HYDROLOGICAL METHODS IN SOIL

1	Course Title:	HYDROLOGICAL METHODS IN SOIL	
2	Course Code:	TPR3924-S	
3	Type of Course:	Optional	
4	Level of Course:	First Cycle	
5	Year of Study:	3	
6	Semester:	6	
7	ECTS Credits Allocated:	4.00	
8	Theoretical (hour/week):	1.00	
9	Practice (hour/week):	2.00	
10	Laboratory (hour/week):	0	
11	Prerequisites:	None	
12	Language:	Turkish	
13	Mode of Delivery:	Face to face	
14	Course Coordinator:	Dr. Ögr. Üyesi Rifat AKIŞ	
15	Course Lecturers:	Yok	
16	Contact information of the Course Coordinator:	rifatakis@uludag.edu.tr, 0224.2941531, U.Ü. Ziraat Fak. Toprak Bilimi ve Bitki Besleme Bölümü. Görükle-Nilüfer/Bursa	
17	Website:		
18	Objective of the Course:	This course, in general, emphasize compartments of hydrological cycle and hydrological methods in data collections and targets to determine quality and quantity of hydrological flows in soil, improves the understanding of coevolution of soil and hydrological systems to adapt soil management to changing climate, contributes to the understanding of measurement methods of hydrological cycle to be essential for soil and rainfall water management, focuses on the names of field and laboratory equipment traditionally used in soil	
19	Contribution of the Course to Professional Development:	Student learns about hydrologic cycle, becomes able to calculate soil water budget, improves efficiency of soil and water conservation plans, successfully measures hydrological flows, properties and parameters in soil, takes necessary measures against floding and drought in soil, be able to apply a sound water budget in soil and effective drainage methods	
20	Learning Outcomes:		
		1	The student; Be able to define hydrological cycle in soil at different hydrological levels
		2	Knows the compartments of hydrological cycle
		3	Measures each of the hydrologcal compartment to constıtute water budget in soil
		4	Collects data of soil hydrological processes and uses effectively in hydrological models
		5	Perform rainfall-runoff analysis
		6	Yüzey akışı dolaylı (taban akış) tan ayırabilir
		7	Develop unit hydrograph and calculate the depth of rainfall
		8	Distinguishes infiltration from deep drainage in soils

	9	Records dischage data from a tile-drainage system and developes drinage hydrograph
	10	Decides on effective use of soil and rainfall water

21	Course Content:	
	Course Content:	
Week	Theoretical	Practice
1	Definition of hydrology, methods of hydrology, hydrologic system and cycle (in labroratuary, lysimetric, and field conditions), hydrological system soil water storage, conservation of mass, modifying water budgets by irrigation-drainage, infiltration-runoff, and soil water storage-redistribution (examples)	The introduction of the students to the equipment to be used
2	Precipitation: the conditions to form a rain drop and rainfall types, measurement of precipitation and definition of equipment used	İntroduction of tipping bucket to the students and technical specifications
3	Analysis of precipitation records: rainfall hyetograph, cumulative rainfall curve, mean rainfall calculations by arithmetic, thiessen polygon and isohyetal methods, the idf theory (intensity-duration-frequency) curves	Introduction of recording and nonrecording rain gages to the students and using precipitation records in the laboratuary session
4	Conditons of evaporation to form, evaporation from water body surfaces and soil surfaces, measurement of evaporation	Problem solving for evaporation computatıons and ddiscussion on the parameters the evaporation equations contain
5	Losses of evapotranspration: potential and actual evaptranspraitons, daily evapotranspration	Problem solving and discussions based web material on evapotranspration
6	İnfiltration: infiltration capacity, infiltration rate, and drainage and redistribution after infiltration	Double ring cyclender infiltrometers to be uesd and their measurements fort he analysis of infitration experiment in field, Fitting of various infiltration models to the measured data
7	Groundwater: zonation of groundwater (vadose zone, p<0 atm, and saturated zone, p>0 atm) groundwater flow direction: high potential to low potential direction flow (H= h +z), mapping of groundwater surfece through piezometric measurements and interpreting contour maps of the potensiometric surfaceses, groundwater hydrographs and seasonal behaviors: percolation and recharge, definitions of these terms, groundwater aquifers and their definitions, piezometric surface and depth to water table	Tension disc infiltrometer and soil moisture profile analysis
8	Runoff: hydrograph theory and analysis of runoff, the elements of runoff hydrograph, direct runoff and baseflow separation and methods used,unit hydrograph theory: definition, creation, and steps to create unit hydrograph, the process from unit hydrograph to a real rainfall depth	Contour mapping of potensiometric surface sourced from piezometry field
9	Hydrograph analysis (continued): synthetic unit hydrographs, instanteneous unit hydrographs, employing unit hydrograph	With the help of computers and excel program, developing rainfall cumulative curve and hyetograph, determining the contribution of a rainfall to the total runoff, direct runoff, and baseflow (HEC-HMS will be specifically used for this step)

