

Facilities for student projects at LTU

LTU Space Campus in Kiruna possesses a number of facilities that are available for students that wish to conduct projects on their own. This can take place either in the framework of the REXUS/BEXUS program (<http://www.rexusbexus.net/>) or as a project course for either 7.5 or 15 ECTS. For students at LTU taking part in REXUS/BEXUS, the Swedish National Space Board offers financial support of up to 30 000 SEK (<http://www.snsb.se/sv/Mediebank/Undervisning/Aktiviteter/Rexus-Bexus/>) while for a project course, 2500 SEK are available from the university for each student. In both cases, the money is managed by the university and students request their tutor to procure parts.

For student projects, the university provides one project room, an electronics lab as well as a mechanical workshop.

The project room can be used for work that does not necessitate special equipment and as a storage space. Students can request access to those rooms after which they can enter at any time, also on weekends and holidays.

The electronics laboratory provides all basic equipment as well as a number of standard components.



Electronics laboratory

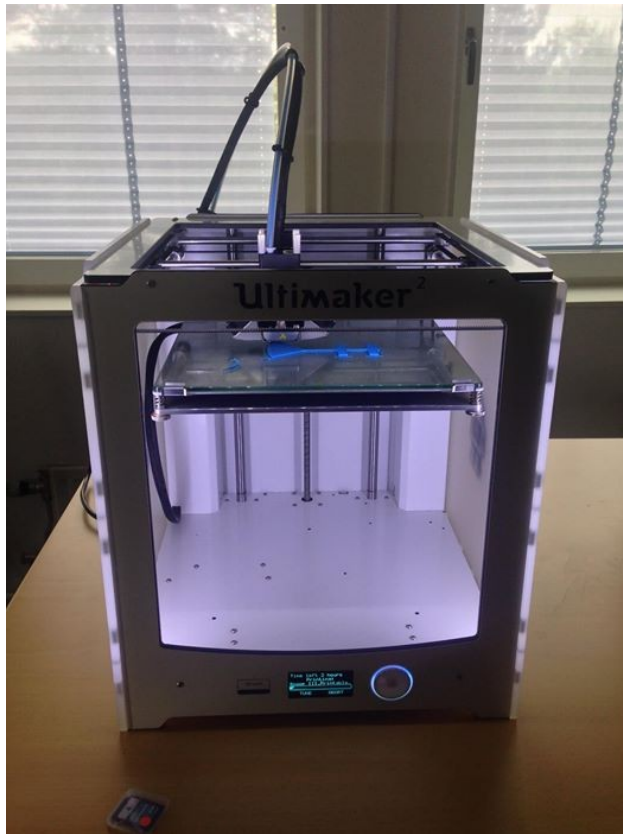
The mechanical workshop is equipped with all basic tools for assembly as well as drills, thread cutters etc. The most common screws and nuts are available. If more sophisticated tools are required, the IRF workshop can in some cases be used for those parts for which manufacturing in the student workshop is not possible. It should be noted that students cannot access the IRF workshop alone, but only together with LTU staff. Note also that IRF

projects always have priority on the use of the machines and students should check at an early stage if the possibility of manufacturing there exists.

