

The Swedish National Graduate School of Space Technology is intended for graduate students in space sciences who are enrolled in all Swedish universities and university colleges. The Swedish National Graduate School of Space Technology was established in 2001 at the decision of the Swedish government.

Luleå University of Technology, in close cooperation with Umeå University and IRF, the Swedish Institute of Space Physics, has the chief responsibility for running the graduate school.

OUR RESEARCH FIELDS

ELECTRONICS

instrument design for planetary studies

PHYSICS

astrophysics, development of instruments, meteors and dust, optics/automation, space plasma physics, relativity theory/plasma physics, space weather

IT

analysis of satellite data, simulation of processes in the Northern Lights

COMMUNICATION TECHNOLOGY

antenna design for satellite navigation

MATERIALS SCIENCE

materials for space applications, ceramic lasers

ENVIRONMENT

atmospheric physics, ozone and charged aerosols in the atmosphere

HUMANS AND LIVING CONDITIONS IN SPACE

simulated residence on Mars

SPACE VEHICLE TECHNOLOGY

design of vehicles for long missions in space



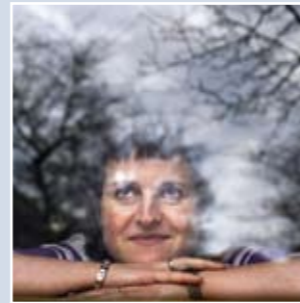
GRADUATE SCHOOL



FACTS

- graduate school studies comprise 20 credits
- 29 doctoral students from five different universities (Luleå, Lund, Stockholm, Umeå, Chalmers) and from IRF are enrolled in the graduate school
- joint projects and networking among doctoral students, researchers and representatives from the space industry are a priority
- space researchers from IRF, Luleå University of Technology and Umeå University are responsible for teaching, curriculum planning, workshops, seminars, project guidance, etc.
- most of the programme is offered as residential courses held at the Luleå University of Technology, Department of Space Studies in Kiruna.

Europe invests in space



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- Kiruna is Europe's space capital. Via IRF, graduate students have access to a worldwide network. To be able to study here and to work with researchers from IRF and Umeå University is a great advantage.

- Today, Europe is investing in space. In the future, we can expect more launches from European countries. EU's interest in space will have an impact on the labour market and the Swedish space industry. This not only applies to big corporations like SAAB, Ericsson and Volvo Aero, but to smaller suppliers as well.

- At Luleå University of Technology we are proud that the government has given us a mandate to lead this graduate school and to contribute to developing Swedish space research and education. It is thrilling to be part of the European space effort."

We welcome you.

Marta-Lena Antti
Director, Swedish National Graduate School of Space Technology
Luleå University of Technology



L The northernmost University of Technology in Scandinavia
Top-class Research and Education

The Swedish National Graduate School of Space Technology



A unique environment for space researchers



Sweden's space capital, Kiruna, is the base for the country's only graduate school of space technology. This international and creative environment, in which many of the major Swedish and international space players are gathered, offers graduate students unique possibilities for conducting high-level space research.

The ideal location for Sweden's only graduate school of space technology



Kiruna is the space capital of Sweden. Here, at the Luleå University of Technology, Department of Space Studies, alongside major space-industry players such as the Swedish Institute of Space Physics (IRF) and the Swedish Space Corporation (SSC) Esrange launch site, is Sweden's only state-funded graduate school of space technology.

For those with a passion for research and space, the Swedish National Graduate School of Space Technology offers:

- a unique high-tech environment with major international space industry players
- exciting joint interdisciplinary projects
- the advantages of a unique geographic location for space studies

The National Graduate School of Space Technology attracts young space researchers from universities throughout Sweden. The collective expertise of researchers from Luleå University of Technology, Umeå University and IRF, the Institute of Space Physics, gives graduate students access to a very broad base of knowledge in space sciences.

Most of the graduate school's courses are given at the department in Kiruna. The concentration of researchers, companies and international space-industry players such as ESA, NASA, IRF, SSC and others, together with Kiruna's geographic location at the fringe of the so-called polar vortex, has given rise to the kind of creative atmosphere that makes new discoveries possible..

Forward Mars!

ELLA CARLSSON

Doctoral student at the National Graduate School of Space Technology, the Department of Physics, Luleå University of Technology, has been a crew member on two simulated expeditions to Mars.

