COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
Computational Methods in Biomedical Engineering	BME 514	1	0 + 0	3	10

Prerequisites	-

Language of Instruction	English
Course Level	Master's Degree
Course Type	Technical Elective
Course Coordinator	Prof. Dr. Ali Ümit Keskin
Instructors	Prof. Dr. Ali Ümit KESKIN
Assistants	-
Goals	Introduce advanced methods of Computational analysis in Biomedical Engineering
Content	Application of numerical methods to solve biomedical engineering problems. Solving linear systems of equations, matrices, model fitting and least squares techniques, data interpolation, numerical integration and differentiation, solving differential equations and data visualization.

Learning Outcomes	**Program Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Adequate knowledge in numerical solutions of problems	2,3,5,10	1,2,3,9	A,C
2) Ability to perform numerical analysis using the basic laws and rules.	1,4	1,2,3,9	A,C
3) Development of practical skills in computational design and application of various techniques in Biomedical Engineering.	1,2,3,4,8,9	1,2,3	A,C

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	Computers, Roundoff and Truncation Errors	Textbook
2	Mathematical Models.	Textbook
3	Conservation Laws in Engineering and Science.	Textbook
4	Use of Built-In Functions, Graphics.	Textbook
5	Polynomials, Roots	Textbook
6	One-and Multi-dimensional Optimization.	Textbook
7	MIDTERM I	-
8	Solving Linear Algebraic Equations.	Textbook
9	Matrices, Matrix Inverse	Textbook
10	Eigenvalues, State equations for higher order dynamic systems	Textbook
11	Curve Fitting , Linear Regression, Interpolation	Textbook
12	Random Numbers and Simulation	Textbook
13	Numerical Integration and Differentiation	Textbook
14	Ordinary Differential Equations	Textbook

RECOMMENDED SOURCES	
Textbook	S.Chapra, Applied Numerical Methods With MATLAB For Engineers And Scientists, McGraw-Hill 2012
Additional Resources	AU Keskin, Electrical Circuits in Biomedical Engineering,Springer,2017

MATERIAL SHARING	
Documents	-
Assignments	-
Exams	-

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	1	25
Assignment	10	75
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	Ability to reach wide and deep knowledge through scientific research in the field of Biomedical Engineering, evaluate, interpret and apply.					**X**
2	Ability to use scientific methods to cover and apply limited or missing knowledge, and to integrate the knowledge of different disciplines to identify, define, formulate solutions to complex engineering problems.				**X**	
3	Ability to construct Biomedical Engineering problems, develop methods to solve the problems and use innovative methods in the solution.				**X**	
4	Ability to develop new and/or original ideas, tools and algorithms; develop innovative solutions in the design of system, component or process.					**X**
5	Ability to have extensive knowledge about current techniques and methods applied in Biomedical Engineering and their constraints.				**X**	
6	Ability to design and implement analytical modeling and experimental research, solve and interpret complex situations encountered in the process.				**X**	
7	Ability to use a foreign language (English) at least at the level of European Language Portfolio B2 in verbal and written communication.					
8	Ability to lead in multidisciplinary teams, develop solutions to complex situations and take responsibility.				**X**	
9	Ability to pass process and the results in Biomedical Engineering field, in national and international area in or outside of the field, systematically and clearly in written or oral form.				**X**	
10	Awareness of the social, legal, ethical and moral values and environmental dimensions. The ability to conduct research and implementation work within the framework of these values.				**X**	
11	Awareness of the new and emerging applications in Biomedical Engineering field, and the ability to examine them and learn if necessary.				**X**	
12	Ability to read, understand, present, critise research work and conduct original theoretical or applied research.				**X**	

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	3	42
Mid-terms	1	14	14
Homework	10	2	20
Final examination	1	14	14
Total Work Load			132
Total Work Load / 25 (h)			5.58
ECTS Credit of the Course			10