

PLANT NUTRITION

1	Course Title:	PLANT NUTRITION
2	Course Code:	TPR3901-Z
3	Type of Course:	Compulsory
4	Level of Course:	First Cycle
5	Year of Study:	3
6	Semester:	5
7	ECTS Credits Allocated:	5.00
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:	Doç.Dr. HAKAN ÇELİK
15	Course Lecturers:	
16	Contact information of the Course Coordinator:	hcelik@uludag.edu.tr, 0 224 2941539, Uludağ Üniversitesi Ziraat Fakültesi Toprak Bilimi ve Bitki Besleme Bölümü
17	Website:	
18	Objective of the Course:	To take macro and micro elements separately that is essential for plant growth and development. To describe the uptake mechanisms of these elements by plants, contents and metabolic functions in plants. To teach deficiency and excess signs and explain ways to resolve these symptoms.
19	Contribution of the Course to Professional Development:	
20	Learning Outcomes:	
	1	Can list the macro and micro elements that are essential for plant growth and development.
	2	Can explain the nutrient uptake mechanisms of the plants that is essential for plant growth and development.
	3	Can define the metabolic functions of the nutrients essential for plant body.
	4	Be able to detect deficiency and excess signs of nutrients within the plant
	5	Can say the ways of removal of nutrient deficiency and excess symptoms within the plant.
	6	Can explain the up taken forms of nutrients from the soil.
	7	Can explain the forms of the nutrients in the soil.
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21	Course Content:	
	Course Content:	

Week	Theoretical	Practice		
1	Plant nutrition studies conducted in the field until today. The amount of nutrient found in plants and the general functions of plants, classification of nutrients essential for plant growth.	The rules and safety precautions in the laboratory. Laboratories and departments of laboratory.		
2	The process of identifying essential plant nutrients and the reasons for the delay. Comparison of the water culture and sand culture methods for the determination of the necessary nutrients.	Laboratory glassware and chemicals used in the laboratory, cleaning methods and cleaning solutions used for cleaning.		
3	Forms of nitrogen received by plants, nitrogen in plants, soil nitrogen, the nitrogen cycle and the events that took place in this cycle. Nitrogen mineralization, immobilization and factors affecting them, nitrification, denitrification and nitrogen fixation, including events such as change.	Introduction of the nutrient element solutions used at hydroponic and sand culture.		
4	Transfer of nitrogen from the atmosphere to ground by rainfall. Organic and chemical nitrogenous fertilizers, factors that limit the activities of nitrogenous fertilizers. The symptoms of nitrogen deficiency in plants, the effects of nitrogen on plant growth.	seed germination studies used for the observation of the nutrient element symptoms on the plants which were grown on hydroponic culture.		
5	Uptake of phosphorus by the plants, phosphorus contents of the plants, organic and inorganic phosphorus compounds, and metabolic processes in plants, soil and soil	percent concentration unit used in the plant nutrient solutions, the calculation of the amounts needed to prepare from solid and liquid materials and preparation of the solution.		
Activites		Number	Duration (hour)	Total Work Load (hour)
Theoretical	conditions of the fixation.	14	2.00	28.00
6	Factors affecting phosphorus availability.	14	2.00	28.00
Practicals/Labs		14	2.00	28.00
Self study and preparation	as the source of phosphorus and later effects of phosphorus fertilizers. The symptoms of	14	2.00	28.00
Homeworks		0	0.00	0.00
Projects	phosphorus on plant root development, harvesting, disease resistance and plant	0	0.00	0.00
Field Studies		0	0.00	0.00
7	Uptake of potassium by the plants, factors	14	2.00	28.00
Others		1	22.00	22.00
Final Exam	water balance, enzyme activity,	1	22.00	22.00
Total Work Load				172.00
Total work load in ECTS				5.00
ECTS Credit of the Course				5.00
8	The symptoms of potassium deficiency in plants, the effects of potassium on the growth and root development, cold tolerance, time of harvest, the effects of nitrogen on the activity and disease resistance. Plants calcium uptake, calcium content of plants and calcium in the metabolic processes in plants, calcium fertilizers and plant calcium deficiency symptoms.	ppm concentration unit used in the plant nutrient solutions, the calculation of the amounts needed to prepare from solid and liquid materials and preparation of the solution.		

