Course	**MTH 443/643, Numerical Analysis**
Semester/Year	**Fall 2018**
Days/Time	**TR 5:00 to 6:15**
Location	**WAEC 3119**
Instructor	**Dr. Scott Sarra**
Office	**WAEC 3227**
E-Mail	**sarra@marshall.edu**
Office/Hours	**Tuesdays and Thursdays by appointment from 1:45 to 5:00**
University Policies	By enrolling in this course, you agree to follow University Policies. The policies can be found at www.marshall.edu/academic-affairs/policies/.

Course Description

Introduction to Numerical Analysis. Floating point number systems, interpolation methods, solutions of linear and nonlinear systems of equations, numerical integration and differentiation, and methods of solution of ordinary differential equations. **Prerequisites:** MTH 331 Linear Algebra, and CS 205 Scientific Computing (may take concurrently).

Learning Outcomes

After completing the course the student will 1) understand the basic topics of numerical analysis: computer representation of numbers, floating point arithmetic, root finding, interpolation, condition numbers, and basic numerical linear algebra, 2) be prepared to embark upon more advanced study in numerical analysis, 3) understand how numerical mathematics fits into science as a whole, 4) will have experience typesetting mathematics using LaTeX, 5) will have gained experience in using mathematical software, and 6) will have experience writing mathematical software.

Required Texts and Other Materials

1. *Numerical Analysis* (2nd Edition) by Tim Sauer, ISBN: 0321783670
2. A laptop computer.

Grades

40% exams, 30% homework, 30% class participation .

Attendance

In 400/600 level classes, attendance at every class is expected.

Exams: 2 exams will be given during the semester. Tentatively the exams are scheduled for 10/4 and 11/29.

Homework:

Approximately 6 homework sets will be given in 2 to 3 week intervals.

Class participation:

A flipped classroom approach will be taken in the course that puts more of the responsibility for learning on the shoulders of the students. Students will be given reading material in advance and then be asked to discuss it during class time. Students will be expected to collaboratively discuss problem solutions during class as well as to clearly explain solutions to problems that have been assigned.

Computer Programming:

An essential part of Numerical Mathematics is implementing algorithms on a computer. The HW sets and the final project will require some (relatively) simple computer programs to be written. Computer languages that are appropriate for and that are commonly used in scientific computing include Fortran, C/C++, Python, and Julia. Python will be the language that is primarily used in class examples. Python is also suggested for use in HW problems and projects since you should be familiar with it from CS 205 which is a prerequisite to this class. However, any other (appropriate) language of your choice may be used.

Collaboration:

Collaboration on HW sets is encouraged. Each student must write up and turn in their own solutions. For problems involving computer programs, a listing of the computer code and its output must be submitted. If the computer program is a collaborative effort, each student in the group must separately type in and execute the program and then generate printed code and output. In addition to working with other students in the class, you are encouraged to use resources such as text books other than the official class text, journal articles, and internet searches. No matter whom you talk to or what you read, HW solutions should be written up on your own, without having the solutions produced by the entire group or other source in front of you. There is a huge difference between collaborating and copying. Copied HW solutions will be given zero credit. Copied HW solutions are usually very easy to identify. Even if copied solutions can not be identified in written

form, the fact that they were copied always comes out in the follow-up oral questions on the HW.

Course Schedule: Selected topics from chapters 0, 1, 2, 3, 5, and 6 of the Sauer textbook will be discussed. A more detailed schedule will be given in class as we proceed through the semester.