COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
ADVANCED SEPARATION PROCESSES	CHBE 554	1 or 2	3 + 0	3	10

Prerequisites	-

Language of Instruction	English
Course Level	Master of Science
Course Type	Elective
Course Coordinator	-
Instructors	
Assistants	-
Goals	The aim of this course is to provide students with an understanding of principles of complex separation processes.
Content	Separation processes which require a mass transfer analysis for complete understanding such as adsorption, ion exchange and chromatography . Absorption with chemical reaction for removing pollutants from flue gases. Separations involving a solid phase such as leaching, crystallization and drying.

Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Advanced knowledge of principles of separation processes.	2,4	1	A,C
2) Ability to analyze a complex separation problem and select or optimize a separation technique or techniques for its solution.	2,4	1	D
3) Ability to communicate effectively in writing and orally in the English language.	8	1	A,C,D

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Discussion, 9: Simulation, 12: Case Study
Assessment Methods:	A: Testing, B: Experiment, C: Homework, D: Project

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Mass Transfer Principles	Textbook, Additional Resources
2	Adsorption	Textbook, Additional Resources
3	Adsorption, Ion Exchange, Chromatography	Textbook, Additional Resources
4	Absorption	Textbook, Additional Resources
5	Absorption	Textbook, Additional Resources
6	Midterm 1	Textbook, Additional Resources
7	Leaching	Textbook, Additional Resources
8	Leaching	Textbook, Additional Resources
9	Crystallization	Additional Resources
10	Crystallization	Additional Resources
11	Midterm 2	Textbook, Additional Resources
12	Drying	Additional Resources
13	Drying	Additional Resources
14	Review	Textbook, Additional Resources

RECOMMENDED SOURCES	
Textbook	"Separation Process Engineering: Includes Mass Transfer Analysis" 4th Edition, Phillip C. Wankat, Prentice Hall
Additional Resources	Separation Process Principles: With Applications Using Process

	Simulators, 4th Edition, J. D. Seader, Ernest J. Henley, D. Keith Roper, Wiley. Library, Science Direct

MATERIAL SHARING	
Documents	-

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-term	2	60
Homework	12	20
Project	1	20
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM							
No	Program Learning Outcomes	Contribution					
		1	2	3	4	5	
1	Acquire expanded and in-depth information via performing scientific research in the field of Chemical Engineering, evaluate, interpret and implement knowledge.						
2	Be knowledgable in the contemporary techniques and methods applied in Chemical Engineering and their respective constraints.				X		
3	Be cognizant of the novel and developing applications of his/her profession, study and learn them as required.						
4	Formulate Chemical Engineering problems, develop methods to solve them and implement innovative techniques in solutions				X		
5	Design and conduct analytical modeling and experimental research, analyze and interpret complex problems encountered in this process.						
6	Develop novel and/or original ideas and methods; conceive innovative solutions in systems, component and process design						

7	Complete information via processing limited or incomplete data by the use of scientific methods and implement it; integrate knowledge from different disciplines					
8	Communicate in at least one foreign language at the level of European Language Portfolio B2 orally and in writing.				X	
9	Communicate stages and results of his/her studies in a systematic and clear manner orally or in writing in intra or interdisciplinary national and international settings.					
10	Defines societal and environmental aspects of Chemical Engineering applications					
11	Observe social, scientific and ethical values during collection, interpretation, and dissemination of data and in all professional activities.					
12	Lead multidisciplinary teams, develop solution methodologies for complex problems and take responsibility					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Including the exam week: 14x Total course hours)	14	4	56
Hours for off-the-classroom study (Pre-study, practice)	14	7	98
Mid-terms	2	3	6
HW’s	12	4	48
Project	1	40	40
Final examination	1	4	4
Total Work Load			252
Total Work Load / 25 (h)			10
ECTS Credit of the Course			10