Skoltech
Skolkovo Institute of Science and Technology

Course Syllabus

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
Contact Person's E-mail	semenov@lpi.ru

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

Topic	Summary of Topic	Lectures (# of hours)	Seminars (# of hours)	Labs (# of hours)
Introduction	QFT. Symmetries. Physical realisations.			
Scalar field	Scalar field and its quantization. Operator approach			
S-matrix	Observales and S-matrix. Fock space interpretation.			

3. Assignments

4. Grading

Type of Assessment	Graded

Grade Structure

Activity Type	Activity weight, %
Problem Set	30
Final Exam	70

Grading Scale

A:	86
B:	76

C:	66
D:	56
E:	46
F:	0
Attendance Requirements	Optional with Exceptions

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?

Masters Programs	PhD Programs
Materials Science Mathematical and Theoretical Physics Photonics and Quantum Materials	Materials Science and Engineering Mathematics and Mechanics Physics

Course Tags	Math Physics

6. Textbooks and Internet Resources

7. Facilities

8. Learning Outcomes

9. Assessment Criteria

Input or Upload Example(s) of Assigment 1:

Input or Upload Example(s) of Assigment 2:

Input or Upload Example(s) of Assigment 3:

Input or Upload Example(s) of Assigment 4:

Input or Upload Example(s) of Assigment 5:

10. Additional Notes