

Study Structure until the summer Semester 2016

Master of Science in Environmental Engineering

This structure of the Master's Programme in Environmental engineering is valid for all students beginning their studies **after the winter term of 2011/12 until the summer term 2016** (FPSO 20111)

The international Master's Program in Environmental Engineering builds upon basic knowledge and competences from undergraduate studies in Environmental Engineering or closely related programmes. It provides students with advanced knowledge and methodologies within a specific „Field of Study“. Teaching in each Field of Study combines different relevant disciplines from the Department of Civil, Geo and Environmental Engineering and gives students a wide range of perspectives on their field of specialisation.

The fields of study in the master's programme are:

- Urban Environments and Transportation
- Environmental Hazards and Resources Management
- Environmental Quality and Renewable Energy
- Energieeffizienz und Nachhaltigkeit von Gebäuden (taught in German)

Duration: 4 Semesters

Language: English

Main Location: Munich Downtown Campus

Field of Study		Courses and labs: 75 credits
Required Elective Modules	24 credits	
Elective Modules	min 12 credits	
Cross Cutting Methods, Technologies and Fundamentals	min 21 credits	
Individual choice modules	max 18 credits	
Study Project	15 credits	Project work: 45 credits
Master's Thesis	30 credits	

The curriculum consists of:

- 2,5 semester (75 credits) aus course and lab work
- 0,5 semester (15 credits) practical study project
- 1 semester (30 credits) master's thesis

The Field of Study is the core of the programme and provides the students with their professional qualification. A common block of Cross Cutting Methods, Technologies and Fundamentals provides competences in acquiring, modelling and visualisation of environmental data. Additionally, students have the opportunity to choose part of their modules from the complete curriculum of TUM incl. language courses and soft skills.

The following pages show the module catalogue, **updated in the winter term 2015/16.**

Field of Study 1: Urban Environments and Transportation

The Field of Study "Urban Environments and Transportation" focusses on the interdependencies between urban development and the need for supply of drinking and process water, transport and mobility needs and the handling of wastewater and air pollutants.

Required Elective Modules

BV400009	Land Management and Land Policy
BV520007	Land Use and Transport - Interactions and Strategies
BV340019	Road and Rail Design
BV560024	Traffic Management
BV560023	Intelligent Transport Systems
BV580008	Modelling of Environmental Effects in Transportation
BV520009	Project Appraisal and Planning Processes in Transportation
BV180071	Fundamentals of Urban Climate
BV380009	Applications of Urban Climate
BGU38014	Water and Wastewater Treatment Engineering
BGU38011	Kanalnetz- und Regenwasserbewirtschaftung

Elective Modules

Urban Water Quality

BGU38010	Advanced Water Treatment Engineering and Reuse
BV180004	Modelling of Water Quality in Aquatic Systems
BV380008	Design, Construction and Operation of Wastewater Treatment Plants
WZ8084	Sewage Sludge Treatment
BGU38013	Technical Communication Skills in Water and Wastewater Treatment Engineering
WZ8017	Material Flow Management

Land Use and Transportation Planning

BV520008	Land Use and Transportation Modelling
AR30213	Public Transport as Urban Generator
BV580013	Local Public Transport Strategy and Organisation
BV560009	Public Transport Operations and Supply
BV460019	Inland Navigation Management and Constructions

Transportation Technology

BGU56035	Practical Application of Traffic Control Methods
BV560007	Traffic Flow Simulation

BGU56041	Transport Planning and Traffic Engineering Concepts for Electric Mobility
BV560019	Applied traffic engineering and planning
BV560005	Intelligent Vehicles

Field of Study 2: Environmental Hazards and Resources Management

The Field of Study “Environmental Hazards and resources Management” focuses on analysis, evaluation and mitigation of natural hazards. It deals with the dynamics that exist in water, soil and climate and the impact of human intervention in these areas especially in the field of resource consumption.

