Course syllabus for

Optics 1, 10.5 credits

Optik 1, 10.5 hp
This course syllabus is valid from autumn 2019.
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	Fail (U), pass (G) or pass with distinction (VG)
Department	Department of Clinical Neuroscience
Decided by	Education committee CNS
Decision date	2019-04-10
Course syllabus valid from	Autumn 2019

Specific entry requirements

Natural sciences 2 (can be certified by Biology 1, Physics 1a / Physics 1b1 + 1b2, Chemistry 1), Mathematics 2a / 2b / 2c. Or: Natural Sciences B (can be certified by Biology A, Physics A, Chemistry A), Mathematics B.

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 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.

Laboratory sessions are compulsory.

The examiner assesses if, and how, absence from compulsory parts can be compensated. Study results cannot be reported until the student has participated in compulsory course elements or compensated for any absence in accordance with instructions from the examiner. Absence from a mandatory education element could mean that the student can not do the part until the next time the course is offered.

Examination

The module Basic Optics is assessed through written examination.
Grading scale: Pass/fail

The module Optics Continuation is assessed through written examination.
Grading scale: Fail/Pass/Pass with distinction

The module Laboratory sessions is assessed through attendance and passed laboratory assignments.
Grading scale: Pass/fail

For a Pass grade in the whole course, the grade Pass is required on all modules.
For the grade Pass with distinction in the whole course, the grade Pass on the module Basic Optics and the module Laboratory sessions is required, as well as Pass with distinction on the module Optics Continuation.

Limitation of number of tests or practical training sessions
Student who do not pass the regular examination are entitled to re-sit the examination at five more occasions. If the student has carried out six failed examinations no additional examination will be given. As examination, the times are counted when the student has participated in the same test. Submission of blank exam is counted as examination.
Examination to which the student registered, but not participated, be counted not as 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 closed down or undergoes major changes, students who have not completed the course are given the possibility, during four semesters from the date when the student first registered in the course, to be examined under the then current syllabus After four semesters, the student is examined under the new syllabus.

Other directives

Course evaluation takes place according to guidelines established by Karolinska Institutet.

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

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
Library search