PHYS-448 **Introduction to particle accelerators**

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Cursus	Sem.	Type
Ing.-phys	MA1, MA3	Opt.
Nuclear engineering	MA1	Opt.
Physicien	MA1, MA3	Opt.

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

Summary

The course presents basic physics ideas underlying the workings of modern accelerators. We will examine key features and limitations of these machines as used in accelerator driven sciences like high energy physics, materials and life sciences.

Content

Overview, history and fundamentals
Transverse particle dynamics (linear and nonlinear)
Longitudinal particle dynamics
Linear accelerators
Circular accelerators
Acceleration and RF-technology
Beam diagnostics
Accelerator magnets
Synchrotron radiation
Medical application of accelerators
Future projects

Learning Outcomes

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

- Design basic linear and non-linear charged particles optics
- Elaborate basic ideas of physics of accelerators
- Use a computer code for optics design
- Optimize accelerator design for a given application
- Estimate main beam parameters of a given accelerator

Transversal skills

- Communicate effectively with professionals from other disciplines.
- Use both general and domain specific IT resources and tools

Assessment methods

mainly written exam
bonus for submitting the solutions to the weekly problem sets and participation in the computer tutorials