

ANAEROBIC TREATMENT OF WASTES

1	Course Title:	ANAEROBIC TREATMENT OF WASTES
2	Course Code:	CEV5269
3	Type of Course:	Optional
4	Level of Course:	Third Cycle
5	Year of Study:	1
6	Semester:	1
7	ECTS Credits Allocated:	6.00
8	Theoretical (hour/week):	3.00
9	Practice (hour/week):	0.00
10	Laboratory (hour/week):	0
11	Prerequisites:	None
12	Language:	Turkish
13	Mode of Delivery:	Face to face
14	Course Coordinator:	Doç. Dr. AHMET UYGUR
15	Course Lecturers:	-
16	Contact information of the Course Coordinator:	e-mail: ahmetuygur@uludag.edu.tr Tel: 0224-2942112 Adres: Bursa Uludağ Üniversitesi Mühendislik Fakültesi Çevre Mühendisliği Bölümü Nilüfer/Bursa,TÜRKİYE
17	Website:	
18	Objective of the Course:	Within the scope of this course, by giving basic, comprehensive and scientific information about the following topics, it is aimed that master of science students have knowledge about the basic working principles, design and operation of anaerobic systems used in the treatment of solid and liquid wastes. Anaerobic digestion model 1; Mathematical equation for the solution of (ADM1) Equations and developing engineering approaches to solve problems systematically are among the main objectives of this course.
19	Contribution of the Course to Professional Development:	The students are given a broad knowledge of the basics of aerobic and anaerobic biological treatment. Gain the ability to use in their professional lives about the design, operation and control of anaerobic treatment reactors.
20	Learning Outcomes:	
	1	They learn about aerobic and anaerobic biological treatment.
	2	Recognize the principles of anaerobic treatment and basic biochemical processes, components and microorganisms.
	3	Gain knowledge about anaerobic treatment systems and reactors
	4	They evaluate events in terms of commissioning and process control.
	5	Learn about aerobic purification kinetics and modeling.
	6	They learn about anaerobic treatability tests, BMP, AZA.
	7	They gain gains on digestion of sewage sludge, sludge quantity and properties, process design and control, operational problems. They gain knowledge about high speed anaerobic reactors.

		8	They will gain knowledge about treatability and applications related to anaerobic treatment of domestic wastewater. To gain knowledge on anaerobic biological treatment of solid waste, anaerobic treatment of solid waste leachate.		
		9	They obtain information about energy use and recovery, COD components and dissolved microbial product formation in waste water, studies with fermentation industry waste water, Biogas calculation, processing and storage in other areas where anaerobic treatment is used.		
		10	Acquire the acquisition of different approach solutions for solving the mathematical problems required for design, operation and control related to anaerobic treatment.		
21	Course Content:				
	Course Content:				
Week	Theoretical		Practice		
1	Biological wastewater treatment, principles, fundamentals and Design, creation of simple matrix format for three important basic components				
2	Overview of aerobic and anaerobic biological treatment				
3	Principles of anerobic treatment, microbiological activities, biochemistry				
4	Anaerobic treatment systems				
5	Start-up and process control, optimum				
Activites			Number	Duration (hour)	Total Work Load (hour)
7	Theoretical Digestion of sewage sludge		14	3.00	42.00
Practicals/Labs			0	0.00	0.00
9	Self study and preparation Anaerobic treatment of domestic waste water		13	3.00	39.00
Homeworks			1	30.00	30.00
11	Projects Anaerobic treatment of solid waste		0	0.00	0.00
Field Studies			0	0.00	0.00
13	Midterm Exam Application examples of anaerobic treatment systems in different fields		1	32.00	32.00
Others			0	0.00	0.00
14	Final Exam Application examples of anaerobic treatment systems in different fields		1	40.00	40.00
Total Work Load					183.00
22	Total work load/ 30 hr Textbooks, References and/or Other Materials:		Anaerobik Arıtma ve Uygulamaları, Prof. Dr. İzzet		6.00
ECTS Credit of the Course					6.00
			Anaerobik Arıtma, Prof. Dr. Ayşe HİNBELİ, Nurdan BÜYÜKKAMACI, Azize AYOL, DEU Atıksuların Havasız Şartlarda Arıtımı Esasları, Prof. Dr. Mustafa ÖZTÜRK, Çevre ve Şehircilik Bakanlığı, 2018 Anaerobic Digestion Model No.1, IWA, 2002 Anaerobic Waste-Wastewater Treatment and Biogas Plants, Joseph C. Akunna, CRC Press, 2019 Wastewater Engineering Treatment and Reuse, George Tchobanoglous, Franklin L. Burton, H. David Stensel, California, 2003 Anaerobic Reactors, Carlos Augusto de Lemos Chernicharo, IWA Publishing, 2007 Anaerobic Biotechnology for Industrial Wastewaters, R.E. Speece, Vanderbilt University, 1996		
23	Assesment				

TERM LEARNING ACTIVITIES	NUMBER	WEIGHT
Midterm Exam	1	20.00
Quiz	1	10.00
Home work-project	1	10.00
Final Exam	1	60.00
Total	4	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	MIDTERM, SHORT EXAM, FINAL EXAM	
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	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK2	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
ÖK3	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK4	0	4	5	0	5	0	0	0	0	0	0	0	0	0	0	0
ÖK5	0	4	5	0	5	0	0	0	0	0	0	0	0	0	0	0
ÖK6	0	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK7	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK8	0	5	0	0	4	0	0	0	0	0	0	0	0	0	0	0
ÖK9	5	0	5	0	4	0	0	0	0	0	0	0	0	0	0	0
ÖK10	0	5	4	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							