



SETOF

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

Presentation of subjects syllabuses in the field of soil erosion and torrential flood prevention on study programmes at the Faculty of Forestry UNSCM

Workshop on Bachelor and Master Curriculum Best Practices - North Macedonia
28-29 October 2019, Skopje

Reference Number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP

"This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein"

Co-funded by the
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of the European Union





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Prevention: Curriculum Development at the
Universities of Western Balkan Countries

“Ss. Cyril and Methodius” University in Skopje
Faculty of forestry – Skopje, Macedonia
Dept. of Land and Water
<http://www.sf.ukim.edu.mk>



Presentation of subject syllabuses in the field
of soil erosion and torrential flood prevention
on study programmes at the Faculty of
Forestry UNSCM

Ivan BLINKOV



SETOF Workshop
October 28-29 , 2019, Skopje, North Macedonia

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Faculty of Forestry has been established in 1947.

Changes of study programmes in the years:

1970/1, (Forestry)

1981/2, (Silviculture and amelioration; Harvesting and transport)

1984/5 (Forestry)

1992/3 (Forestry)

1998/9 (Forestry; Landscaping and environment promotion)

2003/4 ((Forestry; Landscaping and environment promotion) – ECTS

2013/14 – Forestry, Landscape design, Eco-engineering and eco-management

2018/9 – slight changes – F, LD, EE





Soil Erosion and TOrrential Flood
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Universities of Western Balkan Countries

I Cycle

240 ECTS

Co-funded by the
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Study programme 1947

Rb.	I година	II година	III година	IV година
1.	Предвојничка обука	Предвојничка обука	Предвојничка обука	Предвојничка обука
2.	Странски јазик	Странски јазик	Геодезија	Шумски градежи
3.	Физика	Анатомија на дрвото	Дендрометрија	Пошумување
4.	Неорганска хемија	Шумска фитопатологија	Обнова и одглед. на шумите	Уредување на порои
5.	Органска хемија	Генетика и селекција	Уредување на шумите	Полезаштитни појаси
6.	Хемија	Дендрологија	Нацртна геометрија	Организација на трудот
7.	Виша математика	Метеорологија со климатологија	Техничка механика	Шумска економија и планирање
8.	Ботаника	Педологија	Хидраулика	Шумска статистика
9.	Геологија	Микробиологија	-	-
10.	Техничко цртање	Исхрана на растенијата	-	-
11.	Основи на марксизмот-ленинизмот	Шумско машинство	-	-





Study programme 1970/71

Rb.	I година	II година	III година	IV година
1.	Ботаника	Педологија со осн. минерологија	Одгледување на шумите	Уредување на шумите
2.	Хемија	Дендрологија	Типологија на шумите и пасиштата	Шумски транспортни средства
3.	Физика	Генетика со облаг. на шум. дрвја	Пошумување и мелиорации	Ерозија и уредување на порои
4.	Нацртна геометрија со тех. цртанње	Исхрана на шум. растенијата	Шумска ентомологија	Основи на преработка на дрвото
5.	Метеорологија со климатологија	Анатомија со тех. на дрвото	Шумска фитопатологија	Организација на шумско производство
6.	Политичка економија	Техничка механика	Дендрометрија	Економика на шумарството
7.	Социјологија	Основи на машинството	Искористување на шумите	Економика на шум. стоп. организација
8.	Геодезија	Шумска зоологија и ловство	Озеленување на населби и рекреативни места	Заштита на шумите
9.	Геологија	Основи на народната одбрана	-	-
10.	Основи на нар. одбрана	-	-	-





1981/2 – Silviculture and amelioration

Red. бр.	I година	II година	III година	IV година
1.	Ботаника со физиологија	Геодезија	Дендрометрија	Уредување на шумите
2.	Математика	Педологија	Шумска фитопатологија	Раст и прираст
3.	Хемија	Дендрологија	Шумска ентомологија	Заштита на шумите
4.	Анатомија со технологија на дрвото	Облагородување на шумските видови дрвја	Ерозија на поројните сливови	Организација на шумското производство
5.	Метеорологија со климатологија	Семенарство и расадници	Одгледување на шумите	Економика на шумскостопанските организации
6.	Геологија со петрографија	Механизација	Шумски култури	Економика на шумарството
7.	Основи на марксизмот	Ловство	Мелиорација на деградирани шуми и шикари	Заштита на животната средина
8.	Основи на ОНО - 1	Основи на ОНО - 2	Фитоценологија	-

1981/2 – Harvesting and transport

Rb	I година	II година	III година	IV година
1.	Математика	Геодезија	Искористување на шумите	Основи на уредување на шумите
2.	Нацртна геометрија со тех. цртанње	Дендрологија	Дендрометрија	Отварање на шумите
3.	Физика	Механизација	Заштита на дрвото	Уредување на порои
4.	Анатомија со технологија на дрвото	Техничка механика	Шумски комуникации	Транспорт на шумски производи
5.	Метеорологија со климатологија	Градежништво	Ерозија на поројните сливови	Трговија на шумското производство
6.	Геологија со петрографија	Ловство	-	Организација на шумското производство
7.	Основи на марксизмот	Основи на ОНО - 2	-	Економика на шумското производство
8.	Основи на ОНО - 1	-	-	Економика на шумарството
9.	-	-	-	Заштита на животната средина



