Introduction to particle accelerators

Rivkin Leonid

**Cursus**
- Génie nucléaire
- Ing.-phys
- Physicien

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**Language**: English  
**Credits**: 4  
**Session**: Winter  
**Semester**: Fall  
**Exam**: Written  
**Workload**: 120h  
**Weeks**: 14  
**Hours**: 4 weekly  
**Lecture**: 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  
Injection and extraction systems  
Synchrotron radiation

### 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