Degree Program M.Sc. Aerospace
- How to study -

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Departments at the TUM School of Engineering and Design

Aerospace & Geodesy
Architecture
Civil and Environmental Engineering
Energy and Process Engineering

Engineering Physics and Computation
Mechanical Engineering
Mobility Systems Engineering
Materials Engineering
# Dept. of Aerospace & Geodesy: Chairs and professorships

## Aeronautics

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Chair</th>
<th>Professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerodynamics of Air- and Spacecraft</td>
<td>eAviation</td>
<td>Prof. Sophie Armanini</td>
</tr>
<tr>
<td>Aerospace Structure Design</td>
<td>Flight System Dynamics</td>
<td>Prof. Florian Holzapfel</td>
</tr>
<tr>
<td>Aircraft Design</td>
<td>Rotorcraft and Powered Lift Vehicles</td>
<td>Prof. Ilkay Yavrucuk</td>
</tr>
<tr>
<td>Autonomous Aerial Systems</td>
<td>Sustainable Future Mobility</td>
<td>Prof. Agnes Jocher</td>
</tr>
<tr>
<td>Carbon Composites</td>
<td>Turbomachinery and Flight Propulsion</td>
<td>Prof. Volker Gümmer</td>
</tr>
</tbody>
</table>

## Space

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Chair</th>
<th>Professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astronautics</td>
<td>Human Spaceflight Technology</td>
<td>Prof. Ulrich Walter</td>
</tr>
<tr>
<td>Human Spaceflight Technology</td>
<td>Prof. Gisela Detrell</td>
<td></td>
</tr>
<tr>
<td>Lunar and Planetary Exploration Technologies</td>
<td>Prof. Philipp Reiß</td>
<td></td>
</tr>
<tr>
<td>Pico and Nano Satellites, and Satellite Constellations</td>
<td>Prof. Allessandro Golkar</td>
<td></td>
</tr>
<tr>
<td>Space Propulsion</td>
<td>Prof. Chiara Manfletti</td>
<td></td>
</tr>
</tbody>
</table>

## Geodesy

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Chair</th>
<th>Professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astronomical and Physical Geodesy</td>
<td>Engineering Geodesy</td>
<td>Prof. Christoph Holst</td>
</tr>
<tr>
<td>Big Geospatial Data Management</td>
<td>Geodetic Geodynamics</td>
<td>Prof. Florian Seitz</td>
</tr>
<tr>
<td>Cartography and Visual Analytics</td>
<td>Geoinformatics</td>
<td>Prof. Thomas Kolbe</td>
</tr>
<tr>
<td>Communication and Navigation</td>
<td>Land Management</td>
<td>Prof. Walter de Vries</td>
</tr>
<tr>
<td>Data Science in Earth Observation</td>
<td>Photogrammetry and Remote Sensing</td>
<td>N.N.</td>
</tr>
<tr>
<td>Earth System Modelling</td>
<td>Remote Sensing Technology</td>
<td>N.N.</td>
</tr>
<tr>
<td>Satellite Geodesy</td>
<td>Prof. Urs Hugentobler</td>
<td></td>
</tr>
</tbody>
</table>
Structure of the programme

- 2-year (= 4 semesters) full-time study programme
- 120 credits to successfully complete the programme
- The following figure shows the number of credits allocated to each subject area of the program:

- No fixed curriculum: Students are able (and required!) to devise their individual study plan
- For more information and the course catalogue, see: https://wiki.tum.de/x/vwl0N
## Curriculum (example)

Possible arrangement of modules over four semesters \(\textbf{\textit{not obligatory}}\):

