REMOVAL OF METALS AND TOXIC ORGANIC COMPOUNDS BY MICROBIAL METHODS

1	Course Title:	REMOVAL OF METALS AND TOXIC ORGANIC COMPOUNDS BY MICROBIAL METHODS
2	Course Code:	CEV3047
3	Type of Course:	Optional
4	Level of Course:	First Cycle
5	Year of Study:	3
6	Semester:	5
7	ECTS Credits Allocated:	2.00
8	Theoretical (hour/week):	2.00
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:	Dr. Ögr. Üyesi SEVİL Ç. ELEREN
15	Course Lecturers:	
16	Contact information of the Course Coordinator:	Dr. Öğr. Üyesi Sevil ÇALIŞKAN ELEREN sceleren@uludag.edu.tr 224 2942115 Bursa Uludağ Üniversitesi, Mühendislik Fakültesi, Çevre Mühendisliği Bölümü.
17	Website:	
18	Objective of the Course:	Teaching the removal of metals and toxic organic compounds by microorganisms and their adverse effects on microorganisms.
19	Contribution of the Course to Professional Development:	The student who completes this course will have knowledge about metal and toxic organic compounds that can prevent efficient operation of the systems by creating toxic effects on microorganisms in biological treatment systems used for pollution control in the field of Environmental Engineering. The students obtains information about finding solutions and evaluating possible problems in treatment systems by using the information about the fate and effects of metal and toxic organic compounds in biological treatment systems.
20	Learning Outcomes:	
	1	After the completion of the course, the student will be able to know how to remove metals and toxic organic compounds with microorganisms from and other environmental area, and evaluate their adverse effects on microorganisms.
	2	After the completion of the course, the student will be able to have information about the biodegradation process of toxic organic compounds.
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21	Course Content:

Course Content:

Week	Theoretical	Practice
1	Metals in wastewater and sludge	
2	Removal of metal in activated sludge systems	
3	Metal toxicity effects on the microbial cell	
4	Mechanisms of microbial metal resistance and detoxicification	
5	Metal- microorganism interactions. Adverse effects and benefits of metal-microbial interactions	
6	Physical/Chemical methods of metal remediation.	
7	Innovative microbial approaches in the remediation of metal-contaminated soils, sediments and aquatic systems	
8	Sources of toxic organic compounds in wastewater. Classification of toxic organic compounds	
9	Toxic organic compounds in biological systems	
10	Midterm exam	
11	Biodegradation of toxic organic compounds	
12	The relationship between compounds	
13	Bioremediation of toxic organic compounds.	
14	Student Presentation	

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	2.00	28.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	0.50	7.00
Homeworks	1	5.00	5.00
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	16.00	16.00
Total Work Load			62.00
Total work load/ 30 hr			2.07
ECTS Credit of the Course			2.00

TERM LEARNING ACTIVITIES	NUMBER	WEIGHT
Midterm Exam	1	25.00
Quiz	0	0.00
Home work-project	1	15.00
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

22	Textbooks, References and/or Other

1- Gerardi M.H. (1994) Wastewater Biology: The Life

2- Maier R.M., Pepper I.L., Gerba C.P. (2000)

3- Hughes M.N., Poole R.K. (1989) Metals and

4- Patterson J.W. (1985) Industrial Wastewater Treatment

Measurement and Evaluation Techniques Used in the Course	In order to determine the success of the students, questions in the form of classical and multiple-choice test are asked in the exams. In addition, with the homework given within the course, it is ensured that the theoretical knowledge given in the course is reinforced in practice. These activities are evaluated in determining the success grade.

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	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0
ÖK2	3	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**