

# Earth Observation

## Basic information of the minor

**Code:** ENG3054

**Extent:** 25 cr

**Language:** English

**Teacher in charge:** Miina Rautiainen

**Target Group:** The minor is open to all master's level students at Aalto University.

**Application procedure:** None

**Quotas and restrictions:** No quotas. The minor is targeted only for master's level students.

**Prerequisites:** In preparing their study plan, the students are required to check that they fulfil the prerequisites for each course i.e. to take the courses in the right order.

## Content and structure of the minor.

Earth observation (EO), or the gathering of information about our planet's physical, chemical and biological systems through the analysis electromagnetic data recorded by spaceborne and airborne instruments, is a rapidly growing discipline. Most environmental issues require global data sets which are only available through satellite instruments. The international expansion of the Earth observation sector urgently calls for engineers who have an understanding of both the design of remote sensing missions and instruments as well as sophisticated skills for interpreting the data collected through the missions. Currently, nearly all university programs in Earth observation in the world focus either on instrumentation or data interpretation, but do not provide a holistic view of both. The minor will bring together Aalto students interested in different aspects of Earth observation and will enable building a cross-disciplinary community within our university. The overall aim is to train Earth observation professionals who are competent in all levels of the chain, from satellite mission engineers to users of remote sensing data in environmental management and decision-making bodies.

### Learning outcomes:

The minor focuses on the design of satellite systems and instruments, and the preprocessing and interpretation of satellite remote sensing data. Upon completion of the minor, the student will be familiar with the entire chain of Earth observation, so that he/she

- can formulate the basic physical principles governing the processes in Earth observation in different wavelength domains,
- has a deep understanding of how satellite missions are planned and what are key properties of remote sensing instruments,
- is able to apply versatile methods to preprocess and interpret imaging spectroscopy, multispectral and microwave data and products,
- understands spatial aspects in Earth observation data analysis, and
- is familiar with the future trends and upcoming missions in Earth observation.

The minor will be 25 ECTS and comprises five courses from the list below. Only courses which are not compulsory in the student's MSc program can be included in the minor.

Further information is available from Professor Miina Rautiainen ([miina.rautiainen@aalto.fi](mailto:miina.rautiainen@aalto.fi)).

## Structure of the minor

Code	Name	Credits	
courses			
For students who are <i>not</i> in the Geoinformatics MSc program, at least two courses from the following list:			
<a href="#">GIS-E1020</a>	From measurements to maps	5	I
<a href="#">GIS-E1030</a>	Introduction to spatial methods	5	I
<a href="#">GIS-E1040</a>	Photogrammetry, laser scanning and remote sensing	5	II
courses			
For students in the Geoinformatics MSc program, select four to five courses from the list below. For other students, two or three courses from the list below.			
<a href="#">GIS-E3020</a>	Digital image processing and feature extraction	5	III

GIS-E3050	Advanced remote sensing	5	V
ELEC-E4940	Special Assignment in Space Science and Technology	5-10	I - V (Academic Year)
ELEC-E4210	Introduction to space	5	III - IV
ELEC-E4510	Earth observation	5	III - IV
ELEC-E4240	Satellite systems	5	I - V - V
ELEC-E4230	Microwave Earth Observation instrumentation	5	I - II