

Global Learning Semesters

Course Syllabus

Course: MATH-477 Numerical Differential Equations

Department: Computer Science

Host Institution: University of Nicosia, Nicosia, Cyprus



Course Summary		
Course Code	Course Title	Recommended Credit Hours
MATH-477	MATH-477 Numerical Differential Equations	3
Semester Offered	Contact Hours	Prerequisites
Spring	42	MATH-375: Numerical Analysis I MATH-430: Partial Differential Equations MATH-280: Linear Algebra
Department	Level of Course	Language of Instruction
Computer Science	Upper Division	English

Course Description

The following topics are covered: Single-Step Methods for Ordinary Differential Equations (Forward Euler, Backward Euler, Trapezoidal Rule) Truncation Error and Stability, Multistep Methods for ODEs. Order and Convergence. Difference Equations and the Dahlquist Root Theorem, Runge-Kutta Methods, Finite Difference Methods for Partial Differential Equations: Methods for First Order Hyperbolic PDEs and the CFL condition. Schemes for Parabolic PDEs (Crank-Nicholson, ADI). Schemes for Elliptic PDEs (The five-point method for the Poisson Equation). Von-Neumann Stability analysis.

Instructor

Dr Nectarios Papanicolaou

Course Aims and Objectives

The course concentrates on the computational solution of ordinary differential equations. It then provides an introduction to finite differences methods for solving commonly arising partial differential equations. The course also explores the fundamental concepts of convergence, consistency and stability of numerical methods in solving differential equations.

Teaching Methods

The course is delivered through a mixture of lectures, handouts, tutorials, practical exercises and assignments.

Course Teaching Hours

42 hours (42 hours lectures/presentations/tutorials). The course is delivered during the Spring semester in 14-weeks (3 hours/week).

Evaluation and Grading

Class Participation/Homework/Quizzes: 0-30%
Mid-Term(s): 30-50%
Final Exam: 40-50%

Readings and Resources

Required Textbook

Trefethen L., Finite Difference and Spectral Methods for Ordinary and Partial Differential Equations,
<http://web.comlab.ox.ac.uk/oucl/work/nick.trefethen/pdetext.html>, 1996.