COURSE PROFILE

Course Name	Code	Semester	Term	Theory +PS+Lab. (hour/week)	Local Credits	ECTS
Partial Differential Equations	MATH 321	Fall	5	3+0+0	3	7

Prerequisites	None

Course Language	English
Course Type	Required
Course Lecturer	Assoc. Prof. Nalan Antar
Course Assistant	-
Course Objectives	This course aims 1. to develop a basic understanding of occurrence of the partial differential equations and related problems; such as, initial value, boundary value and initial-boundary value problems in the real world. 2. to develop a basic understanding of the theory and methods of solutions for these problems.
Course Learning Outcomes	The students who succeeded in this course should be able to;; • derive the transport, diffusion and wave equations in one spatial dimension, • classify a given second-order PDE as hyperbolic, parabolic or elliptic equation, • solve the initial-value problem for the wave equation, • prove the maximum principle for the diffusion equation, • demonstrate the uniqueness of the solution of an initial-value problem for the diffusion equation (by the maximum principle and by the energy method), • solve the initial-value problem for the diffusion equation, • solve the initial-value problems for the inhomogeneous diffusion and inhomogeneous wave equations, • solve the homogeneous diffusion and homogeneous wave equations on a finite interval using the method of separation of variables (for the Dirichlet, Neumann and Robin conditions), • find the coefficients in the Fourier sine series, the Fourier cosine series and the full Fourier series, • prove the maximum principle for the Laplace equation in two dimensions, • demonstrate the uniqueness of the Dirichlet problem for the Laplace equation using the maximum principle, • solve the Laplace equation in a rectangle using the method of separation of variables, • prove the Posisons formula for the Dirichlet problem for a circle,

	• solve the Laplace equation in a wedge, in an annulus and for the exterior of a circle using the method of separation of variables, • know the notion of Green's function, • express the solution of a Dirichlet problem for the Laplace equation through the Green function,
Course Content	Basic definitions, first-order partial differential equations; types of second-order partial differential equations. The wave equation, the diffusion equation; maximum principle. Boundary value problems, separation of variables. Laplace's equation, Green's identities and functions.

COURSE CONTENT

Week	**Subjects**	**Related Preparation**
1	What is a PDE? First Order-Linear Equations. Flows,Vibrations and Diffusions	Chapter 1.1, 1.2, 1.3
2	Inıtial and Boundary Conditions. Well-Posed Problems. Types of Second-Order Equations.	Chapter 1.4, 1.5, 1.6
3	The Wave Equation. Causality and Energy.	Chapter 2.1, 2.2
4	The Diffusion Equation. Diffusion on the Whole Line.	Chapter 2.3, 2.4
5	Diffusion on the Whole Line. Comparision of Waves and Diffusions.	Chapter 2.4, 2.5
6	Diffusion with a Source. Waves with a Source.	Chapter 3.3, 3.4
7	Seperation of variables. Dirichlet Condition.	Chapter 4.1
8	The Neumann Condition. The Robin Condition.	Chapter 4.2, 4.3
9	Fouries Series. Even, Odd, Periodic and Complex Functions.	Chapter 5.1, 5.2
10	Orthogonality and General Fourier Series. Completeness. Inhomogeneous Boundary Conditions.	Chapter 5.3, 5.4, 5.5
11	Laplace's Equation. Rectangles and Cubes.	Chapter 6.1, 6.2
12	Poisson's Formula. Circles, Wedges and Annuli.	Chapter 6.3, 6.4
13	Green's First Identity. Green's Second Identity.	Chapter 7.1, 7.2
14	Green's Functions. Half-Space and Sphere.	Chapter 7.3, 7.4

Course Textbooks	"Partial Differential Equations- An Introduction" W.A.Strauss, Published by John Wiley& Sons, Inc, 1992.
Recommended References	1. W.E. Williams, Partial differential Equations, Oxford University Press, 1980. 2. I.N. Sneddon, Partial differential Equations, McGraw Hill, 1983

Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	1	-
Laboratory	-	-
Application	-	-
Special Course Internship (Work Placement)	-	-
Quizzes/Studio Critics	2	30
Homework Assignments	5	-
Presentation	-	-
Project	-	-
Seminar/Workshop	-	-
Midterms/Oral Exams	2	30
Final/Resit Exam	1	40
Total	11	100

PERCENTAGE OF SEMESTER WORK	10	60
PERCENTAGE OF FINAL WORK	1	40
Total	11	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,					
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				X	

	statistics to the level of secondary school,					
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	2	26
Homework Assignments	5	3	15
Quizzes	2	10	20
Midterm Exams	2	12	24
Final / Resit Exam	1	20	20
		Total Workload	**175**

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