ROWAN UNIVERSITY
Department of Mathematics

Syllabus
Numerical Analysis

CATALOG DESCRIPTION:

Math 01.529 Numerical Analysis 3 s.h.

(Prerequisites: Math 01.231 Ordinary Differential Equations, Math 01.510 Real Analysis I and prior computer programming experience)

This course examines the theoretical foundations of numerical methods and studies in detail existing numerical methods for solving many standard mathematical problems in analysis and algebra. Error analysis will be developed for all methods. Some recent advances in the theory of chaos and nonlinear dynamics will also be presented.

OBJECTIVES:

Students will learn how the fundamental problems of calculus, linear algebra, and differential equations are translated into problems suitable for solution using computer programming and applications. They will also understand mathematically how the errors in computer computations affect the accuracy of numerical methods. They will also study the inherent limitations of numerical methods as presented in the theory of Chaotic Dynamical Systems, and learn how to interpret the applicability of numerical methods to the solution of problems in mathematics, science, and engineering.

In particular, they will become familiar with numerical methods for dealing with the mathematics listed in the topical outline below. They will also learn how to implement some numerical methods in a programming language and how to use existing mathematical software packages.

CONTENT:

1. Sources of errors in representation and arithmetic computations
2. Solutions of Systems of Equations - Equations - Linear and Non-linear
3. Approximation Methods for Functions, Integrals, Derivatives
4. Optimization
5. Simulation
6. Ordinary and Partial Differential Equations
7. Chaotic Dynamical Systems and Numerical Analysis

TEXTS:

Carl-Erik Froeberg, Numerical Mathematics - Theory and Computer Applications, Benjamin/Cummings, Inc., 1985.