MATH 270C: Numerical Ordinary Differential Equations

MWF 4:00pm–4:50am, APM 2402
http://www.math.ucsd.edu/~mleok/courses/ma270c/

INSTRUCTOR
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TEACHING ASSISTANT
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Office Hours: Th 2:30-3:30pm, APM 5768, and by appointment.

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
Numerical Mathematics, 2nd Edition
Springer Texts in Applied Mathematics 37

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

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.