BMM 310 Numerical Methods in Biomedical Engineering		Department of Biomedical Engineering Department	
Semester	**Credit**		
	Theory	**Practice**	**Laboratory**
2015/2016 Fall	3	0	0
Compulsory / Elective	Compulsory		
Prerequisites	-		
Instructors	Assist. Prof. Dr. Ersin Emre Ören		
Course Description	BMM 310 course will cover both the theoretical and practical studies in the computational bio(nano)technology and theoretical materials science areas. Within the frame of this course, students will learn the numerical methods and algorithms in general. This course will provide information about diffusion, bioinformatics, molecular dynamics, and homology modelling. This course will also give practical information about state of the art computer software, which will adapt the students into this rapidly developing field.		
Course Objectives	Students who complete this course will be able to: 1. have a general knowledge about the numerical methods particularly related to protein structure prediction; 2. construct finite difference methods for the numerical solution of initial-boundary-value problems; 3. have knowledge about the application areas of nanomaterials; 4. apply engineering and mathematical methods for analysis and design of bionanosystems;		
Course Outcomes	Key areas of achievements will be obtaining necessary information about the basic principles of numerical methods, and applying this know-how for the solution of biomedical engineering problems.		
Textbook	• -		
Other Resources	• Advanced Engineering Mathematics, P.V. O'Neil, PWS Publishing Company, 2002. • Numerical Solution of Partial Differential Equations: An Introduction, K.W. Morton and D.F. Mayers, Cambridge University Press, 2005. • An Introduction to Numerical Analysis, E. Suli and D. Mayers, Cambridge University Press, 2003. • Up to date and related articles.		

Evaluation Criteria		**Number**	**Impact (%)**
	Midterm Exams	1	25
	Quiz	8+	25
	Homework		
	Projects	-	-
	Term Paper	1	20
	Laboratory	-	-
	Others	-	-
	Final	1	30

Distribution of Course Content into Basic Fields (%)		
	Mathematics and Basic Sciences	20
	Engineering Sciences	40
	Engineering Design	40
	Social Sciences	-

COURSE OUTLINE	
Week	**Subject**
1	Basic Programming and Algorithms
2	Matrix Operations and Root finding
3	Matrix Operations and Numerical Integration
4	Numerical Methods for Ordinary Differential Equations / Applications
5	Numerical Methods for Partial Differential Equations / Applications
6	Numerical Methods for Partial Differential Equations / Applications
7	Protein Structure Prediction / Molecular Dynamics
8	Molecular Dynamics
9	Bioinformatics
10	Bioinformatics
11	Homology Modelling
12	Homology Modelling / Applications
13	Project / Presentation

RELATIONSHIP BETWEEN THE COURSE AND THE DEPARTMENT PROGRAM				
	Program Outcomes	**1**	**2**	**3**
1	Ability to apply mathematical, scientific and engineering knowledge			√
2	Ability to design and conduct experiments, analyze and interpret the experimental results		√	
3	Ability to design systems, components or process as desired/required			√
4	Ability to work in interdisciplinary teams			√
5	Ability to identify, formulate and solve engineering problems			√
6	Ability to communicate effectively in English and Turkish		√	
7	Comprehensive training necessary to understand the impact of the engineering solutions on globe and society			√
8	Knowledge of contemporary issues			√
9	Ability to use modern tools, techniques and skills necessary for engineering practice			√
	Course Contribution: 1: None 2: Partial 3: Full			