

# Environmental Engineering

## 3.rd cycle doctoral study programme

### 1 General description of the programme

The doctoral study programme of the third cycle “Environmental Engineering” within the Faculty of Mechanical Engineering lasts three years. A student has to acquire 180 ECTS points. The study programme is aligned with the Bologna directives.

Students of the Environmental Engineering study programme upgrade their knowledge of engineering and science with courses in environmental sciences, that allow them to conduct in-depth scientific research in the field of environmental engineering.

The study programme is related to other study programmes in Europe. Three study programmes “Environmental Engineering” from the high-ranked universities were taken as the benchmark and comparison: University di study Udine, Italy, TU Delft, Netherlands and TU Lisbon, Portugal.

A graduate of the programme is able to scientifically assess the existing and actively contribute in development of new environmental technologies. The graduate develops in-depth theoretical knowledge and specific professional skills, that can be used in state of the art environmental technologies and studies.

The study programme is intended to provide industry and academia with a new breed of environmental scientists with a state of the art knowledge of engineering, technology, computer science and experimental methods. Graduates of the environmental engineering doctoral programme have employment opportunities in the academic sectors, research institutions and companies with a research and development departments, and can also be the environmental policy makers on the state and EU level.

### 2 Short description of the study modules

The Environmental Engineering study programme does not include any study modules.

### 3 General learning outcomes and competencies of the students

With the postgraduate doctoral study program "Environmental Engineering" the graduate will deepen the theoretical and special professional expertise, skills and working methods to find new solutions or new methods for solving very complex technical problems in the field of technical environmental protection. With in-depth study of scientific methods the graduate will develop the ability of intense abstract and associative thinking, synthesis of

knowledge from the broad field of fundamental skills and other disciplines, the transfer of research results into practice and the development of innovative problem solving approaches.

Such an orientation of the program is fully in line with the European one, which intensifies in particular the development of new methods, new technologies and products based on top-level/superior knowledge, the use of modern tools for computer modelling of processes and systems.

Moreover, the aim of postgraduate doctoral study program "Environmental engineering" is to ensure the involvement of graduates in research and development units within companies and institutes. With a modern designed program where the academic contents are strongly connected with the scientific research of top researchers at the faculty and with the promoting of creativity and independent work of students the latter will be able to meet the high expectations of the industrial and academic sector.

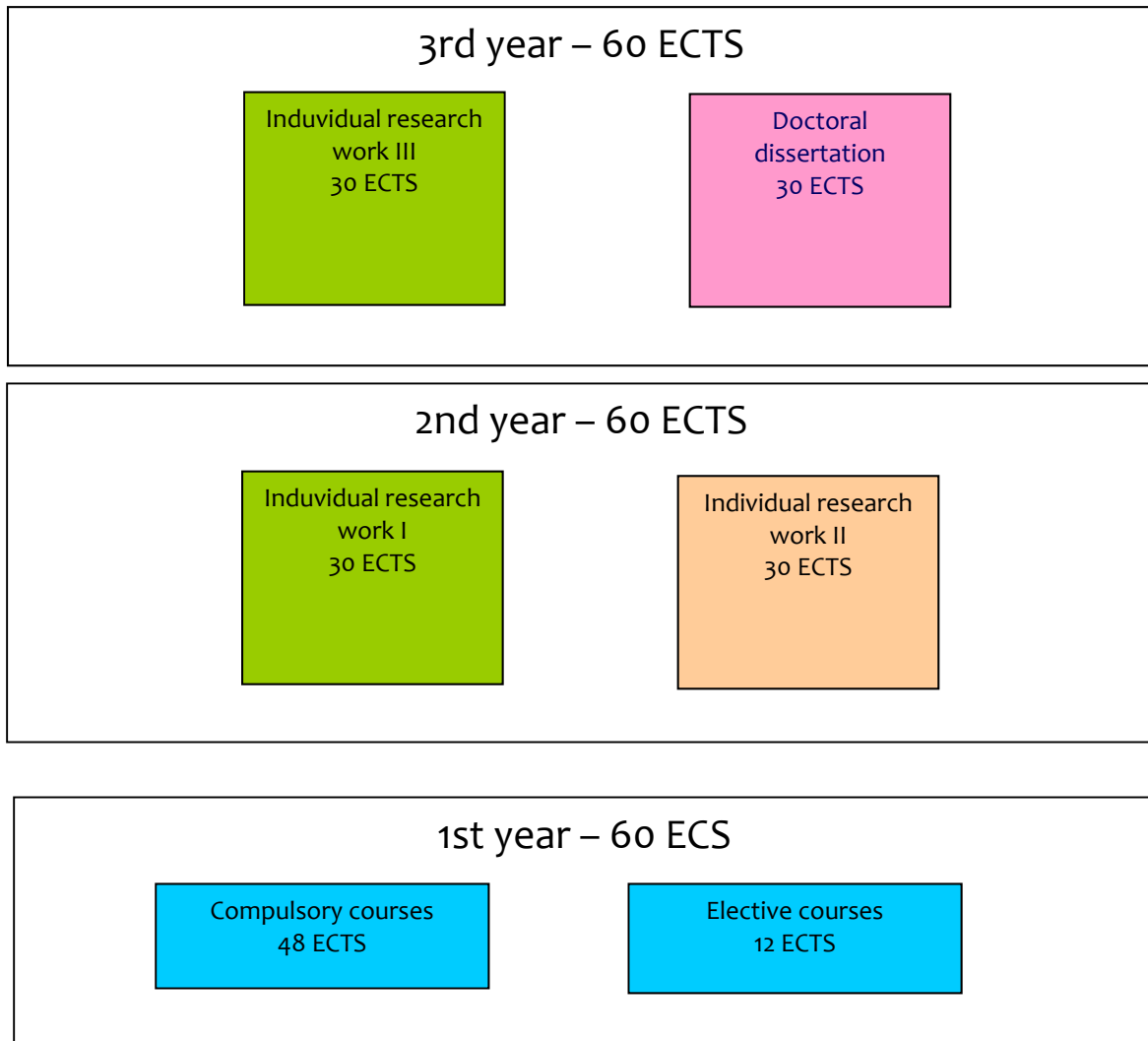
#### 4 The main subject-specific learning outcomes and competencies of the students

