E	BIOLOGICAL NUTRIEN	IT RE	MOVAL FROM WASTEWATERS						
1	Course Title:	BIOLOG	ICAL NUTRIENT REMOVAL FROM WASTEWATERS						
2	Course Code:	CEV4079							
3	Type of Course:	Optional							
4	Level of Course:	First Cycle							
5	Year of Study:	4							
6	Semester:	7							
7	ECTS Credits Allocated:	3.00							
8	Theoretical (hour/week):	2.00							
9	Practice (hour/week):	0.00							
10	Laboratory (hour/week):	0							
11	Prerequisites:	No							
12	Language:	Turkish							
13	Mode of Delivery:	Face to f	ace						
14	Course Coordinator:	Doç.Dr.	AHMET UYGUR						
15	Course Lecturers:								
16	Contact information of the Course Coordinator:	(ahmetuygur@uludag.edu.tr, 0 224 294 21 12, Uludağ Üniversitesi, Mühendislik-Mimarlık Fakültesi, Çevre Mühendisliği Bölümü, 16 059 Görükle/Bursa)							
17	Website:	https://sites.google.com/site/docdrahmetuygur/							
18	Objective of the Course:	The objective of this course is to introduce the principles of both biological nitrogen removal and biological phosphorous removal. Biological processes for carbon, nitrogen and phosphorous removal will be covered with special emphasis on design and operation aspects. Especially, design, operating and reaction kinetics on biological carbon, nitrogen and phosphorous removal are the major topics of this course.							
19	Contribution of the Course to Professional Development:								
20	Learning Outcomes:								
		1	Know the description of carbon, nitrogen and phosphorus compounds to be presented in wastewater.						
		2	Have the ability of the solving methods of biological degradation and synthesis of present compounds.						
		3	Have the ability of cycle theory of carbon, nitrogen and phosphorus compounds.						
		4	Have the ability to solve growth kinetics and stoichiometry for nitrification mechanism.						
		5	Have the ability to solve growth kinetics and stoichiometry for denitrification mechanism.						
		6	Have the ability to solve growth kinetics and stoichiometry for biological phosphorus removal.						
		7	Understand the design, operating and environmental parameters for nitrification process.						
		8	Understand the design, operating and environmental parameters for denitrification process.						
		9	Comprehend the importance of many processes for biological carbon, nitrogen and phosphorus removal.						
		10							
21	Course Content:								
		Co	ourse Content:						

Week	Theoretical	Practice		
1	Carbon, nitrogen and phosphorus compounds in wastewaters.			
2	Cycles of carbon, nitrogen and phosphorus.			
3	Biological processes on nitrogen removal: Nitrification description, nitrification microorganisms, growth kinetics and stoichiometry of bacteria, environmental factors affected nitrification in treatment plants.			
4	Classification of nitrification processes: Separated-recycle processes, combined- recycle processes.			
5	Denitrification description, denitrificationmicrooganisms, growth kinetics and stoichiometry of bacteria, parameters affected denitrification.			
6	Solve the practice problems as regard biological nitrogen removal.			
7	Repeating courses and midterm exam			
8	Description of Phosphorus removal process, mechanism of phosphorus removal and biological processes, microorganism, growth kinetics and stoichiometry of biological phosphorus removal, systems removed biological enhanced phosphorus, PO4-P release in an anaerobic zone. PO4-P uptake			
Activit	es	Number	Duration (hour)	Total Work Load (hour)
Theore	free-step phoredox (A2O) process, free-step phoredox process (modified	14	2.00	28.00
Practica	als/Labs	0	0.00	0.00
Self stu	UC1 process, Dephanox process, dy and picperation sequencing batch reactor (SBR)	14	4.00	56.00
Homew	vorks	0	0.00	0.00
Pr <b>ðje</b> ct	Factors affected biological phosphorous	0	0.00	0.00
Field S	tudies	0	0.00	0.00
Midtern	n exams	1	2.00	2.00
Others		1	1.00	1.00
Final E	Some the practice problems as regard	1	2.00	2.00
Total W	Vork Load			91.00
Total w	rork load/ 30 hr			2.97
ECTS (	Credit of the Course			3.00

	Textbooks, References and/or Other Materials:								Biological and Chemical Systems for Nutrient Removal, Movva Reddy, WEF,1998									
										Biological Phosphorus Removal, Manual for design and operation, P.M.J. Janssen, K.Meinema, H.F. van der Roest, STOWA, Nederland, 2002								
								Bic Wa No	Biological Nutrient Removal (BNR) Operation in Wastewater Treatment Plants, WEF No.29, ASCE No.109,2006									
								Nu	itrient I	Remov	al, WEI	<sup>=</sup> No.34	,2011					
								Mc Na	odelling zik Art	g of Act an, 19	tivated 94	Sludge	Syster	ns, Deri	n Orhon	,		
									Advances in Water and Wastewater Treatment Biological Nutrient Removal, AnnArborSciencePublishers, Martin P. Wanielista, W. Wesley Echenfelder, 1978, USA.									
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									WastewaterEngineeringTreatmentandReuse, George Tchobanoglous, Franklin L. Burton, H. David Stensel, California, 2003.									
23	Assesme	ent																
TERM LE	EARNING	G ACTI	VITIES	;		N R		WE	WEIGHT									
Midterm	Exam					1		30.	30.00									
Quiz						1		10.	10.00									
Home w	Home work-project 0								0.00									
Final Exam 1								0.0	00									
Final Ex	am					1		60.	00 .00									
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ÖK5	3	4	5	0	4	0	0	0	0	0	0	0	0	0	0	0
ÖK6	3	4	5	0	4	0	0	0	0	0	0	0	0	0	0	0
ÖK7	4	5	4	0	3	0	0	0	0	0	0	0	0	0	0	0
ÖK8	4	5	4	0	3	0	0	0	0	0	0	0	0	0	0	0
ÖK9	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0
LO: Learning Objectives PQ: Program Qualifications																
Contrib 1 very low ution Level:				2 low		3	Medi	um		4 Hig	h		5 Ver	y High		