1984/5 – Forestry

1992/3 – Forestry

I година		II година		III година		IV година	
1.	Хемија	8а.	Педологија со петрографија	17.	Одгледување на шумите	23.	Уредување на шумите
2.	Виша математика	9.	Дендрологија	18.	Шумски култури (шумарство, расадници и пошумување)	24.	Шумски комуникации и транспорт
3.	Основи на марксизмот	10.	Облагородување на шумските видови дрвја	19.	Шумска ентомологија	25.	Раст и прираст
4.	ОНО - 1	11.	Механизација на шумарството	20.	Шумска фитопатологија	26.	Ерозија и уредување на порои
5.	Ботаника со физиологија	12.	Ловство	21.	Дендрометрија	27.	Организација на шумското производство
6.	Метеорологија со климатологија	13.	Фитоценологија	22.	Искористување на шумите	28.	Заштита на шумите
7.	Геодезија со техничко цртање	14.	ОНО - 2			29.	Економика на шумарство и ШСО
8.	Педологија со петрографија	15.	Шумско градежништво				
		16.	Анатомија на дрвото				

I година		II година		III година		IV година	
1.	Хемија	10.	Педологија со петрографија	18.	Одгледување на шумите	27.	Уредување на шумите
2.	Математика	11.	Дендрологија	19.	Шумски култури семенарство и расадници	28.	Шумски комуникации
3.	Ботаника	12.	Генетика со облагородување на шум. видови дрвја	20.	Шумска ентомологија	29.	Раст и прираст на шумите
4.	Еоклиматологија	13.	Механизација на шумарството	21.	Шумска фитопатологија	30.	Ерозија и уредување на порои
5.	Геодезија со техничко цртање	14.	Шумско градежништво со тех. цртање	22.	Дендрометрија	31.	Организација на шумското производство
6.	Анатомија на дрвото	15.	Ловство	23.	Мелиорација на деградирани шуми и шикари	32.	Економика на шумарство и на ШСО
7.	Одбрана и заштита	16.	Фитоценологија	24.	Користување на шумите		
8.	Странски јазик	17.	Информатика со нумеричко управување	25.	Социјална екологија		
9.	Педологија со петрографија			26.	Паркови со заштита на човек. околина		



2003/04 – ECTS – Forestry; Landscaping and Environment promotion

ECTS - total 46 courses (30 compulsory, 10 electives courses + 2 sport + 3 practice + 1 BSc diploma thesis

VIII semestar – Compulsory			
42.	Ureduvawe na sumite	4+3	6
43.	Ekonomika i kalkulacii	3+2	5
44.	Zastita na sumite i zelenite površini	4+2	6
45.	Ureduvanje poroi	3+2	6
46.	Diplomska rabota	0+7	7
Vkupno:		14+16	30

FORESTRY

Elective group D2 - 2/3	
RB.	Course
17.	Reclamation of landfills, tailings, minefields
18.	Hidro-amelioration
19.	Erosion control

Landscaping and environment promotion





Current study programme – I cycle

Study programme –

Eco-engineering and Eco-management –

5 courses ETC

Forestry



Landscape design



**1 - Elective course -
Forest and Urban hydrology**





Eco-engineering and eco-management

- The main objective of the study program is to train candidates for analysis and solving complex problems related to natural resources (land, water, vegetation, flora, fauna).
- On the one hand environmental protection is given special importance i.e. engineering planning, designing and executing engineering projects related to land and water (erosion protection, torrent regulation, risk management of disasters). On the other hand, candidates will be trained in activities (planning, organizing, executing, monitoring of natural resources) related with protected areas and zones from various aspects, as well as forests with a protected purpose.





- The study program is designed in a way that enables knowledge acquisition and the competencies necessary for a graduate engineer in the field who will provide the basis for further education and follow up on the latest knowledge in field of eco-engineering and eco-management. At the same time, graduates engineers from this study program will be prepared to respond to the requirements of the entities that manage protected areas, the civil sector that deals with problems in the field of environment, state institutions, local self - government. The purpose of this study program is also to create engineers who are competent for entrepreneurship and rural development in mountain areas. These fundamental knowledge will be the basis for further upgrades to the second and third education cycle.





- **Eco-engineering and eco-management of land and water**
- **Land degradation and desertification**
- **Water resources management**
- **Erosion control**
- **Reclamation of landfill, tailing, mine**
- **Torrent control**

Basic and landscape ecology, Intro to landscape and spatial planning Climatology, Pedology, Dendrology, Afforestation, Silviculture, Land Surveying, Basics of Constructions, Geoinformatic, Topography, Geomorphology, Protection of water ecosystem, Environment Impact Assesment....

- **Natural resources**

Botany, Dendrology, Phytocenology; Zoo-ecology and game systematic; Mycology and lichenology; Forest invertebrate; Poisonous, medicinal and edible plants; Breeding and protection of wild fauna; High mountain ecosystems; Identification and production of mushrooms... Geodiveristy;

- **Protected areas management**

- Eco-monitoring; Forest and green areas protection; Breeding and protection of wild fauna; Silviculture – forest for special purpose; Basics of forest management; Biomass and energy; Agroforestry in rural development
- Recreational touristic aspects of greenery; Forest-environmental policy ; Management of protected areas; Management of enetrprises; Economic of enterprises; Marketing and prices; Ergonomy;





Nro.	Course	Fund per week		ECT S
		L	E	
Semester 1				
1	Eco-climatology	3	2	6
2	Botany	4	3	6
3	Mathematics	2	2	6
4	Elective 1			6
5	Elective 2			6
Semester 2				
6	Pedology and petrography	4	3	6
7	Land surveying and technical drawing	4	3	6
8	Dendrology	4	3	6
9	Intro to construction engineering	3	2	6
10	Elective 3			6
Semester 3				
11	Phytocenology	3	2	6
12	Basics of soil and water conservation	3	2	6
13	Zoo- ecology and game systematic	3	2	6
14	Forest mycology and lichenology	3	2	6
15	Elective 4			6
Semester 4				
16	Afforestation	2	3	6
17	Forest invertibrata	3	3	6
18	General and landscape ecology	3	2	6
19	Elective 5			6
20	Elective 6			6

