

COURSE INFORMATION					
Course Title	Code	Semester	L+P Hour	Credits	ECTS
ADVANCED COMPUTATIONAL TECHNIQUES IN CHBE	CHBE 582	1 or 2	3 + 0	3	10

<b>Prerequisites</b>	-
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<b>Language of Instruction</b>	English
<b>Course Level</b>	Master of Science
<b>Course Type</b>	Elective
<b>Course Coordinator</b>	-
<b>Instructors</b>	
<b>Assistants</b>	-
<b>Goals</b>	The aim of this course is to provide the students with knowledge and abilities to solve engineering equations by numerical methods.
<b>Content</b>	Ordinary differential equations (Initial value problems and boundary value problems); Finite difference methods; Spectral methods; Finite element methods

Learning Outcomes	Program Learning Outcomes	Teaching Methods	Assessment Methods
1) Ability to solve various types of ordinary and partial differential equations by numerical methods	2,4	1	A,C
2) Ability to perform error analysis of solutions and to utilize numerical algorithms efficiently	2,4	1	A, C
3) Ability to communicate effectively in writing and orally in the English language.	8	1	A,C

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

COURSE CONTENT		
Week	Topics	Study Materials

1	Review of Linear Algebra	Lecture notes, library resources
2	Initial value problems	Lecture notes, library resources
3	Initial value problems, Boundary value problems	Lecture notes, library resources
4	Boundary value problems	Lecture notes, library resources
5	Midterm 1, Finite difference method	Lecture notes, library resources
6	Finite difference method	Lecture notes, library resources
7	Finite difference method	Lecture notes, library resources
8	Finite difference method	Lecture notes, library resources
9	Spectral methods	Lecture notes, library resources
10	Spectral methods	Lecture notes, library resources
11	Midterm 2, Finite element method	Lecture notes, library resources
12	Finite element method	Lecture notes, library resources
13	Finite element method	Lecture notes, library resources
14	Finite element method	Lecture notes, library resources

<b>RECOMMENDED SOURCES</b>	
<b>Textbook</b>	
<b>Additional Resources</b>	Library Resources

<b>MATERIAL SHARING</b>	
<b>Documents</b>	-
<b>Assignments</b>	-
<b>Exams</b>	-

<b>ASSESSMENT</b>		
<b>IN-TERM STUDIES</b>	<b>NUMBER</b>	<b>PERCENTAGE</b>

Mid-term	2	60
Homework	12	40
<b>Total</b>		<b>100</b>
<b>CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE</b>		40
<b>CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE</b>		60
<b>Total</b>		<b>100</b>

<b>COURSE CATEGORY</b>	Expertise/Field Courses
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<b>COURSE'S CONTRIBUTION TO PROGRAM</b>						
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					

<b>ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION</b>			
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	9	126
Mid-terms	2	3	6
HW's	12	5	60
Final examination	1	4	4
<b>Total Work Load</b>			252
<b>Total Work Load / 25 (h)</b>			10
<b>ECTS Credit of the Course</b>			10