

COURSE INFORMATION				
Course Code	CHBE 548	Course Title	Statistical Analysis of Multivariate Data in Chemical Processes	
Semester	Credits	ECTS	C + P + L Hour	Prerequisites
1 or 2	3	10	1+2+0	None

Language of Instruction	Course Level	Course Type
English	Graduate	Elective
Course Coordinator	M. Oluş Özbek	
Instructors	M. Oluş Özbek	
Assistants	To be announced	
Goals	The aim of this course is to provide students with hands-on knowledge and abilities to analyze, process and visualize multi variable data using GNU-Octave software.	
Content	1) Introduction to GNU-Octave, 2) Review of advanced root finding methods, 3) Solution techniques for 1st order differential equations with 1 variable, 4) Solution techniques for 1st order differential equations with 2 variables, 5) Solution techniques for 2nd order differential equations, 6) Solution techniques for partial differential equations, 7) Review of advanced integration techniques, 8) Introduction to optimization techniques, 9) Introduction to statistics, 10) Introduction to neural-networks, 11) Analysis of multivariate data.	
Contribution of the Course to the Professional Education	This course gives the students theoretical and practical hands-on knowledge to analyze, process and visualize multi-variable data using computer software.	

Course Learning Outcomes	Program Learning Outcomes	Teaching Methods	Assessment Methods
1) Ability to write GNU-Octave scripts.	1,2	1-4	A,B
2) Ability to apply advanced numerical techniques.	1,2,4,6a,7a,7e,8	1-4	A,B
3) Ability to apply numerical solutions to 1 st order ODE's with n-variables	1,2,4,6a,7a,7e,8	1-4	A,B
4) Ability to apply numerical solutions to 2 nd order ODE's with n-variables	1,2,4,6a,7a,7e,8	1-4	A,B
5) Ability to apply numerical solutions to PDE's	1,2,4,6a,7a,7e,8	1-4	A,B
6) Ability to apply advanced numerical integration techniques	1,2,4,6a,7a,7e,8	1-4	A,B

7) Ability to formulate and solve basic optimization problems.	1,2,4,6a,7a,7e,8	1-4	A,B
8) Ability to build statistical models.	1,2,4,6a,7a,7e,8	1-4	A,B
9) Ability to analyze and process multivariate data.	1,2,4,6a,7a,7e,8	1-4	A,B

Teaching Methods:	1: Lecture by instructor, 2: Lecture by instructor with class discussion, 3: Problem solving by instructor, 4: Hand-on practice
Assessment Methods:	A: Written exam, B: Homework

COURSE CONTENT		
Week	Topics	Study Materials
1	Introduction to GNU-Octave.	Lecture Notes
2	Review of advanced root finding methods	Lecture Notes
3	Solution techniques for 1 st order differential equations with 1 variable	Lecture Notes
4	Solution techniques for 1 st order differential equations with n variables	Lecture Notes
5	Solution techniques for 2 nd order differential equations	Lecture Notes
6	Solution techniques for partial differential equations	Lecture Notes
7	Review of advanced integration techniques	Lecture Notes
8	MIDTERM EXAM 1	
9	Introduction to optimization techniques	Lecture Notes
10	Introduction to statistics	Lecture Notes
11	Introduction to neural-networks	Lecture Notes
12	Analysis of multivariate data	Lecture Notes
13	Analysis of multivariate data	Lecture Notes
14	Analysis of multivariate data	Lecture Notes

RECOMMENDED SOURCES	
Textbook	Lecture Notes
Additional Resources	

MATERIAL SHARING

Documents	Lecture Notes
Assignments	Homework assignments
Exams	

ASSESSMENT		
IN-TERM STUDIES	NUMBER	PERCENTAGE
Mid-terms	1	30
Assignment	10	30
Final	1	40
Total		100
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		100

COURSE CATEGORY	Field Courses
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COURSE'S CONTRIBUTION TO PROGRAM		
No	Program Öğrenme Çıktıları	Katkı
i	a. Adequate uate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline;	X
	b. ability to use theoretical and applied knowledge in these areas in complex engineering problems;	X
ii	a. Ability to identify, formulate, and solve complex engineering problems;	X
	b. ability to select and apply proper analysis and modeling methods for this purpose.	X
iii	a. Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result;	
	b. ability to apply modern design methods for this purpose.	
iv	a. Ability to devise, select, and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice;	X
	b. ability to employ information technologies effectively.	X
v	a. Ability to design experiments for investigating complex engineering problems or discipline specific research questions.	

	b. Ability to conduct experiments, gather data, analyze and interpret results	
vi	a. Ability to work efficiently in intra-disciplinary teams; Ability to work individually	X
	b.	
vii	a. Ability to communicate effectively in Turkish, both orally and in writing; knowledge of a minimum of one foreign language;	X
	b. ability to write effective reports and comprehend written reports	
	c. prepare design and production reports,	
	d. make effective presentations, and	
	e. give and receive clear and intelligible instructions.	X
viii	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.	X
ix	a. Consciousness to behave according to ethical principles and professional and ethical responsibility;	
	b. knowledge on standards used in engineering practice.	
x	a. Knowledge about business life practices such as project management, risk management, and change management;	
	b. awareness in entrepreneurship, innovation;	
	c. knowledge about sustainable development.	
xi	a. Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering;	
	b. awareness of the legal consequences of engineering solutions.	

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 12x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	9	126
Midterm examination	1	10	10
Homework	10	5	50
Final examination	1	10	10
Total Work Load			238
Total Work Load / 25 (h)			9.52
ECTS Credit of the Course			10