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Harmonising Water Resource Management Curricula between EU and Western Balkans

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Strengthening of master curricula in water resources management for the Western Balkans HEIs and stakeholders

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Implemented strategy for courses innovation

The strategy that was proposed to be followed for integrating innovation issues in the existing and new courses is interconnected with the principal aim of the current programme, i.e. the strengthening of master curricula by promoting innovative but also well-established approaches. The proposed strategy is based on two principal issues:

1) Utilization of knowledge produced during previous work packages and relevant actions, and

2) Continuous consultation with the project partners for the selection of approaches and the decision making processes.

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Utilization of knowledge produced during previous activities and WPs

Various activities were included within the WP2 dealing with the development of competence-based Curricula in alignment with EU trends.

A Catalogue of competences was developed (activity WP2.1) including Generic, Engineering and WRM competencies, which was used by the WB partners to correlate them with the various subjects.

The competences were obtained as a result of researching the existing water sector competence requirements and job profiles. This activity was performed by a heterogeneous team, consisting of stakeholders such as curriculum developers, teachers, educational managers, field experts and representatives from the water sector. Together they analyzed and collected information about the competencies within the WRM domain and identified the competencies.

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Generic, Engineering and WRM competencies

GENERIC

Communicating, verbally and in writing, clearly and effectively, critical thinking, scenario modeling, creativity, initiative, prediction of solutions and consequences, collaboration, working in multidisciplinary team, working in an international context, working autonomously, generating new research ideas, intensive use of ICT in acquiring knowledge and solving problems, solving complex multidisciplinary problems in theory and practice applying acquired knowledge, social and civil responsibility, development of professional ethics and responsibility, effective leadership, strategic thinking, experience-based critical decision making, staying up-to-date with technological development, knowledge transfer to the professional and wider public clearly and unambiguously, applying knowledge in practice, retrieving, analyzing and synthesizing data and information, with the use of necessary technologies, designing and managing projects, demonstrating social, professional and ethical commitment and sensitivity to gender issues, being critical and self-critical,

ENGINEERING

Understanding the wider context of the engineering discipline, its practical applications, societal impact and limitations, acceptance of the general principles and practices of engineering professional codes of conduct, following general laboratory, workshop and/or fieldwork safety guidance and precautions, mastering of methods, procedures and processes of risk identification, statistical data processing in order to define and make adequate conclusions, understanding and using appropriate methods for research design regarding data collection and analysis, particularly focused on contemporary qualitative and quantitative methods, cognizant of the needs of special populations, using appropriate engineering software packages as an aid to research, analysis, problem solving and presentation of results, using computer systems to access learning resources, receive communications regarding the degree programme, undertake assessments and submit assignments, preparing technical drawings by hand (following appropriate training), producing sketches to communicate ideas and concepts, using appropriate equipment competently and safely (following appropriate training), forming logical, reasonable conclusions and make sound recommendations based on available data and/or observations.

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Generic, Engineering and WRM competencies

WRM

understanding of climate changes and hydrological hazards and their effects on WRM, devising strategies and developing methodology and methods of emergency as part of WRM, optimizing and managing available resources in WRM systems, applying ICT in WRM, development of human resources in WRM, applying specialized civil engineering fields in WRM, writing documents dealing with natural resource issues and technical information, drawn from a variety of sources, defining objectives for simple projects in a variety of disciplines and to develop and implement basic work plans, understanding of the Water Framework Directive and its implementation processes, using of mathematical models for the simulation of water related processes, understanding the environmental pricing concept with emphasis to the value of the water, understanding the hydrologic cycle, the various natural processes and the simulation methods, defining the interaction of water with other sections, the water-energy-food-environment (WEFE) nexus approach

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From competence catalogue to curriculum development

The procedure for the development of curricula is consisted of the following 4 interconnected steps:

Step 1. The EU project partners created a report entitled as "EU Universities' Courses and Syllabi". In this report the relevant courses on the subject of Water Resources Management that are within the curricula of the EU Universities were identified and described. The report was used by the WB Universities as guidance to develop their own courses.

Step 2. The project partners concluded on the new courses as well as the updating of the existing courses.

The output of this process, i.e. the proposed number of courses per institution, is summarized in the following Table .

