PHYS-216

Mathematical methods for physicists

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Cursus	Sem.	Type
Physics	BA4	Obl.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

This course complements the Analysis and Linear Algebra courses in providing further mathematical background and practice required for 3rd year physics courses, in particular electrodynamics and quantum mechanics.

Content

Review of essential linear algebra concepts and their application to function spaces. Solving Ordinary Differential Equations (ODEs), in particular linear 2nd order: Frobenius method, boundary value problems, Sturm-Liouville problems. Fourier analysis: Fourier Series and Fourier Transforms. Special functions. Methods for solving Partial Differential Equations (PDEs).

Learning Prerequisites

Required courses

Analyse I, II and III. Linear algebra I and II Physics I, II, and III.

Recommended courses

Computational Physics I.

Important concepts to start the course

Linear algebra: Vector spaces, inner product spaces, linear operators, eigenvalue problems, matrix diagonalisation. Analysis: basic theory of ODEs, vector calculus. Complex algebra and towards the end of the course, complex analysis.

Learning Outcomes

By the end of the course, the student must be able to:

- Apply the methods presented in the course for solving (differential) equations met in various fields of physics.

Teaching methods

Ex cathedra lecture and assisted exercises in the classroom

Assessment methods

Written exam

Resources

Bibliography

The main reference for the course is the book by Arfken:
G. B. Arfken, H. J. Weber, and F. E. Harris
"Mathematical Methods for Physicists, A Comprehensive Guide"
7th edition, Academic Press 2013.
Hard copies and electronic version available through EPFL library.

Ressources en bibliothèque

- Mathematical Methods for Physicists, A Comprehensive Guide

Moodle Link

- http://moodle.epfl.ch/course/view.php?id=14376