



**Karolinska  
Institutet**

Course syllabus for

## **Optimal Image Quality, 6 credits**

Avbildningskvalité, 6 hp

This course syllabus is valid from spring 2013.

Course code	1OP055
Course name	Optimal Image Quality
Credits	6 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	Programnämnd 8
Decision date	2012-05-08
Revised by	Education committee CNS
Last revision	2020-04-01
Course syllabus valid from	Spring 2013

## **Objectives**

The course aims at providing enhanced knowledge in geometric and physical optics, especially imaging errors in optical systems and optical image quality needed for further optician education and professional work.

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

- account for aberrations in symmetric optical systems
- assess reasonable demands on F-numbers and visual field of simple optical systems
- use simple radiation calculation programs to analyse a given optical system
- interpret and use information about image quality on the basis of the concepts of point spreading function and MTF
- choose and calculate appropriate photometric units to determine levels of light in technical lighting systems and imaging systems
- account for the usability and properties of achromatic double lenses
- use eye models with several surfaces
- account for the spherical and cylindrical refractive errors of the eye and the concept of far point, and carry out calculations of spherical and astigmatic correction based on the correction principle.
- account opportunities and constraints of diffractive optics.

## **Content**

The course is divided in two (2) parts:

## **Optical image quality, 5.0 hp**

Grading scale: VU

A part of the course is devoted to level raising teaching in the parts treated in the courses Geometrical optics, and Physical optics, where the problem identifying and problem solving capacity is raised. New parts: Monochromatic and chromatic aberrations, ray tracing, toric and cylindrical lenses, astigmatic imaging, aspherical surfaces. Image quality measures, PSF and MTF, optical design. Node points, the eye as an optical system, eye models. Diffractive optical elements, lattices and holograms.

## **Lab experiments, 1.0 hp**

Grading scale: GU

Practical laboratory experiments and computer simulations in optical imaging quality.

## **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 sessions that aim to an increased understanding of the optics through both practical assignments and computer simulations.

## **Examination**

The part Optical image quality of the course is examined through a written examination. The grading scale Fail/Pass/Pass with distinction. The part Lab experiments is examined based on active participation in practical laboratory sessions and reporting of completed computer simulations in the form of a submitted laboratory report. Grading system Fail/Pass.

A Pass grade in the part Optical image quality and in the part Laboratory sessions, render a Pass grade in the entire course. A Pass with distinction in the part Optical image quality, and a Pass in the part Lab experiments, render a Pass with distinction in the entire course.

Compulsory attendance at practical laboratory sessions. In case of absence, measures are discussed with the course director.

Criteria for the evaluation of the parts of the course are stated in a separate document.

Students who have not passed the regular examination are entitled to participate in five more examinations. If the student has failed six examinations/tests, no additional examination or new admission is provided. The number of times that the student has participated in one and the same examination is regarded as an examination session. Submission of a blank examination is regarded as an examination. An examination for which the student registered but not participated in, will not be counted as an examination.

## **Transitional provisions**

The course has been cancelled and was offered for the last time in the spring semester of 2019. Last examination according to this syllabus will be provided in the fall semester of 2021 for students who have not completed the course.

## **Other directives**

Course evaluation will be carried out in accordance with the guidelines established by the Board of Education.

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 teaching language is Swedish but parts of the course may be given in English.

## Literature and other teaching aids

*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](#)