



FSK3374 Visual Optics 7.5 credits

Visuell optik

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for FSK3374 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Registered as PhD-student

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The overall goal of this course is to give the student a fundamental understanding of the optics of the eye and its clinical aspects, with emphasize on the visual function. The course also covers how the optical parameters of the eye can be measured.

After completing this course, the student should be able to:

- Chose and apply different optical approximations to evaluate the quality of the image on the retina for different states of ametropia, levels of accommodation, pupil sizes, objects and visual aids.
- Predict and evaluate the effect of monocular and binocular visual quality from different measures of ocular image quality, including both higher order aberrations and paraxial optical effects.
- Explain the optical principles and functions of instruments commonly found in an optometrist practice, as well as evaluate their limitations regarding accuracy and measurement errors.

Course contents

Fundamental principles of paraxial imaging in the eye; sign convention and cardinal points. Schematic eyes; their axes and optical parameters. Purkinje images. Optical and neural limitations to visual acuity, contrast sensitivity, and depth of field. Refractive errors; distance correction, prescription, astigmatic decomposition, classification and population distribution. Quality of the image on the retina and uncorrected vision in spherical ametropia and astigmatism. Amblyopia. Axial and refractive anisometropia. Aniseikonia. Accommodation, presbyopia, near and far point with and without correction, including effectivity. Convergence and accommodation. Ocular aberrations, scattering, and diffraction, as well as their effect on image quality, visual acuity and depth of field. Aberrometers and wavefront aberrations. Subsidiary optical effects of spectacles. After-images and the Troxler effect. Ocular movements and torsion. Binocular vision, stereopsis, heterophoria and heterotropia. Subjective refraction. Measurement principles and function of instruments; subjective and objective optometers, slitlamp, ophthalmoscope, retinoscope, keratometer, corneal topographer. Techniques for screening and autorefractors. Visual phenomena caused by the pigmentation, polarizing properties, and varying transmission of the eye.

Disposition

Written exercises and oral presentations at seminars. The students read the course literature and prepare presentations and exercises individually. All students and the examiner then meet and discuss during for the oral presentations.

Course literature

R. B. Rabbetts, Bennett and Rabbett's Clinical Visual Optics, 4th edition, Butterworth-Heinemann, 2007.

Newest edition should be used. Is completed with research articles.

Examination

- RED1 - Presentation, 5.0 credits, grading scale: P, F

- INL1 - Exam tasks, 2.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

Approved answers to all written exercises. Presents the course content orally in a coherent way and takes active part in the seminars through discussion on the content of own and others presentations in relation to current research in visual optics.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.