



MARMARA UNIVERSITY - Faculty of Engineering

Environmental Engineering

SYLLABUS

Course Code	Course Name	Course Type	Weekly Course Hours			Credits	ECTS	Campus / Weekly Time & Classroom Schedule
			T	A	L			
ENVE 8025	Advanced Biological Nutrient Removal	Elective	3	0	0	3	8	
Prerequisite	Environmental Microbiology, Unit Operations in Environmental Engineering, Unit Processes in Environmental Engineering		Prerequisite to					
Course Lecturer	Dr. Erkan Şahinkaya					Office Hours Schedule		
E-mail	<a href="mailto:erkan.sahinkaya@medeniyet.edu.tr">erkan.sahinkaya@medeniyet.edu.tr</a>					Office / Room No		
Phone	0216 280 3205					Phone		
Teaching Assistant(s)						Office / Room No		
E-mail								
Course Objectives	Introduction of newly developed nutrient removing biological processes, comparison of various alternative technologies and deeply evaluating their potential advantages and disadvantages, focusing on design of newly developed processes, application of biological nutrient removing processes for drinking water treatment.							
Textbooks and/or References	1. Metcalf & Eddy, Wastewater Treatment and Reuse-Fourth Edition							
	2. Biological and Chemical Systems for Nutrient Removal - WEF - First Edition							
	3. Simon Judd, The MBR Book-Principles and Applications of Membrane Bioreactors for Water and Wastewater Treatment-Second Edition							
	4. Hee-Deung Park et al. Principles of membrane bioreactors for wastewater treatment-CRC Press, 2015							
	2. Şahinkaya E., Yurtsever A., Aktaş Ö., Ucar D., Wang Z., "Sulfur-Based Autotrophic Denitrification Of Drinking Water Using A Membrane Bioreactor", Chemical Engineering Journal, 268, 180-186 (2015).							
	3. Kilic A., Şahinkaya E., Çınar Ö., "Kinetics of Autotrophic Denitrification Process and the Impact of Sulphur/Limestone Ratio on the Process Performance", Environmental Technology, 35, 2796-2804 (2014).							
	4. Karataş S., Hasar H., Taşkan E., Özkaya B., Şahinkaya E., "Bio-Reduction Of Tetrachloroethen Using A H2-Based Membrane Biofilm Reactor And Community Fingerprinting", Water Research, 58, 21-28 (2014).							
	5. Şahinkaya E., Dursun N., "Use of Elemental Sulfur And Thiosulfate as Electron Sources for Water Denitrification", Bioprocess and Biosystems Engineering, 38, 531-541 (2015).							
	6. Şahinkaya E., Kilic A., Duygulu B., "Pilot and Full Scale Applications of Sulfur-Based Autotrophic Denitrification Process for Nitrate Removal From Activated Sludge Process Effluent", Water Research, 60, 210-217 (2014).							
	7. Şahinkaya E., Kilic A., "Heterotrophic and Elemental-Sulfur-Based Autotrophic Denitrification Processes for Simultaneous Nitrate and Cr(VI) Reduction" Water Research, 50, 278-286 (2014).							
8. Şahinkaya E., Kilic A., Calimlioglu B., Tokar Y., "Simultaneous Bioreduction of Nitrate and Chromate Using Sulfur-Based Mixotrophic Denitrification Process" Journal of Hazardous Materials, 262, 234-239 (2013).								
9. Şahinkaya E., N. Dursun, A. Kilic, S. Demirel, S. Uyanik, O. Cinar, "Simultaneous heterotrophic and sulfur-oxidizing autotrophic denitrification process for drinking water treatment: Control of sulfate production" Water Research, 45, 6661-6667 (2011).								
10. Şahinkaya E., Hasar H., Kaksonen A.N., Rittmann B.E. "Performance of a sulfide-oxidizing, sulfur-producing membrane biofilm reactor treating sulfide-containing bioreactor effluent". Environmental Science and Technology, 45, 4080-4087 (2011).								
WEEK	Date	TOPICS					Reference No - Section	
Week 1		Source of nutrients in drinking waters and wastewaters						
Week 2		Principles of nutrient removing membrane bioreactor processes						
Week 3		Design and application of nutrient removing membrane bioreactor processes						
Week 4		Metal salts addition to membrane bioreactor processes for P removal and the impact on fouling propensities						
Week 5		Alternative autotrophic/heterotrophic denitrification processes for drinking water treatment						
Week 6		Principles of elemental sulfur-based denitrification processes for drinking water treatment						
Week 7		Design and application of elemental sulfur based denitrification processes for drinking water treatment						
Week 8		Simultaneous removal of nitrate, phosphorus and other oxyanions (perchlorate, Cr(VI), etc) in autotrophic denitrification processes						
Week 9		Principles of sulfide-based denitrification processes for wastewater treatment						
Week 10		Design and application of sulfide-based denitrification processes for wastewater treatment						
Week 11		The use of H2-based membrane biofilm reactor for drinking water denitrification						
Week 12		The use of membrane biofilm process for nitrification						
Week 13		Design and application of membrane biofilm processes						
Week 14		Improvement of P removal in biological processes by chemical supplementation						
Evaluation Tools	Evaluation Tool		Quantity	Date	Weight in Total (%)	Weight in Semester Evaluation (%)		
	Final Exam		1		50	0		
	Final Make-up Exam (if exists)		1		50	0		
	Semester Evaluation				50	100		
	Midterm(s)		1		25	50.0		
	Quiz(zes)							
	Project(s)		1		15	30.0		
	Homework(s)		3		10	20.0		
	Laboratory							
Other								
*** Lifelong Learning Programme (LLP) ***					Language of Instruction: English			
Evaluation Tool	Quantity	Student Workload Hours		Evaluation Tool	Quantity	Student Workload Hours		
Theoretical Hours	--	42.0		Applied Hours	--	0.0		
Midterm	1	12.0		Final	1	12.0		
Quiz				Project	1	18.0		
Laboratory				Homework	3	30.0		
Atelier				Seminar				
Field Study				Presentation	1	18.0		
Other				Self Study	1	58.0		
TOTAL :					8	190.0		
Recommended ECTS Credit (Total Hours / 25) : 8								