COMPUTER SUPPORTED MODEL APPROACHES IN ACTIVATED SLUDGE SYSTEMS

1	Course Title:	COMPUTER SUPPORTED MODEL APPROACHES IN ACTIVATED SLUDGE SYSTEMS	
2	Course Code:	CEV6227	
3	Type of Course:	Optional	
4	Level of Course:	Third Cycle	
5	Year of Study:	2	
6	Semester:	3	
7	ECTS Credits Allocated:	6.00	
8	Theoretical (hour/week):	2.00	
9	Practice (hour/week):	2.00	
10	Laboratory (hour/week):	0	
11	Prerequisites:		
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:	(ahmetuygur@uludag.edu.tr, 0 224 294 21 12, Bursa Uludağ Üniversitesi, Mühendislik Fakültesi, Çevre Mühendisliği Bölümü, 16 059 Görükle/Bursa)	
17	Website:	https://sites.google.com/site/docdrahmetuygur/	
18	Objective of the Course:	Within the scope of this course, the basic principles of computer aided model approaches in active sludge systems of students of Ph.D. students can be presented by using basic models, comprehensive and scientific information about the subjects mentioned below and solutions for different forms of organic pollutants. It is the main aim of this course to develop mathematical equation equations for solving activated sludge systems and to develop engineering approaches to solving problems systematically.	
19	Contribution of the Course to Professional Development:	Learn to use most activated sludge models to remove organic matter, nitrogen and phosphorus through biological treatment, use mathematical and simulation skills for process-related design, operation and control.	
20	Learning Outcomes:		
		1	They have knowledge about model and model types. Recognizes processes and components in activated sludge systems.
		2	They have extensive knowledge about the bases of microbiology. They gain about the derivation of kinetic and stoichiometry.
		3	They have knowledge about the classification of pollutants that make up the characterization of wastewater.
		4	Microbial kinetics, basic rate expressions, knowledge of extraction of mass balances
		5	The properties of activated sludge processes attain sufficient information about design and operating parameters.
		6	They have knowledge about nitrification / denitrification and phosphorus removal mechanisms.
		7	They have information about the formation of the activated sludge model matrix format.

	8	They have information about the modeling of the activated sludge process with the help of the Excel worksheet. Learn simple carbon removal model using MATLAB.
	9	They have information about using ASIM models and simulation model.
	10	Have knowledge about other practical model applications

21	Course Content:	
	Course Content:	
Week	Theoretical	Practice
1	What is the model? Mathematical Modeling, Simulation	
2	Empirical, Steady-State and Dynamic Modeling	Practice Examples
3	Biological Wastewater Treatment, Principles, Foundation and Design, Formation of Activated Sludge Model Matrix Format	Practice Examples
4	Introduction to Activated Sludge Theory, Process Identification, Wastewater Characterization Methods in Modeling	Practice Examples
5	Modeling of Activated Sludge Systems,	Practice Examples
6	Extraction of Kinetics and Stoichiometric equations of organic compounds, thCOD,	Practice Examples
7	Biological Nutrient Removal Processes, Quiz	Practice Examples
8	Explanation of Mechanisms for Carbon Removal	Practice Examples
9	Modeling of Biological Nutrient Removal	Practice Examples
10	Midterm Exam	Practice Examples
11	Modeling of Activated Sludge Process with the help of Excel Worksheet, ASM1	Practice Examples
12	Simple Carbon Removal Model, N/DN/EBPR Using MATLAB and OCTAVE	Practice Examples
13	ASIM Commercial Package Program Help ASM1, ASM2, ASM2d, and ASM3 Models	Practice Examples
14	Practical Model Applications (BIOWIN, GPS-X, STOAT, WEST, SIMBA, AQUASIM, SASSPRO, SSSP, LYNX etc.)	Practice Examples

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	2.00	28.00
Practicals/Labs	14	2.00	28.00
Self study and preperation	14	9.00	126.00
Homeworks	0	0.00	0.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm Exams	1	2.00	2.00
Others	0	0.00	0.00
Final Exams	1	2.00	2.00
Total Work Load			186.00
Total work load/ 30hr			6.20
ECTS Credit of the Course			6.00

22	Textbooks, References and/or Other Materials:	Wastewater Treatment Biological and Chemical Processes, Mogens Henze & Eric Arvin, Springer, 2011 Wastewater Engineering Treatment and Reuse, George Tchobanoglous, Franklin L. Burton, H. David Stensel, California, 2003 An Introduction to Process Modeling for Designers, WEF No.31, 2009 Modelling of Activated Sludge Systems, Derin Orhon, Nazik Artan, Technomic Pub. Industrial Wastewater Treatment by Activated Sludge Derin Orhon, Fatos Germirli Babuna and Özlem Karahan Mathematical Modelling and Computer Simulation of Activated Sludge Systems, Jacek Makinia, IWA, 2010 Wastewater Treatment Systems, Modelling, Diagnosis and Control, Gustaf Olson, Bob Newell, Methods for Wastewater Characterization in Activated Sludge Modeling, Henryk Melcer et al.,2003, IWA, WEF. Activated Sludge Models ASM1, ASM2, ASM2d, ASM3, Mogenz Henz, Willi Gujer,Tahashi Mino,Mark van Loosdrecht, IWA, 2000.
23	Assesment	

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
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**