Geoinformation has a vital role in the modern society. Accurate maps and 3D models have become increasingly important for personal navigation, autonomous driving, space technology, urban and environmental planning, and maintenance of built environments, as well as for health, safety and security. Spatial data allow numerous applications from visualization to advanced data analysis. Spatio-temporal data analysis provides an understanding of what has happened or even what will happen in our environment. With the methods of geoinformatics, it is possible to detect and understand the behaviour of people or natural phenomena. In addition, spatial data are needed for optimizing tasks, such as finding optimal locations of mobile phone base stations. Geoinformatics is especially multidisciplinary because it usually includes co-operation with people from different fields.

In Finland, the Master’s Programme in Geoinformatics provides the highest education on geoinformatics covering 3D data acquisition methods, processing of large spatial data sets, analysis of data, data assimilation, and presentation of spatial information. Our programme is unique in Finland offering technically and mathematically oriented approach to geoinformatics.

A dynamic world

Human interactions and natural phenomena constantly change our world. Many everyday activities rely on up-to-date maps or 3D models. This in turn creates markets for repeatedly measuring and monitoring our environment. In addition, spatial data analyses support better decision-making and efficient planning processes. All this leads to a constant increase in the need for spatial information experts.

Geoinformatics provides solutions

Geoinformatics provides tools for solving complex spatial problems or for modelling spatio-temporal phenomena. This fascinating discipline utilizes high-tech instruments, applied mathematics, advanced algorithms, and programming as well as applications of artificial intelligence. Data are collected by space-borne and air-borne platforms as well as from terrestrial perspectives.

In our Master’s Programme, we give a solid foundation of all aspects of geoinformatics. In addition, it is possible to deepen knowledge on one or more sub-areas of geoinformatics.

Alternative study paths for getting admitted to the Master’s programme in Geoinformatics are illustrated in the figure below.
Enhance your skills in geoinformatics

Our students have varying backgrounds. Many of the students have a Bachelor’s degree or a degree from a university of applied sciences in surveying sciences, or from a related field. Studies in surveying are, however, not essential if you are enthusiastic about geoinformatics. A good mathematical background and basic programming skills ensure success in the studies.

We have carefully planned high-quality courses that build a strong foundation for students to create a successful career in geoinformatics. The main processes and algorithms are taught both in theory and in practice. Our Master’s Programme is internationally competitive and includes all sub-parts of geoinformatics, namely geodesy, geoinformation technologies, photogrammetry, laser scanning, and remote sensing. Students learn more than only core substance, but also get skills in group work, project management, programming, scientific writing, and many other skills that are needed in working life.

Our research group is very active. Ongoing projects keep teaching up-to-date and gives opportunities for doctoral studies.

Find a job

Geoinformatics engineers are needed in many large and small companies as well as municipalities, cities, international organizations (e.g. United Nations, European Space Agency), and mapping agencies. In addition, to get academic positions in universities and research centres it is encouraged to take part in doctoral studies.

Typical titles for our graduates are geoinformatics engineer, survey manager, development director, spatial data consultant or analyst, application manager, researcher, or city geodesist, just to name few.

International atmosphere

The courses of the Master’s Programme in Geoinformatics in the Aalto University School of Engineering are all given in English. In addition, support services are also available in English. Each student will get a personal Academic Advisor who will discuss studying and give guidance through the Master’s Programme.

Welcome to study geoinformatics in our Master’s Programme!

Major studies, common (30 cr)
Obligatory courses (5 cr each)
• From Measurements to Maps
• Geodesy and Positioning
• Introduction to Spatial Methods
• Photogrammetry, Laser Scanning and Remote Sensing
• Spatial Analytics
• Theories and Techniques in GIS

Major studies, elective (30 cr)
Students select 30 cr courses (5 cr each)
• Advanced Laser Scanning
• Advanced Photogrammetry
• Advanced Remote Sensing
• Digital Image Processing and Feature Extraction
• Spatial Data Science for Sustainable Development
• GIS Development
• Advanced Geodesy
• Project Course (10 cr)

Elective studies (30 cr)

Master’s thesis (30 cr)

http://www.aalto.fi/geoinformatics
Geodesy investigates everything that is on or near the Earth's surface. It aims to determine the size and form of the Earth, providing a primary georeference for navigation and localization. Geodesy also studies the gravity field of the Earth, as well as changes in sea level and movements of the Earth's crust. When tracking moving objects in real time, positioning and guiding them, we speak of (technological) navigation.

