SYLLABUS

Advanced Course on Topics in Physics 7.5 credits F7048T

Fördjupningskurs i fysik

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2022-02-14

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LULEÅ TEKNISKA UNIVERSITET

Advanced Course on Topics in Physics 7.5 credits F7048T

Fördjupningskurs i fysik

Second cycle, F7048T

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	U G#	Fysik	Physics

Entry requirements

Basic and core courses in physics and mathematics equivalent to the first three years of the civil engineering program Engineering Physics and Electrical Engineering or equivalent from another university. In addition, courses under one of the options below depending on the area of specialization are required.
Options for specialization 1: F7045T Solid State Physics , C7004M Numerics and partial differential equations , and some of F7024T multiphysics simulation and calculation or F7035T Statistical Physics and Thermodynamics or equivalent.
Options for specialization 2: F0047T Quantum Physics and any one of F7031T Particle and Nuclear Physics , F7030T Chaos and Nonlinear Physics, F0027T Astrophysics and Cosmology , Relativity F7041T or F7008T atomic and molecular physics, or equivalent obtained at another institution .

Selection

The selection is based on 30-285 credits

Course Aim

The purpose of the course is to provide an opportunity for specialization in physics that is not included in the regular course offering. The student learns to model and solve problems in physics. This is done through studies of books or scientific articles, possibly supplemented with own calculations. The student must present and reason about the chosen specialization. Compilation of literature search and evaluation of this may occur. The student may also, where applicable, learn about research in physics.

After completing the course, the student should be able to:

- Immerse into self-education in advanced physics.
- Independently, with the support of teachers, assimilate new material at the advanced level but also be an independent learner in the specialization.
- Integrate, generalize and combine previously acquired knowledge in the field.
- Apply in-depth knowledge through calculations or simulations in concrete examples or in a project.
- Acquire research results in the field of the in-depth study and reflect on research in physics.
- Present and critically discuss acquired knowledge.

Contents

Detailed course content is specified by the examiner, or a supervisor appointed by the examiner, together with the student(s) in a written course description each time the course is given. Content to be approved by the examiner and any additional supervisor(s). The exact content is controlled by the current specialization/project.

Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.

Specialization 1. Modeling of materials

Examples of specialization areas are, for example (i) an in-depth study of the laws of quantum mechanics in the form of Schrodinger equation by wavefunction methods and/or density functional theory (DFT) used to study the atoms, molecules, clusters and material properties; (ii) Calculations of superconducting and superfluid materials; iii) modeling of nanomaterials , their surfaces and their characterization.

Specialization 2. Particle, atomic, molecular and astrophysics

Examples of specialization areas are, for example (i) the formulation of problems in particle physics , cosmology , chaos theory / nonlinear systems, astrophysics, relativity, quantum physics, including quantum field theory; (ii) studies of molecules in the interstellar medium, or absorption in planetary and stellar atmospheres. The exact content is controlled by the current specialization.

Specialization 3. Applied photonics
Examples of specialization areas are, (i) image theory with specific applications in biomedical imaging, 3D imaging and remote sensing; (ii) Coherence and speckle theory with specific applications in gated imaging, material characterization and sensing; (iii) Elastic and inelastic scattering with applications in spectroscopy.

The specialization course is carried out independently but with the help of the teachers whose work is focused on providing support and structure in the student's own acquisition of knowledge and skills. There are to be regular meetings with the supervisor/examiner at which the student(s) will present their progress and discuss the course work, and set their own agenda for the continuation of the course. Within the framework of the course, and at the end of the course, the student(s) will make oral presentations to all involved, at which time the student(s) will be provided with feedback. At the end of the course it will, in addition, be presented in writing in the form of a project report. Discrepancies may occur.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

The specialization course work is presented with oral presentations, a written report, and final oral presentation at LTU, all of which contribute to the grading.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term “unauthorized aids” refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Course offered by

Department of Engineering Sciences and Mathematics

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0001	Advanced assignment	U G#	7.5	Mandatory	A15	

Last revised

by Niklas Lehto, Programme Director 2022-02-14

Syllabus established

by Mats Näsström 2015-02-12