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>ECTS</th>
<th>Semester 2</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Module 1</td>
<td>5</td>
<td>Master Module 4</td>
<td>5</td>
</tr>
<tr>
<td>Master Module 2</td>
<td>6</td>
<td>Master Module 5</td>
<td>5</td>
</tr>
<tr>
<td>Master Module 3</td>
<td>7</td>
<td>Master Module 6</td>
<td>5</td>
</tr>
<tr>
<td>Research Internship</td>
<td>11</td>
<td>Master Module 7</td>
<td>5</td>
</tr>
<tr>
<td>Practical Course 1</td>
<td>4</td>
<td>Practical Course 2</td>
<td>4</td>
</tr>
<tr>
<td>Supplementary Course 1</td>
<td>3</td>
<td>Supplementary Course 2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 3</th>
<th>ECTS</th>
<th>Semester 4</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Module 8</td>
<td>5</td>
<td>Master's Thesis</td>
<td>30</td>
</tr>
<tr>
<td>Master Module 9</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master Module 10</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master Module 11</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master Module 12</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementary Course 3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Competencies</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Master of Science
Choose from seven subject areas:

**Core columns (electives)**

1. **Total systems** (e.g. design of an aircraft, spacecraft or helicopter…)
2. **Propulsion systems** (e.g. motor, flight power unit and gas turbine, space craft power unit…)
3. **Fluid dynamics/aerodynamics** (aerodynamics of aircraft, aeroelastics, aeroacoustics)
4. **Structure** (e.g. finite elements, design and construction of composite structures…)
5. **Dynamics and control technology** (e.g. helicopter flight physics, orbit and flight mechanics…)

**Additional competencies (electives)**

6. **Course-specific modules** (individual aerospace engineering profile)
7. **Flexibilization in engineering sciences** (modules from other TUM departments, e.g. physics, management…)
2. Supplementary Courses

- From aerospace and other TUM engineering and natural science disciplines
- Sharpening of your individual profiles
- Insight into research trends and professional fields for aerospace engineers
- Choose from a large module catalogue, including
  - Aircraft Systems
  - Near Earth Objects (NEOs)
  - Occupational and Industrial Safety
  - Automotive Software - Methods and Technology
  - Future Air Mobility. What's next for aviation?
  - Flow Physics and Similarity Laws
  - Artificial Intelligence and Machine Learning Trends in Robotics
  - …
3. Lab Courses (practical courses)

- Introduction to practical methods in engineering
- Projects in small groups
- Choose from a large module catalogue, including
  - Embedded Systems and Robots
  - Flight Test Techniques
  - Future Transportation
  - Biosensors and Bioelectronics
  - High Speed Combustion Engines
  - Thermal Space Simulation
  - Satellite Navigation Laboratory
  - …
4. Research Practice (Forschungspraxis)

Choose 1 from

- **LRG0002 Term project:**
  - Independent writing of a paper on an engineering problem
  - Individual support by supervisor

- **LRG0003 Team project:**
  - Working on a single project within a larger project on which several students are working
  - Supervision of the team by examiner

- **LRG0004 Practical Research course (NB: not an industrial internship!):**
  - Written documentation about an engineering problem in the form of a report or a scientific poster and presentation of the results

More information: [https://wiki.tum.de/x/ywl0N](https://wiki.tum.de/x/ywl0N)
5. Key Competences

- Choose from a large number of courses: Soft skills, foreign language courses etc.

- Note: language courses must deal with languages that are **not** among your native languages

For more information:

- Center of Key Competences: [https://wiki.tum.de/x/7gm_QQ](https://wiki.tum.de/x/7gm_QQ)
- Munich Center for Technology in Society/WTG@MCTS: [https://www.cvl-a.mcts.tum.de/english-speaking-seminars/](https://www.cvl-a.mcts.tum.de/english-speaking-seminars/)
- TUM Language Center: [https://www.sprachenzentrum.tum.de/en/sprachenzentrum/languages/](https://www.sprachenzentrum.tum.de/en/sprachenzentrum/languages/)
Areas and credits

