

MICRO-517

**Optical design with ZEMAX**

Pu Ye

Cursus	Sem.	Type
Microengineering minor	H	Opt.
Microtechnics	MA1, MA3	Opt.
Photonics minor	H	Opt.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	During the semester
Workload	90h
Weeks	14
<b>Hours</b>	<b>3 weekly</b>
Courses	1 weekly
Exercises	1 weekly
Project	1 weekly
<b>Number of positions</b>	

**Summary**

Introduction to computer-aided design of optical systems using "ZEMAX OpticStudio" optical design software. Principles of optical systems design and performance analysis with geometrical optics and raytracing. Evaluation and minimization of optical aberrations in an optical design.

**Content**

- Introduction to optical design
- Geometrical optics and ray tracing
- Image formations and aberrations
- Operation of ZEMAX OpticStudio
- Design layout and performance assessment
- Performance optimization
- Non-imaging design
- Advanced design topics I
- Advanced design topics II
- Advanced design topics III
- Design project

**Keywords**

Computer-aided design, ZEMAX, OpticStudio, optical simulation, refraction, refractive index, dispersion, geometrical optics, ray tracing, lenses, objectives, aberrations, wave optics, Fourier optics, diffraction, wave aberrations, Zernike coefficients, telescope, microscope, optimization

**Learning Prerequisites****Required courses**

PHYS-201 General physics: electromagnetism  
 Micro 321 Ingénierie optique I  
 Micro 321 Ingénierie optique II

**Recommended courses**

## MICRO-421 Imaging optics

### Important concepts to start the course

Basics of optics, Refraction, Reflection, Diffraction, Dispersion, Polarization, Snell's law, Fourier transform, Basics of geometrical optics

### Learning Outcomes

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

- Assess / Evaluate the performance of a design by simulation
- Optimize a design with constraints to meet design specifications
- Analyze an optical design problem and specify design targets and constraints
- Construct an optical design in ZEMAX OpticStudio
- Carry out an optical design process efficiently and confidently
- Demonstrate an adequate proficiency in the operation of ZEMAX OpticStudio

### Transversal skills

- Set objectives and design an action plan to reach those objectives.
- Write a scientific or technical report.
- Manage priorities.
- Communicate effectively, being understood, including across different languages and cultures.
- Demonstrate the capacity for critical thinking

### Teaching methods

Lectures, exercises, and final projects

### Expected student activities

A final project to practically design an optical system in ZEMAX OpticStudio with specified requirements and constraints.

### Assessment methods

Exercises 50% + final project 50%

### Supervision

Office hours	No
Assistant.e.s	Yes
Forum	Yes

### Resources

#### Moodle Link

- <https://go.epfl.ch/MICRO-517>