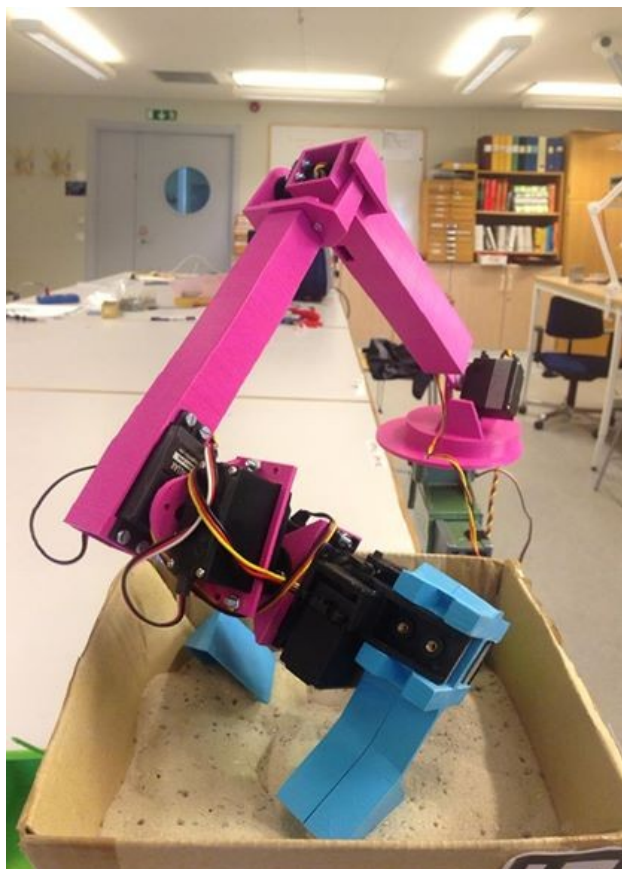


Mechanical workshop

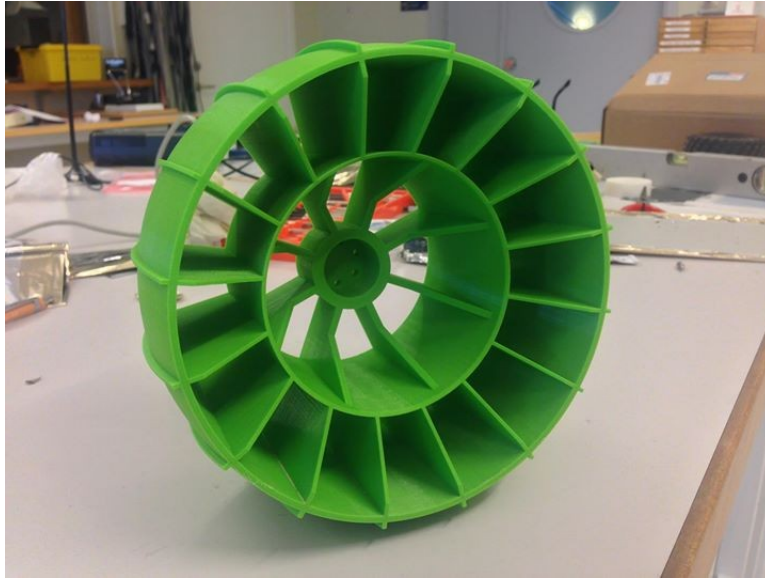
The university has an Ultimaker 2 for 3D printing. Students provide LTU staff with an stl or gcode file (export from Cura) as the printer room is not directly accessible by students. However, if announced beforehand, 3D printing is almost always possible within a short notice. The printer prints PLA and ABS and has a printing volume of 230 x 225 x 205 mm. As shown in the pictures, good surface quality is achieved and even load carrying parts have been made and used successfully.



3D printer

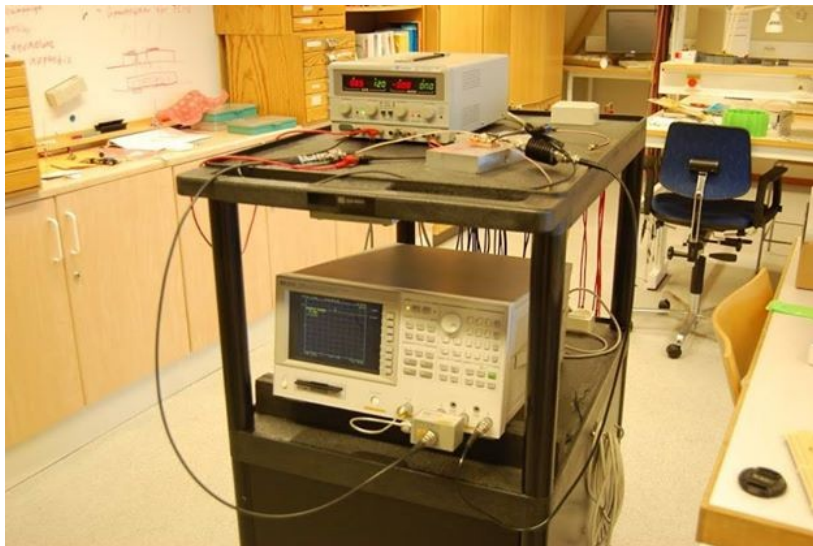


3D printed robotic arm



3D printed wheel

The university has an Agilent 4395A combined network-, spectrum- and impedance analyzer. This instrument enables students who are working on projects and labs to evaluate their designs. Therefore many projects including high-frequency signals can be conducted without the need to use external measurement facilities. The instrument can always be used, but only under the supervision of LTU staff.