Required Elective Modules

WZ8088	Climate Change
BV600001	Risk Analysis I
BGU46026	Alpine Hazards
BGU67001	Landslides
BGU54009	Flood Risk and Flood Management
BV410013	Fluid Mechanics and Turbulence
BV460014	Environmental Hydrodynamic Modelling
BGU41017T2	Numerical River Hydraulics
BGU54008T2	Hydrological and Environmental River Basin Modelling
BGU54010	Groundwater Hydraulics, Modelling and Management
BGU54011	Integrated Water Resources Management
BV460015	Planning and Management of Water Reservoirs

Elective Modules

BGU46027	Rapidly varying Flows in Hydraulic Engineering
BGU46028	Mathematical Modeling of Hydrodynamics and Water Quality in Coastal Regions
BV170004	River Engineering and Hydromorphology
BV410005	Hydraulics Lab
BGU54013T2	Seminar in Rainfall-Runoff Modelling
BV530023	Study Project "Prevention against Alpine Natural Hazards"
BV040005	Nature-oriented Care
BGU46020	Project Work in the Field of Hydraulic Eng. / Hydropower / Water Resources Eng.
BV460009	Practical Training at the Oberrach Laboratory
BV460019	Inland Navigation Management and Constructions
BGU46022	Hydraulics in Water Engineering
BGU54015	Water Management at the Catchment Scale (Field trip to the Adige River Basin)
BV170009	International Water Rights and Politics

BV600002	Risk Analysis II
BV600004	Structural Reliability
BV600010	Introduction to Random Vibration
BV600005	Risk and Reliability Seminar
BV600006	Stochastic Finite Element Methods
BV600007	Computational Methods in Stochastic Dynamics
WZ8017	Material Flow Management

Field of Study 3: Environmental Quality and Renewable Energy

Field of Study 3 focusses on assessing and ensuring the quality of water and soil as well as the use of renewable energy sources. Courses deal with analysing the chemical composition of those elements and developing technologies for improving their quality and remediating damages – mainly focussing on urban and natural water cycles as well as soil resources. Students are also provided with competences in planning and deploying renewable energy technologies – mainly hydropower, wind and geothermal energy.

Required Elective Modules

BGU38011	Kanalnetz- und Regenwasserbewirtschaftung
BGU38014	Water and Wastewater Treatment Engineering
BGU54008T2	Hydrological and Environmental River Basin Modelling
BGU54010	Groundwater Hydraulics, Modelling and Management
WZ8083	Introduction to Soil Science and World Soil Resources
BV400009	Land Management and Land Policy
BGU46023	Energy Economics, Hydro Power and Energy Storage
BV410013	Fluid Mechanics and Turbulence
BGU46024	Geothermal, Ocean and Wind Energy

Elective Modules

Urban Water Quality

BV380008	Design, Construction and Operation of Wastewater Treatment Plants
BGU38010	Advanced Water Treatment Engineering and Reuse
BGU38013	Technical Communication Skills in Water and Wastewater Treatment Engineering

Natural Water Quality

BV180004	Modelling of Water Quality in Aquatic Systems
BGU46030	Ecological Modeling of Surface Waters
BV460012	Rivers as an Ecosystem
BGU46028	Mathematical Modeling of Hydrodynamics and Water Quality in Coastal Regions
BGU54015	Water Management at the Catchment Scale (Field trip to the Adige River Basin)

BGU54013T2	Seminar in Rainfall-Runoff Modelling
BV380004	Microbiology of Groundwater Ecosystems
BV490057	Technical Hydrogeology
BGU66014	Hydrogeological Case Studies
<i>Soil Quality</i>	
BV120050	Environmental Geotechnics for Environmental Engineers
BV500004	Environmental Geotechnics II
BV500005	Building with Geosynthetics for Environmental Engineers
BV500003	Unsaturated soil mechanics
WZ4106-1	Management of Soil Resources
WZ1648	Remediation of Contaminated Sites - Lecture and Seminar
WZ1647	Remediation of Contaminated Sites - Lecture and Exercises
WZ0357	Soil Microbiology
WZ2047	Soil Protection
<i>Renewable Energy</i>	
BV410015	Energy Efficiency
EI8029	Energy Systems & Energy Economy
BV170009	International Water Rights and Politics
BV460005	Hydraulic machinery and plants laboratory
BGU46027	Rapidly varying Flows in Hydraulic Engineering
BGU46020	Project Work in the Field of Hydraulic Eng. /Hydropower /Water Resources Eng.
BGU46022	Hydraulics in Water Engineering
BGU46021	Hydro Power and Energy Storage - Project Work
BV460011	Water Resources Projects in Science and Practice

Field of Study 4: Energieeffizienz und Nachhaltigkeit von Gebäuden (instruction language: German)

Das Field of Study 4 fokussiert der energetischen und materialtechnischen Nachhaltigkeit von Bauten, Siedlungen und Kulturlandschaften über ihren gesamten Lebenszyklus. Bauphysikalische Vorgänge in Gebäuden bezogen auf Wärme, Feuchte und Schall, die Wirkung unterschiedlicher Baustoffe in Hinblick auf ihre Umwelteffizienz sowie Konzepte zum nachhaltigen und energieeffizientem Bauen stehen dabei im Vordergrund.

