



# FSI3225 Superfluids 7.5 credits

## Supravätskor

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

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

## Establishment

Course syllabus for FSI3225 valid from Spring 2019

## Grading scale

P, F

## Education cycle

Third cycle

## Specific prerequisites

Enrolled as PhD student.

Knowledge in:

- Quantum mechanics
- Statistical physics
- Condensed matter physics

## Language of instruction

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

## Intended learning outcomes

- Acquire active knowledge of theoretical tools needed in the modern theory of superconductivity and superfluidity
- Acquire historic perspective of this subject
- Learn different complementary approaches, ranging from phenomenological to microscopic
- Bring PhD student to the research forefront of the subject
- Enable student to apply advanced techniques in condensed matter physics to current research problems

## Course contents

Modern theoretical tools that are needed in order to perform research on suprafluids and superconductors. The course is based on a forthcoming book by Svistunov, Babaev, Prokof'ev "Superfluid states of matter".

## Disposition

Reading course

- Superfluidity from a classical field theory perspective
- Superfluidity at finite temperature
- Hydrodynamics
- KT phase transition
- Superfluid phase transitions and dualities.
- Superconducting systems
- Multicomponent systems
- London and Ginsburg
- Landau models
- Type 1 and 2 superconductivity
- Vortices in a superconductor
- Multicomponent systems
- Quantum field theory perspective
- BCS theory
- Path integrals methods
- Supersolids and insulators
- Disorder in Superfluid. Harris criterion
- Dynamics of vortices and phonons
- Weakly interacting Bose gas

- BEC
- History of the subject

## Course literature

- Svistunov, Babaev, Prokof'ev: "Superfluid states of matter" (forthcoming book)

## Examination

- TEN1 - Oral exam, 7.5 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.

- Solving homework problems
- Oral exam

## 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.