MATH 3310/6310: Scientific Computing I
Spring 2019

Instructor: Tong Wu **E-mail**: twu2@tulane.edu
Office: Stanley Thomas Hall 405 **Office Hours**: MTW 2 PM to 3 PM
Class Meets: MWF, 12:00 to 12:50 PM, GI 126
Course Info:
This course is an introduction to the theory and applications of numerical approximation. It is designed to give engineering, mathematics, and science students familiarity and skill with computer implementation of selected numerical methods for problem solving. Typical topics covered are computational errors, methods in optimization (finding the roots of functions, max, min, etc.), interpolation methods, solutions of nonlinear equations, some matrix equations and some differential equations and computing integrals.
Reference textbook:
A first course in numerical methods, Uri M. Ascher and Chen Greif
Numerical Analysis, Richard L. Burden and J. Douglas Faires
Numerical computing with MATLAB, Cleve B. Moler
Scientific Computing: An introductory Survey, Michael T. Heath

Prerequisites: MATH 221. Helpful background includes MATH 224 and some programming experience.

Grading:
Your final grade will be determined as follows:

Homework	Test-1	Test-2	Final Exam
60%	9%	9%	22%

The plus/minus grading system will be used:

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
97-100	93-96	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	0-59

Homework:
Each assignment contains two groups (A and B) of problems (three problems per group). If you are taking MATH 3310, two group-A and one group-B problems will be graded. If you are taking MATH 6310, one group-A and two group-B problems will be graded. All assignments must be turned in at the beginning of the lecture on the day they are due.

Topics:
1. Introduction: numerical algorithms and errors;
2. Root finding for one-variable equations;
3. Linear system:
   - 3.1 Direct method
   - 3.2 Least square problem
   - 3.3 Iterative methods
4. Interpolation:
   - 4.1 Polynomial interpolation
   - 4.2 Piecewise polynomial interpolation
   - 4.3 Best approximations
5. Numerical differentiation
6. Numerical integration
7. Methods for initial value ordinary differential equations

Tests and Final Exam:
The first test will be a 50-minute in-class exam. The material for the exam will include all sections from the book that are covered in class in Topics 1, 2 and 3 (roughly). The instructor will make this precise before the exam.
The second test will be a 50-minute in-class exam. The material for the exam includes all sections from the book that were covered in class in Topics 4 and 5 (roughly). The instructor will make this precise before the exam.
The final exam will be a 4-hour exam and cover all the topics.
One letter-size cheat sheet could be used for all the tests and the final exam.