

## Course Structure Diagram 2013-2014

### Master of Science (Technology) in Environmental Engineering

#### 2 years, 120 ECTS Credits

Studies in a degree programme are usually classified as basic studies (P), subject/intermediate studies (A) or advanced (S) studies. The letter at the end of the course code indicates the level of the course.

#### The Degree Programme in Environmental Engineering, Study option of Automation Technology (2 years, 120 ECTS credits)

<b>4th Autumn</b>		ECTS credits
<a href="#">031050A</a>	Signal Analysis	2,5
<a href="#">477503S</a>	Simulation	3
<a href="#">477614S</a>	Control System Methods	3
<a href="#">477605S</a>	Digital Control Theory	4
<a href="#">477506S</a>	Modelling and Control of Biotechnological Processes	5
<a href="#">477507S</a>	Automation in Pulp and Paper Industry	5
	Free Choice Courses	7,5
Total ECTS credits		<b>30</b>

<b>4th Spring</b>		ECTS credits
<a href="#">031050A</a>	Signal Analysis	2,5
<a href="#">477504S</a>	Process Optimization	4
<a href="#">477606S</a>	Fault Diagnosis and Process Performance Analysis	2
<a href="#">477607S</a>	Advanced Control and Systems Engineering	5
<a href="#">477505S</a>	Fuzzy-neuromethods in Process Automation	4
<a href="#">477508S</a>	Automation in Metallurgical Industry	5
<a href="#">477611S</a>	Power Plant Automation	2
<a href="#">477613S</a>	Power Plant Simulation	1
<a href="#">477713S</a>	Automation in Mineral Processing	5
Total ECTS credits		<b>30,5</b>

<b>5th Autumn</b>		ECTS credits
<a href="#">488002S</a>	Advanced Practical Training	3
<a href="#">488982S</a>	Master's Thesis	8
	Free Choice Courses	18,5
Total ECTS credits		<b>29,5</b>

<b>5th Spring</b>		ECTS credits
<a href="#">477610S</a>	Process Information Systems	5
<a href="#">477612S</a>	Power Plant Control	3
<a href="#">488982S</a>	Master's Thesis	22
<a href="#">480429S</a>	Maturity test	0
Total ECTS credits		<b>30</b>

**The Degree Programme in Environmental Engineering, Study option of Bioproducts and Bioprocess Engineering**  
**(2 years, 120 ECTS credits)**

Select either **Bioproducts Engineering** or **Bioprocess Engineering**:

<b>4th Autumn / Bioproducts Engineering</b>		ECTS credits
<a href="#">477104S</a>	Chemical Processing of Biomasses	3
<a href="#">477105S</a>	Mechanical Processing of Biomasses	3
<a href="#">477106S</a>	Recycling of Bioproducts	3
<a href="#">477107S</a>	Paper and Board Manufacturing	3
<a href="#">477108S</a>	Printing Technology	3
<a href="#">477109S</a>	Pulp and Paper Laboratory Analyses	3
<a href="#">477113S</a>	Bioeconomy Research Seminar	5
	Free Choice Courses	7
Total ECTS credits		<b>30</b>
<b>4th Spring / Bioproducts Engineering</b>		ECTS credits
<a href="#">477110S</a>	Bioeconomy Research Seminar	3
<a href="#">477113S</a>	Research Training of Bioprocess Technology	5
	Free Choice Courses	22
Total ECTS credits		<b>30</b>
<b>5th Autumn / Bioproducts Engineering</b>		ECTS credits
<a href="#">488002S</a>	Advanced Practical Training	3
	Free Choice Courses	27
Total ECTS credits		<b>30</b>

