Module Description, available in: EN

Applied Photonics

General Information

Number of ECTS Credits

3

Module code

TSM_AppPhot

Valid for academic year

2026-27

Last modification

2024-10-24

Coordinator of the module

Markus Michler (OST, markus.michler@ost.ch)

Explanations regarding the language definitions for each location:

- Instruction is given in the language specified for each location and module execution.
- Documentation is available in the language(s) listed for each location and module execution. If the documentation is in multiple languages, the percentage distributed is indicated (100% = all documentation provided).
- The examination, including both questions and answers, is provided entirely (100%) in the language(s) specified for each location and module execution. The exams are on-site.

	Lausanne			Lugano	Zurich		
Instruction					**X** E 100%		
Documentation					**X** E 100%		
Examination					**X** E 100%		

Module Category

TSM Technical scientific module

Lessons

2 lecture periods and 1 tutorial period per week

Entry level competences

Prerequisites, previous knowledge

- Optics: Basics of wave and geometrical optics;
  without optics basics during bachelor studies, the EVA "Fundamentals of light" should be visited before visiting further TSM modules.
- Physics: Basics for engineers (bachelor niveau)
- Electronics: Basic analog electronics (bachelor niveau)

Brief course description of module objectives and content

Applied photonics offers an insight into various application areas of photonics, such as optoelectronics, waveguide optics, micro-optics and several application examples. Starting from the basic physics of light matter interaction, the module covers various topics of modern optoelectronics in the field of light detection systems and light sources. After an introduction to the basics of light guiding and the occurrence of fiber modes, loss and dispersion mechanisms in fibers are discussed. The module gives an overview of different types of fibers and shows the importance of single mode fibers, specialty fibers and integrated waveguides for modern photonic applications. Furthermore, microoptical components are introduced to emphasize their advantages for light shaping, beam guidance and fiber coupling. The module is rounded off by a selection of special applications such as optical telecom, fiber measurement and sensor technology, organic electronics, optical biosensors, smart lighting concepts or similar topics.

Aims, content, methods

Learning objectives and competencies to be acquired

After successfully completing this course the student

- understands the main principles of light matter interaction
- has a clear picture of the different types of semiconductor light sources and detectors used today
- knows how micro optics can be used to shape light in modern photonic systems
- knows the principles of light guiding in optical waveguides including losses and dispersion
- is familiar with different types of fibers and waveguides and their fields of applications
- knows how to select and apply sources, detectors, micro optics and fibers for designing photonic systems

Module content with weighting of different components

1. Fundamentals of light-matter interaction (absorption, emission, scattering) (1 week)
2. Optoelectronics (4 weeks):
    1. detectors: photodiodes, photomultipliers, CCDs, CMOS sensors and dedicated electronic circuits
    2. sources: LEDs, SLEDs, OLEDs, laser diodes
3. Micro-optics: ROEs and DOEs (1 week)
4. Fibers & Waveguides (4 weeks):
    1. modes in planar waveguides and fibers, loss mechanisms and dispersion
    2. single mode fibers, specialty fibers and integrated waveguides
5. Photonic systems (4 weeks):
   modern applications that illustrate the importance of optoelectronics, micro-optics and fiber optics like e.g. optical telecom, fiber metrology and sensing, organic electronics, optical biosensors, smart lighting concepts and many others more

Teaching and learning methods

- Lectures and self-study
- Practical exercises

Literature

Lecturers' scripts with references to current literature

Textbook: Optoelectronics & Photonics: Principles & Practices (2nd Edition), S.O. Kasap, Pearson Education Limited

Assessment

Additional performance assessment during the semester

The module does not contain an additional performance assessment during the semester

Basic principle for exams

As a rule, all standard final exams are conducted in written form. For resit exams, lecturers will communicate the exam format (written/oral) together with the exam schedule.

Standard final exam for a module and written resit exam

Kind of exam

Written exam

Duration of exam

120 minutes

Permissible aids

Aids permitted as specified below:

Permissible electronic aids

none

Other permissible aids

Personal formulary: 4 A4 pages

Exception: In case of an electronic Moodle exam, adjustments to the permissible aids may occur. Lecturers will announce the final permissible aids prior to the exam session.

Special case: Resit exam as oral exam

Kind of exam

Oral exam

Duration of exam

30 minutes

Permissible aids

Aids permitted as specified below:

Permissible electronic aids

No electronic aids permitted

Other permissible aids

Personal formulary: 4 A4 pages