



UNIVERSITY OF GOTHENBURG

FACULTY OF SCIENCE

FIM850, Liquid Crystals, 7,5 higher education credits

Liquid Crystals, 7.5 högskolepoäng

Second Cycle

1. Confirmation

The course syllabus was confirmed by Department of Physics on 2006-10-25 to be valid from 2007-09-01.

Field of education: Science 100 %

Department: Physics

2. Position in the educational system

The course FIM850 is a programme course in the Physics of Materials and Biological Systems programme, as well as a single subject course at the University of Gothenburg.

Main field of studies

Physics

Specialization

A1N, Second cycle, has only first-cycle course/s as entry requirements

3. Entry requirements

Basic courses in physics and/or condensed materials at the Bachelor level. Applicants must prove knowledge of English: TOEFL test result of at least 600 points (computerized 250 points, on Internet 100 points) or IELTS test result of at least 6.0, including at least 6.5 for the Writing. This requirement does not apply to students with a Bachelor degree from an English speaking university, or to students having passed English level B at Swedish/Nordic Upper Secondary School.

4. Course content

Liquid crystals are materials that exhibit phases at the boarder between the solid and the liquid phase, balancing between disorder and order and between high and low symmetry, responding to external fields and adapting to boundary conditions.

Liquid crystals are important components in the living systems and are used extensively today as electro-optically active media in the vast majority of displays incorporated in a variety of electronic devices, ranging from electronic watches, cellular phones and laptops to video projectors, space light modulators and large

area liquid crystal TV screens. Liquid Crystals made possible the revolutionary development of the Informational Technology during the last two decades.

Starting with the presentation of theoretical models of the liquid crystalline state of matter, the course proceeds through the description of different liquid crystalline phases and phase transitions towards more complex liquid crystalline systems such as liquid crystal composites and biomembranes, representing self-assembled liquid crystal systems. The role of the molecular structure as well as the effects of the molecular chirality in the appearance of different liquid crystalline phases and their physical properties will be enlightened. General theories describing the behaviour of liquid crystal materials subjected to external factors such as magnetic and electric fields, light, temperature, etc. will be presented.

The course will also be dealing with the basic physics of liquid crystal/surface interactions, playing a vital role in all device applications of liquid crystals. A general overview of LCDs and advanced liquid crystal devices for photonics as well as basic information about their performance and manufacturing will be given.

5. Learning outcomes

After having taken *Liquid crystals* the students should:

- have a broad knowledge in the physics of liquid crystals and their applications in displays and photonic devices as well as highlighting their importance of liquid crystals for living systems.
- achieved a deeper understanding of some important liquid crystal effects and phenomena and their device applications. Among the selected ones are the optical and electro-optical effects, alignment of liquid crystals by solid surfaces, temperature and light- induced effects, spontaneous and induced polarization, etc.

6. Literature

See separate literature list.

7. Assessment

Presentation of required reading material and participation in tutor-lead discussions. Individual literature study project that is presented both in written and oral form. The final grade for the course is obtained when all compulsory parts of the course have been approved.

Students that have failed the course twice has the possibility of asking for another examiner. Such a request must be registered to the relevant institution.

8. Grading scale

The grading scale comprises Fail (U), Pass (G), Pass with Distinction (VG).

9. Course evaluation

The evaluation of the course is done by the teacher and students together during and after the course.

10. Additional information

Language of instruction: English.

One day visit to LC Tec, the only producer of LCDs in Sweden, and Swedish LCD Center, LCD institute, both situated in Borlänge, is planned to take place during the course period.

The Masters Programme in *Physics of Materials and Biological Systems* is given in collaboration with the Physics Departments at Chalmers University.