COURSE PROFILE

Course Name	Code	Semester	Term	Theory +PS+Lab. (hour/week)	Local Credits	ECTS
Numerical Methods	MATH 302	Spring	6	3+0+0	3	5

Prerequisites	Math 200

Course Language	English
Course Type	Required
Course Lecturer	Assoc. Prof. Nalan Antar
Course Assistant	-
Course Objectives	The primary objective of the course is to provide the students basic theory of numerical methods, to teach how to identify and clasify the problem to be solved and choose the most appropriate numerical method for the solution, to understand the properties of the methods and to interpret the resulting numerical solutions.
Course Learning Outcomes	By the end of the course the students should be able to: • solve nonlinear equations in a single variable numerically, • have a basic knowledge of numerical interpolation and approximation of functions, • have a basic knowledge of numerical integration and differentiation, • be familiar with numerical solution of ordinary differential equations**.**
Course Content	Solution of non-linear equations, fixed point iteration; interpolation, Chebyshev polynomials, cubic spline interpolation. Numerical differentiation and integration, solution of system of linear equations: direct and iterative methods. Numerical solution of ordinary differential equations.

COURSE CONTENT

Week	Subjects	Related Preparation
1	Taylor polynomials, error and computer arithmetic, polynomial evaluation	Chapter 1.1, 1.2, 1.3
2	Rootfinding: the Bisection method, Newton's method, the Secant method	Chapter 3.1, 3.2, 3.3
3	Fixed point iteration, Aitken's extrapolation formula	Chapter 3.4
4	İnterpolation and approximation: polynomial interpolation, divided differences, error in polynomial interpolation	Chapter 4.1, 4.2
5	Interpolationusing spline functions, the best approximation theorem	Chapter 4.3, 4.4
6	Chebyshev polynomials, a near-minimax approximation,	Chapter 4.5, 4.6

7	Least squares method.	Chapter 4.7
8	Numerical integration, the trapezodial and Simpson rules, error formulas	Chapter 5.1, 5.2
9	Gaussian numerical intergration method, numerical differentiation, differentiation by interpolation, method of undetermined coefficients.	Chapter 5.3, 5.4
10	Systems of linear equations, Gaussian elimination, partial pivoting, LU factorization	Chapter 6.1, 6.3, 6.4
11	Tridiagonal systems, errors in solving linear systems, iteration methods	Chapter 6.4, 6.5, 6.6
12	Jacobi iteration, Gauss-Seidel iteration	Chapter 6.6
13	Ordinary differential equations, Euler's method, convergence	Chapter 8.2, 8.3
14	Taylor and Runge-Kutta methods for initial value problems	Chapter 8.5

Course Textbooks	K. E. Atkinson, W. Han (2004) Elementary Numerical Analysis, 3rd edition, Wiley.
Recommended References	David Kincaid and Ward Cheney (2002) Numerical Analysis: Mathematics and Scientific Computing, 3rd edition, Brooks/Cole.

Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	1	-
Laboratory	-	-
Application	-	-
Special Course Internship (Work Placement)	-	-
Quizzes/Studio Critics	-	-
Homework Assignments	5	10
Presentation	-	-
Project	-	-
Seminar/Workshop	-	-
Midterms/Oral Exams	2	50
Final/Resit Exam	1	40
Total	9	100

PERCENTAGE OF SEMESTER WORK	8	60
PERCENTAGE OF FINAL WORK	1	40
Total	9	100

Course Category	Core Courses	X
	Major Area Courses	
	Supportive Courses	
	Media and Managment Skills Courses	
	Transferable Skill Courses	

COURSE'S CONTRIBUTION TO PROGRAM

#	**Program Qualifications / Outcomes**	*** Level of Contribution**				
		1	2	3	4	5
1	To have a grasp of basic mathematics, applied mathematics and theories and applications of statistics.					X
2	To be able to use theoretical and applied knowledge acquired in the advanced fields of mathematics and statistics,					X
3	To be able to define and analyze problems and to find solutions based on scientific methods,					X
4	To be able to apply mathematics and statistics in real life with interdisciplinary approach and to discover their potentials,				X	
5	To be able to acquire necessary information and to make modeling in any field that mathematics is used and to improve herself/himself,				X	
6	To be able to criticize and renew her/his own models and solutions,					X
7	To be able to tell theoretical and technical information easily to both experts in detail and nonexperts in basic and comprehensible way,				X	
8	To be able to use international resources in English and in a second foreign language from the European Language Portfolio (at the level of B1) effectively and to keep knowledge up-to-date, to communicate comfortably with colleagues from Turkey and other countries, to follow periodic literature,				X	
9	To be familiar with computer programs used in the fields of mathematics and statistics and to be able to use at least one of them effectively at the European Computer Driving Licence Advanced Level,				X	
10	To be able to behave in accordance with social, scientific and ethical values in each step of the projects involved and to be able to introduce and apply projects in terms of civic engagement,					
11	To be able to evaluate all processes effectively and to have enough awareness about quality management by being conscious and having intellectual background in the					

	universal sense,					
12	By having a way of abstract thinking, to be able to connect concrete events and to transfer solutions, to be able to design experiments, collect data, and analyze results by scientific methods and to interfere,					X
13	To be able to continue lifelong learning by renewing the knowledge, the abilities and the compentencies which have been developed during the program, and being conscious about lifelong learning,					
14	To be able to adapt and transfer the knowledge gained in the areas of mathematics and statistics to the level of secondary school,					X
15	To be able to conduct a research either as an individual or as a team member, and to be effective in each related step of the project, to take role in the decision process, to plan and manage the project by using time effectively.					

*1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	**Number**	**Duration (Hours)**	**Total Workload**
Course Hours (Including Exams)	14	3	42
Tutorials	-	-	-
Laboratory	-	-	-
Application	-	-	-
Special Course Internship (Work Placement)	-	-	-
Field Work	-	-	-
Study Hours Out of Class	14	2	28
Presentations / Seminar	-	-	-
Project	-	-	-
Preparatory reading	13	1	13
Homework Assignments	5	2	10
Quizzes	-	-	-
Midterm Exams	2	10	20
Final / Resit Exam	1	12	12
		Total Workload	**125**

COURSE CATEGORY

ISCED GENERAL AREA CODES	GENERAL AREAS	ISCED BASİC AREA CODES	BASIC EDUCATIONAL AREAS	
1	Education	14	Teacher Training and Educational Sciences	0
2	Humanities and Art	21	Art	0
2	Humanities and Art	22	Humanities	0
3	Social Sciences, Management and Law	31	Social and Behavioral Sciences	0
3	Social Sciences, Management and Law	32	Journalism and Informatics	0
3	Social Sciences, Management and Law	38	Law	0
4	Science	42	Life Sciences	0
4	Science	44	Natural Sciences	0
4	Science	46	Mathematics and Statistics	100
4	Science	48	Computer	0
5	Engineering, Manufacturing and Civil	52	Engineering	0
5	Engineering, Manufacturing and Civil	54	Manufacturing and Processing	0
5	Engineering, Manufacturing and Civil	58	Architecture and Structure	0
6	Agriculture	62	Agriculture, Forestry, Livestock, Fishery	0
6	Agriculture	64	Veterinary	0
7	Medicine and Welfare	72	Medical	0
7	Medicine and Welfare	76	Social Services	0
8	Service	81	Personal Services	0
8	Service	84	Transport Services	0
8	Service	85	Environment Protection	0
8	Service	86	Security Services	0