■ CE59 - Partial Differential Equations

GENERAL

SCHOOL	EXACT SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CE59	**SEMESTER**	E
COURSE TITLE	PARTIAL DIFFERENTIAL EQUATIONS		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	4	5

COURSE TYPE	Scientific Field
PREREQUISITE COURSES	Infinitesimal Calculus II-III-IV Ordinary Differential Equations
LANGUAGE OF TEACHING AND EXAMINATIONS	Greek/English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://eclass.uowm.gr/

LEARNING OUTCOMES

Learning Outcomes
With the successful completion of the course, the student will be able to: • understand the concept of a partial differential equation, its difference compared to an ordinary differential equation both in the form of its solutions and its solution techniques, • understand concepts such as initial conditions-boundary conditions, • recognize the type of a partial differential equation and be able, in any case, to apply specific techniques for solving differential equations with partial first and

second order derivatives in initial and boundary value problems,
- be able to examine the form of the solutions by drawing conclusions about the model under consideration and trying to apply knowledge from theoretical mathematics.

General Competencies

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Adapting to new situations.
- Working in an interdisciplinary environment.
- Individual work.
- Team work.
- Creation of new research ideas.
- Promotion of free, creative and inductive thinking.

CONTENT OF THE COURSE

POE of first order, linear and almost-linear equations, Cauchy's problem, Monge cones-characteristic strips, Solving linear POE of α order with the method of transformations, total differential equations, Charpit method. Classification of second-order differential equations, normal forms, D' Alembert-type wave equation, propagation of discontinuities, wave reflections, separation of variables method, wave equation, diffusion equation, Laplace equation, initial and boundary value problems of Dirichlet, Neumann, Robin types, Fourier series, orthogonal functions, Sturm-Liouville eigenvalue problems, generalized functions or distributions, finding fundamental solutions with Fourier and Laplace transforms.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	In the classroom.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	e-Lecture. Use of e-class. Communication through face-to-face discussions and e-mails.
TEACHING ORGANIZATION	

Activity	Semester Workload
Lectures	40 hours
Teaching Exercises	20 hours
Solving Selected Exercises	25 hours

	Individual Study: 40 hours Course Total (25 hours per ECTS): 125 hours
STUDENT EVALUATION	Written final examination 100% whcich includes: - Theory - Solving Exercises - Applications to Mathematical Physics.

RECOMMENDED BIBLIOGRAPHY

1. Partial Differential Equations, Trachanas S. (Greek)
2. Partial Differential Equations, Akrivis G., Alikakos N. (Greek)
3. Partial Differential Equations, Skoutaris N. (Greek)
4. Partial Differential Equations, Vol. A, Tsoumpelis D. (Greek)
5. Partial Differential Equations, Volume 1, Kyventidis Th. (Greek)
6. Walter A. Strauss, Partial Differential Equations: An Introduction, 2nd edition, Wiley, 2008.
7. Fritz John, Partial Differential Equations, 4th edition, Springer, 1982.
8. Stanley J. Farlow, Partial Differential Equations for Scientists and Engineers, 2nd edition, Dover Pub. Inc., 1993.
9. J. David Logan, Applied Partial Differential Equations, 2nd edition, Springer, 2000.
10. Paul W. Berg and James. L. McGregor, Elementary Partial Differential Equations, Holden-Day, 1980.
11. Lawrence C. Evans, Partial Differential Equations, 2nd edition, AMS, 2010.
12. Gerald B. Folland, Introduction to Partial Differential Equations, 2nd edition, Princeton University Press, 1995.