Syllabus for MATH 475-01
Numerical Analysis, Spring 2015
http://jamesrohal.com/teaching/spring-2015-math-475-01/

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Description: A study of numerical methods in mathematics: fundamental analysis of computer error; solving linear systems of equations; interpolation; numerical differentiation and integration; and solving nonlinear equations.

Prerequisite: Grades of C or better in MATH 175 and MATH 211.

Course Objectives: The question around which this course revolves is, "How can we get approximate answers to mathematical problems when no exact solution is available?" The primary objective of the course is to develop the basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use. The emphasis of the course will be the thorough study of numerical algorithms to understand (1) the guaranteed accuracy that various methods provide, (2) the efficiency and scalability for large scale systems, and (3) issues of stability. An important component of numerical analysis is computational implementation of algorithms which are developed in the course in order to observe first hand the issues of accuracy, computational work effort, and stability. Exercises will include computational experiments in a programming language of the student's choice. One class lecture will be devoted to a high level pseudo-code type programming language (*Mathematica*).

Text: *Numerical Analysis* (9th Edition) by R. L. Burden and J. D. Faires.

Attendance: Attendance is mandatory. I will pass a seating chart around the first week of class. You are expected to sit in your assigned seat the remainder of the semester and attend all classes on time. Arriving late for a class or leaving early is very disruptive of class. If you need to leave early, please let me know at the beginning of class.

Homework: Homework problems will be listed on Sakai. I encourage you to work together on assignments. Each homework assignment will have a programming component. There are two types of problems: suggested and required. Suggested problem are a list of problems I suggest that you do. Required problems are the ones that will be turned in for grading.

***Mathematica*:** You can access *Mathematica* for free online by creating a Wolfram ID and accessing the Wolfram Programming Cloud. Details will be posted on Sakai. The first day of class will be a crash course in *Mathematica*.

Exams: There will be one in class exam, one take home exam, and a take home final.

Fri, Feb 6	Exam #1 (In Class)
Fri, Mar 20	Exam #2 (Take Home)

Make-up Policy: If you are absent the day of an exam, then the score for that item will be zero unless you and I discuss it, and we both agree that a make-up is appropriate. Adjustments will be made for students who must miss class due to illness, observance of a religious holiday, and for students who must due to a university sponsored activity (with letter from coach, sponsor, etc). I am more willing to give make-ups if *prior* permission is obtained. If an assignment is due on a day you are absent, you must have a valid excuse to receive points on the assignment.

Cheating: Don't do it. Take home exams are to be worked on individually. Students are expected to adhere to the official Academic Dishonestly Policy as stated below:

> *Academic Dishonesty, in whatever form, belies the stated philosophy of WLU "to promote the development of the intellectual, cultural, social, physical, emotional, moral, and vocational capacities of all persons within its sphere of influence." Individuals who commit acts of academic dishonesty violate the principles, which support the search for knowledge and truth. The academic community has established appropriate penalties and disciplinary action for such behavior that can include being expelled from WLU.*

Grading:

Homeworks	12×30 points
Exams	2×200 points
Final	1×240 points

The standard grading scale will be used.

Special Attention: If you have a disability that affects your academic experience and plan to seek accommodations, it is your responsibility to inform Disability Support Services as soon as possible. Disability Support Services is located in the Learning and Student Development Center (LSDC) in Main Hall. Carrie Young is the ADA representative; she can be reached at (304) 336-8216 or by email at carrie.young@westliberty.edu. It is important to request accommodations early enough to provide adequate time to facilitate your request and provide faculty with written verification of eligibility.

Course Outline:

Chapter 1	Mathematical Preliminaries and Error Analysis
Chapter 2	Solutions of Equations in One Variable
Chapter 3	Interpolation and Polynomial Approximation
Chapter 4	Numerical Differentiation and Integration
Chapter 5	Initial-Value Problems for Ordinary Differential Equations
Chapter 6	Direct Methods for Solving Linaer Systems
Chapter 7	Iterative Techniques in Matrix Algebra
Chapter 9	Approximating Eigenvalues
Chapter 10	Numerical Solutions of Nonlinear Systems of Equations