SETOF Soil Erosion and TOrrential Flood Prevention: Curriculum Development at the Universities of Western Balkan Countries

Co-funded by the Erasmus+ Programme of the European Union

WP2

Development of curricula

Lead Organisations of WP2**: UNS - Serbia**

Participating Organisation: UB;UNI; UBL; UNSA; INSZASUM; BOKU; UNSCM; UNIRC;FRI-BAS

Deliverable 2.3

Title: **Established new and improved existing subjects of bachelor and master programme**

Participating Organisation: UB; UNS; UNI; UBL; UNSA

PROJECT INFO

Project title	Soil Erosion and Torrential Flood Prevention: Curriculum Development at the Universities of Western Balkan Countries
Project acronym	SETOF
Project reference number	598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP(2018-2579/001-001)
Coordinator	University of Belgrade
Project start date	November 15, 2018
Project duration	36 months

DOCUMENT CONTROLSHEET

Ref. No and Title of Activity	**2.3.Established new and improved existing subjects of bachelor and master programme**
Title of Deliverable:	Report on new and improved existing subjects of bachelor and master programme
Institutions:	University of Nis
Author/s of the deliverable	Slobodan Milutinović, Tatjana Golubović, Dejan Vasović
Status of the document:	final

Description: **Contribution of University of Nis to the Deliverable 2.3: Established new and improved existing subjects of bachelor and master programme**

Date: **01.03.2020.**

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Language: **English**

1. NEW COURSE

1. Name of the course	Soil erosion and torrential floods protection
2. Curriculum name	Emergency management
3. Curriculum type	Master academic studies
4. Course type	1st year of study, elective
5. Status	New master degree course; Submition for the accreditation process expected in April 2020
6. Rationale for course content changes	Processes of soil erosion and torrential flood protection are increasingly in the focus of international research, as well as the subject of cooperation on international projects aimed at strengthening the capacity of society to cope with them. Since there was no course dedicated to this issue within the existing Emergency management study program, it is quite justified to implement it as most of the negative adverse effects derived from natural hayards in the Republic of Serbia are caused by torrential floods. Given the above mentioned, new syllabus was introduced with new topics of interests, including the impact of different pressures to the soil erosion occurance, characterization of soil erosion, mitigation measures as wel as set of topics dedicated to the origins of the torrential floods, influential parameters, spatio-temporal characterization of torrential floods, magnitude of the events and preventive measures. New syllabus is presented bellow.
7. Expected schedule of course implementation	Outumn 2020

Curriculum: Emergency management

Course title: Soil erosion and torrential floods protection

Instructor(s): Dejan M. Vasović

Status of the course: Elective | **Course code:**

Number of ESPP: 6

Requirement(s): -

Course goal

Acquiring knowledge about soil erosion, torrential flows and torrential floods, as wel as the most important factors of soil and water degradation and the environment as a whole, acquaintance with methods, facilities and technologies for the regulation of torrential flows and torrential basins and defense mesures against torrential floods.

Course outputs

Enhanced ability of students to acquire scientific and professional knowledge of water and aeolian soil erosion processes, torrential flows and torrential floods for:

soil erosion assessment and protection measures

planning, torrential flood risk assessment, and

planning adaptation measures facing changing climatic conditions.

Course content

Theoretical classes

1. Concept and classification of soil erosion: definition of soil erosion, division - surface and subsurface species. 2. Mechanism of water and eolian erosion: analysis of the structural connections of soil-rock mass and mechanisms of action of exogenous forces. 3. Basic factors of water and eolian erosion: determination of natural (soil composition, vegetation cover, terrain slope, precipitation amount and distribution, wind intensity ...) and social factors (interventions on vegetation cover, agro-ecological activities, urbanization...) of water and aeolian erosion. 4. Processes and forms of water and eolian erosion: process of destruction of soil-rock mass, forms: denudation, abrasion, fluvial, aeolian, glacial, karst erosion. 5. River flows and river basins: characterization of river basins with a view to identifying river basins where river flows can be formed. 6. Analysis of natural characteristics of torrential basins and erosion areas: meteorological-hydrological determinants, soil composition, terrain elevation, vegetation cover. 7. Hydrology of torrential flows: calculation of expected volume flows in relation to the basin area, rainfall intensity and runoff coefficient, flow modeling. 8. Sediment transport in torrents: formation and properties of river sediment, towed sediment, critical velocity. 9. Principles and systems for the regulation of torrents and torrential basins: prevention principle, principle of impact reduction, multi-purpose systems on the basin. 10. Methods and facilities for the regulation of torrents: technical and biotechnical anti-erosion works, facilities for receiving and transformation of large waters, regulation works inside and outside the riverbed. 11. Protection against torrential floods: modification of the water regime, regulation structures on torrential flows. 12. Ecological bases for the regulation of torrential flows: renaturalization of river basins and river beds.

