**Master’s Theses in Nanoelectronics**

The nanoelectronics group at the department of Electrical and Information Technology (EIT) is offering three different master projects. If you are a highly motivated student interested in a project in a very exciting and active field of research please contact Lars-Erik Wernersson at lars-erik.wernersson@eit.lth.se. You will be supervised by an experienced researcher but you are still expected to be able to work at a high level of independency.

**mm-Wave Pulse Generators**

We have developed unique high frequency pulse generators, operating in the millimetre wave (mmW) spectrum, 30-300 GHz. The technology is based on resonant tunnel diodes (RTDs), which have wideband negative differential conductance due to physical quantum effects. Switching the RTDs on and off with high-speed III-V transistors, we have so far been able to study short wavelets with center frequencies within the mmW spectrum. These wideband pulses may, e.g., be used for Gbit/s wireless communicaion, material spectroscopy, and high resolution radar.

We are looking for students interested in one or several of the following topics:
1) process and measurement optimisation
2) device and circuit modelling
3) applied measurements utilising mm-wave pulses.

Suitable background: electronics/physics

**Block Co-Polymer Self Assembly for Nanowire Seed Definition**

In a newly started project, we target the development of a scalable process that combines directed self-assembly of block co-polymers with other lithographic techniques to produce arrays of densely packed gold nanoparticles. The nanoparticles will be used for growth of III-V nanowires and, successively, fabrication of vertical III-V nanowire FETs. This process would be a low cost and high through-put alternative to the electron beam process currently used, and would enable scaling of nanowire diameter and inter-nanowire spacing in order to improved device performance.

The diploma project would comprise of process development in the Lund Nano Lab with three main goals; controlled microphase separation of a thin film block co-polymer; lift-off process using block co-polymers; combination of directed self-assembly with other lithographic techniques such as UV lithography, electron beam lithography or nano imprint.

Suitable background: physics/chemistry

**Antireflection Patterning for InAsSb Nanowire Infrared Photodetectors**

We are fabricating photodetectors for the LWIR band (8-14 µm) using InAsSb nanowires grown on Si substrates. The detectors are backside illuminated with the Si acting as a transparent window for IR radiation. However, the abrupt change in index of refraction (n) at the air/Si interface results in large reflection losses. This problem can be overcome by grading n from that of air to that of Si using an antireflective coating or through patterning of the backside surface.

In this project you will pattern Si using wet and/or dry etching techniques to obtain high transmission measured using an Fourier transform infrared spectrometer in collaboration with nmC at LU. A comparison between the efficiency of etched structures and tapered nanowires is also highly desirable. If successful, these structures will be implemented in a nanowire photodetector.

Suitable background: physics