Semester 5				
21	Management of land, water and risk of natural hazards	4	3	6
22	Reclamation of landfill, ash slags, minefield	3	2	6
23	Elective 7			6
24	Elective 8			6
25	Elective 1 -UNISCM			2
26	Elective 2 -UNISCM			2
Semester 6				
27	Erosion control	3	2	6
28	Elective 9			6
29	Elective 10			6
30	Elective 11			6
31	Elective 3 -UNISCM			2
Semester 7				
32	Management of protected areas	3	2	6
33	Management of companies	3	2	6
34	Intro to landscape and spatial planning	3	2	6
35	Environmental Impact assessment	3	2	6
36	Elective 4 -UNISCM			2
Semester 8				
37	Torrent control	3	3	6
38	Economic of enterprise	3	3	6
39	Forest and green areas protection			6
40	Elective 12			6
	BSc Diploma thesis	0	6	6





Elective courses

Nro.	Course	Fund per week		ECTS	Semester
		L	E		
Winter semesters - 5 out of 10					
1	Chemistry	2	1	6	1, 3
2	Computer applications	1	2	6	1, 3
3	Topography	2	2	6	1, 3
4	Poisonous, medicinal and edible plants	2	2	6	3, 5
5	Wood protection	2	2	6	3, 5
6	Introduction to forestry	2	1	6	3, 5
7	Breeding and protection of wild fauna	2	2	6	3, 5, 7,
8	Forest-environmental policy	2	2	6	3, 5, 7
9	Silviculture – forest for special purpose	3	1	6	5, 7
10	Basics of forest management	3	1	6	5, 7

Nro.	Course	Fund per week		ECTS	semester
		L	E		
Summer semesters - 7 out of 13					
1	Geomorphology and geodiversity	2	1	6	2, 4
2	Urban greenery	2	1	6	2, 4
3	Computer graphic	2	1	6	2, 4
4	Recreational touristic aspects of greenery	2	2	6	2, 4
5	Identification and production of mushrooms	2	1	6	4, 6
6	Biomass and energy	2	2	6	4, 6
7	High mountain ecosystems	2	1	6	4, 6
8	Geo-informatics	2	2	6	4, 6, 8
9	Marketing and prices	2	2	6	4, 6, 8
10	Ergonomy	2	1	6	6, 8
11	Protection of aquatic ecosystems	2	1	6	6, 8
12	Eco-monitoring	2	2	6	4, 6, 8
13	Agroforestry in rural development	3	1	6	4, 6





- Changes in 2019

Instead of :

- Basics of soil and water conservation; 3+2
- Management of land, water and natural hazards, 4+3

New Reorganized Courses

- Land Degradation and desertification, 3+2
- Management of water resources, 4+3





History of the cathedra

- Cathedra for technical courses -1947 (**Torrent Control, Hydraulic**, Mechanic, Forest Constructions, Geodesy, Mathematic, Descriptive Geometry....)
- Department for Harvesting and Designing in Forests -80's (**Erosion control, Torrent control**, Geodesy and technical drawing, Forest communication and transport, Constructions, Forest road network; Technical mechanic, Mechanization in forestry, Harvesting)
- Cathedra for Erosion and Geodesy - 2000 (**Erosion Control, Torrent Control Hydroamelioration, Reclamation of tailings, landfills**, Geodesy and technical drawing)

Teaching staff

- Prof. Milorad Sibinovic - 1947 – 1960 (ass. B. Popovski 1949)
- Prof. Boris Popovski - 1961 – 1986 (ass. S. Jovanovski 1973)
- Prof. Stojmen Jovanovski, 1984 – 1998 (ass. I. Blinkov 1987)





Cathedra for Land and Water

Current staff

- **Prof. Ivan Blinkov (erosion control...) - 1987(98) – on going**
- **Prof. d-r Aleksandar Trendafilov (torrent control...) 1999 – on going**
- **Doc. d-r Ivan Mincev - 2012 - on going**

Courses:

I cycle – 11 (7 compulsory and 4 elective)

II cycle - 9 (4 - A or B list, 5 – C list)





Courses on the I cycle

	Course	teacher	Study programme	Status
1	Land surveying and technical drawing	Ivan Blinkov	EE, F, LD	compulsory
2	Land degradation and desertification	Ivan Blinkov	EE	compulsory
3	Erosion Control	Ivan Blinkov	EE	compulsory
4	Management of water resources	Ivan Blinkov	EE	compulsory
5	Topography	Aleksandar Trendafilov	EE, F, LD	elective
6	Forest and Urban Hydrology	Aleksandar Trendafilov	F, LD	elective
7	Torrent control	Aleksandar Trendafilov	EE	compulsory
8	Reclamation of landfill, tailings,	Aleksandar Trendafilov	EE,	compulsory
9	Computer applications	Ivan MIncev	EE, F, LD	elective
10	Geoinformatics	Ivan MIncev	EE, F, LD	elective
11	Basics of landscape and spatial planning	Ivan MIncev	EE	compulsory



