INSTITUTE OF MATHEMATICS
College of Science
University of the Philippines Diliman

Math 171 Course Syllabus

A. Course Catalogue Description

Course Number	Math 171
Course Title	Numerical Analysis
Course Description	Error analysis; solution of a single nonlinear equation; solution of systems of equations; solutions of ordinary differential equations; series
Prerequisite	Math 122/equiv. and Math 110.2/equiv.
Course Credit	3 units
Number of Hours	3 hours/week

B. Course Content

   I. Course Introduction and Orientation

   II. Computer Arithmetic

   1. Binary, decimal and hexadecimal representation of numbers
   2. Machine representation of real numbers

   III. Error Analysis

   1. Sources of error
   2. Taylor series
   3. Accuracy, convergence and the Big-oh notation

   IV. Monte Carlo methods

   1. Review of probability theory and random numbers
   2. Monte Carlo integration
   3. Monte Carlo simulation
      Percentile Matching, Maximum Likelihood Estimation

   V. Introduction to Scilab

   1. Implementation of some Monte Carlo Algorithm in Scilab

   VI. Solution of Nonlinear Equations

   1. Review of analysis
   2. Bisection algorithm
   3. Fixed point iteration method
   4. Newton-Raphson iteration method
   5. Error-analysis of iterative methods

   VII. Solution of Linear Systems

   1. Gauss-Jordan Elimination
   2. Lower-upper triangular factorization of matrices
   3. Theory: Iterative methods for solving systems of linear equations
   4. Gauss-Jacobi and Gauss-Siedel iterative methods
   5. Error-analysis of iterative methods

   VIII. Interpolation

   1. Polynomial interpolation
   2. Piecewise polynomial interpolation and orthogonal polynomials
   3. Forward and backward difference formulas of Newton and of Gauss
   4. Cubic splines

   IX. Numerical Integration and Differentiation

    1. Newton's formula
    2. Trapezoidal rule
    3. Simpson's rule
    4. Gaussian integration
    5. Finite differences

X. Numerical Solution of Ordinary Differential Equations

    1. One-step methods such as Euler's, Taylor series and Runge-Kutta
    2. Multi-step methods such as Adam's and Milne's methods

For a more detailed syllabus, send an email request to ddapr@math.upd.edu.ph.