FYTN01, Theoretical Physics: Mathematical Methods of Physics, 7.5 credits

Teoretisk Fysik: Fysikens matematiska metoder, 7,5 högskolepoäng
Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2007-03-01 (N2007267). The syllabus comes into effect 2007-07-01 and is valid from the autumn semester 2007.

General information

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

Language of instruction: Swedish and English
If needed, the course is given in English in its entirety.

Main field of study	Specialisation
Physics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The purpose of the course is to teach the student more advanced mathematical tools and methods that are commonly used within physics and the application of these methods on concrete physical systems.

The aims of the course are that, upon completion of the course, the student should have acquired the following knowledge and skills:

- Analytic functions: The student can describe Cauchy-Riemann's equations, Cauchy's integral theorem and the Laurent expansion as well as masters calculus of residues.
- Special functions: The student can make use of the gamma function, Bessel functions, Legendre polynomials and spherical harmonics.

- Fourier analysis: The student can make use of Fourier series and Fourier transforms.
- Laplace transforms: The student can make use of Laplace transforms.
- *Ordinary Differential Equations:* The student masters series solutions and can account for concepts such as self-adjoint operators and complete function systems.
- *Partial Differential Equations:* The student can describe important partial differential equations in physics, such as the wave and the heat equations and Poisson's equation and masters the method of separation of variables.
- Green functions: The student can describe the Green function method, apply it to one-dimensional problems, and account for the method of images.

Examples of problems that the student should be able to solve upon completion of the course:

- Calculate integrals over the real axis using calculus of residues.
- Solve boundary value problems for the Laplace equation using the method of separation of variables.
- Solve the equation for a vibrating string that is acted on by an external force with the Green function method.

Course content

The course consists of the elements described above for a total of 7.5 credits.

Course design

The teaching consists of lectures and exercises.

Assessment

The examination consists of a written problem solving exam and an oral theory exam. Students who do not pass the regular exam are offered a re-exam shortly after the regular exam.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
To pass the entire course it is required to pass both the written and oral tests.
The final grade is determined by combining the results in the different parts of the examination.

Entry requirements

The prerequisites required for admission to the course are: English B and general entry requirements as well as knowledge equivalent to 90 credits in physics and 30 credits in mathematics.

This is a translation of the syllabus
which was established in Swedish.