

# BIOLOGICAL NUTRIENT REMOVAL FROM WASTEWATERS

<b>1</b>	Course Title:	BIOLOGICAL NUTRIENT REMOVAL FROM WASTEWATERS	
<b>2</b>	Course Code:	CEV4079	
<b>3</b>	Type of Course:	Optional	
<b>4</b>	Level of Course:	First Cycle	
<b>5</b>	Year of Study:	4	
<b>6</b>	Semester:	7	
<b>7</b>	ECTS Credits Allocated:	3.00	
<b>8</b>	Theoretical (hour/week):	2.00	
<b>9</b>	Practice (hour/week):	0.00	
<b>10</b>	Laboratory (hour/week):	0	
<b>11</b>	Prerequisites:	No	
<b>12</b>	Language:	Turkish	
<b>13</b>	Mode of Delivery:	Face to face	
<b>14</b>	Course Coordinator:	Doç.Dr. AHMET UYGUR	
<b>15</b>	Course Lecturers:		
<b>16</b>	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)	
<b>17</b>	Website:	<a href="https://sites.google.com/site/docdrahmetuygur/">https://sites.google.com/site/docdrahmetuygur/</a>	
<b>18</b>	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.	
<b>19</b>	Contribution of the Course to Professional Development:		
<b>20</b>	Learning Outcomes:		
		<b>1</b>	Know the description of carbon, nitrogen and phosphorus compounds to be presented in wastewater.
		<b>2</b>	Have the ability of the solving methods of biological degradation and synthesis of present compounds.
		<b>3</b>	Have the ability of cycle theory of carbon, nitrogen and phosphorus compounds.
		<b>4</b>	Have the ability to solve growth kinetics and stoichiometry for nitrification mechanism.
		<b>5</b>	Have the ability to solve growth kinetics and stoichiometry for denitrification mechanism.
		<b>6</b>	Have the ability to solve growth kinetics and stoichiometry for biological phosphorus removal.
		<b>7</b>	Understand the design, operating and environmental parameters for nitrification process.
		<b>8</b>	Understand the design, operating and environmental parameters for denitrification process.
		<b>9</b>	Comprehend the importance of many processes for biological carbon, nitrogen and phosphorus removal.
		<b>10</b>	
<b>21</b>	Course Content:		
		<b>Course Content:</b>	

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, denitrification microorganisms, 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, PO <sub>4</sub> -P release in an anaerobic zone, PO <sub>4</sub> -P uptake			
Activites		Number	Duration (hour)	Total Work Load (hour)
Theoretical	process, three-step Phoredox (AZO) process, five-step phoredox process (modified	14	2.00	28.00
Practicals/Labs		0	0.00	0.00
10	Self-study and preparation UCI process, Dephanox process, sequencing batch reactor (SBR)	14	4.00	56.00
Homeworks		0	0.00	0.00
11	Projects Factors affected biological phosphorous removal	0	0.00	0.00
Field Studies		0	0.00	0.00
12	Midterm exams Repeating courses and quiz	1	2.00	2.00
13	Others Experimental analyses for biological nutrient	1	1.00	1.00
14	Final Exam Solve the practice problems as regard	1	2.00	2.00
Total Work Load				91.00
Total work load/ 30 hr				2.97
ECTS Credit of the Course				3.00



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**

<b>Contribution Level:</b>	<b>1 very low</b>	<b>2 low</b>	<b>3 Medium</b>	<b>4 High</b>	<b>5 Very High</b>
----------------------------	-------------------	--------------	-----------------	---------------	--------------------