources

You can request at most two required textbooks. Additionally, you can suggest up to nine recommended textbooks.
<table>
<thead>
<tr>
<th>Recommended Textbooks</th>
<th>ISBN-13 (or ISBN-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Guide to Quantum Groups by Chari. CUP. 1995</td>
<td>9780521558846</td>
</tr>
<tr>
<td>Papers</td>
<td>DOI or URL</td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td>N. Seiberg, E. Witten, “Monopoles, Duality and Chiral Symmetry Breaking in N=2 Supersymmetric QCD”</td>
<td>arXiv: hep-th/9408099</td>
</tr>
</tbody>
</table>
7. Facilities

8. Learning Outcomes

These last bits of information (§8 and §9) is critical to prepare Educational Programs for International Accreditation requirements.

<table>
<thead>
<tr>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monopoles and</td>
</tr>
<tr>
<td>instantons,</td>
</tr>
<tr>
<td>Integrable</td>
</tr>
<tr>
<td>systems,</td>
</tr>
<tr>
<td>Schur-Weyl</td>
</tr>
<tr>
<td>duality,</td>
</tr>
<tr>
<td>Ising model,</td>
</tr>
<tr>
<td>2d sigma models.</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Skill</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading modern scientific literature, selecting more relevant for the project purpose.</td>
<td></td>
</tr>
<tr>
<td>Discussing the questions with the experts in the field.</td>
<td></td>
</tr>
<tr>
<td>Presentation skills.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Experience</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The experience of serious work in the team to study the difficult subject.</td>
<td></td>
</tr>
<tr>
<td>The work in another prominent scientific institute.</td>
<td></td>
</tr>
</tbody>
</table>

Do you want to specify outcomes in another framework?

Knowledge-Skill-Experience is good enough


It is summarized here. Please read the summary before specifying outcomes below.


It is summarized here. Please read the summary before specifying outcomes below.

Note: some of the knowledge levels listed below might not apply to your course. You can leave them blank, but at least three out of six levels must be filled. It should help to prepare Educational Programs for International Accreditation requirements.
Sample verbs to use for this objective:

- define
- identify
- record
- name
- list
- retrieve
- repeat

Sample verbs to use for this objective:

- discuss
- report
- summarize
- restate
- tell
- recognize
- express
- locate
- extrapolate
- translate
- review
- explain
- describe
- interpret
Sample verbs to use for this objective:

- demonstrate
- practice
- apply
- use
- schedule
- sketch
- illustrate
- operate

Sample verbs to use for this objective:

- authenticate
- decipher
- itemize
- distinguish
- analyze
- differentiate
- appraise
- calculate
- experiment
- solve
- compare
- contrast
- criticize
- diagram
- inspect
- debate
- test
Sample verbs to use for this objective:

- compose
- design
- integrate
- construct
- organize
- plan
- manage
- appraise
- grade
- qualify
- measure
- score
- estimate
- create
- assemble
- set up
- formulate
- arrange
- prepare
- judge
- evaluate
- rate
- compare
- choose
- assess
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- compare
- choose
- assess

9. Assessment Criteria

Select Assignment 1 Type

Input or Upload Example(s) of Assignment 1:

Input Example(s) of Assignment 1 (preferable)

Nakajima quiver varieties: proof of equivalence between different definitions, proof of the smoothness.

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.).

Select Assignment 2 Type

Talk

Input or Upload Example(s) of Assignment 2:

Input Example(s) of Assignment 2 (preferable)

Talk based on the topic for Assignment 1.
Input or Upload Example(s) of Assignment 3:

Input Example(s) of Assignment 3 (preferable)
Main examples of Nakajima quiver varieties

Or Upload Example(s) 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.

Input or Upload Example(s) of Assignment 4:

Or Upload Example(s) of Assignment 4

Input or Upload Example(s) of Assignment 5:

10. Additional Notes

Status of this Syllabus
The syllabus is a final draft waiting for form approval