Course Title (in English) | Quantum Field Theory  
---|---
Course Title (in Russian) | Квантовая теория поля  
Lead Instructor(s) | Semenov, Andrei  
Is this syllabus complete, or do you plan to edit it again before sending it to the Education Office? | The syllabus is a work in progress (draft)  
Contact Person | Andrei Semenov  
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1. Annotation

Course Description

At present time Quantum Field Theory (QFT) is the main theoretical tool used for the description of the phenomena occurring in the microworld. Examples include interactions between elementary particles, hadron structure and so on. At the same time, QFT methods are widely used in all areas of modern theoretical physics such as condensed matter physics, statistical mechanics, turbulence theory and others. Moreover, the creation of QFT has stimulated the development of many modern areas of mathematics.

The course is aimed at the study of the basic ideas and methods of QFT, as well as the discussion of its applications in various areas of modern theoretical and mathematical physics. Topics include quantization of scalar and gauge theories, path integral approach, perturbative expansions and Feynman diagrams, (1+1) dimensional exactly soluble models and some other ideas of modern science.

Course Prerequisites / Recommendations | Calculus, Complex analysis, ODE and PDE, Classical Mechanics, Classical Fields, Quantum mechanics

2. Structure and Content
Course Academic Level
Master-level course suitable for PhD students

Number of ECTS credits
6

<table>
<thead>
<tr>
<th>Topic</th>
<th>Summary of Topic</th>
<th>Lectures (# of hours)</th>
<th>Seminars (# of hours)</th>
<th>Labs (# of hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>QFT. Symmetries. Physical realisations.</td>
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<tr>
<td>Scalar field</td>
<td>Scalar field and its quantization. Operator approach</td>
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<tr>
<td>S-matrix</td>
<td>Observables and S-matrix. Fock space interpretation.</td>
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3. Assignments

4. Grading

Type of Assessment
Graded

Grade Structure

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Activity weight, %</th>
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<tbody>
<tr>
<td>Problem Set</td>
<td>30</td>
</tr>
<tr>
<td>Final Exam</td>
<td>70</td>
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</tbody>
</table>

Grading Scale

A: 86
B: 76
5. Basic Information

Course Term (in context of Academic Year)
- Term 3
- Term 4

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

<table>
<thead>
<tr>
<th>Masters Programs</th>
<th>PhD Programs</th>
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<tbody>
<tr>
<td>Materials Science</td>
<td>Materials Science and Engineering</td>
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<tr>
<td>Mathematical and Theoretical Physics</td>
<td>Mathematics and Mechanics</td>
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<tr>
<td>Photonics and Quantum Materials</td>
<td>Physics</td>
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Course Tags
- Math
- Physics

6. Textbooks and Internet Resources

7. Facilities

8. Learning Outcomes

9. Assessment Criteria

Input or Upload Example(s) of Assignment 1:

Input or Upload Example(s) of Assignment 2:

Input or Upload Example(s) of Assignment 3:

Input or Upload Example(s) of Assignment 4:
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<tr>
<th>Input or Upload Example(s) of Assignment 5:</th>
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| 10. Additional Notes                     |