10	Soil drainage: definition of agricultural drainage, discussions visually and theorically on the types of drainage system, surface drain dithes and subsurface tile drainas draınage coeffıcient definition, drainage coefficient under steady-state conditions, drainage coefficient under fluctuationg water table, and examples and their solutions, Hooghoudt equation (ellipsoid equation) and drain depth and spacings, an example problem with solution	In the Excel, unit hydrograph will be developed as a first step, then continued to the calculations of depth of real rainfall by using hydrograph logging (HEC-HMS to be used for this part of the experiment)
11	Drainage water quality: salinity (EC), pH, nutrient concentrations, and pollutants (NO3-, PO4-3, DOC) concentratıons, drainage equilibrium with salts (leaching)	A small-scale soil drainage design project in DRAİNMOD environment will be carried out
12	Drainage discharge measurements and drainage hdyrographs, peak flow rate, volume and time evaluation of the hydrograph, the use of tensiometry and piezometry in deep drainage determinations of soil water in the profile	A small-scale soil drainage design project in DRAİNMOD environment will be carried out
13	Drainage water quality and agricultural use	Introduction of orifice, v-notch weir and flow meters to measuring drainage flows, how to make a standard reading on them will be illustrated and actıve-passive drain flow samplers for automatic sampling will be presented.
14	Soil water budget and effective drainage	Introduction of orifice, v-notch weir and flow meters to measuring drainage flows, how to make a standard reading on them will be illustrated and actıve-passive drain flow samplers for automatic sampling will be presented.

22	Textbooks, References and/or Other Materials:	Mehmetçik Beyazıt. 2013.Hidroloji. Birsen Basım ve Yayım Evi, Cağaloğlu/İSTANBUL
23	Assesment	

TERM LEARNING ACTIVITIES	**NUMBER**	**WEIGHT**
Midterm Exam	1	40.00
Quiz	0	0.00
Home work-project	0	0.00
Final Exam	1	60.00
Total	2	100.00
Contribution of Term (Year) Learning Activities to Success Grade		40.00
Contribution of Final Exam to Success Grade		60.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course		Homework assignment, quiz, term papere, web page preparation

24	**ECTS / WORK LOAD TABLE**

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	1.00	14.00
Practicals/Labs	14	2.00	28.00
Self study and preperation	12	5.00	60.00
Homeworks	0	0.00	0.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	1	8.00	8.00
Others	0	0.00	0.00
Final Exams	1	10.00	10.00
Total Work Load			120.00
Total work load/ 30 hr			4.00
ECTS Credit of the Course			4.00

25	CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS															
	PQ1	**PQ2**	**PQ3**	**PQ4**	**PQ5**	**PQ6**	**PQ7**	**PQ8**	**PQ9**	**PQ10**	**PQ11**	**PQ12**	**PQ13**	**PQ14**	**PQ15**	**PQ16**
ÖK1	2	3	3	3	4	3	3	3	4	4	5	5	5	0	0	0
ÖK2	2	3	3	3	4	4	3	3	4	2	3	3	3	0	0	0
ÖK3	2	3	3	3	4	3	2	3	3	3	4	4	4	0	0	0
ÖK4	2	3	3	4	3	3	4	3	4	3	3	3	5	0	0	0
ÖK5	3	3	3	4	4	4	3	3	4	4	4	4	4	0	0	0
ÖK6	2	2	2	2	3	3	3	3	5	3	4	3	5	0	0	0
ÖK7	4	4	5	5	4	4	5	5	4	5	4	4	4	0	0	0
ÖK8	4	3	3	5	4	4	4	4	3	3	2	2	2	0	0	0
ÖK9	3	3	2	1	3	3	4	4	3	3	4	3	4	0	0	0
ÖK10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LO: Learning Objectives PQ: Program Qualifications																
Contribution Level:	**1 very low**		**2 low**		**3 Medium**		**4 High**			**5 Very High**						