Required Elective Modules (Wahlpflichtmodule)

BV360014	Bauphysik Vertiefung
BV510009	Baukonstruktion II / III
BV550017	Nachhaltige Immobilienentwicklung

BV550014	Projektorganisation und Management
BV620003	Wechselwirkungen zwischen Nachhaltigkeit und Baukultur
Elective Modules (Wahlmodule)	
BV360011	Bauphysik in der Forschung
BV110006	Bauphysik in der Praxis
BV620016	Building Performance Modelling and Simulation
BV360002	Energetische Modernisierung und Bauschäden
BV620011	Grundfragen einer nachhaltigen Stadtplanung
NN	Grundlagen der Nachhaltigkeit
BV060001	Grundlagen des Brandschutzes
BV550017	Nachhaltige Immobilienentwicklung
BV620008	Nachhaltige Lichttechnik
BV620029	Nachhaltigkeit in Architektur, Stadt und Landschaft
BV110050	Nachhaltigkeit von Gebäuden
BV360009	Ökobilanzierung
NN	Ökologisches Bauen
BV550014	Projektorganisation und Management
BV110002	Raumklima und Behaglichkeit
BV110005	Seminar Bauphysik
BV620006	Sonderthemen des nachhaltigen Bauens
BV000006	Tragwerkslehre I
BV360007	Wärme- und Feuchtetransport nach DIN, EN und ISO

Cross Cutting Methods Technologies and Fundamentals

The Cross Cutting Methods Technologies and Fundamentals provide students with the necessary pre-requisites for deepening fundamental theoretical principles in their field of studies, for acquiring environmental data from sensors, lab experiments and simulations as well as processing and visualising these data.

Elective Modules

Fundamentals

WZ8088	Climate Change
BV360008	Sustainable Development
BV360009	Life-cycle Assessment
MW1475	Renewable Energy Technology I
MW1476	Renewable Energy Technology II

BV400016	Scientific Paper Writing
BV040005	Nature-oriented Care
BV180006	Hydrochemistry
BV150050	Environmental Geology / Geochemistry
BV410013	Fluid Mechanics and Turbulence
BGU41017T2	Numerical River Hydraulics
BV600001	Risk Analysis I
BV600002	Risk Analysis II
BGU43012T2	Technical Acoustics
BV020007	Boundary Element Method
BV430002	Integral Transform Methods
BV430008	Structural Dynamics
<i>Programming skills</i>	
BV030004	Software Lab
BV030001	Computation in Engineering I
BV440010	Introduction to Matlab
BGU65006	Professional Software Development
<i>Labs</i>	
BV410005	Hydraulics Lab
BV180051	Hydrochemistry Lab
BV410004	Fluid Mechanics Lab
BV040053	Computational Fluid Dynamics
<i>Data Acquisition</i>	
BV360010	Measurement Technology
BV480018	Applied Remote Sensing
BV230050	Atmospheric Physics and Remote Sensing
BV250050	As-built Surveying and geodetical Monitoring
BV570007	Observing and Modeling Global Dynamic Processes
BV450001	Introduction to Earth System Science
BV480016	Introduction to Photogrammetry, Remote Sensing and Image Processing
BV480010	Photogrammetry - Selected Chapters
BV000124	Photogrammetry and Remote Sensing II
BV480004	Photogrammetry and Remote Sensing III
BV480015	Project Photogrammetry and Remote Sensing

Data Processing, Modelling and Simulation

BV470017	Advanced GIS for Environmental Engineering - Applications
BV470016	Advanced GIS for Environmental Engineering - Theory
BV480007	Understanding Images - Basics
BV480006	Digital Image Processing for Environmental Engineering
BV470002	Geo Web Services
BV470015	Geodatabases
BV470003	Harmonisation of Geospatial Data
BV510002	Transient System Simulation – Buildings
MW0164	Energy Optimization for Buildings
BV470018	Spatiotemporal Analyses in GIS