Master of Science

Information Technologies for the Built Environment

Master’s Days
22. March 2024

TUM School of Engineering and Design
Architecture, Civil & Environmental Engineering, Geodesy
MSc Information Technologies for the Built Environment

Built Environment Applications

Computer Science Foundations
MSc Information Technologies for the Built Environment

- Smart Cities & Regions
- Construction Processes
- Design Automation
- Urban Information Modeling
- Human Computer Interaction
- Numerical Simulation
- Artificial Intelligence
- Digital Fabrication
- Building Information Modeling
- Pointcloud Generation/Processing
- Remote Sensing

Smart Cities & Regions
Urban Information Modeling
Human Computer Interaction
Numerical Simulation
Artificial Intelligence
Digital Fabrication
Building Information Modeling
Pointcloud Generation/Processing
Remote Sensing
Master program will educate experts with:

a. fundamental knowledge of information technology in the field of digital methods of building models, construction processes and urban models

b. skills for developing new digital methods in the fields of architectural informatics, construction and environmental informatics, geoinformatics and photogrammetry

c. domain knowledge in digital architecture, digital construction, and digital geodesy

d. skills in the development of (distributed) software systems, in-depth programming knowledge

e. an understanding of interdisciplinary cooperation and interface design (GIS, BIM, etc.) in the field of semantic models and processes of the built environment

f. an insight into Design Thinking methods and socio-technical issues, e.g., the impact of digitisation on work and communication processes and sustainability aspects
Information Technologies for the Built Environment

- geometric modeling (Brep, CSG, Octrees, etc.)
- semantic modeling: ontologies
- data modeling languages (UML, EXPRESS, XML, OWL, JSON)
- data models (CityGML, IFC, OKSTRA, XPlanung, XBau,)
- database technologies (triple stores, RDBMS, graph databases …)
- distributed systems (client-server, cloud, security, TCP/IP, web services, REST)
- computer graphics (visualization, rendering, etc.)
- BIM methods (partial models, use cases, process management), GIS methods
- AI methods
Fields of employment

- **BIM experts** (BIM managers, BIM consultants, BIM project managers, etc.)
- **System analysts and designers** for complex, distributed software systems for large-scale built environment applications
- **Software developers and data engineers** in the field of the built environment
- **Specialists in the use of Geographic Information Systems** for Smart Cities applications
- **Experts in the use of modern digital acquisition methods** (photogrammetry, laser scanning, drone deployment, point cloud processing)
- **Architectural offices, Engineering offices and Surveying companies**
- **Construction industry and construction machinery companies**
- **Software industry with a focus on construction, geoinformatics and related fields**
- **Administration (ministries and municipalities)**
- **Research and development**
LOC Career Day
General Information

Degree: Master of Science (M.Sc.)

Standard period of study (CP): 4 (120 CP)

Form of study: Full time

Admission: Aptitude Assessment

Start date: WS 2024/25

Language: English

Faculties involved in teaching: School of Engineering and Design (Architecture, Civil and Environmental Engineering, Geodesy), School of Social Sciences (MCTS)
Program Structure

Bachelor | MSc ITBE
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GEO | Semester 1
AR | gain knowledge and skills on IT in different BE domains (create common understanding)
BI | Semester 2
IT | gain integrated knowledge/skills on BE topics
BE = primarily architecture, civil engineering, and geodesy

GEO = geodesy, AR = architecture, BI = civil engineering, IT = information technologies

Semester 3 | Semester 4
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apply ITBE skills and knowledge to BE task | identify ITBE research question, develop and execute approach, evaluate and communicate results

ITBE Expert | ITBE
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<td>Geospatial Information Science 6 ECTS</td>
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<td>Fusion Lab* 12 ECTS</td>
<td>Master Thesis 30 ECTS</td>
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<td>Computational Design in Architecture, 3 ETCS</td>
<td>BIM Fundamentals* 6 ECTS</td>
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<td>Photogrammetry and Remote Sensing, 3 ETCS</td>
<td>System-Theoretical Principles of Project Management 6 ECTS</td>
<td>Distributed and Cloud-Based Systems* 6 ECTS</td>
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<td>*interdisciplinary module</td>
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Possible Electives (examples)

- Internet of Things in the Built Environment, Chair of Geoinformatics (Prof. Kolbe),
- Modelling Urban Development, Assistant Professorship of Modeling Spatial Mobility (Prof. Moeckel),
- Big Geospatial Data, Professorship Big Geospatial Data Management (Prof. Werner),
- Principles of Spatial Data Mining and Machine Learning, Professorship Big Geospatial Data Management (Prof. Werner),
- Performance Based Design, Chair of Architectural Informatics (Prof. Petzold),
- Spatial Decision Support Systems, Chair of Cartography and Visual Analytics (Prof. Meng),
- Engineering Databases, Chair of Computational Modeling and Simulation (Prof. Borrmann),
- Robotic Fabrication in Architecture, Chair of Digital Fabrication (Prof. Dörfler),
- And many more…
Application from the following Bachelor’s programs

- Architecture, Urban planning, Landscape planning
- Civil engineering
- Environmental engineering
- Geodesy and Geoinformatics
- (General) engineering sciences
- Computer science

MSc. Information Technologies for the Built Environment
Application

Required application documents:

- Online application.
- Bachelor's degree certificate.
- Proof of English language skills (e.g., TOEFL Test, IELTS, Cambridge Main Suite of English Examinations).
- Official Transcript of Records with modules adding up to at least 150 ETCS.
- Curriculum vitae (in table format).
- A motivation letter in English of maximum of two A4 pages, describing:
  - Why you have chosen to study this program at the TUM,
  - and why you consider yourself particularly suitable for the program incl. previous experience with IT in the built environment.

Further information on the application process available here:
https://wiki.tum.de/pages/viewpage.action?pageId=944017053
Admissions Process

First Phase
- The application is checked for completeness,
- the applicant's suitability for the course is evaluated based on:
  - technical qualification (max. 60 points),
  - bachelor grade (max. 10 points),
  - and the motivation letter (max. 30 points).

Applications with:
>70 points are accepted
<60 points are rejected
Between 60 and 70 points enter a second phase.

Second Phase
- A digital test to evaluate applicants' technical qualifications
  - Built environment (max. 30 points),
  - Information technologies (max. 30 points).

New score based on:
technical qualification, bachelor grade, digital test.

Applications with:
>105 points are accepted
Key Dates

Application
- Apply 1\textsuperscript{st} Jan. – 31\textsuperscript{st} May 2024 (for WS24/25)

Program Start
- Semester start: 1\textsuperscript{st} Oct. 2024
- Welcome: 11\textsuperscript{th} Oct. 2024 (date to be confirmed)
- Lecture Period: 14\textsuperscript{th} Oct. 2024 to 7\textsuperscript{th} Feb. 2025
- Exam Period: 10\textsuperscript{th} Feb. 2025 to 7\textsuperscript{th} March 2025
Master of Science
Information Technologies for the Built Environment

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TUM Georg Nemetschek Institute
Artificial Intelligence for the Built World

Further information on the M.Sc. ITBE application process available here:
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Questions

Can I apply as a mechanical engineer?
Can I apply as a landscape architect?
Is a bachelor's degree in environmental engineering also suitable?

Do I need to submit an architectural portfolio?
Do I need to know programming? If so, what type of language?
In order to get the most out of the program, in which areas would it be beneficial for us to improve ourselves?
Are there virtual classes?
Are there many group works?

Is construction area, mining area, or airport runway also considered as built environment?
Study fees

There will be study fees starting this Winter term for applicants from non-EU countries:

6,000€/semester