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Table:

Number of new and updated courses

WB HEI	Undergraduate		Master	
	New courses	Upgrade/improve of existing courses	New courses	Upgrade/improve of existing courses
Univ. of Pristina in Kosovska Mitrovica/ Faculty of Technical Sciences	3	1	2	
Technical College of Applied Sciences Urosevac-Leposavic			3	
Univ. of Montenegro/ Faculty of Civil Engineering				4
Univ. of Novi Sad/ Faculty of Technical Sciences			5	1
Dzemal Bijedic Univ. of Mostar/ Faculty of Civil Engineering			1	2
Univ. of Nis/ Faculty of Civil Engineering and Architecture	4		2	
Univ. of Sarajevo/ Faculty of Civil Engineering				4
TOTAL	7	1	13	11

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Step 3. A common format for the description of the courses was agreed among the WB project partners. The general form that was proposed and approved is presented in the following Table.

Study programme:				
Level:				
The name of the course:				
Lecturer (Name, middle name, last name):				
Course status:				
Number of ECTS:				
Prerequisites:				
Course objective				
Learning outcomes				
Content				
Literature				
Number of classes of active teaching				**Other**
Lectures:	Exercises:	Other form of lectures:	Study and research work:	
Teaching methods				
Grade (maximum number of credits 100)				
Pre-exam requirements		**Credits**	Final exam	**Credits**
activity during lectures			written exam	
practical teaching			oral exam	
colloquia				
seminar paper				

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Step 4. The WB partners proposed the syllabus of the proposed courses. A consolidated document that included all the syllabi was created and was sent to the EU partners for their comments and reviews.

Step 5. The EU partners proceeded in the review of the proposed courses, their content, objective and teaching outcomes. A consolidated review was sent to the WB project partners.

Step 6. The WB partners carefully deliberated the revised courses. Many comments were accepted, but there were also a lot of comments that couldn't be accepted, such as the change of the name of a course, since this is a process that needs approval at Ministerial level. In the final report a unique set of courses was produced.

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Table: SWARM undergraduate study programme courses

WB HEI	Course title	Type of course	ECTS
UNI	Hydrotechnical Facilities	Mandatory	5
	Water Energy management	Elective	5
	Water Supply and Sewerage of Buildings	Elective	5
	Municipal Hydrotechnics	Elective	5
UPKM	Water Resources Management	Mandatory	5
	Modern methods in the preparation of drinking water	Mandatory	6
	Advanced techniques in wastewater treatment	Mandatory	6
	Protection and water resources management	Elective	5

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Table Existing and new courses in the Bachelor programme on PROJECT MANAGEMENT –UNIV OF NIS

Existing courses	New courses
Fluid Mechanics (EC, III semester)	Hydrotechnical Facilities (MC, V semester)
Basics of Hydrology (EC, IV semester)	Water energy management (EC, V semester)
Hydrotehnics (MC, V semester)	Water Supply and Sewerage of Buildings (EC, VII semester)
Hydropower (EC, V semester)	Municipal Hydrotechnics (EC, VII semester)
Groundwater (EC, VI semester)	
Urban Hydrotehnics (EC, VII semester)	

MC-Mandatory Course, EC –Elective Course

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Table: SWARM Master programme courses

WB HEI	Course title	Type of course	ECTS
UNI	Water Resources Management	Elective	5
	Hydrological Risks Management	Elective	4
UNS	Environmental Practicum	Elective	7
	Groundwater Flow	Elective	7
	Alternative Separation Processes in Water Treatment	Mandatory	7
	Water Quality Management and Methods for Sediment Remediation	Mandatory	6
	Open Channel Hydraulics	Mandatory	6
	Fundamentals in hydrotechnics, hydromechanics and geotechnics	Elective	6

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Table: SWARM Master programme courses

WB HEI	Course title	Type of course	ECTS
UNSA	Sewage water systems	Mandatory	6
	Water Protection	Mandatory	6
	Water treatment of drinking water	Mandatory	6
	Water Resources Systems	Mandatory	6
UNMO	Sustainable Management of Communal Water Supply Enterprises	Mandatory	6
	Water Protection	Elective	5
	Urban hydrology	Elective	5
UPKM	Groundwater use, protection and management	Elective	6
	Water treatment technologies in industry	Elective	5

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Table: SWARM Master programme courses