or

<b>4th Autumn / Bioprocess Engineering</b>		ECTS credits
<a href="#">488304S</a>	Bioreactor Technology	6
<a href="#">488310S</a>	Laboratory Course in Microbiology**	2
<a href="#">488305S</a>	Advanced Course for Biotechnology	2,5
<a href="#">488311S</a>	Industrial Microbiology**	5
<a href="#">740148A</a>	Biomolecules	5
<a href="#">477506S</a>	Modeling and Control of Biotechnological Processes	5
<a href="#">477204S</a>	Chemical Engineering Thermodynamics	5
Total ECTS credits		<b>30,5</b>
<b>4th Spring / Bioprocess Engineering</b>		ECTS credits
<a href="#">488305S</a>	Advanced Course for Biotechnology	2,5
<a href="#">488307S</a>	Bioprocess Engineering	7
<a href="#">740149A</a>	Metabolism I	4
<a href="#">477308S</a>	Multicomponent Mass Transfer	5
<a href="#">477502A</a>	Process Control Engineering II	5
	Free Choice Courses	7
Total ECTS credits		<b>30,5</b>
<b>5th Autumn / Bioprocess Engineering</b>		ECTS credits
<a href="#">488311S</a>	Industrial Microbiology**	5
<a href="#">477306S</a>	Non-ideal Reactors	5
<a href="#">488002S</a>	Advanced Practical Training	3
	Free Choice Courses	16
Total ECTS credits		<b>29</b>

<b>5th Spring / Bioproducts Engineering and Bioprocess Engineering</b>		ECTS credits
<a href="#">488983S</a>	Master's Thesis	30
<a href="#">480429S</a>	Maturity test	0
Total ECTS credits		<b>30</b>

## The Degree Programme in Environmental Engineering, Study option of Chemical Engineering (2 years, 120 ECTS credits)

4 th Autumn		ECTS credits
<a href="#">477306S</a>	Non-ideal Reactors	5
<a href="#">477309S</a>	Process and Environmental Catalysis	5
<a href="#">477305S</a>	Flow Dynamics	5
<a href="#">477204S</a>	Chemical Engineering Thermodynamics	5
<a href="#">477209S</a>	Chemical Process Simulation	5
	Free Choice Courses	5
Total ECTS credits		<b>30</b>

4th Spring		ECTS credits
<a href="#">477310S</a>	Advanced Catalytic Processes*	5
<a href="#">477311S</a>	Advanced Separation Processes*	5
<a href="#">477308S</a>	Multicomponent Mass Transfer	5
<a href="#">477504S</a>	Process Optimization	4
<a href="#">477206S</a>	Advanced Process Design	6
<a href="#">477207S</a>	Industrial Water and Wastewater Technologies	5
Total ECTS credits		<b>30</b>

5th Autumn		ECTS credits
<a href="#">488002S</a>	Advanced Practical Training	3
<a href="#">488984S</a>	Master's Thesis	3
	Free Choice Courses	24
Total ECTS credits		<b>30</b>

5th Spring		ECTS credits
<a href="#">477208S</a>	Biorefineries	3
<a href="#">488984S</a>	Master's Thesis	27
<a href="#">480429S</a>	Maturity test	0
Total ECTS credits		<b>30</b>

## The Degree Programme in Environmental Engineering, Study option of Extractive Metallurgy (2 years, 120 ECTS credits)

4th Autumn		ECTS credits
<a href="#">477412S</a>	Phenomena-based modelling in extractive metallurgy	10
<a href="#">477414S</a>	Process Simulation in Extractive Metallurgy	10
	Free Choice Courses	10
Total ECTS credits		<b>30</b>

4th Spring		ECTS credits
<a href="#">477413S</a>	Experimental Research in Extractive Metallurgy	10
	Free Choice Courses	20
Total ECTS credits		<b>30</b>

5th Autumn		ECTS credits
<a href="#">488002S</a>	Advanced Practical Training	3
	Free Choice Courses	27
Total ECTS credits		<b>30</b>

5th Spring		ECTS credits
<a href="#">488985S</a>	Master's Thesis	30
<a href="#">480429S</a>	Maturity test	0
Total ECTS credits		<b>30</b>

**The Degree Programme in Environmental Engineering, Study option of Mineral Processing  
(2 years, 120 ECTS credits)**

<b>4th Autumn</b>		ECTS credits
<a href="#">477701A</a>	Basic Course in Geology	4
<a href="#">477704A</a>	Principles of Mineral Processing	5
<a href="#">477703A</a>	Surface Chemistry Principles of Minerals	3
<a href="#">477711S</a>	Rock and Mining Engineering	5
<a href="#">488115A</a>	Geomechanics	2,5
<a href="#">488203S</a>	Industrial Ecology	5
<a href="#">477715S</a>	Environmental and Social Responsibility in Mining**	5
Total ECTS credits		<b>29</b>

