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Study programme
Environmental Engineering

**Welcoming**
new Master students
in Environmental Engineering 2023

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## Overall Goal

**Graduates can develop engineering solutions to environmental problems. In particular, they should be able to:**

- model and manage resources sustainably
- model, design and operate pollution control technologies
- assess and improve the environmental performance of technical systems

→ Environmental Engineer

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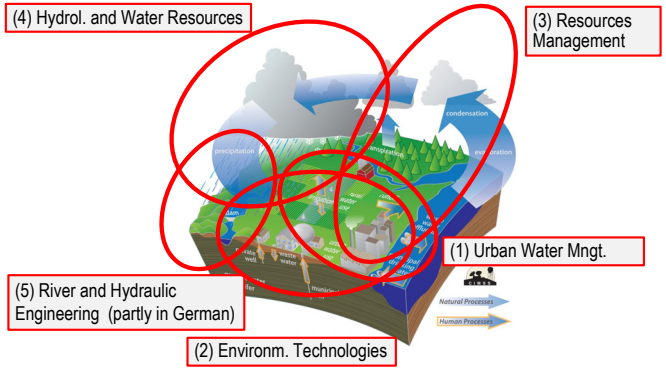
## What is environmental engineering?




http://cimss.ssec.wisc.edu/climatechange/GreatLakesModernWaterCycleCIMSS.jpg

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Sustainable development goals

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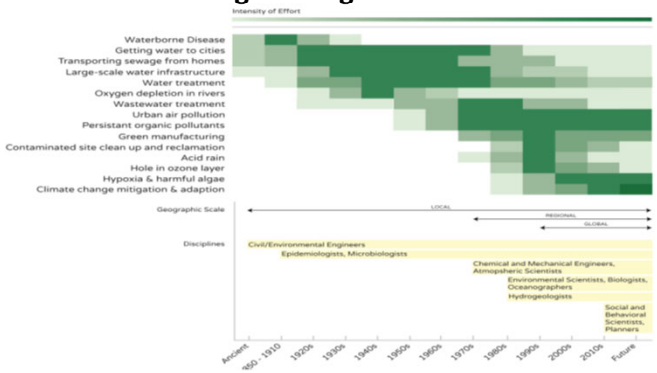
## Environmental Engineering Efforts




Timeline of major U.S. environmental engineering efforts, highlighting the broadening scale and complexity of the challenges and the expanding numbers of disciplines involved.

Environmental Engineering for the 21st Century: Addressing Grand Challenges, p.79, THE NATIONAL ACADEMIES PRESS, 2018.

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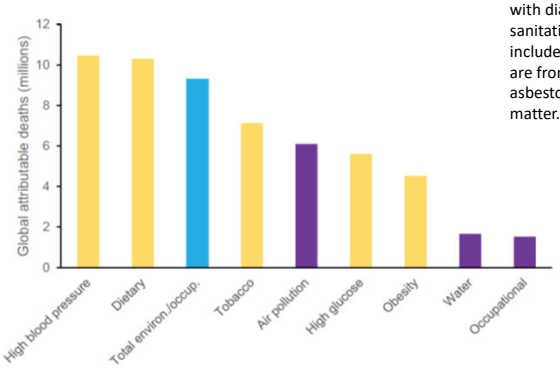
## Global Estimated Risk Factors




Global estimated deaths by risk factor and by total environmental and occupational causes. Air pollution–attributable deaths are primarily linked to particulate matter pollution and indoor burning of solid fuels. Water-related risks are associated with diarrheal disease from unsafe water and poor sanitation. The estimated occupational deaths include 0.33 million from injury, but the remainder are from pollution-related causes, such as asbestos, carcinogens, and airborne particulate matter.

Environmental Engineering for the 21st Century: Addressing Grand Challenges, p.47, THE NATIONAL ACADEMIES PRESS, 2018.