What skills will our students learn?

Students learn how to build geodetic networks covering a building site, a municipality, a nation or the whole Earth, supporting a range of precise mapping, positioning and navigation technologies that are currently in use or being planned. They learn to understand and use satellite positioning using global navigation satellite systems and their ground-based support infrastructures. They learn how to operate geodetic instruments, how to process measurements, and how to bring locally obtained measurements into a common reference frame at the national or global level.

Students learn to understand how the Earth moves in space, how the planet lives, with plate tectonics, glacial isostatic adjustment and sea-level rise, and how geodesy serves the study of all this. Students also learn how modern positioning and navigation techniques can be implemented to serve our technological society, on the roads, on the sea and in the air, and even underground and indoors.

Career prospects?

For many years the field of geodesy has had negative unemployment figures. This will only get worse as satellite positioning, indoor navigation and other location technologies proliferate throughout society. Massive volumes of spatial information, like cadastral and zoning maps and data associated with infra-structural and community development projects, pre-exist in traditional reference frames, and these must be moved forward to remain usable with the modern reference frames of satellite positioning. Geodetic knowledge is essential in getting this right and avoiding costly errors.

Major employers include public service providers like the Finnish National Land Survey, the Finnish Environment Institute, and the Finnish Transport Agency, municipalities, construction companies, and commercial operators running, i.e., base station networks for satellite positioning, mobile mapping and road construction machine guidance.

The need of efficient 3D data acquisition methods is increas-
Geoinformation Technology

spatial programming and software development. The knowledge offered in Geoinformation technology courses makes the student into a real geoinformatics engineer instead of a GIS user.

What skills will our students learn?

Courses give a solid basis to understand diverse methods in spatial analysis, even analysis of big spatial data. The students learn methods, but also how the methods are implemented and what mathematical and computational methods and algorithms they are based on. The student also teaches him/herself to implement new methods by programming.

GIS software architectures and databases make another important field of geoinformation technology. Not only programming an algorithm but also implementing larger information systems requires knowledge on standardized interfaces and representation formats.

The third but not the least important part of GI technology is visual representation of geoinformation for maps and for interactive analysis processes called visual analytics.

Career prospects?

Geoinformation technology offers at least three main sectors to specialize: spatial analytics, software development and visualization. When you know what sectors attracts you most, you can easily see the career possibilities: as a spatial data analyst, GIS software engineer or even a cartographer or GI visualist.

The job offers vary from GIS marketing and use to researcher focusing on methods development. You will be hired either by a big governmental organisation or by a small private company among computer science, mapping or any other sector of business of public actor. Every point on Earth will be viewed from space with a spatial resolution better than 1km every single minute by the year 2020. To make the most

Remote Sensing

of this technological revolution, we must invest in the knowledge of handling and interpreting the massive data flow. The rapid expansion of the remote sensing sector, or Earth observation, urgently calls for experts who have sophisticated skills in processing and interpreting the data collected through new satellite missions.

What skills will our students learn?

Our remote sensing courses introduce students to the fascinating world of Earth observation. To begin with, students will become acquainted with the physical basics and theories of remote sensing. They will also learn how we can use satellite images to monitor the global environment, and what current and upcoming satellite missions are like. In addition, they will get hands-on experience in analyzing satellite data and collecting ground reference measurements using a spectrometer.

Career prospects?

A remote sensing expert has many career opportunities. You can work in national environmental agencies or major international organizations such as the United Nations or European Space Agency. Alternatively, you can opt for a business career and set up your own startup for a new remote sensing application, or go work in, for example, a forestry company to monitor industrial forests. Many remote sensing experts also decide to pursue doctoral studies and are employed in research institutes or universities.