1 Course aim

After completion of the course you should be able to:

• use functional integrals and perturbation theory in quantum field theory,
• apply renormalization and regularization with quantum field theory,
• have knowledge about gauge theories as well as quantum electrodynamics and quantum chromodynamics,
• know spontaneously broken gauge theories as BCS theory and the Higgs model.

2 Course contact details

Course coordinator and examiner: Mattias Blennow (A4:1047, emb@kth.se)
Course homepage: http://courses.theophys.kth.se/SI2410/

3 Course literature

The course is based on:

• An Introduction To Quantum Field Theory, M.E. Peskin and D.V. Schröder.

Other recommended reading:

• Quantum Field Theory, L.S. Brown.
• Quantum Field Theory, F. Mandl and G. Shaw.
4 Reading instructions

The course is given in the form of a reading course. The following material from Peskin-Schröder (PS) is included:

• Chapter 9: The entire chapter.
• Chapter 10: 10.1-10.4.
• Chapter 11: 11.1-11.2.
• Chapter 12: 12.1-12.3.
• Chapter 15: 15.1, 15.2, 15.4.
• Chapter 16: The entire chapter.
• Chapter 17: The entire chapter.
• Chapter 20: The entire chapter.

5 Student seminars

During the course there will be a set of 8 student seminars. Each seminar will have reading instructions to be completed in advance and a set of six preparation questions. Students should be prepared for briefly answering and discussing the preparation questions during the seminar. In the beginning of the seminar, the students will be given the opportunity to choose which questions they are prepared to initiate discussion on. The seminars will act as an oral exam (TEN1) and be graded according to the number of questions the student is willing to start a discussion on according to the following: 6=A, 5=B, 4=C, 3=D, 2=E, 1=F, 0=F. In order to obtain a given overall grade on the TEN1 part, the student has to obtain at least that grade in four of the seminars and have at least two other seminars with the grade below. The student to initiate discussion on each particular question will be randomized and failure to do so satisfactorily will result in grade F on the seminar in question.

Example: Bob has participated in 7 seminars and been given the grades: AAABBCD. This will result in an overall grade of B, since Bob has five seminars with grade B or better (AAAB) and two other seminars with grade C or better (BC).

In case there are very few students, the course will be given as a reading course only. The seminars will then be replaced by an oral exam. However, students are still encouraged to meet and discuss the material.
6 Hand in assignments

The second part of the examination will be through hand in assignments (INL1). The hand in assignments will be handed out in two sets after the relevant material has been covered in the seminars. The hand in assignments will consist of 3+2 problems which will each be awarded a grade A-F. In order to obtain a given overall grade on the INL1 part, a student must have been given that grade or higher on at least three of the problems and obtained at least the grade below on the other two.

Example: Claire has been given the grades ABCCD. This will result in an overall grade of C, since Claire has three problems with grade C or better (ABC) and the other problems have been given grade D or better (CD).

7 Final grade

The final grade in the course will be decided mainly by the result of the hand in assignments and will be awarded according to the following table:

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