<b>4th Spring</b>		ECTS credits
<a href="#">477712S</a>	Phenomena in Mineral Processing	5
<a href="#">477713S</a>	Automation in Mineral Processing	5
<a href="#">555362S</a>	Safety in Process Industry	5
<a href="#">488115A</a>	Geomechanics	2,5
<a href="#">477207S</a>	Industrial Water and Wastewater Technologies	5
<a href="#">488205S</a>	Environmental Load of Process Industry	4
<a href="#">477709S</a>	Financial and Project Valuation of Mining Project**	3
Total ECTS credits		<b>29,5</b>

<b>5th Autumn</b>		ECTS credits
<a href="#">477708S</a>	Mining Project Feasibility Study**	4
<a href="#">488002S</a>	Advanced Practical Training	3
	Free Choice Courses	24,5
Total ECTS credits		<b>31,5</b>

<b>5th Spring</b>		ECTS credits
<a href="#">488986S</a>	Master's Thesis	30
<a href="#">480429S</a>	Maturity test	0
Total ECTS credits		<b>30</b>

**The Degree Programme in Environmental Engineering, Study option of Industrial Energy and  
Environmental Engineering  
(2 years, 120 ECTS credits)**

<b>4th Autumn</b>		ECTS credits
<a href="#">477309S</a>	Process and Environmental Catalysis	5
<a href="#">488110S</a>	Water and Wastewater Treatment	5
<a href="#">488202S</a>	Production and Use of Energy	5
<a href="#">488203S</a>	Industrial Ecology	5
<a href="#">488204S</a>	Air Pollution Control Engineering	5
<a href="#">488402A</a>	Sustainable Development	3
<a href="#">477307S</a>	Research Methodology	2
Total ECTS credits		<b>30</b>

<b>4th Spring</b>		ECTS credits
<a href="#">477206S</a>	Advanced Process Design	6
<a href="#">477208S</a>	Biorefineries	3
<a href="#">488104A</a>	Industrial and Municipal Waste Management	5
<a href="#">488205S</a>	Environmental Load of Process Industry	4
<a href="#">488206S</a>	Sustainable Energy Project	5
<a href="#">477307S</a>	Research Methodology	3
	Free Choice Courses	4
Total ECTS credits		<b>30</b>
<b>5th Autumn</b>		ECTS credits

<a href="#">488103A</a>	Environmental Impact Assessment*	8
<a href="#">488002S</a>	Advanced Practical Training	3
	Free Choice Courses	19
Total ECTS credits		<b>30</b>

<b>5th Spring</b>		ECTS credits
<a href="#">488987S</a>	Master's Thesis	30
<a href="#">480429S</a>	Maturity test	
Total ECTS credits		<b>30</b>

### The Degree Programme in Environmental Engineering, Study option of Industrial Engineering (2 years, 120 ECTS credits)

<b>4th Autumn</b>		ECTS credits
<a href="#">555223A</a>	Introduction to Production Control	1,5
<a href="#">555320S</a>	Strategic Management	5
<a href="#">555240A</a>	Basic Course in Product Development	3
<a href="#">555340S</a>	Technology Management	4
Total ECTS credits		<b>13,5</b>
<i>Choose one of those (16,5 ECTS credits)**</i>		
<b>Automation Engineering**</b>		
<a href="#">477503S</a>	Simulation	3
	Free Choice Courses	13,5
Total ECTS credits (Automation Engineering)		<b>16,5</b>
<b>Bioprocess Engineering**</b>		
<a href="#">488304S</a>	Bioreactor Technology	6
<a href="#">488305S</a>	Advanced Course for Biotechnology	2,5
<a href="#">477506S</a>	Modelling and Control of Biotechnological Processes	5
	Free Choice Courses	3
Total ECTS credits (Bioprocess Engineering)		<b>16,5</b>
<b>Bioproducts**, 32,5 ECTS</b>		
<a href="#">477104S</a>	Chemical Processing of Biomasses	3
<a href="#">477105S</a>	Mechanical Processing of Biomasses	3
<a href="#">477106S</a>	Recycling of Bioproducts	3
<a href="#">477108S</a>	Printing Technology	3
	Free Choice Courses	4,5
Total ECTS credits (Bioproducts)		<b>16,5</b>
<b>Chemical Engineering**</b>		
<a href="#">477306S</a>	Non-ideal Reactors	5
<a href="#">477309S</a>	Process and Environmental Catalysis	5
	Free Choice Courses	6,5
Total ECTS credits (Chemical Engineering)		<b>16,5</b>
<b>Extractive Metallurgy **</b>		
<a href="#">477412S</a>	Phenomena-based modelling in extractive metallurgy	10
	Free Choice Courses	6,5
Total ECTS credits (Extractive Metallurgy)		<b>16,5</b>
<b>Water and Geo Engineering, choose 3 course**</b>		
<a href="#">488103A</a>	Environmental Impact Assessment*	4
<a href="#">488121S</a>	Introduction to Civil Engineering	5
<a href="#">488110S</a>	Water and Wastewater Treatment	5
<a href="#">488117S</a>	Water Resources Management *	5
	Free Choice Courses	1,5-2,5
Total ECTS credits (Water and Geo Engineering)		
Total ECTS credits		<b>30</b>

