

PHYS-448

**Introduction to particle accelerators**

Seidel Mike

<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
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
<b>Hours</b>	<b>4 weekly</b>
Lecture	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**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  
 Synchrotron radiation and related dynamics  
 Linear and circular accelerators  
 Acceleration and RF-technology  
 Beam diagnostics  
 Accelerator magnets  
 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

**Expected student activities**

working on weekly problems, submitting the solutions and participation in the computer tutorials

**Assessment methods**

written exam

## Resources

### Moodle Link

- <https://go.epfl.ch/PHYS-448>