Course syllabus for

Optics 1, 10.5 credits

Optik 1, 10.5 hp
This course syllabus is valid from autumn 2023.
Please note that the course syllabus is available in the following versions:
Autumn2019 , Spring2021 , Autumn2022 , Autumn2023

Course code	1OP065
Course name	Optics 1
Credits	10.5 credits
Form of Education	Higher Education, study regulation 2007
Main field of study	Optometry
Level	G1 - First cycle 1
Grading scale	Pass with distinction, Pass, Fail
Department	Department of Clinical Neuroscience
Decided by	Utbildningsnämnden CNS
Decision date	2019-04-10
Revised by	Education committee CNS
Last revision	2023-03-22
Course syllabus valid from	Autumn 2023

Specific entry requirements

Matematik 2a, 2b eller 2c, Naturkunskap 2.

Objectives

The course intends to give basic knowledge of geometric refraction and paraxial reproduction in optical systems , as well as phenomena and fields in the optics connected to the wave nature, that is necessary for continued optician education and profession.

On completion of the course, the student should be able to

- account for and use the concept of image in an optical system
- solve optical problems related to paraxial reproduction, lateral magnification and visual fields in systems of spherical lenses and surfaces.
- use simple eye models
- account for spherical refractive errors of the eye and the concept of far point and make simple calculations of optical correction based on the correction principle
- describe and analyse imaging properties of a compound optical system by means of a major plane

- evaluate visual instruments and visual aid based on the concepts angular magnification and visual field
- account for function and calculate optical characteristics of various basic optical instruments
- account for basic wave concepts and the relevance of the wave length of light to the eye's experience of colour
- explain the meaning of various wave length dependent characteristics of materials
- account to and apply the concepts of polarisation, interference and diffraction in situations that are relevant to the eye and the visual system.

Content

The course is divided in the following three modules:

Basic optics, 4.5 hp

Grading scale: GU

Ray notion, real and virtual images. Specular and diffuse reflection, laws of reflection, Absorption and scattering, laws of refraction, total internal reflection, paraxial approximation, imaging in flat surfaces and thin prisms, imaging in spherical surface, reduced eye model, thin lenses, ray tracing, intermediate images, Toric and cylindrical surfaces, astigmatic imaging. The eye's refractive error and the correction principle.

Continuation basic optics, 5.0 hp

Grading scale: VU

Concept of principal planes, thick lenses, lens system. Aperture stop, field stop, field of view, vignetting, numerical aperture, aperture number. Angle magnification, loupe, microscope, telescope, binoculars. Wave concept and light sources. Dispersion, selective absorption and reflection, color. Polarization. Coherence, interference, thin film interference and antireflection.

Laboratory, 1.0 hp

Grading scale: GU

Laboratory assignments in optics.

Teaching methods

The teaching is given in the form of lectures interleaved with calculation exercises and assisted problem solving where the theoretical knowledge is illustrated and practiced individually through calculation examples. The course also comprises laboratory assignments that aim at an increased understanding of the optics through practical assignments.

Examination

The course is examined separately for each module.

Module 1, Basic Optics is assessed through written examination. Grading scale: Fail/Pass
The module is given the same grade as the written examination.

Module 2, Optics Continuation is assessed through written examination. Grading scale: Fail/Pass/Pass with distinction
The module is given the same grade as the written examination.

Module 3, Laboratory sessions is assessed through passed laboratory assignments. Grading scale for

each assignment: Fail/Pass
For a Pass grade in module 3, the grade Pass is required on all laboratory assignments.

Course grade
For a Pass grade on the entire course, the grade Pass is required on all modules.
For the grade Pass with distinction on the entire course, the grade Pass is required on module 1 and 3, and Pass with distinction is required on module 2.

Possibility of exception from the course syllabus' regulations on examination
If there are special grounds, or a need for adaptation for a student with a disability, the examiner may decide to deviate from the syllabus's regulations on the examination form, the number of examination opportunities, the possibility of supplementation or exemptions from the compulsory section/s of the course etc. Content and learning outcomes as well as the level of expected knowledge, skills and attitudes may not be changed, removed or reduced.

Transitional provisions

If the course is cancelled or undertakes major revisions, you will find information on transition rules under this heading.

Other directives

Course evaluation takes place according to guidelines established by Karolinska Institutet. Compilation of the students' answers in course questionnaires and the course coordinator's analysis of these are published on KI's public course web.

The course is given in cooperation with the department of Applied physics, section of Biomedical physics and X-ray physics at the Royal Institute of Technology (KTH). The course may be given in parallel with the course *Basic Optometry 1 and Research Methodology*.

Some teaching may be in English.

Literature and other teaching aids

Mandatory literature

Unsbo, Peter
Kurskompendium i geometrisk och fysikalisk optik
Institutionen för tillämpad fysik, KTH, 2020

Recommended literature

Freeman, Michael Harold
Optics
Hull, C. C.; Charman, W. N.
11. ed. : Oxford : Butterworth-Heinemann, 2003 - 563 s.
ISBN:0-7506-4248-3 LIBRIS-ID:8917891
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