"Forest hydrology" SYLLABUS

Basic data of the subject	
Academic Unit:	**Faculty of Life and Environmental Science**
Course title:	**Forest hydrology**
Program:	**Forest and environmental sciences**
Level:	**Bachelor**
Course status:	**Elective**
Study year:	**Third year, Second semester**
Number of hours per week:	**2+1**
Credit value – ECTS:	**3**
Time / location:	**To be anounced**
Lecturer:	**Prof. Asoc. Dr. Arben Alla**
Contact details:	**benialla@ubt.edu.al**
Course description:	Forest hydrology is a separate and unique branch of hydrology due to the special conditions caused by trees, and the understorey beneath them. Forest hydrology studies the distribution, storage, movement, and quality of water and the hydrological processes in forest-dominated ecosystems. Forest hydrological science is regarded as the foundation of modern integrated watershed management. Forests and the way that they are managed can have profound effects on water. Well designed and managed forests help to protect water and the wide range of flora and fauna that depend on this important habitat. In contrast, poor planning and management can contribute to water shortages, local flooding and water pollution.
Course objectives:	This module aims to better understand the effects of forests on water since forestry not only protects, but where possible enhances the freshwater quality. The overall objective of the module is to improve our understanding of the effects of forests on water to ensure that future benefits can be secured and any negative effects minimised. Specific objectives include: • Know and understand hydrological processes at different water cycle stages. • Quantify water flows between stages to calculate parameters and variables of hydrological processes. • Understand the meaning of "watershed" and its role as a territorial unit in hydrological planning and integrated water resources management. • Know and understand the interaction of water and soil. • Recognize the effects of forests and forestry management on the quality and quantity of water.

	• Understand the long-term effects of forestry on surface water. • Use available basic tools and know the main advanced tools for hydrological calculation.
Learning outcomes:	Upon completion of this course, students will be able to: • Recognize the role and importance of forest hydrology, the methods, techniques and tools used. • Be aware of the impact of water, rain and snow precipitations on forest environments. • Know the characteristics of water flow and the impact of precipitation on forests. • Know the ecology and diversity of species living in these aquatic habitats. • Aware of the impacts of polluted water flowing into forest areas.

Contribution on student load (must correspond with learning outcomes)			
Activity	**Hours**	**Days/week**	**Total**
Lectures	2	15	30
Exercise theoretical/laboratory	1	15	15
Practice work			
Contact with lecturer/consultations	1	15	15
Field exercises	-	-	-
Mid-terms, seminars	-	-	-
Homework	-	-	-
Individual time spent studying (at the library or home)	1	5	5
Final preparation for the exam	1	5	5
Time spent in evaluation (tests, quiz, final exam)	1	5	5
Projects, presentations, etc.	-	-	-
Total			**75 orë (3 ECTS)**

Teaching methods :	Lectures, discussions, laboratory exercises, outdoor research exercises, consultations, independent projects, homework assignments, colloquia, seminars, assessments (I and II), exams.
Evaluation methods:	First assessment: 20%

	Second assessment: 20% Seminars or other engagements: 10% Final exam: 50% Total: 100%
Literature	
Basic Literature:	• Amatya D.M., Williams T.M, Bren L. and de Jong C. (2016) Forest hydrology. CABI, London, UK. pp: 310. • Bren L. (2015) Forest hydrology and catchment management. Springer, London, UK. pp: 276 • Chang M. (2012) Forest hydrology. An introduction to water and forests. Third edition. CRC Press, Taylor and Francis Group. New York, US. pp: 587 • Hewlett J.D. (1982) Principles of forest hydrology. The University of Georgia Press Athens. Georgia, US. pp: 215 • Sun G., Amatya D., and McNulty, S. (2016) Forest hydrology. In Chapter 85: Part 7 Systems hydrology, handbook of applied hydrology, Ed. V.V. Sing. 85–1-85–8
Additional Literature:	• Brooks K.N., Folliott P.F. and Magner J.A. (2013) Hydrology and the management of watersheds. Fourth Edition. Wiley-Blackwell. Iowa, US. pp: 547 • Levia D.F., Carlyle-Moses D. and Tanaka T. (2011) Forest hydrology and biogeochemistry. Springer. New York, US. pp: 734. • Pike R.G., Redding T.E., Moore R.D., Winkler R.D. and Bladon K.D. (2010) Compendium of forest hydrology and geomorphology in British Columbia, vol. 1 of 2. Min. For. Range, For. Sci. Prog. Victoria, British Columbia. pp: 456.

Designed study plan:		
Week	**Lectures**	**Exercises**
First week:	Introduction to forest hydrology. What is forest hydrology? Development of forest hydrology. Challenges for forest hydrology. The future of forest hydrology.	Practical examples of hydrological cycle.
Second week:	Forests and precipitation, precipitation processes, forest interception, snow accumulation and snowmelt.	Practical knowledge of precipitation retention by forest trees.

Third week:	Forests and water quality. Water quality measurement. Quality of natural water. Wastewater.	Analyzing the impact of vegetation on water quality.
Fourth week:	Water flow processes in forests. Distribution processes.	Calculation of superficial water flows.
Fifth week:	Forests evapotranspiration. Evapotranspiration processes. Direct measurement of evapotranspiration. Indirect evapotranspiration calculations.	Measurement of forest water use.
Sixth week:	Forest hydrology of mountain watersheds. Potential impacts of climate change on watershed processes.	Determine the impact of watershed size on the amount of superficial water flows.
Seventh week:	Forests and floods. Protective role of forests against floods. Floods control.	The importance of forests in reducing surface water flows depending on the forest species.
Eighth week:	Hydrology of flooded and wetland forests. Wetlands due to surface and groundwater runoff.	Impact and importance of trees on flooded areas by surface or groundwater.
Ninth week:	Erosion and sedimentation in relation to forests. Mechanics of water erosion. Measurement of erosion.	Calculation of sediments transported by superficial water flow.
Tenth week:	Hydrological impacts on forest management. Impacts of forest fires. Impacts of pests and diseases.	Recognition of forest fires and pest impacts on surface hydrology.
Eleventh week:	Forest hydrology of after forest fires. Impacts of forest fires on soils, vegetation, the response of watersheds, on solid materials.	Determine the measures for the protection and restoration of forest areas damaged by forest fires.

Twelfth week:	Impacts of native forest management on catchment hydrology. Hydrology of man-made forests (plantations).	Recognize the importance of forest stands origin in relation to forest hydrology.
Thirteenth week:	The use of geospatial technology in forest hydrology. Modeling forest hydrological processes with the help of geospatial technology.	Course assignment - Determination of superficial water flow and sediments volume calculation transported by water flow over a given forest area.
Fourteenth week:	Use of forest hydrology science in watershed management. Expected biophysical and socio-economic changes in the future.	Course assignment - Determination of superficial water flow and sediments volume calculation transported by water flow over a given forest area.
Fifteenth week:	European perspectives on forest hydrology. Drought and forest interactions. Development of European forest policies and their impacts on forest hydrology. Water scarcity and climate change.	Course assignment - Determination of superficial water flow and sediments volume calculation transported by water flow over a given forest area.
Academic policies and rules of conduct:		
Students are obliged to attend regular lectures, participate in field visits (excursion). Disconnection of mobile phones, timely access to the classroom and keeping quiet in the lesson are also mandatory.		