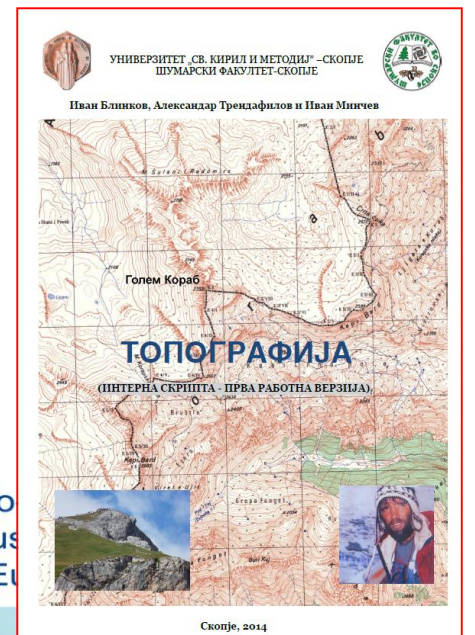
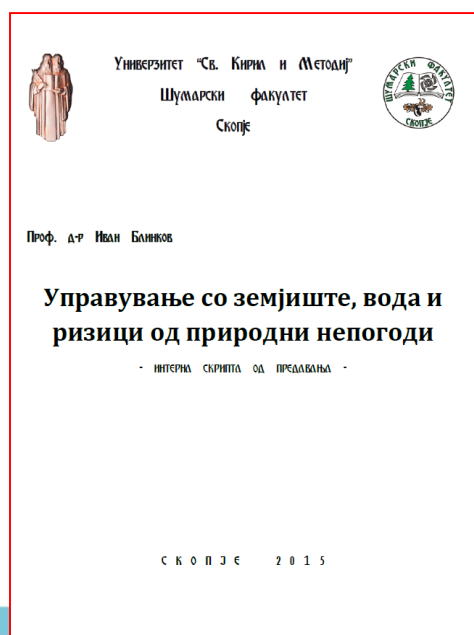
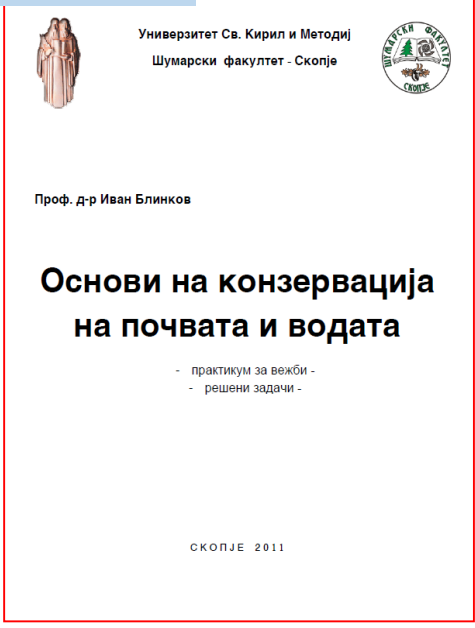
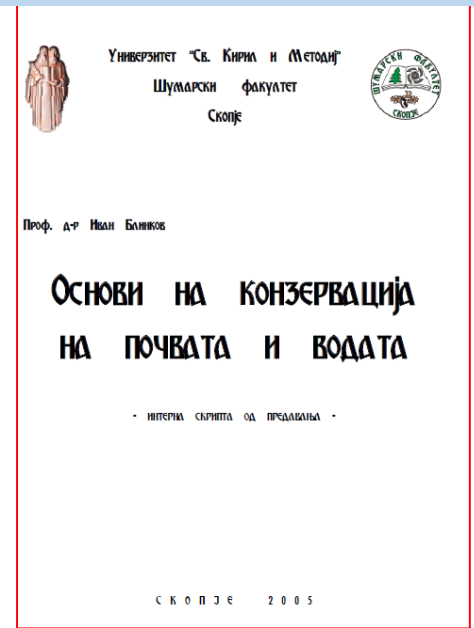
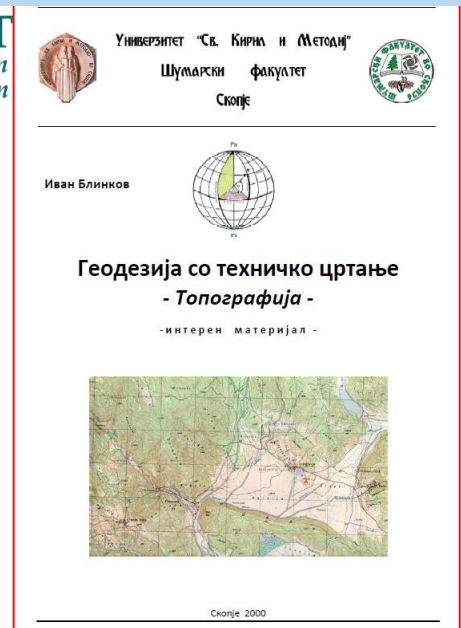


