Faculty of Science

FYSN23, Physics: Advanced Electromagnetism, 7.5 credits

Fysik: Avancerad elektromagnetism, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2018-03-06 to be valid from 2018-03-06, autumn semester 2018.

General Information

The course is an elective course for second-cycle studies for a Degree of Master of Science (120 credits) with a specialisation in physics.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Physics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The general aim of the course is that the student on completion of the course should have advanced knowledge about and understanding of electromagnetism and be able to use it to solve practical problems.

Knowledge and understanding

On completion of the course, the students shall be able to:

1. explain the origin of dispersion and how it is described mathematically,

2. describe the radiation from time-dependent current distributions, simple antennas and oscillating multipoles,

3. on a general level describe the relativistic invariance of the electromagnetic theory,

4. on a general level describe radiation from accelerated point charges such as synchrotron radiation.

Competence and skills

On completion of the course, the students shall be able to:

5. use Maxwell's equations to solve practical problems,

6. calculate light absorption dependent on the dielectric properties of the material,

7. interpret electromagnetic modes in waveguides,

8. relate electric and magnetic fields to dynamic potentials and sketch their partial differential equations for different gauge choices,

9. independently acquire knowledge of special subjects in electromagnetism and present them orally and in writing.

Judgement and approach

On completion of the course, the students shall be able to:

10. describe the usefulness of a thorough mathematical concept formation for an understanding of physical phenomena,

11. work with and evaluate various information and literature sources.

Course content

The course covers advanced electromagnetism. In particular the following is included:

- Maxwell's equations, conservation laws, electromagnetic potentials and gauge choices
- the interaction of radiation with material and dispersion
- waveguides and impedance
- retarded electromagnetic potentials and radiating systems including multipole radiation
- relativistic formulation of electromagnetism
- The Lienard-Wiechert potential, synchrotron radiation

Course design

The teaching consists of lectures, group work, written assignments and project work including a workshop with project presentations. Written assignments and participation in the workshop with project presentations are compulsory.

Assessment

Examination consists of a written exam at the end of the course and a presentation of the project work. Students who do not pass a regular assessment will be offered another opportunity for assessement soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
To pass the whole course, approved examination, passed project report, in time submitted written assignments and participation in the workshop with project presentations are compulsory. The final grade is decided through a weighing of the results of the examination (70%) and the written assignments (30%).

Entry requirements

Admission to the course requires 90 credits in physics and 45 credits in mathematics, or a Degree of Bachelor in physics. In both cases including knowledge equivalent to FYTB13 Electromagnetism, 7.5 credits. Furthermore is required English 6/B as well as general entry requirements.

Further information

The course cannot be included in a degree together with FYSN13 Electromagnetism, 7.5 credits.

Subcourses in FYSN23, Physics: Advanced Electromagnetism

Applies from V19

1901 Examination, 5,5 hp
Grading scale: Fail, Pass, Pass with distinction
1902 Project, 2,0 hp
Grading scale: Fail, Pass, Pass with distinction