ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINEERING & SCIENCE
ADVANCED MATERIALS AND NANOTECHNOLOGY PROGRAM
COURSE DESCRIPTION AND SYLLABUS

Course Title	Code	Semester	T+L Hours	Credit	ECTS
Membrane Separations in Aquatic Systems	AMN 535	FALL/SPRING	3 + 0	3	10

Prerequisite Courses	-

Type	Selective
Language	English
Coordinator	Assoc. Prof. NİĞMET UZAL
Instructor	Assoc. Prof. NİĞMET UZAL
Adjunt	none
Aim	The aim of this course is to make a general view about membranes, membrane materials ans preparation methods. In addition to these, examination of the characterization of membranes morphology, and applications of membrane processes in water and wastewater treatment and recovery
Learning Outcomes	• Learning membrane materials, polymers and ceramic materials and their properties • Learning methods of membrane preparation • Learning the parameters of membrane morphology and characterization methods • Learning the type and structure of membranes • Learning the application of membrane technologies in drinking, municipal and industrial water treatment and reuse • Learning the nanocomposite membranes and their application areas
Course Content	• Membrane materials, polymers and ceramic materials and their properties • Membrane fabrication techniques • Characterization parameters of membrane morphology and their methods • Type and structure of membranes • Membrane technology applications in municipal water treatment and reuse • Membrane technology applications in integrated industrial wastewater treatment and reuse and hybrid processes • Nanocomposite membranes and their application areas

WEEKLY TOPICS AND PRELIMINARY STUDY

Week	Topic	Preliminary Study
1	Membranes, its history and development in literaure	The relevant articles from the recent literature and related book chapters
2	Membrane materials, polymer and ceremic materials and their properties.	The relevant articles from the recent literature related book chapters
3	Membrane preparation and fabrication methods.	The relevant articles from the recent literature related book chapters
4	Nonocomposite membranes and their manufacturing methods.	The relevant articles from the recent literature related book chapters
5	Ion exchange membranes and their application areas	The relevant articles from the recent literature related book chapters
6	Characterization parameters of membrane morphology and their methods	The relevant articles from the recent literature related book chapters
7	Membrane types and structures. (microfiltration, ultrafiltration) and treatment mechanisms	The relevant articles from the recent literature related book chapters
8	Membrane types and structures. (nanofiltration and reverse osmosis) and treatment mechanisms	The relevant articles from the recent literature related book chapters
9	Fouling in membranes and pretreatment	The relevant articles from the recent literature related book chapters

10	Midterm	
11	Application of membranes in drinking water treatment	The relevant articles from the recent literature related book chapters
12	Application of membranes in municipal water treatment and reuse.	The relevant articles from the recent literature related book chapters
13	Application of membranes in integrated industrial wastewater treatment and reuse and hybrid membrane processes.	The relevant articles from the recent literature related book chapters
14	Application of different industrial wastewaters (Textile, Tannery, Food, Chemical industry etc)	The relevant articles from the recent literature related book chapters
15	Nanocomposite membranes and their application areas	The relevant articles from the recent literature related book chapters
16	Final Exam	

SOURCES	
Lecture Notes	Lecture notes and slides
Other Sources	1. Rautenbach, R. And Albrecht, R., 1989. Membrane Processes, John Wiley & Sons, New York,USA. 2. Mulder, Marcel, 1996. Basic Principles of Membrane Technology, Second Edition, Kluwer Academic Publishers, Dordrecht, The Netherlands. 3. Baker R.W. 2004, Membrane Technology and Applications, Second Edition John Wiley & Sons, England

COURSE MATERIALS SHARING	
Documents	Lecture notes, slides
Homeworks	Students will be given 10 homeworks during the semester
Exams	1 Midterm and 1 Final Exam

EVALUATION SYSTEM		
SEMESTER STUDY	**NUMBER**	**CONTRIBUTION**
Midterm	1	30
Homework	10	30
Quiz	0	0
SUB-TOTAL	1	40
Contribution of Semester Study		100
Contribution of Final Exam		60
TOTAL		40

Course Category	
Sciences and Mathematics	%40
Engineering	%60
Social Sciences	%0

RELATIONSHIPS BETWEEN LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS							
No	Program Qualifications	Contribution Level				
		1	2	3	4	5
1	The ability to reach, evaluate, and interpret the knowledge by conducting scientific research in the field of Material Science and Nanotechnology.					**X**
2	Being able to use science, and engineering information to develop new methods in the fields of material science and nanotechnology.					**X**
3	The ability to apply knowledge of Materials Science and Nanotechnology Engineering to the analysis of material based systems			**X**		
4	To design and apply analytical, modelling and experimental based research.					**X**

5	The ability to resolve and interpret problems encountered in experimental based research			x		
6	To consider social, scientific and ethical issues in the processes of data collection, and interpretation				x	
7	Completion of knowledge using data, applying and integrating it with the knowledge out of various disciplines, with helping of the scientific methods					x
8	To lead disciplinary and interdisciplinary teams and take responsibility in team work.					x
9	To be able to contribute to the solution of social, scientific, and ethical problems that are faced in the field of Material Science and Nanotechnology					x
10	10) To be able to define, interpret and formulate new knowledge's related interdisciplinary interactions of the material science and nanotechnology field					x

*Increasing from 1 to 5.

ECTS / WORK LOAD TABLE			
Activities	Number	Duration (Hours)	Total Work Load
Course Length (includes exam weeks: 16x total course hours)	16	3	48
Out-of-class Study Time (Pre-study, practice)	16	5	90
Internet search, library work, literature search	16	4	64
Presentation	7	3	21
Homework	10	4	40
Midterm	1	20	15
Final Exam	1	25	20
Total Work Load			298
Total Work Load / 30			298/30
Course ECTS Credit			10