

Environmental Sciences: Sustainable Water Technology

Minor code	MIN-ESWT			
Education cycle	1st cycle (Bachelor)			
Mode of delivery	On-campus			
Study programme	Environmental Sciences			
Part of study year	Year 3			
Location	Leeuwarden			
Semester	Spring semester; terms 3 and 4			
Number of credits (ECTS)	30			
Language of instruction	English			
Target group	<p>Van Hall Larenstein students, Erasmus+ students, external students</p> <p>Students with two years of study in an environmental sciences-oriented or related program at a BSc level, who are interested in learning more about an integrated approach to environmental sciences, water- and environmental technology issues.</p>			
Minor co-ordinator and contact person	Leo Bentvelzen, leo.bentvelzen@hvhl.nl			
Entry requirements and prerequisites	<ul style="list-style-type: none"> • Two years of study in an environmental sciences-oriented or related program at a BSc level. • A solid base in mathematics, physics, chemistry, micro biology and more specifically statistics, research, physiology, cell biology, biochemistry, ecology. • Knowledge of physical/chemical characteristics of substances • Knowledge of transport processes of substances in environment • Lab skills (passed a course: 'work safely in the laboratory') 			
Application procedure	<p>Motivation letter in which the student motivates his choice. Depending on your study background and motivation letter, you may be asked for additional information, e.g. in an intake interview with representatives of this minor. Their advice is binding.</p> <p>Consult Exchange possibilities</p>			
Major study units	Term of teaching	Study unit code	Name of the study unit	ECTS
	Term 3	LMK230VE	Water Treatment and Soil remediation	7
	Term 3	LMK258VE	Basic GIS	7
	Term 4	LMK231VE	Advanced Water Technology	7
	Term 4	LMK222VE	Dealing with large scale Environmental Risks	7
	Term 3 and 4	LMK910VNMI	Supplementary Assignment	2
Content	<p>How to develop and balance sustainable solutions to environmental issues? Where environmental issues involve urban environment, air quality, climate and energy and material cycles, this minor focuses on concern water and soil remediation technologies, large scale environmental risks and sustainable urban environment. GIS (Geographic Information System) is a supporting tool. In this minor you are also challenged to develop sustainable solutions, taking planet, profit and people into account.</p> <p>The minor consists of four Environmental Sciences modules and a supplementary assignment.</p>			
Competences	<p>ES 1: developing and balancing sustainable solutions; level 2 and 3 (advanced and professional)</p> <p>ES 2: to work interdisciplinary and internationally; level 2 (advanced)</p> <p>ES 3: to think, act and perform research in a methodical and reflective level 2 and 3 (advanced and professional)</p>			

ES 4: project work; level 3 (professional)
 ES 5: advising professionally; level 2 and 3 (advanced and professional)
 ES 6: to function responsibly; level 3 (professional)

Learning goals

LMK222VE: Dealing with large scale environmental risks:

After successful completion of this module the student is able to:

- Analyze and evaluate the effects of human activities on organisms, ecosystems, biodiversity and different types of landscapes.
- Apply risk assessment methods in complex situations to map the different aspects of sustainability.
- Take the factors concerning human behavior into account in formulating solutions and advices
- Take the international aspects of environmental issues into account.
- Research scientific articles and makes a critical assessment of the selected material.
- Formulate a problem description based on the outline of an (environmental)problem; make a problem analysis and design a methodological adequate research plan.
- Execute the research plan systematically, and focus on the purpose of the research.
- Apply simple analytical techniques to data processing.
- Interpret the outcomes of the research.
- Present the outcomes of the research to the client in an appropriate way.
- Reflect on the used methods and research results.
- Defend effectively the research plan, its execution, results and conclusions.
- Keep up to date with the current situation and the (global) developments in his field of expertise.
- Show an independent research attitude and acts responsibly.

LMK230VE: Water treatment and soil remediation:

After successful completion of this module the student is able to:

- Describe water treatment technologies and assess them in specific situations
- Size waste water treatment plants (WWTP)
- Operate water treatment techniques at lab scale and combine these techniques in a logical way
- Describe soil remediation techniques and assess them
- Choose between different soil remediation techniques in a specific situation of pollution
- Describe the most important microbial processes in soil remediation and waste water treatment
- Calculate degradation rates in the soil (predict) in specific situations
- Calculate transport rates in soils
- Integrate sustainability and recognize this in the different treatment systems
- Make simple calculations of heat transport

LMK231VE: Advanced Water Technology:

After successful completion of this module the student is able to:

- Apply knowledge of different water treatment systems in the field of wastewater and drinking water treatment
- Discern how to (re)use water from several sources for various applications
- Perform basic design calculations for water treatment systems
- Have an overview of possible nutrient recovery techniques
- Operate pilot scale water treatment systems.

The fundamentals of sustainability in water treatment will be considered as a principle in this module.

	<p>LMK258VE: Basic GIS: After successful completion of this module the student is able to:</p> <ul style="list-style-type: none"> • design and implement a suitability analysis; • have basic understanding about raster data; • recognize and make use of different policy instruments; • use GIS as an instrument in spatial planning; • carry out spatial analysis based on a layered approach using a GIS and supporting theory; • report the GIS operations effectively, in writing to professionals; • critically review his own findings with respect to the procedures.
Added value	Students will obtain a wider view on environmental issues. They will learn how to apply the knowledge and skills using innovative methods to solve actual problems. It will benefit them and enable to become a professional in environmental sciences and in the end it will benefit the environment. And thus, our society.
Mandatory literature	Materials will be published on Moodle (ELO) in due course
Teaching methods and student workload	<p>LMK222VE: Lectures, assignments, integral assignment, lab work, computer exercises</p> <p>LMK230VE: <i>Theory</i> (total 57 slh): Waste Water treatment (19 slh) Soil remediation (19 slh) Microbiology (19 slh) <i>Assignments and excursions</i> (total 112 study hours) Description processes in WWTP (18 slh) Calculations for dimensioning (30 slh) Writing soil remediation proposal (64 slh) <i>Practical work:</i> Execution (16 slh) Presentation (4 slh) Sludge practical (8 slh)</p> <p>LMK231VE: (Guest)Lectures (40 slh) Practical (16slh) Excursion (16slh) Exercises (16 slh) Design assignment (56 slh) Home work (52 slh)</p> <p>LMK258VE: Report spatial analysis of case, including practical, tutoring, and self-study 86 hours Exam on GIS, including specific thematic topics (e.g. Hydrology), including lectures and self-study 86 hours ArcGIS certificate, including practical and self-study 28 hours</p> <p>LMK910VNMI: Supplementary assignment, content depends on student background (56 hours)</p>
Assessment	<p>LMK222VE:</p> <ul style="list-style-type: none"> • LMK222VE-01 Assignments • LMK222VE-02 Theory (written exam)

- LMK222VE-03 Practical

LMK230VE:

- Written exam
- Assessment of (group) assignments
- Assessment practical (method & presentation)

LMK321VE:

- LMK231DE – 01 Written exam (open book) – 70%
- LMK231DE – 02 Report design assignment – 30%

LMK258VE:

- Exam (3EC)
- Report (3EC)
- AcrGIS certificate (1EC)

LMK910VNMI (2EC):

- report (2EC)

Evaluation scale

Grades between: 1-10; 0,1 interval; 5,5 pass
View [ECTS credits and grading](#)