Courses on the II cycle

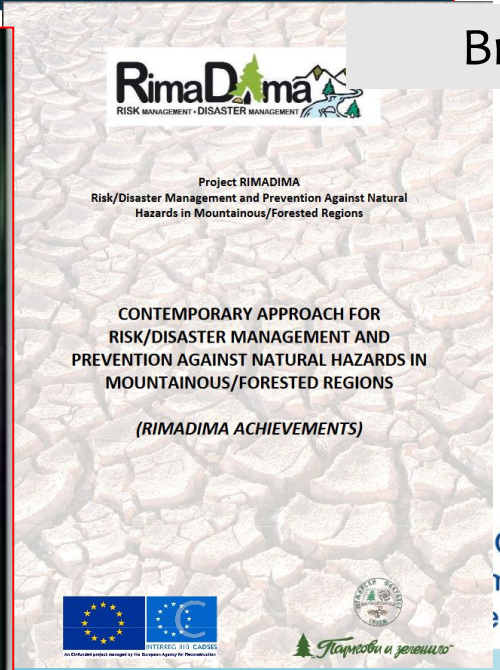
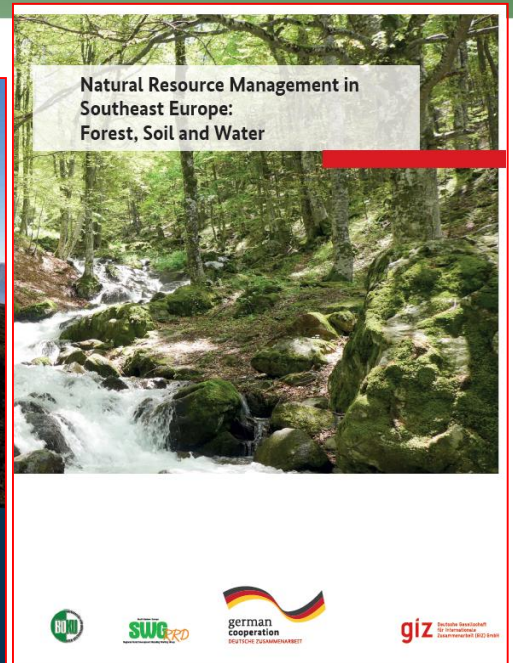
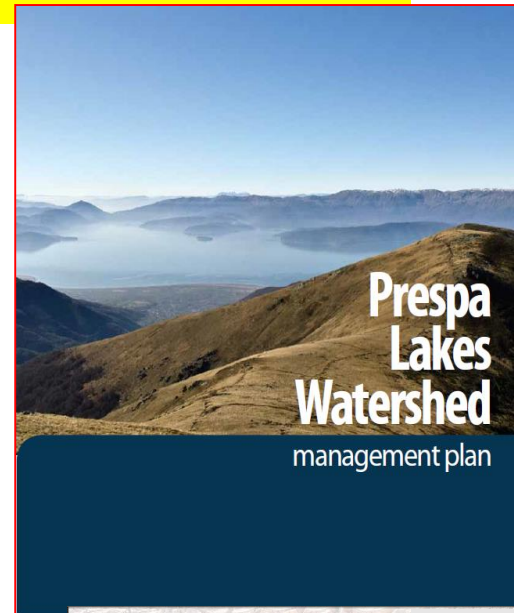
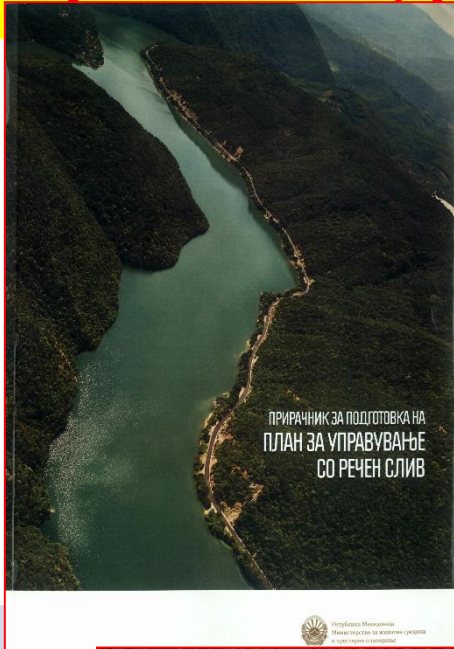
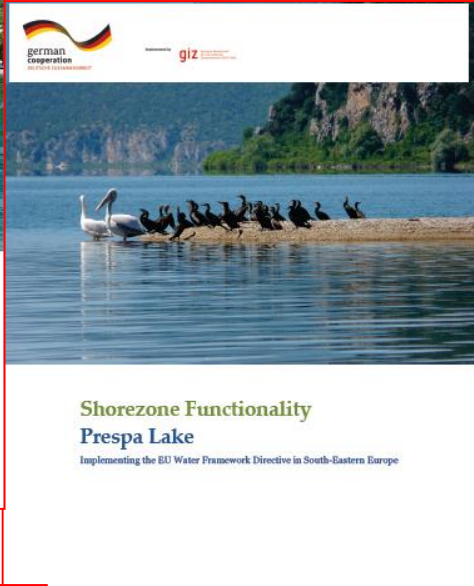
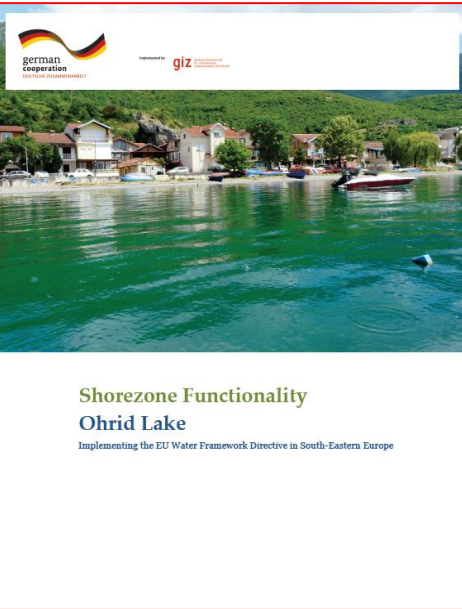
No	Course	Teacher	SP	Status
1	Planning and management of Land resources	Ivan Blinkov	LEP	A
2	Land degradation, desertification and erosion control	Ivan Blinkov	LEP	B
3	Management of water and water related hazards	Ivan Blinkov	LEP	C
4	Torrent hydrology and hydraulic	Ivan Blinkov	LEP	C
5	Torrent Control 2	Aleksandar Trendafilov	LEP	A
6	Management of degraded land	Aleksandar Trendafilov	LEP, F	B, C
7	Reclamation of landfills, tailings, minefield 2	Aleksandar Trendafilov	LEP	C
8	Project cycle in engineering	Aleksandar Trendafilov	LEP	C
9	Geoinformatics	Ivan MIncev	LEP, F	C