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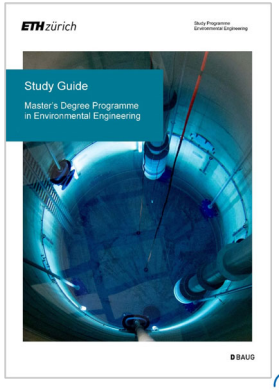
## Please read carefully…

Download here:

https://www.baug.ethz.ch/en/studies/environmental-engineering/documents.html

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## Building blocks

- Majors = Your area of specialization (p. 10-11)
- Modules = Combination of two or three courses equivalent to 9 CP (p. 12-17)
  - Compulsory modules = Each major has 4 compulsory modules
  - Elective modules = Each student must choose 2 elective modules
- Electives = Course you can choose (p. 18)
- Science in Perspective = Courses you can choose (p. 19)
- Experimental and Computer Laboratory (p. 19)
- MSc Project (p. 20)
- MSc Thesis (p. 21)

**Note: Pages refer to study guide**

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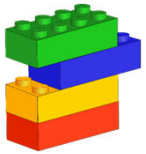
## Structure of curriculum (p. 9)

Master Degree

| 1st Sem. | 2nd Sem. | 3rd Sem. | 4th Sem. |
|---|---|---|---|
| Major: Six modules (6 x 9 = 54 CP) | | MSc Project (12 CP) | MSc Thesis (6 months, 30 CP) |
| Env. Comp. Lab (10 CP) (Year course) | | | |
| Electives (12 CP) | | | |
| GESS Science in Perspective (2 CP) | | | |



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| Modules (compulsory) ↓ / Five Majors → | (1) Urban Water Mngt. | (2) Environm. Technologies | (3) Resources Management | (4) Hydrol. and Water Resources | (5) River and Hydraulic Engineering |
|---|---|---|---|---|---|
| Water Infrastr. Plan. & Stormw. Mangt. | ● | | | | |
| Syst. analysis in Urban Water Mangt. | ● | ● | | | |
| Proc. Engr. in Urban Water Managt. | ● | ● | | | |
| Air Quality Control | | ● | | | |
| Waste Management | | ● | ● | | |
| Ecological Systems Design | ● | | ● | | |
| Groundwater | | | ● | ● | |
| Water Resources Management | | | ● | ● | ● |
| Flow and Transport | | | | ● | ● |
| Landscape | | | | ● | |
| River Systems (partly in German) | | | | | ● |
| Hydraulic engr. (in German) | | | | | ● |
| Remote sensing and Earth Observation | | | | | |
| Soil | | | | | |

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Modules (p. 14 – 17)

Name of module

Description

Prerequisites

COURSE in the Module

3.2.3 Overview of modules

| Modules | Description | Prerequisites and recommendations for the modules | Required courses |
|---|---|---|---|
| Water Infrastr. Plan. & Stormw. Mangt. [WatInfra] | How do we make sure that in the future we have good wastewater and drinking water services? Deficits of existing sewer and water supply networks need to be identified and reasonable measures suggested. A focus is put on adapting urban drainage systems to climate change and to improve water quality of rivers and lakes. Specifically, this module teaches the basics of infrastructure management and the various tools to quantitatively identify the hydraulic and hydrologic performance of urban drainage systems. | General understanding of urban water management. | • Infrastructure Syst. in Urb. Wat. Managt. (3 CP)<br>• Urban Drainage Planning and Modelling (6 CP) |
| Syst. Analysis in Urban Water Mangt. [SysUWM] | This module provides the fundamental concepts needed for the design and critical evaluation of treatment processes applied for water or wastewater treatment. Systems Analysis provides the tools for a structured approach to develop and apply mathematical modeling. Process Engineering Ia is focused on biological processes. | General understanding of urban water management. | • Systems Analysis and Mathematical Modelling (6 CP)<br>• Process Engineering Ia (3 CP) |
| Proc. Eng. in Urban Water Managt. [ProcUWM] | This module builds on the fundamental concepts introduced in the module [SysUWM]. In Process Engineering II students are introduced to physical-chemical processes for water and wastewater treatment. In Process Engineering Ib the application of biological processes is further advanced. | The module [SysUWM] is a required prerequisite | • Process Engineering Ib (3 CP)<br>• Process Engineering II (6 CP) |
| Air Quality Control [AIR] | The students understand air pollution sources and impacts and can apply the learned technologies for air quality control. | BSc course on Air quality control (Luftreinhaltung) is strongly recommended. | • Air Pollution Modeling and Chemistry (3 CP)<br>• Air Quality and Aerosol Mechanics (3 CP)<br>• Air Quality and Health Impact (3 CP) |
| Waste Management [WASTE] | The students understand thermal and biological waste treatments and recycling technologies for solid waste and waste water and can evaluate the designs of such systems. | General understanding of waste management (e.g. from Bachelor course in Abfalltechnik). | • Waste Recycling Technologies (3 CP)<br>• Process Engineering Ia (3 CP)<br>• Biological Processes for Waste Treatment (3 CP) |