<b>4th Spring</b>		ECTS credits
<a href="#">555223A</a>	Introduction to Production Control	1,5
<a href="#">555281A</a>	Basic Course of Quality Management	3
<a href="#">555282A</a>	Project Management	5
<a href="#">555322S</a>	Production Management	3
<a href="#">555324S</a>	Advanced Supply Chain Management	3
<a href="#">555360S</a>	Administration, Organization and Education in Working Life	5
<a href="#">555362S</a>	Safety in Process Industry	5
	Total ECTS credits	<b>25,5</b>
One of these (6 ECTS credits)		
	<b>Automation Engineering**</b>	
<a href="#">477504S</a>	Process Optimization	4
<a href="#">477606S</a>	Fault Diagnosis and Process Performance Analysis	2
	Total ECTS credits (Automation Engineering)	<b>6</b>
	<b>Bioprocess Engineering**</b>	
<a href="#">488305S</a>	Advanced Course for Biotechnology	2,5
	Free Choice Courses	3,5
	Total ECTS credits (Bioprocess Engineering)	<b>6</b>
	<b>Bioproducts**</b>	
<a href="#">477109S</a>	Pulp and Paper Laboratory Analyses	1,5
	Free Choice Courses	4,5
	Total ECTS credits (Bioproducts)	<b>6</b>
	<b>Chemical Engineering**</b>	
<a href="#">477206S</a>	Advanced Process Design	6
	Total ECTS credits (Chemical Engineering)	<b>6</b>
	<b>Extractive Metallurgy **</b>	
	Free Choice Courses	6
	Total ECTS credits (Extractive Metallurgy)	<b>6</b>
	<b>Water and Geo Engineering**</b>	
	Free Choice Courses	6
	Total ECTS credits (Water and Geo Engineering)	<b>6</b>
	Total ECTS credits	<b>31,5</b>

<b>5th Autumn</b>		ECTS credits
<a href="#">555222A</a>	Demonstration in Industrial Engineering and Management	2
<a href="#">555224A</a>	Methods of Production Management and Logistics	5
<a href="#">477002S</a>	Advanced Practical Training	3
<a href="#">477988S</a>	Master's Thesis	5
	Total ECTS credits	<b>16</b>
One of these (13,5 ECTS credits)		
	<b>Automation Engineering **</b>	
	Free Choice Courses	13,5
	Total ECTS credits (Automation Engineering)	<b>13,5</b>
	<b>Bioprocess Engineering **</b>	
	Free Choice Courses	13,5
	Total ECTS credits (Bioprocess Engineering)	<b>13,5</b>
	<b>Bioproducts **</b>	
<a href="#">477109S</a>	Pulp and Paper Laboratory Analyses	1,5
<a href="#">477107S</a>	Paper and Board Manufacturing	3
	Free Choice Courses	9
	Total ECTS credits (Bioproducts)	<b>13,5</b>
	<b>Chemical Engineering **</b>	
	Free Choice Courses	13,5
	Total ECTS credits (Chemical Engineering)	<b>13,5</b>
	<b>Extractive Metallurgy**</b>	
<a href="#">477414S</a>	Process Simulation in Extractive Metallurgy	10
	Free Choice Courses	3,5
	Total ECTS credits (Extractive Metallurgy)	<b>13,5</b>
	<b>Water and Geo Engineering**</b>	
	Free Choice Courses	13,5
	Total ECTS credits (Water and Geo Engineering)	<b>13,5</b>
	Total ECTS credits	<b>28,5</b>