9	Uptake of magnesium by the plants, magnesium content of plants, metabolic functions, soil and magnesium fertilizers, magnesium deficiency symptoms in the plants. Uptake of sulfur by the plants, sulfur content, sulfur assimilation and metabolic functions, fertilizers, and atmospheric sulfur, sulfur cycle, sulfur deficiency symptoms in plants.	Preparation of stock nutrient solution compositions and their applications at the greenhouse.
10	Iron uptake by plants, plant, environmental and soil factors that affect iron uptake, various strategies of plant, iron content of plants, iron metabolic functions in plants, iron fertilizers, symptoms of iron deficiency,	Preparation of deficient nutrient solution compositions and their application at the greenhouse.
11	Uptake of manganese by the plants and factors affecting manganese uptake, the contents of manganese in plants and metabolic processes in plants, manganese fertilizers, manganese deficiency symptoms.	Observation of the macro element deficiency symptoms on the slides and photos.
12	Uptake of boron by the plants. Factors affecting boron uptake, the boron content of plants, the metabolic functions of boron in plants and sources of boron, symptoms of boron deficiency and the excess in plants.	Observation of the micro element deficiency symptoms on the slides and photos.
13	Zinc uptake by plants and factors affecting zinc uptake, zinc content of plants, the metabolic functions of zinc in plants, plant sources of zinc, zinc deficiency symptoms in plants.	Observation of the nutrient element deficiency symptoms on the plants grown at the greenhouse.
14	Copper uptake of plants and factors affecting copper uptake, copper content of plants, the metabolic functions of copper in plants, sources of copper, copper deficiency symptoms in plants. Molibdenum uptake and factors affecting plant uptake of molibdenum, molibdenum content of plants, the metabolic functions of molibdenum in plants, sources of molibdenum, molibdenum deficiency symptoms in plants.	Practice Exam
22	Textbooks, References and/or Other Materials:	<p>Kacar. B. ve Katkat, A. V. 2010. Bitki Besleme. (5. Baskı) Nobel Yayın Dağıtım. No:849, Ankara.</p> <p>Barker Allen V.and, Pilbeam David J. 2007 Handbook of Plant Nutrition. CRC Pres. Taylor and Francis Group. Boca Raton, FL</p> <p>Barber, S.A. 1995. Soil Nutrient Bioavailability. 2nd Ed. 414p. John Wiley and Sons Inc. New York.</p> <p>Marschner H. 1995. Mineral Nutrition of Higher Plants. 2nd Ed. 889 p. Academic Press, New York.</p> <p>Bergmann W. 1992. Nutritional Disorders of Plants. Gustav Fischer Verlag Jena, Stuttgart, New York.</p> <p>Mengel, K. and Kirlby, E.A. 1987. Principles of Plant Nutrition. 4th Edition. 687p. International Potash Institute. Bern, Switzerland.</p>
23	Assesment	
TERM LEARNING ACTIVITIES		NUMBE R WEIGHT

Midterm Exam	1	20.00
Quiz	1	20.00
Home work-project	0	0.00
Final Exam	1	60.00
Total	3	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		
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	5	1	5	3	0	0	5	5	2	5	4	0	0	0	0	0
ÖK2	5	2	4	3	0	0	5	5	2	5	3	0	0	0	0	0
ÖK3	5	2	4	3	0	0	5	5	2	0	4	0	0	0	0	0
ÖK4	5	2	5	4	0	0	5	5	4	5	3	0	0	0	0	0
ÖK5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK6	5	2	4	3	0	0	5	5	2	5	3	0	0	0	0	0
ÖK7	5	2	4	3	0	0	5	5	2	5	3	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							