MATH 270C: Numerical Ordinary Differential Equations

TTh 12:30pm–1:50pm, APM 2402
http://www.math.ucsd.edu/~mleok/courses/ma270c/

INSTRUCTOR
Prof. Melvin Leok, Department of Mathematics
Office: APM 5763, phone: (858)534-2126, email: mleok@math.ucsd.edu
http://www.math.ucsd.edu/~mleok/
Office Hours: TBA, APM 5763

TEACHING ASSISTANT
Minxin Zhang, Department of Mathematics
Office: APM 6446, email: miz151@ucsd.edu

COURSE DESCRIPTION
This course will focus on the mathematical analysis and derivation of numerical methods for the solution of ordinary differential equations. Issues include order of accuracy, convergence, stability, adaptivity, and structure-preservation. Time permitting, we will also introduce methods for elliptic PDEs based on finite-difference, finite-element, and spectral discretizations.

PREREQUISITES
MATH 270B or consent of instructor. Programming experience in any language, e.g., C/C++, FORTRAN, MATLAB.

TEXTBOOK
A First Course in the Numerical Analysis of Differential Equations, 2nd Edition
Cambridge Texts in Applied Mathematics

ADDITIONAL ADVANCED READING
Numerical Methods for Ordinary Differential Equations, 2nd Edition
Solving Ordinary Differential Equations I: Nonstiff Problems, 2nd Revised Edition
Solving Ordinary Differential Equations II: Stiff and Differential-Algebraic Equations, 2nd Revised Edition
Geometric Numerical Integration, 2nd Edition

COURSE TOPICS
One-step numerical methods and their analysis, difference equations, multistep methods and their analysis, predictor-corrector methods, Runge–Kutta methods, two-point boundary value problems, spectral collocation, Galerkin methods.

GRADING
The grade will be determined by a combination of homework (25%), one midterm exam (25%), and one final exam (50%).

Students taking the graduate numerical analysis qualifying examination are excused from the final exam, and their performance on the qualifying examination will be used in lieu of the final exam in determining their grade in MATH 270C.