SOIL PHYSICS

1	Course Title:	SOIL PHYSICS	
2	Course Code:	TPR3907	
3	Type of Course:	Compulsory	
4	Level of Course:	First Cycle	
5	Year of Study:	3	
6	Semester:	5	
7	ECTS Credits Allocated:	3.00	
8	Theoretical (hour/week):	2.00	
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:	To provide better plant development and create the optimum plant rooting depth conditions in rhizosphere by examining the the relations among plant root, soil, water, and atmosphere	
19	Contribution of the Course to Professional Development:	The student gains ability to apply more and more innovative technologies (sensors and telemetric measurements) in agriculture; to use soil-water equations for plant breeding, irrigation and drainage water management; to measure and interpret soil water potential and plant water potential; confidently to propose solutıons to environmental soıl and water pollution and remediaton problems	
20	Learning Outcomes:		
		1	Upon completing the course, the students should be able to discuss and describe soil physical properties such as texture, structure, porosity, surface area and more
		2	Gain knowledge of flow mechanisms in soil
		3	Communicate the principles underlying transport mechanisms of dissolved chemicals and contaminants in soil
		4	Demonstrate soil hydraulic parameters and their use in a model context
		5	Determine measurements methods of soil water content
		6	Evaluate the phenomenon of water repellency and its implications
		7	Recognize the differences between saturated and unsaturated flow
		8	Evaluate soil water potential values and produce transport breakthrough curve
		9	Determine soil air content and composition
		10	Measure and manage soil thermal properties
21	Course Content:		
	Course Content:		
Week	Theoretical	Practice	

1	Introduction to physical characteristics of soil, overview of weathering and soil formation, soil profile and horizons, multiphase system in soil and mass and volume relations of soil constituents	Acclimatization to the laboratory equipment and environment
2	Properties of water in relation to porous media, phenomenon of capillarity, adsorption of water to solids, vapor pressure and surface tension, dynamic and kinematic viscosity, density and compressibility of water	Acclimatization to the laboratory equipment and environment
3	Particle size and specific surface area: particle size distribution, mechanical analysis, measuring specific surface area by adsorption and by calculation methods	Particle size analysis
4	Nature and behavior of clay: structure of clay minerals, electrostatic double layer and zeta potential, hydration and swelling, ion exchange, flocculation and dispersion, soil organic constituents	Particle size analysis
5	Soil structure and aggregation: types of soil structures, structure of granular soils, structure of aggregated soils, factors affecting aggregation, aggregate size distribution, aggregate stability, classes of soil pores, soil crust formation, soil conditioners, hydrophobic soil aggregates	Aggregate stability and aggregate size distribution
6	Soil water content and soil water potential: measurement of soil wetness, gravimetric and volumetric water contents, energy state of soil moisture potential	Aggregate stability and aggregate size distribution
7	Water flow in saturated soil: Darcy's Law, heads, flux, flow velocity, and tortuosity; hydraulic conductivity, intrinsic permeability, relations, measurement of hydraulic conductivity of saturated soils, equations of horizontal soil column	Soil water content determination and bulk density
8	Flow in unsaturated versus saturated soil, suction, hydraulic diffusivity, calculation of the hydraulic conductivity function, laboratory	Soil water content determination and bulk density
9	Movement of solutes and soil salinity: solutes, hydrodynamic dispersion, miscible displacement and breakthrough curves, soil salinity and alkalinity, salt balance of soil profile	Soil saturated hydraulic conductivity measurement
10	Content and composition of soil air: volume fraction of soil air, composition of soil air, soil respiration and aeration requirements, measurement of air content and compositions, measurement of soil respiration, poorly aerated soils	Soil saturated hydraulic conductivity measurement /constant head/falling head methods
11	Convective flow of air in soils, diffusion of gasses in the soil, measurement of gaseous convection and diffusion in soil, greenhouse gas emissions	Soil moisture characteristic curve determinations
12	Heat conduction in soils and thermal diffusivity and conductivity relations	Soil moisture characteristic curve determinations
13	Processes of heat transport in soils	Soil air and temperature measurements

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	2.00	28.00
Practicals/Labs	14	2.00	28.00
Self study and preperation	14	1.00	14.00
Homeworks	7	1.00	7.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	1	6.00	6.00
Others	0	0.00	0.00
Final Exams	1	7.00	7.00
Total Work Load			90.00
Total work load/ 30 hr			3.00
ECTS Credit of the Course			3.00

14	Mathematical formulation of heat regime in soils and analytical and numerical solutions to heat transport equation	Soil air and temperature measurements

22	Textbooks, References and/or Other Materials:	Hillel, D. 2002. Environmental Soil Physics Kirda, C. and Sarıyev, A. 2012. Toprak Fiziği

23 Assesment

TERM LEARNING ACTIVITIES	**NUMBER**	**WEIGHT**
Midterm Exam	1	25.00
Quiz	0	0.00
Home work-project	7	15.00
Final Exam	1	60.00
Total	9	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

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**