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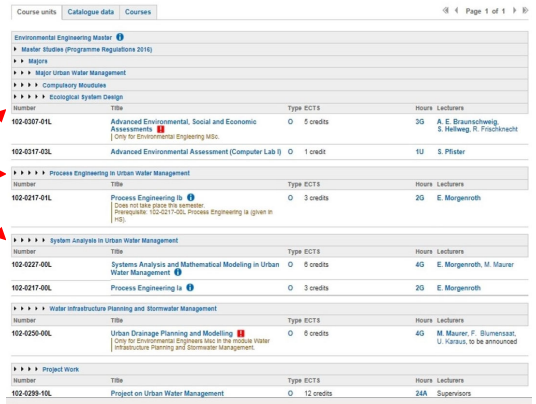
Course catalogue (http://vvz.ethz.ch)

Search result: Course units in Autumn Semester

Major

Four compulsory modules



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## Recommended optional modules (P.18)

- Overlap of lecture times for some courses
- In case of conflicts the course can be taken one year later
- MSc Thesis can be only started when all CP have been collected (compulsory and optional + Experimental and Computer Lab )

| Major | Recommended elective modules |
|---|---|
| Urban Water Management | Flow of water and transport of contaminants in the natural environment: [GROUND] + [FLOW].<br>Broader aspects of processes for environmental protection: [AIR] + [WASTE]<br>Urban planning and remote sensing: [LAND] + [RemSens] |
| Environmental Technologies | Decision making and environmental impact: [ESD]<br>Resource monitoring: [RemSens]<br>Linking waste management with soil protection: [SOIL]<br>Overall environmental technology planning: [WatInfra] |
| Resource Management | Soil and land resources: [SOIL] + [LAND]<br>Clean air as a resource: [AIR]<br>Crosscutting for resource monitoring: [RemSens]<br>In addition, recommended elective courses: Supply and Responsible Use of Mineral Resources I (860-0015-00L) and Supply and Responsible Use of Mineral Resources II (860-0016-00L) |
| Water Resources Management | For urban hydrology: [WatInfra] + [SysUWM]<br>For river engineering: [RIVER] + [HydEng]<br>For soil processes: [SOIL]<br>For global hydrology: [RemSens]<br>For environmental impacts: [ESD] |
| River and Hydraulic Engineering (partly in D) | For urban water engineering: [WatInfra] + [SysUWM]<br>For river system management: [RemSens]+[LAND]<br>For hydraulic structures and natural hazard processes: [SOIL]+[LAND] |

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## Projects in the Experimental and Computer Lab

- 1-year course
- Courses in corresponding modules are pre- or co-requisites
- Schedule
  - Required labs in required modules CAN be combined
  - NOT all labs corresponding to elective modules can be combined due to overlapping schedule – sorry.
  - First sign up for required labs and only then choose from compatible labs corresponding to elective modules