Textbooks, Practicums and Scripts



Printed project books, practicums





The most important recent projects

- “Development of a National Action Plan to combat Drought, Land degradation and desertification (NAP DLDD)” 2014-7, GEF-UNEP
- “WB FLOODS - Gap analysis and needs assessment in the context of implementing EU Floods Directive in the Western Balkans “, COWi, 2015
- Support to Introducing the Flood Risk Management Requirements in Accordance with the EU Floods Directive, UNDP, 2015
- Development of Prespa Lake Watershed Management Plan 2” 2016-2021, GEF–UNDP, 2015-16
- **Management of forest, water and soil within the framework of environmental and rural development policies in SEE, 2016**
- Shorezone Functionality Index (SFI), Lakes Prespa and Ohrid”, GIZ, 2016
- Land Degradation Neutrality Target setting Programme – country report, 2017, GEF-UNEP
- Study of erosion and action Plan for the City of Skopje, 2017-8, UNDP & LMA Skopje
- Review of the Vodno erosion and flash floods protection system, 2018 , UNDP & LMA Skopje
- Flood management plan for Upper Vardar sub-basin, UNDP, 2018
- **“Generating momentum on water and forests in the Balkans” Target countries – N.Macedonia and Albania, 2019**
- **Preparation of soil erosion and drought vulnerability map, and identification of high-risk zones and their impact to biodiversity, 2019 – GEF-UNEP**





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

DESCRIPTION of COURSES

Co-funded by the
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SETOF Soil Erosion and TOrrential Flood
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COURSE: LAND DEGRADATION AND DESERTIFICATION

Code: ШФ190; Status – Compulsory; Lecturer: Prof. D-r Ivan Blinkov

Course goals / Competences:

Knowledge of the causes of land degradation and desertification, as well as concepts for reclamation of degraded land

Course content

Introduction; Geochronology and basics of geomorphology - formation of relief and relief elements;

Ecosystems: Ecosystems in general, ecosystem services,

Concept of meaning and categorization of land - Concept of land, meaning of land classes, categorization in construction;

Land cover / use: classification (UNLCS, EUCORINE LCU, cadastral classification, urban,

Land degradation and desertification - basic definitions and divisions,

Natural factors of land degradation and desertification (including water resources and drought) :

Socio-economic factors of land degradation and desertification

Land Degradation and Desertification in Macedonia: Types of Land Degradation, Desertification Processes

Sustainable land management: general, sustainability indicators, land management models, cadastral practices and land consolidation, sustainable techniques, land sealing management, Policies related to SSA - international policy related to SSA, national policies - land policy in RM

Practical work: assignment - each student produces an elaborate with data collected from field documents and maps for his / her region: geomorphological units, cadastral parcels, land cover analysis, land degradation type analysis, land degradation factor analysis and possible to deal with land degradation



COURSE: EROSION CONTROL

Code: ШФ148; Status – Compulsory; Lecturer: Prof. D-r Ivan Blinkov

Course goals / Competences:

Introducing students to erosion as a dominant form of land degradation in RM, and thus one of the major environmental degraders as well as methods and techniques to combat erosion

Course content

Erosion and the environment; Damage from erosion;

Erosion factors; Types of erosion; division by cause, shape, place

Erosion categorization; Gavrilovic classification, EEA Classification

Erosion intensity calculation, Erosion coefficient calculation,

Calculating Land Losses; Calculation of watershed production and transfer; Erosion monitoring;

Erosion protection: Anti-erosive materials; Mechanism for anti-erosive work,

Erosion control works and activities: Technical-ameliorative measures (terraces, trenches, walls, furrows, retentive-technical operations); Agri-ameliorative measures and activities; Forestry measures and activities; Watershed buildings; Educational measures; Administrative measures;

Economics of erosion control;

Specific cases (landslides, slopes, slope stabilization);

- *Practical work - Elaborate, calculating erosion intensity and sediment yields, designing erosion control measures, calculating the effect of these measures; Seminar - Erosion Problem Solving (each in his hometown)*

COURSE: Reclamation of landfills, tailings and minefields

Code: ШФ106; Status – Compulsory;

Lecturer: Prof. D-r Aleksandar Trendafilov

Course goals / Competences:

Knowledge of the causes, manner and conditions for the creation of the pits, landfills and tailings and the adverse environmental effects of the relief and environmental impacts, as well as methods and procedures for their revitalization, primarily from a biological-biotechnical point of view

Course content

Introduction;

Waste and types of waste; Waste characteristics and properties, with emphasis on solid communal waste; Landfills and types of landfills; Tailings and types of tailings; Buckets. Natural factors as a condition factor for selecting a landfill and tailings location;

Basics of construction-mining-physical stabilization of landfill slopes and tailings; Reclamation concepts; Biological Reclamation; Natural factors and biological conditions reclamation; Conceptual Selection for Biological Reclamation: Technique and Technology for Biological Reclamation: Selection of species for biological reclamation; Preparation for biological reclamation; Procedure, methods and methods of biological re-cultivation; Reclamation project documentation with an emphasis on biological reclamation.

Practical work: Elaborate - seminar on reclamation (mine, tailings or landfill)



Course goals / Competences:

Introducing students to: water resources; Hydrology; Hydraulic; Hydraulic; River basin management according to WFD; Natural hazards; Management water related hazards/risk

Course content

WATER: Water resources: (world water resources, water resources in RM), Hydrology(Water cycle; Forest hydrology) Hydraulics:(hydrostatics, hydrodynamics; open flow hydraulics; Hydrometry(statistical data processing); Hydrology and Hydraulics of Watercourses (Ecological Flow, Maximum Water Flow; Factors Affecting Flow, Maximum Flow Calculation Methods, Sediment Flow) , Water resource degradation - excessive abstraction, pollution, disruption of the regime;

RBM: Basic principles of river basin; Water Framework Directive; other relevant directives ; Water bodies (division, delineation, typology of water bodies, characterization-classification of ecological status; Impact of activities on water bodies;

Introduction to River Basin Management Planning

NATURAL HAZARDS: Introduction to Hydrological Disaster Risk Management: Basic terminology ; Type of natural hazards; Characteristics of natural hazards; World and national policy related to natural hazards; Basic principle of water related hazard and risk management , Principles for flood hazard/rsi management

