UNIVERSITY OF NEBRASKA AT OMAHA

MATH 8510: Numerical Differential Equations

MW 4:00 PM – 5:15 PM | Remote Learning| Dr. Baccouch

Overview: Numerical analysis is the study of numerical methods, which are mathematical techniques for generating approximate solutions to mathematical problems of various types. The purpose of this course is to

1. introduce/analyze numerical methods for approximating solutions to ordinary differential equations (ODEs) and partial differential equations (PDEs),
2. explain how, why, and when they can be expected to work, and
3. provide a foundation for further study of numerical analysis and scientific computing.

Description: The laws of nature are often described with ODEs and PDEs. It is important for students in science, engineering, and mathematics to be familiar with the numerical solution of these differential equations. The main objectives and expectation of this course is that students learn methods for computing accurate numerical solutions to ODEs and PDEs.

The main topics covered are: Interpolation and approximations, numerical differentiation and integration, numerical solutions of initial/boundary-value problems for ODEs and, numerical solutions of PDEs -- including parabolic, hyperbolic and elliptic types. Convergence and stability criterion are developed.

Objectives: This course emphasizes the development of numerical methods to provide solutions to common problems formulated in science and engineering. The student should:

- become familiar with: approximating functions by polynomials, approximating derivatives and definite integrals, techniques for solving numerically ODEs and PDEs.
- be able to use the numerical analysis approach to solve real world problems governed by ODEs and/or PDEs.

Textbook: Numerical Analysis, 10th Ed., by Burden & Faires, Brooks/Cole, 2016. ISBN 9781305253667.

For Whom Intended: Graduate (majors in mathematics, engineering, or computer science) needing numerical methods for solving problems described by differential equations.

Prerequisites: MATH 1970 and MATH 2350; or permission of instructor. Familiarity with computer programming is assumed. Other topics will be introduced as needed.
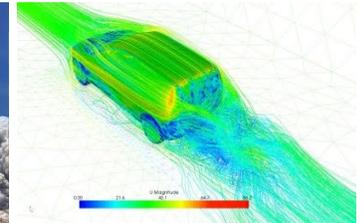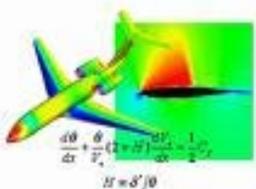
For More Information:

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