Department of Physics

Stockholm University

Syllabus

for course at advanced level

Quantum Field Theory
Kvantfältteori

7.5 Higher Education Credits
7.5 ECTS credits

Course code:	FK7023
Valid from:	Spring 2008
Date of approval:	2007-08-28
Department	Department of Physics
Subject	Physics
Specialisation:	A1F - Second cycle, has second-cycle course/s as entry requirements

Decision

Prerequisites and special admittance requirements

Degree of Bachelor with major in Physics, or equivalent. Analytic mehanics (FK8001), 7.5 HECs, and Quantum mechanics III (FK8007), 7.5 HECs. Also required is knowledge equivalent to Swedish upper secondary course English B.

Course structure

Examination code	Name	Higher Education Credits
1100	Quantum Field Theory	7.5

Course content

Standard quantum mechanics cannot describe processes where particles are created and annihilated. These are important, both in high energy physics, where elementary particles are created in particle accelerators, and in condensed matter physics where many phenomena are described in terms of quasi particles, which can also be created and destroyed. In both cases, the natural language is quantum field theory, which is introduced in this course.

Learning outcomes

After having passed the course the student is expected to:
* have a good understanding and be able to describe the free quantized scalar-, Dirac- and Maxwell-fields including their properties of symmetry
* understand and be able to describe the logical chain of: interacting fields - timedependent perturbation theory - Feynman diagrams - S-matrix elements - cross sections and be able to perform simple calculations
* understand why and how ultra violet divergencies arise in quantum field theory and be able to calculate simple one loopdiagram
* be able to use path integral formulation of a quantum field theory in order to derive the Feynman rules and be able to understand the relation between path integrals and different types of correlation functions

Education

The education consists of lectures, hand-ins and exercises.

Forms of examination

a. The student's knowledge will be tested by a hand-ins and an oral exam.

b. Grading is carried out according to a 7-point scale related to learning objectives:
A = Excellent
B = Very Good
C = Good
D = Satisfactory
E = Sufficient
Fx = Fail
F = Fail

c. Grading criteria for the course will be distributed at the start of the course.

d. A minimum grade of E is required to pass the course.

e. Students who fail to achieve a pass grade in an ordinary examination have the right to take at least further four examinations, as long as the course is given. The term “examination” here is used to denote also other compulsory elements of the course. Students who have achieved a pass grade on an examination may not retake this examination in order to attempt to achieve a higher grade. Students who have failed to reach a pass grade on two occasions have the right to request that a different teacher be appointed to set the grade of the course. A request for such appointment must be sent to the departmental board.

Interim

Students may request that the examination is carried out in accordance with this syllabus even after it has ceased to apply. This right is limited, however, to a maximum of three occasions during a two-year-period after the end of giving the course. A request for such examination must be sent to the departmental board.

Limitations

The course may not be included as a part of a degree together with any of the courses Kvantfältteori, 10 p (FY4020) or Kvantfältteori, 15 hp (FK7008).

Misc

The course may be a component of the master programmes in physics or studied as an individual course.

Required reading

Course literature is decided by the departmental board and is described in an appendix to the syllabus.