Practical work: Each student prepare elaborate consist of: hydrological and hydraulic calculations; analyze of water bodies in any basin; analyze of factors that influence water quality; analyze of natural hazards in the region (basin) with focus on water related hazards





COURSE: TORRENT CONTROL

Code: ШФ147; Status – Compulsory;

Lecturer: Prof. D-r Aleksandar Trendafilov

Course goals / Competences:

Introducing students to the torrent activity of watercourses and the methods of torrent management

Course content

Basic terms and classification of torrential watercourses;

Damage from torrents;

Water flow, Water leaks; Water flows through dressings through openings

Sediments; Sediment transport; Calculation of sediment discharge

Torrents management basics;

Hydraulic facilities for the regulation of torrents (channel, embankment, spillway, compartment, sill, sash);

Other flood control measures; Stormwater basin management systems

Engineering design techniques, technical documentation content

Practical work:

Elaborate - hydrological-hydraulic calculations, layout design, type and dimensioning torrent control structures



**Course: Forest and urban hydrology
(for students of other study groups LD, F)
Code: ШФ147; Status – Elective (F, LD);
Lecturer: Prof. D-r Aleksandar Trendafilov**

Course goals / Competences:

Introducing students to hydrological aspects

Course content

Water balance in the forest' Factors affecting water balance in the forest, influence on structure, composition and age of the forest; impact of forest operations on water balance; catching on water in forest ecosystems; Erosive processes in a forest ecosystem'; Types of erosion processes in forest ecosystems, forest operations and erosion processes; sediment

Urban Hydrology - urban offshore, urban and off-urban greenery and offshore

Planning measures to improve water balance

Flood planning according to forest / natural potential / capacity

ecosystems and the need for water for different purposes, according to urban and peri-urban greenery

Basic approaches to erosion protection in forest ecosystems and in urban environments

Practical work:

Elaborate - case study, forest activities and water balance, forest activities and erosion, urban activities and water and sediment runoff





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II cycle – MSc

60 ECTS

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70's - 90's of the XX century - 4 semesters

- - Hydrology, hydraulic and hydraulic structures (I sem.)
- - Pedology and geomechanic (I sem.)
- - Afforestation and amelioration of degraded land (I sem.)
- - Erosion Control (II, III sem.)
- - Torrent Control (II, III sem.)
- MSc thesis (III, IV sem.)

2009 – 2014 - total 12 study programmes 60 ECTS

2 compulsory courses, 3 elective group A, 1 elective group B

SP - Management of Land and water in mountain ecosystems

Module 1 – Erosion control and reclamation of degraded land

(Erosion control 2; Reclamation of landfills, tailings, minefield 2)

Module 2 – Management of watershed and water related hazards

(Torrent control 2; Torrent hydrology and hydraulic, Water related hazards)

Module 3 – Sustainable land and water Management

(Sustainable land use planning; Integral land management)





2013/14 ; 2019 – accreditation - 60 ECTS - 2 semesters

- 1 main course (List A); 1 supportive course (list B); 3 elective courses (list V); 1 elective course from university list
- 2 (two) Study programmes: - Forestry; - Landscaping and environment promotion

A - Torrent Control 2

B – Land degradation, desertification and erosion control

Group V (3 courses) - recommended

- Geoinformatics
- Project cycle in engineering
- Torrent hydrology and hydraulic
- Management of water and water related hazards
- Reclamation of landfills, tailings, minefield 2

A - Planning and management of Land resources

B - Management of degraded land

Group V (3 courses) - recommended

- Geoinformatics
- Agroforestry practices
- Reclamation of landfills, tailings, minefield 2
- Silviculture in forest for special purpose
- Forest-environmental policy
- High mountain ecosystems





A - Torrent Control 2

- Basic terms and classification of torrential watercourses; Damage from torrents; Water flow Water flow; Flow on drainage water through holes Coating: Coating term; Sediment transport; Calculate sediments; Flow Regulation Hydraulic facilities for torrent regulation (canal, embankment, spillway, barrier, sill, belt); Other measures for torrent control, torrent drainage systems, engineering design techniques, content of torrents technical documentation
- Practical work:
Elaborate - Hydraulic-hydraulic calculations, layout design, type and dimensioning countermeasures facilities





B – Land degradation, desertification and erosion control

- Basic terms ; Land degradation factors (natural factors, non-economic factors); Types soil degradation; Types of water degradation; Landscape degradation; Desertification; Climate changes and desertification;
- Erosion and the environment; Damage from erosion; Erosion Factors; Types of erosion; division by cause, shape, place; Erosion categorization; Classification of Gavrilovic, EEA Classification Erosion Intensity Calculation, Calculating Soil Losses; Calculation of watershed production and transfer; Erosion monitoring;
Erosion protection: Erosion control materials; Works and activities: Technical-ameliorative measures (terraces, ditches, walls, furrows, retentive-technical activities);
Agri-ameliorative measures and activities; Forestry measures and activities; Hydraulic structures; Educational measures; Administrative measures; Economics of anti-erosion operations; Specific cases (landslides, slopes, slope stabilization);
Practical: Task - Elaborate, calculating erosion intensity and sediment yields, designing anti-erosion measures, calculating the effect of anti-erosion measures
Seminar - Erosion Problem Solving (each from his hometown)





A - Planning and management of Land resources

CONTENT:

Land cover / use- Land concept, land cover classification / use (Classification by CORINE LCU) Space and Space Use Types, NUT1 -3, INSPIRES Directive, Land Categorization, Land Resources Management (Land Policy, Legislative Framework and ways to manage land resources in RM and EU, Threats and barriers to sustainable management of Land Resources, Soil and Land Monitoring, Soil Sealing

- Landscapes (established EU terminology and definitions)

Geoecology - (introduction, definitions, terminology, fundamental settings and concepts of space), Abiotic and biotic landscape elements (geomorphology with geodiversity, hydrography, vegetation, fauna), Introduction in Landscape Typology, Landscape Character Assessment Landscape Planning - LANDEP / LANDMAP methodology, Subject, goals and objectives of land use planning; Basic principles and methods; Models, development concepts and theories,

Practical work: elaborate, basic calculations for landscape typology (Delineation of the region.

