CS/MA 321 002, Introduction to Numerical Methods, Spring 2018

TIME AND PLACE: TR 2:00–3:15, 102 - CB

INSTRUCTOR: G. W. Wasilkowski, 301 D. Marksbury Building
E-MAIL: greg@cs.uky.edu, PHONE: 257-8029
OFFICE HOURS: TR 12:30–1:45, or by appointment

GRADER ASSISTANT: TBA

TEXTBOOK: W.Cheney and D. Kincaid, *Numerical Mathematics and Computing* (any edition)

PREREQUISITE: MA 213 and CS 221 or equivalent. A knowledge of some high-level programming language such as FORTRAN or C is required.

DESCRIPTION: Floating point arithmetic. Numerical linear algebra: elimination with partial pivoting and scaling. Polynomial and piecewise interpolation. Least squares approximation. Numerical integration. Roots of nonlinear equations. Ordinary differential equations. Laboratory exercises using software packages available at computer center.

LEARNING OUTCOMES: Students will learn basic concepts, problems and methods used in numerical computing. Specifically students will be able to:

1. Estimate computed errors
2. Select/propose methods that yield small errors (if possible)
3. Understand important properties for a number of basic methods (e.g., Gaussian elimination, Lagrange and spline interpolation, Trapezoidal and Simpson's quadratures, Newton's iteration, Runge-Kutta methods)
4. Modify problems for better algorithm performance
5. Analyze results computed in fl-arithmetic

Course Evaluation Questions: The course has helped me:

37. An ability to apply knowledge of computing and mathematics appropriate to the discipline
38. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
39. Understand fl-arithmetic and errors caused by it
40. Learn basic numerical methods
41. Identify efficient methods for specific problems
42. Analyze/understand computed results
43. Understand the relevance of continuous mathematics to numerical computations

GRADING: There will be 5 or 6 homework assignments collected within one week **at the beginning of the lecture. Late papers will not be accepted! Homework assignments are to be worked on independently! Illegible work will not be graded!**

There will be two exams during the semester and a comprehensive final exam. They must be taken at the scheduled times. In case of legitimate reasons (see *Student Rights and Responsibilities*), students must inform the instructor in advance to schedule an exam that will take place before the exam for the whole class. Make-up exams after that will only be given in case of unforeseen (legitimate) reasons.
GRADE COMPOSITION: Homeworks 20%, Two exams (25% each) 50%, Final 30%

FINAL GRADE: Assigned according to the following scale:
$90 \le A$, $80 \le B < 90$, $70 \le C < 80$, $60 \le D < 70$, $E < 60$

ACADEMIC INTEGRITY: Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website:

http://www.uky.edu/Ombud.

A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Part II of Student Rights and Responsibilities, available online

http://www.uky.edu/StudentAffairs/Code/part2.html

states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone elses work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also

includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be.

Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a students assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1).

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Accommodations due to disability: If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (257-2754, email address: jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Religious Observance: Since I do not check for attendance, I only need to know at the beginning of the term about conflicts with the exam dates.

Date	**Topic**	**Chapter**
Jan. 11 – 25	Floating-point arithmetic and errors	Ch. 1
Jan. 30 – Feb. 8	Nonlinear equations	Ch. 3
Feb. 13 – 22	Polynomial interpolation and numerical differentiation	Ch. 4
Feb. 27	**Exam 1**	
March 1 – 8	Numerical integration	Ch. 5
March 12 – 18	Spring Break	
March 20 – 22	Numerical integration	Ch. 5
March 27 – April 5	Numerical solution of systems of linear equations	Ch. 2, 8
April 10	Approximation by spline functions	Ch. 6
April 12	**Exam 2**	
April 17 – 19	Least squares methods	Ch. 9
April 24 – 26	Ordinary Differential Equations	Ch. 7, 11
May 2	**Final Exam, 3:30 PM**	