



T.C.

ESKİŞEHİR OSMANGAZİ ÜNİVERSİTESİ

FACULTY OF SCIENCES

MATHEMATICS AND COMPUTER SCIENCES DEPARTMENT



COURSE INFORMATION FORM

Course Name	Course Code
Numerical Analysis II	821614006

Semester	Number of Course Hours per Week		Credit	ECTS
	Theory	Practice		
4	3	0		5

Course Category (Credit)				
Basic Sciences	Engineering Sciences	Design	General Education	Social
X				

Course Language	Course Level	Course Type
Turkish	Undergraduate	Elective

Prerequisite(s) if any	
Objectives of the Course	The aim of this course is to develop students' ability to solve problems representing mathematical models using numerical methods. By applying numerical methods through computer programs, students will gain the ability to develop solutions to real-world problems in engineering, physics, economics, and other fields.
Short Course Content	This course covers the numerical solutions of differential equations.

Learning Outcomes of the Course	Contributed PO(s)	Teaching Methods *	Measuring Methods **
1 Be able to apply approximation theory and the least squares approximation.	1,2,3	1,2,5	A
2 Recognize and use spline and B-spline functions for interpolation.	2,3	1,2,5	A
3 Apply numerical methods to find solutions for nonlinear equation systems.	3,4,5	1,2,5	A
4 Prove the existence and uniqueness of solutions for initial value problems and boundary value problems, and solve them numerically.	1,4,6	1,2,5	A
5 Apply differential equations representing mathematical models to computer programs, and obtain numerical solutions using programming languages such as Python, MATLAB, or similar.	7,8,9,10	14,15	A
6 Understand the application areas of numerical methods and grasp how they are applied and their significance in engineering, physics, economics, and other fields. Develop solutions to real-world problems through numerical analysis.	11,12,13,14,15	14,15	A

*Teaching Methods 1:Expression, 2:Discussion, 3:Experiment, 4:Simulation, 5:Question-Answer, 6:Tutorial, 7:Observation, 8:Case Study, 9:Technical Visit, 10:Trouble/Problem Solving, 11:Individual Work, 12:Team/Group Work, 13:Brain Storm, 14:Project Design / Management, 15:Report Preparation and/or Presentation

**Measuring Methods A:Exam, B:Quiz, C:Oral Exam, D:Homework, E:Report, F:Article Examination, G:Presentation, I:Experimental Skill, J:Project Observation, K:Class Attendance; L:Jury Exam

Main Textbook	Burden, R. L. & Faires J. D, Numerical Analysis, Fifth Ed., PWS Publishing Company, Boston, 1993.
Supporting References	Ward Cheney & David Kincaid, Numerical Mathematics and Computing, Second Ed., Cole Publishing Company, California, 1985.
Necessary Course Material	

Course Schedule	
1	Approximation theory and least squares approximation
2	Approximation theory and least squares approximation
3	Spline and B-spline functions
4	Spline and B-spline interpolation
5	Finding approximate eigenvalues
6	Fixed point iteration for numerical solution of nonlinear equation systems
7	Newton iteration for numerical solution of nonlinear equation systems
8	Mid-Term Exam
9	Existence and uniqueness of solutions for initial value problems
10	Existence and uniqueness of solutions for boundary value problems
11	Numerical methods for solving initial value problems
12	Numerical methods for solving boundary value problems
13	Euler method, Taylor method, Runge-Kutta method
14	Analysis of numerical methods
15	Computer algorithms for numerical methods
16,17	Final Exam

Calculation of Course Workload			
Activities	Number	Time (Hour)	Total Workload (Hour)
Course Time (number of course hours per week)	14	3	42
Classroom Studying Time (review, reinforcing, prestudy,...)	14	3	42
Homework			
Quiz Exam			
Studying for Quiz Exam			
Oral exam			
Studying for Oral Exam			
Report (Preparation and presentation time included)			
Project (Preparation and presentation time included)			
Presentation (Preparation time included)	1	5	5
Mid-Term Exam	1	2	2
Studying for Mid-Term Exam	1	20	20
Final Exam	1	2	2
Studying for Final Exam	1	30	30
Total workload			143
Total workload / 30			4.76
Course ECTS Credit			5

Evaluation	
Activity Type	%
Mid-term	50
Quiz	
Homework	
Bir öge seçin.	
Bir öge seçin.	
Final Exam	50
Total	100

RELATIONSHIP BETWEEN THE COURSE LEARNING OUTCOMES AND THE PROGRAM OUTCOMES (PO) (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low)		
NO	PROGRAM OUTCOME	Contribution
1	The ability to apply knowledges of Mathematics and Computer Sciences,	5
2	To have sufficient theoretical and practical knowledge of Mathematics at international level,	3
3	The ability of describing, modelling and solving of mathematical problems at Mathematics and related subjects,	5
4	The skill to solve and design a problem process in accordance with a defined target,	5
5	Skills to analyze data, interpret and apply to other datum and using these data on computer,	4
6	The skill to use the modern techniques and computational tools needed for mathematical applications,	5
7	The skill to make team work within the discipline and interdisciplinary,	3
8	The ability to improve oneself by following the developments on other modern, scientific and technological subjects as well as Mathematics and Computer Sciences,	4
9	The skill to communicate orally and in written way, in a clear and concise manner by having individual work skills and ability to independently decide and analytical thinking,	2
10	The skill to have professional and ethical responsibility,	2
11	The skill to have consciousness for quality issues and scientific research,	2
12	The skill to be sensitive to environmental issues related with problems and development of living area and consistent in the social relations,	1
13	Ability to solve problems in the working life faced to find an appropriate algorithms via mathematical modeling and to write computer programs,	5
14	The skill to developed design of software systems at different complex levels,	4
15	The credence of necessity of life-long learning and ability to apply the formation long-life learning.	2

LECTUTER(S)				
Prepared by	Assoc. Dr. Özlem ERSOY HEPSON			
Signature(s)				

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