Department of Physics

Stockholm University

Syllabus

for course at advanced level

Molecular Physics
Molekylfysik

7.5 Higher Education Credits
7.5 ECTS credits

Course code:	FK7066
Valid from:	Autumn 2018
Date of approval:	2018-01-15
Department	Department of Physics
Main field:	Physics
Specialisation:	A1N - Second cycle, has only first-cycle course/s as entry requirements

Decision

This course plan has been established by the Board of Science at Stockholm University on 2018-xx-xx.

Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to passed courses (excluding introductory courses) of 45 credits in mathematics and 60 credits in physics, where the courses Quantum Mechanics, 7.5 credits (FK5020), Atomic and Molecular Physics, 7.5 credits (FK5023) and Advanced Quantum Mechanics, 7.5 credits (FK5027) should be included.
Additionally, requires knowledge equivalent to upper secondary school English B/English 6.

Course structure

Examination code	Name	Higher Education Credits
BEGR	Concepts	6
EXPT	Experiment	1.5

Course content

The course starts with a description of how the concept of symmetry can be applied to describe the geometrical structure of molecules. The foundations of group theory are introduced, and then applied to describe molecular structure, electronic structure, the vibrational and rotation motion, as well as deriving selections rules for interaction with electromagnetic radiation. The experimental techniques used to study molecular properties are described. Examples from different areas of experimental molecular physics, such as ultra-fast laser spectroscopy, storage rings for ions, and X-ray and synchrotron based radiation, are used to illustrate the theoretical concepts.

Learning outcomes

It is expected that after taking the course the student will be able to:
Course unit BEGR, Concepts, 6 credits
• explain and apply the central concepts and theoretical models in molecular physics
• apply group theory to predict or explain properties of molecules and molecular-light interactions
• describe experimental methods to investigate molecular properties

Course unit EXPT, Experiment, 1.5 credits
• describe and perform spectroscopic methods to study molecular properties.

Education

The education consists of lectures and laboratory work. Participation in laboratory work and any associated integrated instruction is compulsory. In the event of special circumstances, the examiner may, after consultation with the teacher concerned, grant a student exemption from the obligation to participate in certain compulsory instruction.

The course will be given in English if requested by any student enrolled.

Forms of examination

a. The course is examined as follows: knowledge assessment takes the form of
part BEGR, Concepts: written exam and homework problems
part EXPT, Experiment: written reports.
If the instruction is in English, the examination may also be conducted in English.

b. Grades will be set according to a seven-point scale related to the learning objectives of the course:
A = Excellent
B= Very good
C = Good
D = Satisfactory
E = Adequate
Fx = Fail, some additional work required
F = Fail, much additional work required

The course unit EXPT will be graded according to a two-point scale: Pass (G) or Fail (U).

c. The grading criteria will be distributed at the beginning of the course.

d.In order to pass the course, students must receive a passing grade on all course units BEGR Concept and EXPT Experiment.

e. Students who receive a failing grade on a regular examination are allowed to retake the examination as long as the course is still provided. The number of examination opportunities is not limited. Other mandatory course elements are equated with examinations. A student who has received a passing grade on an examination may not retake the examination to attain a higher grade. A student who has failed the same examination twice is entitled to have another examiner appointed, unless there are special reasons to the contrary. Such requests should be made to the department board.
The course includes at least two examination opportunities per year when the course is given. At least one examination opportunity will be offered during a year when the course is not given.

f. Students awarded the grade Fx are given the opportunity to improve their grade to E. The examiner decides the supplementary assignments to be performed and the pass mark criteria. The supplementary assignments will take place before the next examination session.

Interim

Students may request that the examination be conducted in accordance with this course plan even after it has ceased to be valid. However, this may not take place more than three times over a two year period after course instruction has ended. Requests must be made to the departmental board. The provision also applies in the case of revisions to the course plan (and the revisions of the course literature).

Limitations

The course may not be included in examinations in combination with course Molecular Physics I, 7.5 credits (FK7012) or equivalent.

Misc

The course can be included as part of the master's programs offered at the Physics department, but is also offered as a separate course.

Required reading

The course literature is decided by the department board and published on the Department of Physics’s website at least two months before the start of the course.