COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
TRANSPORT PHENOMENA	ChBE 534	1 or 2	3 + 0	3	10

Prerequisites	-

Language of Instruction	English
Course Level	PhD
Course Type	Compulsory
Course Coordinator	-
Instructors	Prof.Dr.Salih Dinçer
Assistants	-
Goals	The aim of this course is to teach the formulation and application of momentum, energy and mass transport concepts using shell balances and derived transport equations in vector-tensor notation, together with the approaches used for the relevant analytical solutions.
Content	The course comprises an introduction to vector-tensor notation and relevant vector-tensor operations useful in transport phenomena, and the presentation of the concepts, formulations, analogies, analytical approaches and applications used for each of momentum, energy and mass transport.

Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Acquires the knowledge of mathematics, science and engineering subjects pertaining to momentum, energy and mass transfer at Master's level; ability to use theoretical and applied information in these areas to solve relevant engineering problems.	1,2,3	1	A,C
2) Gains the ability to identify, formulate, and solve complicated science and engineering problems related to momentum, energy and mass transfer at Master's level; ability to select and apply proper analysis methods for this purpose.	1,2,3	1	A,C
3) Gains the 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	Introduction to vector-tensor notations and relevant vector-tensor operations useful in transport phenomena	Textbook, library, Sci Direct
2	The mechanism of momentum transport and viscosity; shell momentum balances and velocity distributions in laminar flow	"
3	The equations of change (conservation) for isothermal systems	"
4	Velocity distributions with more than one independent variable; velocity distributions in turbulent flow	"
5	Interphase momentum transport in isothermal systems	"
6	Macroscopic balances for isothermal flow systems	"
7	The mechanism of energy transport and thermal conductivity; shell energy balances and temperature distributions in solids and laminar flow	"
8	Midterm exam 1	"
9	The equations of change (conservation) for nonisothermal systems; introduction to temperature distributions with more than one independent variable	"
10	Interphase energy transport in nonisothermal systems; macroscopic balances for nonisothermal systems	"
11	The mechanisms of mass transport and the diffusivity; concentration distributions in solids and laminar flow	"
12	Equations of change (conservation) for multicomponent systems; interphase mass transport in nonisothermal systems	"
13	Interphase mass transport in nonisothermal systems (contd); macroscopic balances for multicomponent systems	"
14	Midterm exam 2	"

RECOMMENDED SOURCES

Textbook	Bird, R.B., Stewart,W.E., Lightfoot, "Transport Phenomena", John Wiley & Sons, Inc., New York, revised 2.ed., 2007. [BSL]
Additional Resources	Library and Sci Direct

MATERIAL SHARING	
Documents	-
Assignments	-
Exams	-

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-term	2	83.3
Homework	12	(Bonus: 5% of HW's added to the total points)
Attendance		16.7
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60 (5% of HW's added as bonus to the total points)
Total		**100** (5% of HW's added as bonus to the total points)

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM						
No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Understand and apply fundamental sciences, mathematics and engineering sciences at high level.				X	
2	Have a wide and deep knowledge in his/her field including the latest progresses.				X	
3	Reach the latest knowledge in the field and through its comprehension possess high level competence in required methods and skills for doing research.				X	

4	Ability to do an extensive study which brings novelty to science and technology, develop a new scientific method or technological product/process, or apply a known method to a new field.					
5	Understand a genuine research process independently, design, apply and carry through; manage this process.					
6	Contribute to science and technology literature by publishing the outcomes of his/her academic studies in prestigious media.					
7	Able to do critical analysis, synthesis and evaluation of ideas and progresses in his/her specialization.					
8	Able to communicate and discuss at high level orally, written and visually by using a language at least at the level of European Language Portfolio B2 orally and written.				X	
9	Able to communicate with persons in his/her career and widely with scientific and social ensemble orally and writtten.					
10	Able to evaluate scientific, technological, social and cultural developments and transfer them to society with senses of scientific disinterest and ethical 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	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	10	140
Mid-terms	2	3	6
HW's	12	5	60
Final examination	1	4	4
Total Work Load			252
Total Work Load / 25 (h)			10
ECTS Credit of the Course			10