MICRO-605 Optical MEMS and micro-optics

Ataman Caglar				
Cursus	Sem.	Туре	Language of	English
Microsystems and Microelectronics		Opt.	teaching	Linglish
Photonics		Opt.	Credits	1
			Exam	Written
			Workload	30h
			Hours	14
			Lecture	14
			Number of positions	20

Frequency

Every 2 years

Remark

November 14th to 17th, 2023 (Microcity, Neuchatel)

Summary

Micro-optics and optical MEMS encompass a wide range of methods, devices and systems that enable precise, high-speed manipulation of light at the wavelength scale. MICRO605 provides a comprehensive insight into this field, covering topics from fundamentals to applications.

Content

1. Optics at the micro-scale: An introduction (0.5 hours)

- 2. Fundamental optical concepts (2.5 hours)
- 2.1. Gaussian beam propagation (0.5 hour)
- 2.2. Scalar diffraction theory (1 hour)
- 2.3. Interference and interferograms (1 hour)
- 3. Fundamental micro-electro-mechanical concepts (2 hours)
- 3.1. Actuation and position sensing (1 hour)
- 3.2. Modeling of dynamic behavior (1 hour)
- 4. Building blocks of micro-optics (4 hours)
- 4.1. Scanning and pointing micromirrors (1 hour)
- 4.2. Diffraction gratings (1 hour)
- 4.3. Diffractive and refractive microlenses (1 hour)
- 4.4. Optical micro-resonators (1 hour)

5. Applications (4 hours)

- 5.1. Projection displays (1 hour)
- 5.2. Medical imaging (1 hour)
- 5.3. Adaptive optics (1 hour)
- 5.4. Optical switching (1 hour)

6. Emerging topics: A look into the imminent future (1 hour) EXAM:

Written report on a design study

Learning Prerequisites

Recommended courses

Basic knowledge of physics and mathematics MICRO-621: Micro and Nanofabrication (MEMS) MICRO-606: Scaling in MEMS

Resources

Bibliography Micro-Optics: Elements, Systems and Applications, *edited by Hans Peter Herzig* Fundamentals of Micro-Optics, *by Hans Zappe* Optical MEMS, Nanophotonics, and Their Applications, *edited by Guangya Zhou & Chengkuo Lee* MOEMS: Micro-Opto-Electro-Mechanical Systems, *by Manouchehr E. Motamedi* Microsystem Design, *by Stephen Senturia* Fundamentals of Microfabrication, *by Marc Madou* Micro Electro Mechanical System Design, *by J. Allen* Analysis and Design Principles of MEMS Devices, *by Minhang Bao*

Références suggérées par la bibliothèque

- Micro Electro Mechanical System Design, by J. Allen
- Microsystem Design, by Stephen Senturia

Moodle Link

• https://go.epfl.ch/MICRO-605