The Masters in Applied & Environmental Geoscience AEG
(last update August 2017)

What is Applied & Environmental Geoscience?
Applied & Environmental Geoscience (AEG) is a research oriented two-year Master of Science program, beginning in the winter semester of each year. Established as the first international full time M.Sc. Program at the University of Tübingen in 1999, AEG has since hosted students from more than 60 countries.

The program addresses applicants with a firm background in science (math, physics, chemistry, environmental science), who wish to acquire a well-founded scientific knowledge enabling them to approach complex problems in environmental geosciences and engineering from a multidisciplinary angle and to gain an internationally recognized high level of qualification.

General Course Outline and Structure of the AEG Masters Course

The AEG program consists of a series of compulsory and elective elements.

To complete the program students have to earn 120 credits points from a suite of six compulsory modules (marked in light blue) accounting for 36 credit points, nine elective modules (54 credit points) and a master thesis (30 credit points).

Modules typically are a combination of lectures, exercises and/or laboratory and field tutorials.
Compulsory Modules and Master Thesis

The three compulsory modules Hydrogeology, Aquatic and Environmental Chemistry and Environmental Modelling 1, introduce students to the necessary theoretical and quantitative aspects of three crucial core areas of environmental and applied geosciences. All three modules are taught in the first semester, allowing students to focus on their respective fields of specialization in semesters 2-4.

- **Hydrogeology** is the science of groundwater. The course has a strong emphasis on physical hydrogeology, covering flow and transport in groundwater systems. Emphasis is given on quantitative description of groundwater flow and solute transport, deriving governing equations and analytical solutions for simple configurations. Computer methods for the solution of groundwater problems are taught in the courses of environmental modeling.

- **Environmental Modeling 1** deals with the simulation of the terrestrial water cycle with particular emphasis on computer models for groundwater flow. The class, however, also includes modeling of hydrological processes at the land surface, river hydraulics, and general aspects of modeling spatial processes, such as interpolation methods. Hands-on exercises with computer programs used in practice are combined with introductions to the underlying principles.

- **Aquatic and Environmental Chemistry** covers chemical thermodynamics in aqueous systems, sorption and partitioning processes of organic and inorganic compounds in the hydrosphere and practical case studies. The objective is to gain quantitative evaluation and prediction capabilities for important hydrogeochemical parameters based on sound thermodynamic concepts and quantitative structure activity relationships. By this, fate and behaviour of chemicals in the environment can be predicted.

The three additional compulsory modules, namely Scientific Practice 1&2 and Scientific Presentation (semesters 2-4), allow the students to gain practical interdisciplinary skills in the course of their studies. They acquire methodological, conceptual as well as practical skills for scientific research in close interaction with staff and research groups.

- **Scientific Practice 1** is a research-oriented internship within the work groups at University of Tübingen participating in the AEG program or an external internship in industry, environmental administration or research institutions. The key objective is to participate in research projects from the second semester of the study program on. **Scientific Practice 2** in the third semester, scientific practice is targeted at the formulation of a research agenda for M.Sc. thesis in the fourth semester ("Scientific Presentation").

Integral part of the scientific-practice program is the presentation of the thesis results in the form of seminar talks and a poster presentation in the fourth semester ("Scientific Presentation").

The third and fourth semesters focus mainly on the elaboration of a **master thesis**, which can be started in the third semester.
Elective Modules

In addition to the comprehensive compulsory program, students according to their individual focus of studies, specialize in one of the three distinct fields of environmental and applied geosciences namely: Hydrogeology (1), Environmental Chemistry and Environmental Microbiology (2), Environmental Physics and Environmental Modelling (3).

In order to study any of the above specializations, a defined combination of three elective core modules, which are of special relevance, must be incorporated in the respective program of studies.

Specialization in Hydrogeology requires
- Applied Hydrogeology
- Contaminant Hydrogeology
- Geotechnical Engineering

Specialization in Environmental Chemistry and Environmental Microbiology requires
- Environmental Microbiology and Geomicrobiology
- Hydrogeochemical Modeling
- Environmental Analytical Chemistry

Specialization in Environmental Physics and Environmental Modelling requires
- Environmental Modeling 2
- Case Studies in Environmental Geoscience
- Physics of the Atmospheric Boundary Layer

The remaining necessary thirty credits can be chosen from any of the available elective modules. The following figures show the degree program for all three specializations along with additional elective modules and the semesters they are offered in (WiSe – Winter Semester / SoSe – Summer Semester).

Additional elective modules offered from other departments and/or universities can be accepted by the chairman of the examination committee after prior consultation. A continuously updated list of generally accepted modules is found on the website in the download section.

Course Language

AEG courses are taught in English and course notes in English will accompany the lecture series.

Degree

The degree will be Master of Science in Applied & Environmental Geoscience and qualifies to enter in doctoral programmes.
Specialization Hydrogeology

Elective Modules (6 Credits)
- Case Studies in Environmental Geoscience (WiSe)
- GIS and Remote Sensing (WiSe)
- Environmental Modeling 2 (SoSe)
- Advanced Geophysics (WiSe)
- Physics of the Atmospheric Boundary Layer (SoSe)
- Environmental Microbiology and Geomicrobiology (SoSe)
- Geomicrobiology Lab (WiSe)
- Environmental Analytical Chemistry (WiSe)
- Environmental Isotope Chemistry (SoSe)
- Lab Course Environmental Chemistry (WiSe)
- Environmental Risk Assessment (WiSe)
- Hydrogeochemical Modeling (SoSe)
- Field Seminars in Applied Geosciences (WiSe/SoSe)
- Advanced Topics in Flow and Transport (SoSe)
- Geophysics (SoSe)
- Spectroscopic and Microscopic Analysis in the Environment (WiSe)
- Applied Data Analysis and Modeling for Geoscientists (SoSe)
- Sustainable Environmental Biotechnology Systems (WiSe)
- Introduction to Earth Surface Processes (WiSe)

Elective Modules (3 Credits)
- Earth Processes (WiSe)
- Geostatistics (SoSe) / Water Treatment (WiSe)
- Field Seminars in Applied Geosciences (WiSe/SoSe)
- Principles of Model Calibration (WiSe)
Specialization Environmental Chemistry and Environmental Microbiology

Elective Modules (6 Credits)
- Environmental Isotope Chemistry (SoSe)
- Geotechnical Engineering (WiSe)
- Applied Hydrogeology (SoSe)
- Contaminant Hydrogeology (SoSe)
- Case Studies in Environmental Geoscience (WiSe)
- GIS and Remote Sensing (WiSe)
- Environmental Modeling 2 (SoSe)
- Advanced Geophysics (SoSe)
- Physics of the Atmospheric Boundary Layer (SoSe)
- Laboratory Course Geomicrobiology (WiSe)
- Lab Course Environmental Chemistry (WiSe)
- Environmental Risk Assessment (WiSe)
- Advanced Topics in Flow and Transport (SoSe)
- Geophysics (SoSe)
- Spectroscopic and Microscopic Analysis in the Environment (WiSe)
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Specialization Environmental Physics and Environmental Modeling

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- Geotechnical Engineering (WiSe)
- Applied Hydrogeology (SoSe)
- Contaminant Hydrogeology (SoSe)
- GIS and Remote Sensing (WiSe)
- Advanced Geophysics (SoSe)
- Laboratory Course Geomicrobiology (WiSe)
- Lab Course Environmental Chemistry (WiSe)
- Environmental Microbiology and Geomicrobiology (SoSe)
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