Numerical Analysis
(Autumn 2016 – MATH 6006/5106)

Time and Place: MWF 1:25-2:20 PM and 60WCHARL 270.
Instructor: Donald A. French (5510 French Hall).
Phone/Email: 556-4039 & french@ucmail.uc.edu.
Office Hours: MW 12:15–1:15 PM and by appointment.

Prerequisites: Calculus I–III, Differential Equations, Linear Algebra and maturity/skill in mathematics at an advanced level. Programming experience preferred but not absolutely necessary. [1]

Text: Introduction to Numerical Analysis (2nd edition) by Kendall E. Atkinson.

Description: Scientific computation is used to study physical problems arising from a wide range of real world situations. Understanding the accuracy and viability of such computer analyses is crucial. This semester course introduces graduate and advanced undergraduate students to the fundamentals needed to study their computations on mathematical models of physical problems. The class is intended for a broad spectrum of students in Engineering, Chemistry, Physics, Economics and Mathematics.

Most of the first five chapters of the text will be covered. Topics include fundamental theorems used in this field such as the integral mean value theorem and Taylor's theorem, floating point arithmetic, stability and conditioning, rootfinding for nonlinear equations with Bisection and Newton methods as well as fixed point analysis, polynomial interpolation, least squares methods for function approximation, numerical approximation of definite integrals and differential equations (including Euler and Runge-Kutta methods).

We will typically examine carefully chosen model or prototype problems in order to furnish theorems and insight into the behavior of the approximation methods.

The focus of this course is on the <u>analysis</u> of the methods, thus, skill with proofs and theoretical mathematics (e.g. MATH 6001/6002) is desireable.

Grading: There will be two in-class exams and a final that count toward most of the course grade.

> Midterm I: Friday, September 23 (In Class)
> Midterm II: Friday, October 21 (In Class)
> Final: Wednesday, December 7, 1:30–3:30 PM.

Homework assignments will also count and will be given every 1-2 weeks. Late homework may not be accepted or be subject to point reductions. Tentatively, homework will count 35% of the grade, the midterms will be 15% each and the comprehensive final will account for the remaining 35%.

In general, overall scores will converted to letter grades according to A: 94% or higher, A-: 90%-93.9%, B+: 88%-89.9%, B: 84%-87.9%, B-: 80%-83.9%, etc.

Lectures: Class notes are the primary study source.

Last Day to Withdraw – Friday, October 28, 2016. In case a withdrawal shall occur, the instructor will be required to verify whether or not you minimally participated in the class. Although the instructor will try his best to respond accurately, however, in the absence of any evidence to the contrary, the instructor

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[1]You will have several assignments that involve <u>optional</u> small computer programs; MATLAB is preferred but most other languages are acceptable.

will have to verify that you did not minimally participate. Ways for you to provide clear evidence of your presence in the class include taking at least one quiz and taking the midterm exam.

Academic Integrity Policy: The University Rules, including the Student Code of Conduct, and other documented policies of the department, college, and university related to academic integrity will be enforced. Any violation of these regulations, including acts of plagiarism or cheating, will be dealt with on an individual basis according to the severity of the misconduct.

Special Needs Policy: If you have any special needs related to your participation in this course, including identified visual impairment, hearing impairment, physical impairment, communication disorder, and/or specific learning disability that may influence your performance in this course, you should meet with the instructor to arrange for reasonable provisions to ensure an equitable opportunity to meet all the requirements of this course. At the discretion of the instructor, some accommodations may require prior approval by Disability Services.