WB HEI	Course title	Type of course	ECTS
UoM	Hydraulic Engineering	Mandatory	5
	Groundwater hydraulics	Mandatory	5
	Measurements in hydrotechnics	Mandatory	5
	River Engineering	Mandatory	5
TCASU	Basic Principles of Water Resources Management and Policy	Mandatory	6
	Fundamentals of Water Resources Protection	Mandatory	6
	Water and Wastewater Treatment Methods and Technologies	Mandatory	6

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Table: Master program and distribution of courses per semester of the Univ. of Sarajevo

Existing courses, updated existing courses through SWARM project

No.	Year/Semester	Course Title	M(andatory) /E(lective)	Classes	ECTS
1	I/I	Mathematic III	M	3+2	6
2	I/I	Hydrology	M	3+2	6
3	I/I	Water supply	M	3+2	6
4	I/I	Hydraulic	M	3+2	6
5	I/I	Water treatment of drinking water	M	3+2	6

No.	Year/Semester	Course Title	M(andatory) /E(lective)	Classes	ECTS
1	I/II	Water resources and systems	M	3+2	6
2	I/II	Sewage water system	M	3+2	6
3	I/II	Hydrogeology	M	3+2	6
4	I/II	Environmental Protection	M	3+2	6
5	I/II	Solid Waste Management	E	3+2	6
6	I/II	Hydrodinamic of ground water	E	3+2	6
7	I/II	Stohastic hydrology	E	3+2	6

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Table: Master program and distribution of courses per semester of the Univ. of Sarajevo

Existing courses, updated existing courses through SWARM project

No.	Year/Semester	Course Title	M(andatory) /E(lective)	Classes	ECTS
1	II/III	Project management	M	2+2	5
2	II/III	Hydropower	M	3+2	7
3	II/III	River Engineering	M	3+2	6
4	II/III	Water Protection	M	3+2	6
5	II/III	Treatment of waste water	E	3+2	6
6	II/III	Numerical hydraulics	E	3+2	6
7	II/III	Melioration system	E	3+2	6

No.	Year/Semester	Course Title	M(andatory)/E(lective)	ECTS
1	II/IV	Master thesis - preparation work and defense	M	30

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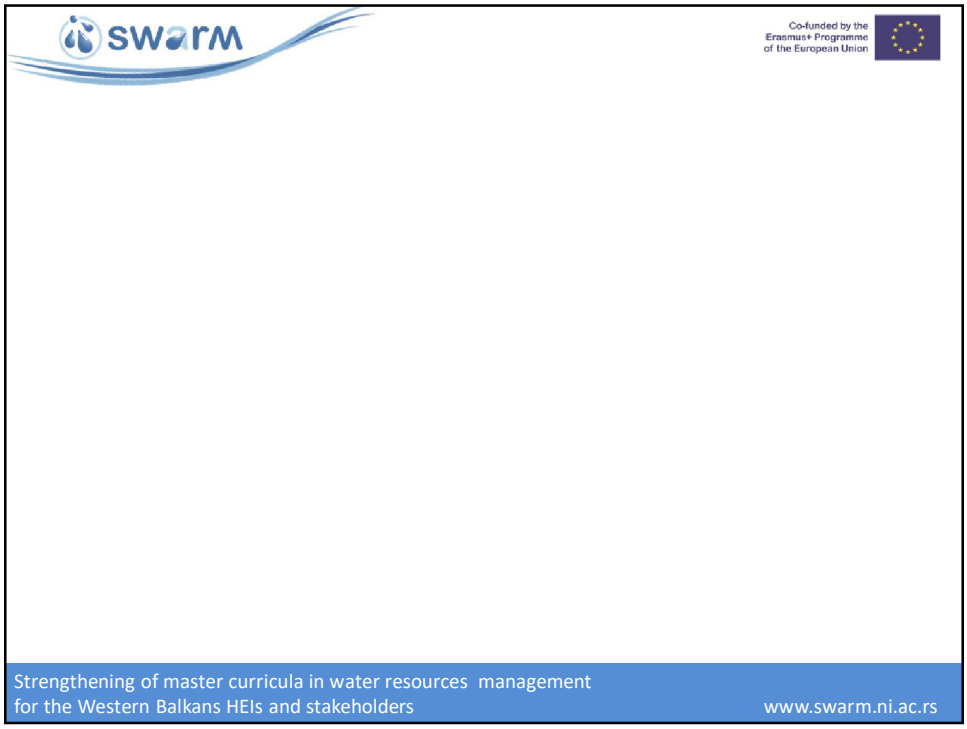
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