5th Spring		ECTS credits
<a href="#">488988S</a>	Master's Thesis	25
<a href="#">480429S</a>	Maturity test	0
One of these (5 ECTS credits)		
	<b>Automation Engineering **</b>	
<a href="#">477610S</a>	Process Information Systems	5
	Total ECTS credits (Automation Engineering)	<b>5</b>
	<b>Bioprocess Engineering **</b>	
	Free Choice Courses	5
	Total ECTS credits (Bioprocess Engineering)	<b>5</b>
	<b>Bioproducts **</b>	
	Free Choice Courses	5
	Total ECTS credits (Bioproducts)	<b>5</b>
	<b>Chemical Engineering **</b>	
	Free Choice Courses	5
	Total ECTS credits (Chemical Engineering)	<b>5</b>
	<b>Extractive Metallurgy**</b>	
	Free Choice Courses	5
	Total ECTS credits (Extractive Metallurgy)	<b>5</b>
	<b>Water and Geo Engineering **</b>	
	Free Choice Courses	5
	Total ECTS credits (Water and Geo Engineering)	<b>5</b>
	Total ECTS credits	<b>30</b>

**The Degree Programme in Environmental Engineering, Study option of Water and Geo Engineering**  
(2 years, 120 ECTS credits)

4th Autumn		ECTS credits
<a href="#">488110S</a>	Water and Wastewater Treatment	5
<a href="#">488108S</a>	Groundwater Engineering*	5
<a href="#">488118S</a>	Laboratory and Field Measurements in Environmental Engineering	5
<a href="#">488121S</a>	Introduction to Civil Engineering	5
<a href="#">488117S</a>	Water Resources Management *	5
<a href="#">488131S</a>	Geoenvironmental Engineering	5
	Total ECTS credits	<b>30</b>

4th Spring		ECTS credits
<a href="#">488118S</a>	Laboratory and Field Measurements in Environmental Engineering	5
<a href="#">488105A</a>	Water Supply Networks	5
	Total ECTS credits	<b>10</b>
<i>Choose another (20 ECTS credits)**</i>		
	<b>Water Engineering **</b>	
<a href="#">488123S</a>	River Engineering and Hydraulic Structures*	5
	Free Choice Courses	15
	Total ECTS credits (Water Engineering)	<b>20</b>
	<b>Geo Engineering **</b>	
<a href="#">488111S</a>	Modelling in Geoenvironmental Engineering	5
<a href="#">460163S</a>	Foundation Engineering	5
<a href="#">488123S</a>	River Engineering and Hydraulic Structures*	5
<a href="#">488132S</a>	Cold Climate Engineering	5
	Total ECTS credits (Geo Engineering)	<b>20</b>
	Total ECTS credits	<b>30</b>

<b>5th Autumn</b>		ECTS credits
<a href="#">488002S</a>	Advanced Practical Training	3
<a href="#">488103A</a>	Environmental Impact Assessment *	8
	Total ECTS credits	<b>11</b>
<i>Choose another (19 ECTS credits)**</i>		
	<b>Water Engineering **</b>	
<a href="#">488122S</a>	Statistical Methods in Hydrology*	5
<a href="#">488124S</a>	Advanced Course in Hydrology *	5
<a href="#">488113S</a>	Introduction to Surface Water Quality Modelling*	5
	Free Choice Courses	4
	Total ECTS credits (Water Engineering)	<b>19</b>
	<b>Geo Engineering **</b>	
	Free Choice Courses	19
	Total ECTS credits (Geo Engineering)	<b>19</b>
	Total ECTS credits	<b>30</b>

<b>5th Spring</b>		ECTS credits
<a href="#">488989S</a>	Master's Thesis	30
<a href="#">480429S</a>	Maturity test	
	Total ECTS credits	<b>30</b>