FSH3312 Symmetries in Physial Systems 7.5 credits

Symmetrier i fysikaliska system

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FSH3312 valid from Spring 2016

Grading scale

Education cycle

Third cycle

Specific prerequisites

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The main aim of the course is to understand the basic concepts in symmetry principles and group theories and their mathematical formalisms. On completion of the course, the students will be able to apply them to analyze the symmetry properties of complex quantum

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physical systems including atoms, nuclei and elementary particles. They should also be able to analyse both discrete and continuous symmetries of physical systems using group theory. In particular they should be able to decompose a representation into its irreducible representations. The students will also be able to identify approximate symmetries including isospin and pseudospin and understand their limitations.

Course contents

•Symmetry and conservation laws

Groups and group representations

Point groups

Permutation Groups

Lie Groups and Lie Algebras

Unitary Groups

Real Orthogonal Groups

The Symplectic Groups

Theory of identical particles

Angular momentum

SU(N) group in nuclear and particle physics

Coefficient of fractional parentage and seniority

Isospin symmetry

Spin and pseudospin symmetry in nuclear and relativistic systems

Disposition

Lecture notes will be distributed and the students are expected to study mostly by themselves. Discussions and lectures will be arranged together with the students.

Course literature

J.P. Elliott and P.G. Dawber, Symmetry in Physics (Volume 1 & 2), Oxford and own lecture notes.

Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

To pass the course the students should give 1-2 open seminars on the subject and hand in a study report. In both cases the students should demonstrate that they have obtained good understanding of the subject and be able to apply their knowledge to practial problems and answer the questions and comments raised by the teacher and other students in a proper way.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.