Practical classes

Determination of basic factors of water and eolian erosion. Estimation of soil losses due to water and aeolian erosion. Torrential flows and basins. Analysis of natural characteristics and parameters of torrential basins important for the genesis of soil erosion, runoff and sediment transport. Hydrological calculations in torrential flows (large waters). Hydraulic calculations in torrential flows (medium and maximum water velocities, equilibrium and equilibrium falls). Calculation of sediment transport.

Readings

[1.] Dejan Vasović. (2020). Erozija zemljišta i zaštita od bujičnih poplava - interni materijal za pripremu ispita. Niš: Fakultet zaštite na radu

[2.] Stanimir Kostadinov. (2008). Bujični tokovi i erozija. Beograd: Šumarski fakultet Univerziteta u Beogradu

[3.] Ratko Ristić, Dragan Malošević. (2011). Hidrologija bujičnih tokova. Beograd: Šumarski fakultet Univerziteta u Beogradu

[4.] Grupa autora. (2015). Vode Srbije - u vremenu prilagođavanja na klimatske promene (urednik Nebojša Veljković), Beograd: Agencija za zaštitu životne sredine Republike Srbije

Number of teaching hours (per week)

Lectures	2	Practical classes	2	Other forms of teaching		SIR/IR	-	Other classes	-

Teaching methods

Teacher presentations; Case study analysis;

Score (maximum points 100)

Pre-exam obligations	Points	**Exam**	Points
activities during the lectures	5	written exam (practical part of the exam)	
activities during the practical classes	5	oral exam (theoretical part of the exam)	40
seminary work	20		
colloquium	15		
colloquium	15		

2. IMPROVED AND UPDATED COURSES

1. Name of the course	Climate change adaptation
2. Curriculum name	Environmental management
3. Curriculum type	Master academic studies
4. Course type	1st year of study, elective
5. Status	Upgraded existing master degree course; Submition for the accreditation process expected in April 2020
6. Rationale for course content changes	Soil erosion rates may be expected to change in response to changes in climate for a variety of reasons, the most direct of which is the change in the erosive power of rainfall. Rainfall amounts and intensities are the most direct and most important factors when it comes to the influence of climate changes on soil erosion potential. Higher rainfall affects the increase in soil moisture and its inability to infiltrate large amounts of water. This leads to an intensification of the runoff process, which intensifies the denudation process. Given the above mentioned, existing syllabus was upgraded with new topics, including the impact of climate change on water and aeolian erosion, vulnerability assessment and adaptation measures. Upgraded syllabus is presented bellow.
7. Expected schedule of course implementation	Outumn 2020

Curriculum: Environmental management

Course title: Climate change adaptation

Instructor(s): Slobodan J. Milutinović

Status of the course: Elective | **Course code:**

Number of ESPP: 4

Requirement(s): -

Course goal

Enabling students to understand existing climate change-related problems caused by anthropogenic impacts, and the role adaptation measures play as a key to addressing these issues.

Course outputs

Students' competence and acquisition of skills for:

independent study of the ecological and evolutionary implications of climate change on natural systems, as well as human and cultural implications for social and socio-economic systems;

implementation of different adaptation frameworks, as well as specific adaptation measures to policies in different sectors, to more effectively manage climate change risk, reduce system vulnerability and increase their resilience;

independent or teamwork to develop sensitivity analyzes and action plans for climate change adaptation at national and local levels.

Course content

Theoretical classes

The basics of climate change and adaptation to climate change. Hydrological and carbon cycle, greenhouse gases, climate sensitivity. Climate projections and scenarios.

Adaptation and mitigation. Vulnerability, resilience, and adaptability in ecological and social systems. Adaptation and equitable development.

Impact of climate change in different sectors and adaptation measures: water resources and water safety; public health; agriculture; forestry; energetics; biodiversity.

Climate impacts and vulnerability in urban systems. Urban vulnerability assessment and adaptation mechanisms. Planning for adaptation to climate change in urban areas.

Impact of climate change on water and aeolian erosion. Vulnerability assessment and adaptation measures. Managing the implementation of adaptation measures globally and nationally. National Framework for Climate Change and Disaster Risk Reduction. Financing and monitoring climate change adaptation.

Practical classes

Case Studies: EU Climate Change Adaptation Strategy; Climate change adaptation strategy for the Danube basin; Climate Change Adaptation Action Plan with Vulnerability Assessment for Belgrade; Climate Change Adaptation Action Plan for Kraljevo.

Readings

[1] Milutinović, S. (2018). Priručnik za planiranje prilagođavanja na izmenjene klimatske uticaje u lokalnim zajednicama u Srbiji. Beograd: Stalna konferencija gradova i opština

[2] Vlada Republike Srbije (2016). Prvi nacionalni plan adaptacije na izmenjene klimatske uslove. (u pripremi).

[3] UNDP (2015). Rezime poglavlja Promene klime, pogođenost i adaptacija Drugog izveštaja R. Srbije prema Okvirnoj konvenciji UN o promeni klime. Beograd: UNDP.