Character analysis, landscape typology,)





B - Management of degraded land

- Content:
- Land Degradation - Types of Land Degradation, Natural and Socioeconomic Causes of Land Degradation; Legislation regarding land degradation, Soil Pollution,
- Waste - Types of waste; Characteristics and properties of waste, with emphasis on solid municipal waste; Waste Management, Municipal Landfills, Landfill Reclamation Basics, Basic Approaches minefields and tailings, and their reclamation,
- Soil Erosion - Basics of soil erosion, Erosion classification, Erosion control





Torrent hydrology and hydraulic

- Introduction to Statistics and Probability; Hydrology: water resources, precipitation, parametric and stochastic methods for calculation of meteorological-hydrological elements; Forest hydrology: Forest ecosystems and water quality;
- Hydrology of torrential watercourses;
General Hydraulics: Hydrostatics (basic laws of hydrostatics); hydrodynamics (basic laws of hydrodynamics);
Open Flow Hydraulics: Even and Uneven, Stationary and Non-stationary leakage; Flooding hydraulics;
- Maximal discharge estimation - Water discharge (stochastic methods), Mudflow discharge estimation, Debris flow discharge calculation
- Sediment and sediment movement, sediment characteristics, sediment characteristics in river beds, river roughness, flow rates, volume of sediment debris, sediment transport
torrential flow characteristics and torrential lava.
- Hydrometry: measurement of water flows, water speeds, leaks, sediment, granulometry, data monitoring - information and database- information





Management of water and water related hazards

- WATER - - Water Management Basics: Water Management Activities, Water Policy - European Water Framework Directive (daughter directives - groundwater, flood protection and others; Water Bodies (division, delineation, typology of water bodies, characterization-classification of environmental status; Impact activities on water bodies; Introduction to water monitoring, Role of forests and forest activities; Introduction to river basin management planning (water body classification, pressure identification, ecological lenses, program of measures)
- RISK / HAZARD MANAGEMENT - Disaster Risk Management: Introduction, Types of Disasters, features of natural disasters, gravitational and hydrological disasters, basic principles of management, International policy (Sendei); Concepts of flood management
- Practical: Elaborate for a specific area (delineation and typology of water bodies, analysis of pollution sources, introduction to program of measures, gravitational and hydrological disasters, frequency analysis, strength of disasters, measures)





Reclamation of landfills, tailings, minefield 2

- Introduction;
- Pits, Landfills and Landfill Types; Tailings and types of tailings; Buckets. Natural factors for site and tailings site selection;
- Basics of construction-mining-physicalstabilization of landfills and tailings slopes;
- Recultivation concepts; Biological Reclamation;
Natural factors and conditions for biological re-cultivation; Conceptual Selection for Biological Reclamation: Technique and
recultivation technology: Selection of species for biological recultivation; Preparation for biological reclamation;
Procedure, methods and methods of biological re-cultivation; Reclamation project documentation with emphasis on biological reclamation.
- Practical: Elaborate - seminar on reclamation (mine, tailings or landfill)





Geoinformatics

- Repetition of basic terms and methods of geodesy and topography;
Cartographic projections
External data input - instrumentation (GPS, Total Station, RS, manual data entry)
- Remote sensing - Satellite imagery (concept, recording, decoding and usage);
- GIS (GIS introduction, GIS hardware and software, data sources, information organization, GIS essence, data entry, data digitization, georeferencing, attribute table creation)
- Advanced analysis of geospatial data
- Practical work- GIS project preparation (scanning, processing, rectification, digitization, creation attribute database, advanced geopotential analyzes ..)





III CYCLE - 180 ECTS

- The established PhD model of Ss. Cyril and Methodius University in Skopje, following the developed European universities, is the first of its kind, not only in the country, but also in the Balkans.
- The study programmes consist of:
 1. Training for research work, that corresponds to 30 ECTS credits;
 2. Teaching, that corresponds to 30 ECTS credits;
 3. Application, preparation and defense of doctoral dissertation, which corresponds to 120 ECTS credits





STRUCTURE OF THE PhD STUDY PROGRAM
(allocation of credits and liabilities per semester)

‡

I year		
I semester		
September 15 October November December	1. 1. <u>subjects</u> for generic knowledge acquisition 2. subjects in the field and area of research	Maximum (1.+2.) 30 c
January	Exam session	
II semester		
February March April May	1. 1. <u>subjects</u> for generic knowledge acquisition 2. subjects in the field and area of research doctoral seminar with presentation research (for the preparation of a doctoral dissertation topic)	Maximum (1.+2.) 12 c 2 c 14 c
June	Exam session	
September	annual conference with presentation of a report	2 c

II year		
III semester		
September 15 October November December	preparation and submission of application for doctoral dissertation thesis, research	28 c
January	Exam session ; doctoral seminar with presentation of report	2 c
IV semester		
February March April May	workshop on research practice research and publication of results	3 c 25 c
June		
September	annual conference with presentation of a report	2 c

III year		
V semester		
September 15 October November December	research and publication of results	28 c
January	doctoral seminar with presentation of report	2 c
VI semester		
February March April May	workshop on research practice research and thesis writing	3 c 25 c
June		
September	annual conference with presentation of a report	2 c





- III cycle studies on the Faculty of Forestry hasn't been established yet.
- Reasons:





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STUDENT PRACTICAL WORK

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Blagodaram na vnimanieto

Thank you for your attention!



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