"I think it's great that the graduate school arranges joint courses for all of us who do space research. You get to meet everyone, as well as having the opportunity to cooperate on different projects. The graduate studies director is super and always offers good advice and suggestions, which is very reassuring."



FIELD OF RESEARCH:

Planetology with a focus on Mars

Using data from ESA satellite Mars Express, Ella analyses ravines that may provide evidence of the existence of water, and possibly life, on Mars. She studies the effect of solar wind on the atmosphere of Mars to determine the degree of atmospheric erosion. Her research findings indicate that much of the erosion is probably caused by major meteorite impacts, not the solar wind.

Evidence to indicate the presence of water and possibly microscopic life on Mars is mounting. Among other things, researchers have discovered the remnants of a coastline, salt layers, frozen water in the form of permafrost and methane and formaldehyde, gases that may be the product of inner thermal activity or are organic in origin – evidence of life.

How does one train in space?



MARCUS VON EULER
Doctoral student at the National Graduate School for Space Technology, Department of Architecture and Built Environment, Lund Institute of Technology

"A combination of the abstract and the concrete makes the research projects conducted by doctoral students at the grad school both fun and exciting."

FIELD OF RESEARCH:

Architectural Life Support Systems

Marcus's research, which is being conducted in collaboration with NASA, concerns the study and modelling of how extreme physical environments, e.g., space capsules, should best be designed to meet the psychological and social needs of crew members. Six months is now considered the maximum residence time in space. However, researchers are attempting to push this limit farther. A trip to Mars can be expected to take more than two years, which places a whole new set of demands on the living environment in the capsule. Issues that have to be dealt with include, for example, physical training under conditions of weightlessness, the individual crew members' needs for privacy, the risk of exposure to radiation, and dietary concerns. Poor nutrition, resulting from a uniform diet of freeze-dried foods, is a problem facing today's space travellers.

Burial with a satellite-controlled shooting star



LARS-GÖRAN WESTERBERG
Doctoral student at the National Graduate School of Space Technology, Department of Applied Physics and Mechanical Engineering, Luleå University of Technology

"The network is great, it's exciting to meet space researchers from all over Sweden, and the courses are interesting – these are the big advantages of the grad school. In one of the courses, we're working on a project to develop future space burials. The ashes of the deceased are sent into space and the family decides the date for when the ashes will be ceremoniously returned to Earth – followed by a beautiful shooting star."

FIELD OF RESEARCH:

Space plasma physics

When the solar wind collides with the magnetic field, openings can occur where the solar wind flows into the magnetosphere, giving rise to various atmospheric phenomena, e.g. the Northern Lights. The process is called magnetic reconnection. Lars-Göran investigates how magnetic reconnection influences the solar wind when it penetrates the outermost layer of the magnetic field. Research in magnetic reconnection can be applied in many different areas, one of which is space weather. In the USA, considerable resources are invested in the study of space weather and how it can destroy satellite-borne equipment, disrupt the operation of power stations, cause interference in radio traffic, etc.



IRF - member of the international space community

IRF, the Swedish Institute of Space Physics, is a partner in the National Graduate School of Space Technology. Since the 1950s IRF has been a major contributor to international space research

efforts. Students of the graduate school have access to IRF's research expertise and to valuable contacts with leading international space industry players, e. g. ESA, NASA, the Japanese space research institute ISAS, Chinese CSSAR and the Swedish Space Corporation.

Currently, IRF is participating in several large international joint projects:

- Cluster - ESA project, studies of the magnetosphere
- Mars Express - ESA project, studies of Mars
- Rosetta - ESA project, studies of comets
- Venus Express - ESA project, studies of Venus
- Chandrayaan - Indian project, satellite studies of the Moon

IRF conducts basic research, graduate studies and associated observatory activities in space physics, space technology and atmospheric physics. IRF's small-satellite programme, the results of which have included the creation of the nanosatellite Munin, is the only one of its kind in Europe.

IRF develops advanced measurement instruments for space probes, satellites and other equipment. One example is the particle instrument ASPERA, which has been used onboard ESA's space probes Mars Express and Venus Express. Measurements in the atmosphere, the ionosphere and the magnetosphere and around other planets are an important part of the institute's operations and provide a basis for international and national space research.