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 Skvortsov
Contact Person's E-mail: m.skvortsov@skoltech.ru
Course Title (in English): Research Immersion (Theoretical Physics)
Course Title (in Russian): Научно-исследовательская практика (теоретической физике)
Lead Instructor(s): Feigelman, Mikhail, Skvortsov, Mikhail
Course Description
The goal of Research Immersion in Theoretical Physics is to familiarize students with current research directions and trends in modern theoretical physics. The specific tasks to be implemented regarding the above goal are two-fold: i) immersion into environment of the international conference on condensed matter theory, and ii) formation of skills for independent research work. Therefore it involves two types of activities: (1) participation in one of top-rank international conferences/workshops in theoretical physics resulting in a 5-pages report on modern trends in theoretical physics, and (2) implementation of a proposed research projects suggested by the course instructor. The location of the second type of activity is person-specific for each of the students (Skoltech, Landau Institute, Google Corp.)
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

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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 than 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>Conference</td>
<td>Report on new trends in theoretical physics (based on the participation in the conference)</td>
</tr>
<tr>
<td>Project</td>
<td>Research project report</td>
</tr>
</tbody>
</table>

4. Grading

<table>
<thead>
<tr>
<th>Type of Assessment</th>
<th>Pass/Fail</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Grade Structure</th>
<th>Activity Type</th>
<th>Activity weight, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conference</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Project</td>
<td>70</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.

- **A (Excellent)**: 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.

- **B (Good)**: 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.

- **C (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.

- **D (Poor)**: 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.

Una/ ccep 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. Fail

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: 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>Web-resources (links)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>subscription to the main physical journals</td>
<td>APS, Nature group, Elsevier, etc.</td>
</tr>
</tbody>
</table>

### 7. Facilities

**Software**

Wolfram Mathematica

### 8. Learning Outcomes

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

**Knowledge**

Knowledge of modern research topics and approaches in theoretical physics - applicable to both types of activity
Skill

Application of novel theoretical methods and tools in condensed matter physics - applicable to both types of activity.

Experience

Participation in a conference/workshop in theoretical physics.

Participation in the research project in theoretical physics.

Preparation of the Report based on the participation at the Conference.

Preparation of the Report after completion of the Research project.

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
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9. Assessment Criteria

Select Assignment 1 Type

Conference

Input or Upload Example(s) of Assignment 1:

Assessment Criteria for Assignment 1

Report on the Conference:
Correctness and completeness of the overview of the most important presentations.

Research Project Report:
Quality of the result, clearness of presentation

Input or Upload Example(s) of Assignment 2:
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

Status of this Syllabus

The syllabus is a final draft waiting for form approval