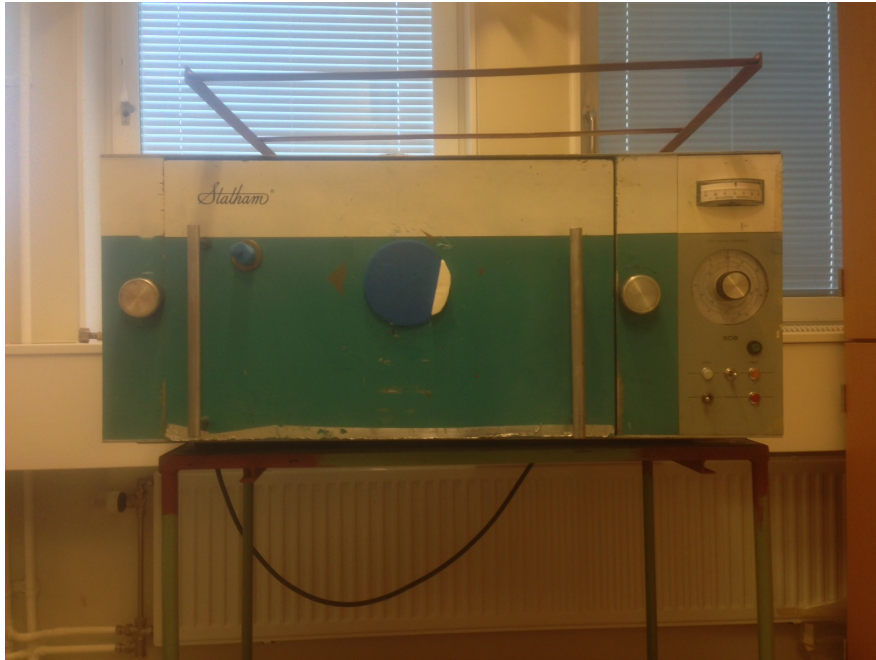


Spectrum analyzer

A thermal chamber is available to test a systems response to changes in the temperature environment, for example during balloon flights.

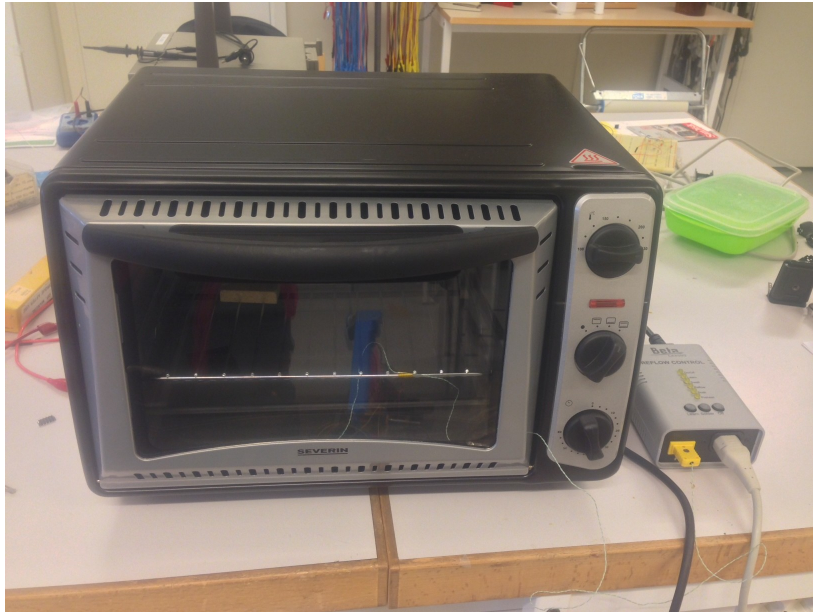
Note that although thermal vacuum chambers are available at IRF, the can NOT be used for verification of student experiments. Although this was possible in the past, there has recently been raise in the cleanliness requirements standards for ESA payloads.

Therefore, the use of this equipment is not permitted for student projects because of contamination of the chambers. Possibilities of vacuum testing exist at Estring. Students are advised to contact LTU staff to check if this can be an option.



Thermal Chamber

When building complex electronics for student projects and experiments, the usage of reflow-soldering is often necessary. This enables the usage of modern electronic devices with high-density, small pitched leads. To facilitate the usage of reflow-soldering techniques, there is a small, pizza-oven sized reflow-oven available. This can be controlled either manually or with a reflow temperature controller to achieve good soldering results where hand soldering is not an option.



Reflow oven

On the roof of the LTU campus in Kiruna, there are the antennas of the amateur radio satellite ground station. The ground station is remotely controllable and is able to receive signals in the VHF and UHF band. These signals are typically sent to Earth by amateur radio relays satellites, CubeSats or other experimental satellites.



Ground station