



# FIL3014 Microscale 3D Patterning Techniques 7.5 credits

3D-mönstertekniker i mikroskala

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

## Establishment

Course syllabus for FIL3014 valid from Autumn 2020

## Grading scale

P, F

## Education cycle

Third cycle

## Specific prerequisites

Enrolled as a doctoral student.

## Language of instruction

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

## Intended learning outcomes

After the course, the students should be able to:

1. Describe the working principles, equipment, applicability, and sustainability aspects of all the microscale 3D patterning techniques introduced in the course.
2. Propose a research project that employs at least one of the 3D patterning techniques and has potential to contribute to at least one of the UN Sustainable Development Goals (SDGs).
3. Formulate the concrete plan for a research project relevant to the 3D patterning techniques with the consideration of sustainability.
4. Identify and assess the technical feasibility, and environmental, social or economic advantages and disadvantages of the employment of the 3D patterning techniques in a relevant research project.

## Course contents

The course covers the theory, working principle and applicability of the following patterning techniques:

1. Lithography-based patterning (Soft lithography, Through-Silicon Via (TSV), Grayscale lithography),
2. 3D replication (Direct laser interference patterning, Pulsed-Nanoimprint lithography),
3. 3D additive/subtractive fabrication (Electrohydrodynamic inkjet printing, Laser Nanoprinting, Laser Nanoscribe, femtosecond laser micromachining, 3D printing),
4. 3D Origami and Self-assembly (Laser origami, Focused Electron Beams, Self-assembly of nanoparticles),
5. Thermal scanning probe lithography (Oxidation scanning probe lithography, NanoFrazor Lithography).

The following relevant topics are also included:

- Advanced materials for 3D patterning (2D materials, nanoparticles, polymers, etc.),
- Sustainability of the 3D patterning techniques.

## Examination

- EXA1 - Written examination, 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.

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

## Other requirements for final grade

The course will be assessed with a Pass/Fail grade, based on the completion of the homework assignments and a scientifically sound research plan and corresponding written report. In

addition to this, a passing student must attend the final workshop and at least 5 (out of 7) lectures.

## **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.