SK2300 HT20-1 Optical Physics

Course activities

Here you find the complete schedule with the lecture contents, the chapters you should read from Hecht, 'Optics', the exercises and the labs. Please note that this schedule will be updated during the course.

Labs

The lab groups you find in this document. If you have not yet signed up for a lab group, you can sign up by writing an email to Marijn Versteegh (verst@kth.se). If you want to switch lab occassions with another lab group, feel free to do so, as long as you make sure that you do all five labs. Please send an email to Marijn Versteegh in case of schedule changes. If you cannot do a lab because you are ill or showing Covid-19 symptoms , write an email to your lab teachers (Marijn Versteegh (verst@kth.se) and Stephan Steinhauer (ssteinh@kth.se)) and you will get the opportunity to do the lab at a later time. Please note: Labs start at 8:00 or 13:00, not 8:15 or 13:15.

Please prepare for the labs by reading the lab instructions, which you find here:

Microscope

Polarisation

Michelson

Fourier

Quantum entanglement

During each lab each student group should write a lab report, which you hand in and discuss with your lab teacher at the end of the lab. Upon successful completion of all 5 labs you earn 2.0 ECTS. The remaining 4.0 ECTS you get by passing the written exam.

All labs, except ‘Optical microscope’, are in Albanova. Meet your lab teacher at the Albanova main entrance on the fifth floor. The lab ‘Optical microscope’ is not in Albanova, but in the yellow building at Roslagstullsbacken 33, rooms 012:004, 012:005, 012:024 and 012:025.

Measures to prevent spreading of the coronavirus

The teaching activities for this course will be mainly on campus. In order to prevent spreading of the coronavirus, the following measures are taken:

1. If you have fever, or are coughing or sneezing, or have a sore throat, please stay home. We will provide lecture notes, and opportunities for asking questions, so that you can catch up if you miss a lecture.

2. Please wash your hands frequently and thoroughly.

3. Please keep 2 meter distance to other students and to the teachers. The lecture rooms are large enough so that everyone can sit at 2 meter distance from others.

4. Labs will not be done in groups of 3 students, as in previous years, but in groups of 2 students. All labs will be in separate rooms. Please keep distance also during the labs.

5. If you cannot do a lab because you are ill (for example fever, coughing, sneezing, or a sore throat), write an email to your lab teachers (verst@kth.se and ssteinh@kth.se) and you will get the opportunity to do the lab at a later time.

6. If you are unable to attend a large number of course activities on campus due to the coronavirus (for example because you are ill, or belong to a risk group, or because you are unable to travel to Sweden), contact the course responsibles and we will look for a solution.

Course contents

Electromagnetic fields, propagation in vacuum and matter, polarization, interference, thin film optics, optical instruments and metrology, diffraction, Fourier optics, holography, coherence, quantum optics, labs.

Intended learning outcomes

After completing the course the student should be able to:

1) Explain optical phenomena and solve technical problems related to optical technology applications

2) Build and use optical setups to analyze optical phenomena

Course responsibles

Marijn Versteegh (verst@kth.se) and Val Zwiller (zwiller@kth.se)

Specific prerequisites

For external students the following are required: 120 credits within natural sciences and engineering or corresponding knowledge and documented proficiency in English B or corresponding knowledge.

Recommended previous knowledge:
Basic knowledge within classical physics, particularly waves and elementary classical optics (course SK1101, Classical Physics or corresponding), mathematics (vector analysis, Fourier transformation).

Literature

"Optics", by Eugene Hecht, 5th edition, Pearson Education. ISBN: 978-1-292-09693-4.

It is recommended that you purchase the book in printed form, because you are allowed to have it with you at the exam.

Schedule

The schedule can be found in the Course and programme directoryLinks to an external site.. Note however that the schedule will be changed as a result of corona measures. Please check the schedules therefore for changes.

Files

Under 'files' you find lecture notes, problems and solutions, the lab schedule, lab instructions and old exams.

Examination and completion

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

Grading scale: A, B, C, D, E, FX, F

Examination:

- LAB1 - Laboratory Work, 2.0 credits, Grading scale: P, F
- TEN1 - Examination, 4.0 credits, Grading scale: A, B, C, D, E, FX, 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.

Allowed at the written exam: Books, simple calculator or graphing calculator, any handwritten or printed notes.

Forbidden at the written exam: Communication devices, computers.

Grading criteria:

For the written exam:

E: The student demonstrates some knowledge of optical phenomena and is able to solve basic problems related to technological applications of optics.

D: The student demonstrates considerable knowledge of optical phenomena and is able to solve basic problems related to technological applications of optics.

C: The student demonstrates considerable knowledge of optical phenomena and is able to solve advanced problems related to technological applications of optics from some parts of the course.

B: The student demonstrates wide and deep knowledge of optical phenomena and is able to solve advanced problems related to technological applications of optics from several parts of the course.

A: The student demonstrates wide and deep knowledge of optical phenomena and is able to solve advanced problems related to technological applications of optics from all parts of the course.

F: The student does not meet the criteria for grade E.

Operational grading criteria:

The written exam consists of 6 questions. Answering all questions correctly gives 6 points. You need 2.6 points to pass. Grading scale: A 5.0-6.0; B 4.1-4.9; C 3.5-4.0; D 2.9-3.4; E 2.6-2.8; F 0.0-2.5.

For the lab work and reports:

P: The student group completed all lab tasks of all labs and handed in a report about each lab, which appropriately presents the results, analyses and conclusions from the labs, including answers to all questions from the instructions.

F: The student group does not meet the criteria for grade P or the student did not actively participate in the student group.

Examiner

Val Zwiller (zwiller@kth.se)

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.