

COURSE INFORMATION					
Course Title	Code	Semester	L+P Hour	Credits	ECTS
ADVANCED CHEMICAL ENGINEERING III: MASS TRANSFER	CHBE 533	1 or 2	3 + 1	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 the students with knowledge and abilities to the formulate and solve complex mass transfer problems.
Content	Diffusion in binary mixtures, Fick's first law of diffusion. Molecular diffusion in steady and unsteady state conditions. Diffusion in falling films, reactors and on the catalytic surfaces. Diffusion in multi-component mixtures, applications of the Maxwell-Stefan relations. The balance equations for simultaneous momentum, heat and mass transfer, and mass transfer in boundary layers. Mass transfer in turbulent flow and correlations for mass transfer coefficients.

Learning Outcomes	Program Learning Outcomes	Teaching Methods	Assessment Methods
1) Knowledge of mathematics, science and engineering subjects pertaining to mass transfer at advanced level.	2,4	1	A,C
2) Ability to formulate and solve complicated mass transfer problems; ability to select and apply proper analysis methods for this purpose.	2,4	1	A,C
3) Ability to communicate effectively in writing and orally in the English language.	8	1	A,C

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

COURSE CONTENT		
Week	Topics	Study Materials
1	Diffusion Models	Textbook
2	Diffusion in Dilute Solutions	Textbook
3	Diffusion in Concentrated Solutions	Textbook
4	Midterm 1	Textbook
5	Diffusion Coefficients	Textbook
6	Multicomponent Diffusion	Textbook
7	Mass Transfer Coefficients, Correlations for Mass Transfer	Textbook
8	Forced Convection	Textbook
9	Diffusion in Heterogeneous Chemical Reactions	Textbook
10	Midterm 2	Textbook
11	Diffusion in Homogeneous Chemical Reactions	Textbook
12	Simultaneous Mass and Heat Transfer	Textbook
13	Simultaneous Mass and Heat Transfer	Textbook
14	Review	Textbook

RECOMMENDED SOURCES	
Textbook	"Diffusion: Mass Transfer in Fluid Systems", E. L. Cussler, 3rd Edition, Cambridge University Press
Additional Resources	"Analysis of Transport Phenomena", W . M. Deen, 2nd Edition, Oxford University Press

MATERIAL SHARING	
Documents	-
Assignments	-
Exams	-

ASSESSMENT		
IN-TERM STUDIES	NUMBER	PERCENTAGE
Mid-term	2	80

Homework	12	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 knowledgeable 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	10	140
Mid-terms	2	3	6
HW's	12	4	48
Final examination	1	4	4
Total Work Load			254
Total Work Load / 25 (h)			10
ECTS Credit of the Course			10