[4] Akcioni plan adaptacije na klimatske promene sa procenom ranjivosti za Beograd. (2015).

Lectures	2	Practical classes	2	Other forms of teaching		SIR/IR	-	Other classes	-

Teaching methods

Teacher presentations; Case study analysis;

Score (maximum points 100)

Pre-exam obligations	Points	**Exam**	Points
activities during the lectures	20	written exam (practical part of the exam)	
activities during the practical classes	20	oral exam (theoretical part of the exam)	40
a colloquium	20		

1. Name of the course	Soil protection
2. Curriculum name	Environment
3. Curriculum type	Bachelor
4. Course type	Obligatory
5. Status	Upgraded existing bachelor degree course; Submition for the accreditation process expected in April 2020
6. Rationale for course content changes	Upgraded syllabus is presented bellow.
7. Expected schedule of course implementation	Outumn 2020

Curriculum: Environment

Course title: Soil protection

Instructor(s): Tatjana D. Golubović

Status of the course: Obligatory | **Course code:**

Number of ESPP: 6

Requirement(s): -

Course goal

Acquiring knowledge about the morphological, physical, chemical and biological properties of soil; soil pollution, the sources and types of pollutants, the behavior and fate of pollutants in the soil, the effects of pollutants on soil, living organisms and the environment; basic categories of land damage.

Course outputs

Students' competence and acquisition of skills for:
• understanding the basic characteristics of soil,
• understanding how the soil is polluted,
• understanding of soil degradation,
• application of acquired knowledge in land remediation,
• application of acquired knowledge for sustainable land management.

Course content

Theoretical classes

Basic concepts of soil: definition of soil, soil as a natural resource, functions of soil; **Genesis and classification of soil**: abiotic and biotic factors affecting soil formation, soil horizons, soil classification; **Soil properties**: solid, liquid and gaseous soil phase; physical properties of soil (texture, porosity, color, voluminous mass); chemical properties of soil (mineral and organic substances in soil, soil reaction, adsorptive properties, redox potential); biological properties of soil; **Land pollution**: definition, types and sources of pollution; behavior of soil pollutants; entry of pollutants into the food chain; the effects of pollutants on soil, living organisms and the environment; soil pollution assessment; **Categories of soil damage**: degradation, destruction, exclusion of land from production, soil erosion - concept and classification, mechanism and main factors of water and eolian erosion, soil erosion due to torrential floods, salinization and alkalisation of soil, acidification, reduction of organic matter content, compaction, impact landfill, landslides, construction of roads on land, etc.; **Soil monitoring**: monitoring objective, monitoring planning, selection of sites and monitoring parameters, data processing and presentation; **Soil remediation**: Remediation techniques for contaminated soils (physical, chemical, thermal and biological treatments (bioremediation and phytoremediation)); **Sustainable agriculture** (basic concepts, basic principles in organic farming, advantages and disadvantages); S**oil protection legislative**.

Practical classes

Introducing students to classical and instrumental methods used for sampling and qualitative and quantitative analysis of basic soil quality parameters (CaCO3 content, organic matter content, total nitrogen, available phosphorus and potassium, active and potential acidity - pH), introducing students to the classical and instrumental methods used for sampling and qualitative and quantitative analysis of potentially polluting substances in soil and plants (Pb, Ni, Cd, As, Hg, etc.).

Readings

[1.] T. Golubović (2011). Zagađivanje i remedijacija zemљišta-interni materijal za pripremu ispita.Niš: Fakultet zaštite na radu u Nišu.

[2.] P. Sekulić, R. Kastori, B. Hadžić (2003). Zaštita zemљišta od degradacije. Novi Sad: Naučni institut za ratarstvo i povrtarstvo, Novi Sad.

[3.] R. Kastori, J. Kadar, P. Sekulić, D. Bogdanović,N. Milošević, M. Pucarević (2006). Uzorkovanje zemљišta i biљaka nezagađenih i zagađenih staništa. Novi Sad: Naučni institut za ratarstvo i povrtarstvo, Novi Sad.

[4.] R. Kadović, R., M. Knežević (2002). Teški metali u šumskim ekosistemima Srbije. Beograd: Šumarski fakultet Beograd, Univerzitet u Beogradu.

[5.] I. A. Mirsal (2008). Soil Pollution: Origin, Monitoring and Remediation, 2nd edition. Berlin: Springer.

Number of teaching hours (per week)

Lectures	2	Practical classes	2	Other forms of teaching		SIR/IR	-	Other classes	-

Teaching methods

Lectures, tutorials, calculus exercises, consultations

Score (maximum points 100)

Pre-exam obligations	Points	**Exam**	Points
Activities during the lectures	5	written exam (practical part of the exam)	-
Activities during the practical classes	5	oral exam (theoretical part of the exam)	40
Colloquium 1	20		
Colloquium 2	20		
Seminary paper	10		