<table>
<thead>
<tr>
<th>Master modules</th>
<th>Credits: 60 in total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core columns 1 - 5</td>
<td>At least 25 credits (5 credits per column)</td>
</tr>
<tr>
<td></td>
<td>At most 60 credits</td>
</tr>
<tr>
<td>Column 6: Domain-specific modules</td>
<td>0 to at most 35 credits</td>
</tr>
<tr>
<td>Column 7: Flexibilization in engineering sciences</td>
<td>0 to at most 15 credits</td>
</tr>
</tbody>
</table>

Rule 1: You must pass 1 module from core columns (1) to (6) within your first two semesters

Rule 2: You must pass 1 module from each of the core columns (1) to (5) until the end of your studies
Areas and credits cont’d

<table>
<thead>
<tr>
<th>Area</th>
<th>Credits in total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab courses</td>
<td>8 credits</td>
</tr>
<tr>
<td>Supplementary courses</td>
<td>9 credits</td>
</tr>
<tr>
<td>Key competences</td>
<td>2 credits</td>
</tr>
<tr>
<td>Research practice</td>
<td>11 credits</td>
</tr>
</tbody>
</table>

There are cases when you can have more than the total number of credits per area:

Example supplementary courses:
(I) Module A (3 credits) + module B (3 credits) + module C (5 credits) = 11 credits = **OK**, because module C is needed to achieve at least 9 credits

(II) Module A (3 credits) + module B (3 credits) + module C (3 credits) + module D (3 credits) = 12 credits = **not OK**, because module D is not needed to achieve at least 9 credits
6. Master‘s Thesis

- written scientific paper, to be completed within **6 months**
- Oral presentation (no grade)
- Recommended: **last examination** of study program
- Note: Prior admission is possible when you have obtained **at least 80 credits**

→ **30 credits**
Master‘s Thesis cont‘d

Important:

• Enrolled at TUM throughout work on thesis

• No semester on leave possible during work on thesis

• Deadline for submission extendable for at most 3 months (with application)

• In case of illness: deadline will be extended for duration of illness (with application)

→ Applications must be handed in at the board of examiners before deadline of submission is reached

→ In case of illness you need to submit a medical statement by a doctor

Send documents to: examination.asg@ed.tum.de
Master‘s Thesis cont‘d

<table>
<thead>
<tr>
<th>Thesis supervisor</th>
<th>Profs from Engineering &amp; Design Departments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aerospace &amp; Geodesy</td>
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<td>Materials Engineering</td>
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Any professor from another TUM School or Department who is giving courses in Master module columns (1) to (6) is also eligible as supervisor

- Just talk to one of our professors or other lecturers where you wish to write your thesis with
- Sometimes professors have topics for theses ready at hand. You are free to suggest your own topics, though
Master‘s Thesis cont‘d

• Admission, submission and extension of deadline for submission:

  See programme‘s wiki:
  https://wiki.tum.de/pages/viewpage.action?pageId=875823811#Studierende/StudentsM.Sc.AS-Abschlussarbeit

• You can (and should) always contact the examination office when you have questions:

  examination.asg@ed.tum.de
Overall grade

• Weighted grade average including
  - Master modules 60 credits
  - Research practice 11 credits
  - Supplementary courses 9 credits
  - Lab courses 8 credits
  - Master's thesis 30 credits

• Weighing according to the number of credits of graded modules

• Key competences have to be passed, but do not count towards final grade
Registration for exams

- Registration for exams by yourselves via your curriculum support in TUMonline

- During registration the exam can be assigned to subject areas of the program

- Registration periods:
  - Summer semester 2023: 22 May 2023 – 30 June 2023
  - Winter semester 2023/24: 20 November 2023 – 15 January 2024

See also, including guide for TUMonline: https://wiki.tum.de/x/wwl0N
Examination regulations

• Cancellation of an exam registration:
  - Cancellation by yourselves via TUMonline
  - If there are any problems with the registration process → ask at examination office (examination.asg@ed.tum.de)