The main competences developed by postgraduate doctoral study program "Environmental Engineering" can be summarized in the following points:

- qualifications to further develop the knowledge in a particular research area (like the construction of technical and environmental systems, computer and experimental modelling of technical and environmental systems and environmental phenomena, advanced management concepts in environmental protection).
- qualifications for researching new sources of knowledge in scientific and technical fields of environmental protection,
- qualifications for advanced planning, evaluation and elaboration of emerging and new technologies, that have been or will be commercialized at the global markets,
- the evaluation and assessment of advantages and disadvantages of new technologies and processes,
- the ability to design innovative procedures in environmental process engineering,
- ability of advanced modeling of environmental systems,
- ability of using modern computer simulation tools for virtual modeling of environmental systems,
- advanced expertise in wastewater treatment processes,
- advanced knowledge of transport phenomena in environmental systems.

## 5 General curriculum

The doctoral study programme of Environmental Engineering is divided into the following parts:



## 6 Detailed curriculum

1. year								
Subject	1 <sup>st</sup> semester				Cont. hours	Individ. work	Hours	ECTS
	L	S	T	K				
Obligatory subjects	105	75	0	0	180	360	540	18
METHODS OF SCIENTIFIC RESEARCH WORK 1	0	30	0	30	60	300	360	12
Together semester:	105	105	0	30	240	660	900	30

Subject	2 <sup>nd</sup> semester				Cont. hours	Individ. work	Hours	ECTS
	L	S	T	K				
Elective subjects	90	90	0	0	180	360	540	18
METHODS OF SCIENTIFIC RESEARCH WORK 2	0	30	0	30	60	300	360	12
Together semester:	90	120	0	30	240	660	900	30
<b>Together year:</b>	<b>195</b>	<b>225</b>	<b>0</b>	<b>60</b>	<b>480</b>	<b>1320</b>	<b>1800</b>	<b>60</b>

2. year								
Subject	3 <sup>rd</sup> semester				Cont. hours	Individ. work	Hours	ECTS
	L	S	T	K				
INDIVIDUAL RESEARCH WORK I	0	5	0	30	35	865	900	30
Together semester:	0	5	0	30	35	865	900	30

Subject	4 <sup>th</sup> semester				Cont. hours	Individ. work	Hours	ECTS
	L	S	T	K				
INDIVIDUAL RESEARCH WORK II	0	5	0	30	35	865	900	30
Together semester:	0	5	0	30	35	865	900	30
<b>Together year:</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>60</b>	<b>70</b>	<b>1730</b>	<b>1800</b>	<b>60</b>

3. year								
Subject	5 <sup>th</sup> semester				Cont. hours	Individ. work	Hours	ECTS
	L	S	T	K				
INDIVIDUAL RESEARCH WORK III	0	5	0	30	35	865	900	30
Together semester:	0	5	0	30	35	865	900	30

Subject	6 <sup>th</sup> semester				Cont. hours	Individ. work	Hours	ECTS
	L	S	T	K				
DOCTORAL THESIS	0	0	0	60	60	840	900	30
Together semester:	0	0	0	60	60	840	900	30
<b>Together year:</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>90</b>	<b>95</b>	<b>1705</b>	<b>1800</b>	<b>60</b>
<b>Together 3 years:</b>	<b>195</b>	<b>240</b>	<b>0</b>	<b>210</b>	<b>645</b>	<b>4755</b>	<b>5400</b>	<b>180</b>

L – lectures, S – seminar; T – tutorial; K - konsultation

### 1.year – Obligatory subjects

Subject	1 <sup>st</sup> semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
SYSTEMATIC ENVIRONMENTAL REGULATION	30	30	0	60	120	180	6
ENVIRONMENTAL ENGINEERING	30	30	0	60	120	180	6
ECOLOGICAL MEASUREMENTS	45	15	0	60	120	180	6

### 1.year – Elective subjects

Subject	1 <sup>st</sup> semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
WASTE MANAGEMENT	30	30	0	60	120	180	6

ENVIRONMENTAL ANALYTICS (SELECTED CHAPTERS)	30	15	15	60	120	180	6
MODELING OF ENVIRONMENTAL SYSTEMS	30	15	15	60	120	180	6
ADVANCED WASTEWATER TREATMENT	30	30	0	60	120	180	6
ENVIRONMENTAL IMPACTS OF ENERGY PRODUCTION	30	30	0	60	120	180	6
HAZARDOUS SUBSTANCES IN THE ENVIRONMENT	45	15	0	60	120	180	6
TRANSPORT PHENOMENA IN ENVIRONMENTAL SYSTEMS	30	30	0	60	120	180	6
ENVIRONMENTAL CONTROL	15	15	20	50	130	180	6