

## t.AGO - Applied Optics

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**Person responsible for the course:** Ralf Markendorf, mklf

**Credits:** 4

**Valid for:** 2010/2011

**Last saved:** 08.09.2010 09:17

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### Learning objectives:

Students learn and acquire the principles of geometrical and Gaussian beam optics, guided light waves, light switching and interaction of light and matter that are technologically important in integrated optics, fiber optics, optical measurement engineering and sensor technology. They gather experience in evaluating optical parameters and their impact when implementing optical entities in the range of sensors, optical analytics and fibers.

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### Course content:

Wave optics: wave function, types of waves, Huygens-Fresnel's principle, simplest superpositions of waves, ARC, HR-Spiegel, wave properties of laser light

Geometrical optics: Optical images from lenses, lense equation, ABCD-matrices

Interference: two-wave interference, Michelson- and Mach-Zehnder-Interferometer, multiple-wave interference, Fabry-Perot-Interferometer, temporal coherence

Diffraction: diffraction at a single slit, circular aperture, diffraction grating, gratings in spectroscopy and holography, wave propagation in free space, far field, resolution of optical instruments

Laser: Quantum nature of light, spontaneous and stimulated emission, 4-level-laser

Optical wave guides, laser diodes: Principles of light guidance, mode equation, material-, wave guide- and modal dispersion, fiber-parameters, bandwidth-length-product, setup and characteristics of laser diodes

Laboratory in 3 areas:

- a) Optical biosensors and measurement engineering
  - b) Properties of optical fibers, sources of coherent light, fiber sensors
  - c) Materials processing with lasers
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### Previous knowledge:

Physics and Mathematics taught during the first term

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### Teaching method:

Type of lesson:	Number of lessons per week:
Lecture	8*3
Tutorial/Practicum	exercise couses: 8*1, lab: 6*4
Group teaching	
Block instruction	
Seminar	

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**Assessment:**

According to the table or as specified in writing by the lecture at the beginning of the semester!

Number	Type	Weighting
1	End of term exam	
3	Exam during the semester	
1	Further assessments	

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**Language of instruction:**

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**Instruction material:**

- Lecture notes - Collection of problems and solutions - laboratory documents

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**Comments:**

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