



## Degree Program in Brief

### Duration of Study/Credits

4 semesters/120 credits, full-time program

### Degree Type

Master of Science (M. Sc.)

### Start of Course

Winter semester (October)

### Language

English

### Admission Requirements

- Bachelor's degree (or higher) in engineering or natural sciences (e.g. Aerospace, Mechanical, Electrical, Communication Engineering, Informatics, Geodesy, Mathematics, Physics)
- English Language Certificate for non-native speakers
- Curriculum vitae
- Motivation letter
- Self-written scientific essay

### Location

Courses given at Downtown Campus in Munich and at Garching Campus.

### Costs per Semester

No tuition fee. Detailed information:  
[www.tum.de/en/studies/fees-and-financial-aid/](http://www.tum.de/en/studies/fees-and-financial-aid/)

### Further Information

[www.espace-tum.de](http://www.espace-tum.de)

## Contact

### Technical University of Munich

Department of Aerospace and Geodesy  
Willy-Messerschmitt-Str. 1  
82024 Taufkirchen/Ottobrunn

### General Questions about Studying at TUM

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### Program-specific Questions

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## Master of Science

Department of Aerospace and Geodesy

## Earth Oriented Space Science and Technology (ESPACE)



## Objectives

Observing global change processes from space is of mutual interest of science and society. Global satellite navigation systems (e.g. GPS, GALILEO) and Earth observation satellite missions, such as the European Sentinel missions, represent the fundament for monitoring the complex Earth system from space. Researchers in Earth sciences like hydrology, oceanography, meteorology, geophysics, atmosphere and climate sciences as well as national agencies and companies depend on up-to-date satellite data.

Design, development and data analysis of satellite missions require professionals with in-depth knowledge in spacecraft design and orbit mechanics in conjunction with expertise in Earth system science, remote sensing, navigation, and satellite applications.

From an educational point of view, this diversity is a challenge. Classical university programs usually cover parts of this spectrum in different disciplines. These are aerospace engineering, electrical engineering or geodesy - just to mention a few. However, there is important information at the interfaces between these fields that urgently require knowledge transfer.

Therefore, several institutions in the Munich 'space valley' combine their expertise and contribute to a graduate program with the aim of educating Satellite Application Engineers. The resulting multidisciplinary Master's program Earth Oriented Space Science and Technology (ESPACE) combines space technologies with its applications. It bridges the gap between disciplines, and makes it a unique Master's Program, which runs successfully since 2005."

## Requirements

To enjoy the program and to succeed, your interests and qualities should meet the following:

- Eager to become an expert working at the interface between space technology and satellite applications
- Enjoy working in international teams and interdisciplinary projects

## Degree Program Structure

1st semester	<ul style="list-style-type: none"> <li>▪ Applied Computer Science</li> <li>▪ Introduction to Earth System Science</li> <li>▪ Introduction to Photogrammetry, Remote Sensing and Digital Image Processing</li> <li>▪ Introduction to Satellite Navigation and Orbit Mechanics</li> <li>▪ Numerical Modeling</li> <li>▪ Signal Processing and Microwave Remote Sensing</li> </ul>
2nd semester	<ul style="list-style-type: none"> <li>▪ Applied Earth Observation</li> <li>▪ Estimation Theory and Machine Learning</li> <li>▪ Ground and Space Segment Control</li> <li>▪ Satellite Navigation and Advanced Orbit Mechanics</li> <li>▪ Scientific Working in Earth Oriented Space Science and Technology</li> <li>▪ Spacecraft Technology 1</li> </ul>
3rd semester	<ul style="list-style-type: none"> <li>▪ Compulsory: Spacecraft Technology 2</li> </ul> <p>Specialization 1 - Earth System Science from Space:</p> <ul style="list-style-type: none"> <li>▪ Atmosphere and Ocean</li> <li>▪ Earth Observation Satellites</li> <li>▪ Geokinematics and Continental Hydrology</li> </ul> <p>Specialization 2 - Remote Sensing:</p> <ul style="list-style-type: none"> <li>▪ Geoinformation</li> <li>▪ Photogrammetry - Selected Chapters</li> <li>▪ Remote Sensing</li> </ul> <p>Specialization 3 - Navigation:</p> <ul style="list-style-type: none"> <li>▪ Advanced Aspects of Navigation Technology</li> <li>▪ Navigation Labs</li> <li>▪ Precise GNSS</li> </ul>
4th semester	<ul style="list-style-type: none"> <li>▪ Master's Thesis</li> </ul>

The program is complemented by electives to be chosen among courses offered by TUM or affiliated universities. These electives cover at least 30% of the program in the 3<sup>rd</sup> semester.

## Distinctive Features of the Program

- Experienced researchers from Technical University of Munich, Ludwig-Maximilian-Universität München, University of Federal Armed Forces, German Geodetic Research Institute and German Aerospace Center and guest lecturers from industry are directly involved in ESPACE.
- Limited number of students enables close contact to teachers
- Specialization in the third semester in either Earth System Science, Remote Sensing or Navigation
- Opportunity to participate in a Double Degree Program with Wuhan University in China.
- Leading positions of TUM regularly in national and international university rankings
- Great job perspectives for high-level positions

## Career Profile

ESPACE graduates can be best described as satellite application engineers working or doing PhD studies in national space agencies, space industry, research institutions, or universities. The scope of their work may include:

- Studies on global change for modelling geophysical processes in the Earth system, e.g. in the fields of climate research, water cycle and geodynamics.
- Analysis of remote sensing data for Earth system monitoring, e.g. to provide essential information on security, disaster and environmental issues to the public.
- Accurate positioning by means of satellite navigation systems, e.g. for localization of vehicles and location based services.