→ Please de-register from an exam that you do not wish to attend

• Withdrawal from exam (on day of the exam):
  - only possible for valid reasons for which you are not responsible (e.g. illness, accident etc.)
  - with application and submission of medical certificate at examinations office
  - More information and application form:
    https://wiki.tum.de/pages/viewpage.action?pageId=875823811#Studierende/StudentsM.Sc.AS-Pr%C3%BCfungsr%C3%BCcktritt
Academic Progress Check (*Studienfortschrittskontrolle*)

- Monitors your academic progress per semester (§ 10 General Academic and Examination Regulations of TUM)

- The following minimum of credits is due

  At the end of 3rd semester  
  At the end of 4th semester  
  At the end of 5th semester  
  At the end of 6th semester  
  30 credits  
  60 credits  
  90 credits  
  120 credits

- **NB:** If you gain less than the above-specified number of credits per semester you will fail your studies and will not be able to graduate
Auflagen – Additional requirements

- Students can be admitted to the program on the condition that they pass additional tests in order to prove their competencies in certain basic engineering subjects.

- Tests have to be passed within your first year of studies. Otherwise, you will get exmatriculated and cannot finish your degree at TUM.

Auflagen tests include:
- LRG0220 Fundamentals of mathematics
- LRG0221 Engineering mechanics 1 + 2
- LRG0222 Engineering mechanics 3
- LRG 0223 Fundamentals of materials science
- LRG0224 Basic course thermodynamics
- LRG0225 Basic course fluid mechanics
- LRG0226 Basic course automatic control
- LRG0227 CAD/Construction and machine elements

→ these tests are not modules, hence there are no lectures.
Auflagen – Additional requirements cont‘d

• Tests are held together with tests for aptitude assessment
• Failed tests can be repeated once within first year of studies

• Dates for tests:
  - winter semester 2023/24: March 2024
  - summer semester 2023: 17 and 18 August 2023

• Those of you who have been assigned Auflagen tests will be informed about registering for these in due course

• More information, including dates for tests, mock exams and levels of expectation:

  https://wiki.tum.de/x/ZqI0N
Double Degree Program

With ISAE SUPAERO in Toulouse - École Nationale Supérieure de l'Aéronautique et de l'Espace
https://www.isae-supraero.fr/en/

Two tracks:

• **M.Sc. Aerospace Engineering**
  2 semesters at TUM, 2 semesters at ISAE
  language of instruction: English

• **Ingénieur ISAE-SUPAERO** (Diplôme d'Ingénieur)
  2 semesters at TUM, 4 semesters at ISAE
  language of instruction: French
Double Degree Program cont’d

Requirements:

• Good/very good Bachelor’s degree – 2.5 or better
• Good/very good command of English – level B2 or better
• For Ingénieur ISAE: Good/very good command of French – level B2 or better
• First year of M.Sc. AS completed prior to stay abroad

Financing:
• Erasmus+: Approx. EUR 300/month

Application deadline: mid-December – mid-January for beginning in following winter semester at ISAE

For more information about application process and requirements, see: [https://wiki.tum.de/x/9wSONw](https://wiki.tum.de/x/9wSONw)
Examination Office – Board of Examiners

Secretary to the board of examiners / programme coordinator M.Sc. Aerospace

Daniel Hartenstein, M.A.
Phone 089/289 – 55504
examination.asg@ed.tum.de
coordination.asg@ed.tum.de

Internship office / thesis registration / credit recognition

Isabelle Canchila Acuña, M.A.
Phone 089/289 – 55507
examination.asg@ed.tum.de

Support staff office hours:

See https://wiki.tum.de/x/woLCQ
Find more information and all relevant application forms here:

https://wiki.tum.de/x/wwI0N

https://wiki.tum.de/x/ywl0N
Thank you very much for your attention

and

Alle the best for your studies at TUM!
MISSION SPACE VALLEY
EUROPEAN RESEARCH CENTER OF THE MUNICH METROPOLITAN AREA

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