

Title: PSI 2019/2020 - Computational Physics - Lecture 1

Speakers: Erik Schnetter

Collection: PSI 2019/2020 - Computational Physics

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PERIMETER  INSTITUTE FOR THEORETICAL PHYSICS

# General Information

## Content

**Lecturers:** Erik Schnetter, Dustin Lang, several guest lecturers

**Outline:** This course is a practical introduction to computational physics, mixing theoretical lectures and lab-based (programming) work. The main topics will be:

- Hyperbolic partial differential equations (PDEs) with examples from general relativity
- Linear algebra (matrix factorization) with examples from condensed matter physics
- Optimization (in particular convex optimization) with examples from quantum information
- Data analysis (image processing) with examples from astronomy

The course begins with an introduction to the Julia language and related practices (e.g. version control, automated tests). It covers also certain software technologies such multi-threaded, distributed, or GPU programming.

**Reference material:** no textbook, although "Scientific Computing" by Heath might be useful

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## Format

**Course number:** This is course PHYS 776 at the [University of Waterloo](#)

**Format:** The course consists of six two-week modules; most can be attended independently

**Assessment mechanism:** One lab assignment per module, pair work is encouraged

**Assessment type:** pass/fail