| Major → / ↓ Modules | Urban Water Management (9×2CP) | Environmental Technologies (9×2CP) | Resources Management (9×2CP) | Hydrology and Water Resources (9×2CP) | River and Hydraulic Engineering (9×2CP) | selectable as additional project | Semester | Project Title |
|---|---|---|---|---|---|---|---|---|
| WatInfra (2CP) | • | | | | | o | spring | Water Infrastructure |
| UWM: SysUWM + ProcUWM (2+2=4 CP) | • | • | | | | o | fall | Operation of Lab-WWTP |
| | • | • | | | | | | |
| AIR (2CP) | | • | | | | o | spring | Air Quality Measurements |
| WASTE (2CP) | | • | • | | | o | fall | Anaerobic Digestion |
| ESD (2CP) | • | | • | | | o | fall | Environmental Assessment |
| GROUND (2CP) | | | • | • | | o | summer | Groundwater Field Course Kappelen |
| WRM (2CP) | | | • | • | • | o | spring | Optimal Water Allocation |
| FLOW (2CP) | | | | • | • | o | fall | 1D Open Chanel Flow Modelling |
| LAND (2CP) | | | | • | | o | fall | Landscape Planning and Environmental Systems |
| RIVER (2CP) | | | | | • | o | fall | Discharge Measurements |
| HydEng (2CP) | | | | | • | o | fall/spring | Hydraulic Experiments |
| RemSens (2CP) | | | | | | o | spring | Earth Observation and Landscape Planning |
| SOIL (2CP) | | | | | | o | fall | Soil and Environmental Measurements Lab |
| *1 additional Project, dependent on selected modules (2CP)* | * | * | * | * | * | | | |

Fig. 1: Projects assigned to the different majors. The students have to participate the projects according to their major as indicated by the black dots. One additional project (grey dot) has to be chosen corresponding to one of the students elective modules.

http://www.luiw.ethz.ch/lehre/experimental-and-computer-laboratory/organisation.html

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## Oral exams

- Need to study the course content to such an extent that you can **extrapolate and think independently** based on the course content.
- Memorizing facts from the lectures is not sufficient.
- If possible, study for the oral exams with **fellow students** who have already experience in these, so that you can realistically train for exam situations

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## Keep up the reading and do the exercises

- Do not optimize too much…

- Many courses have **only one final exam** during the semester break
- But we **offer exercises** to support your learning → It is your choice if you do them
- If you do not **keep up with reading/learning** then you will benefit much less from the lectures

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## Professional training and internships

- not required
- strongly recommended
- difficulty: work permit for international students

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## Organizational matters

Please also note the information from the Executive Board and the Rectorate.

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## Lecture times

| Entries in Course Catalogue | Zentrum All buildings | Hönggerberg HIF, HIL, HIP, HIQ, HIR | Hönggerberg All other buildings |
|---|---|---|---|
| 08:00–09:00 | 08:15-09:00 | 08:00-08:45 | 07:45-08:30 |
| 09:00–10:00 | 09:15-10:00 | 08:50-09:35 | 08:45-09:30 |
| 10:00–11:00 | 10:15-11:00 | 09:45-10:30 | 09:45-10:30 |
| 11:00-12:00 | 11:15-12:00 | 10:45-11:30 | 10:45-11:30 |
| 12:00–13:00 | 12:15-13:00 | 11:45-12:30 | 11:45-12:30 |
| 13:00–14:00 | 13:15-14:00 | 12:45-13:30 | 12:45-13:30 |
| 14:00–15:00 | 14:15-15:00 | 13:45-14:30 | 13:45-14:30 |
| 15:00–16:00 | 15:15-16:00 | 14:45-15:30 | 14:45-15:30 |
| 16:00–17:00 | 16:15-17:00 | 15:45-16:30 | 15:45-16:30 |
| 17:00–18:00 | 17:15-18:00 | 16:45-17:30 | 16:45-17:30 |
| 18:00–19:00 | 18:15-19:00 | 17:45-18:30 | 17:45-18:30 |
| 19:00-20:00 | 19:15-20:00 | 18:45-19:30 | 18:45-19:30 |

Duration of one lesson: 45 minutes

Information to find in study guide

Normally most of the Environmental Engineering courses are in HIL building.

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## Limited Workplaces

- HIL E 19.1 (for quiet studies)
- HIL G 15 (coordination by GESO)
- Library HIL E-floor
- Mensa (not during eating hours)

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## Recommendations…

- Read emails from rectorate, study secretariat, professors, assistants carefully!
- Read the study guide
- Keep deadlines (e.g. for enrolling in lectures, exams etc.)
- Update your addresses in myStudies


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## Contact persons

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## Das IfU-Team

IfU = Institut für Umweltingenieurwissenschaften


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## Good start and good luck!