New York Institute of Technology: Mathematics Department

MATH 330: Computational Analysis

Term: Spring 2024

Class Times: 8:50-10:50AM Tuesdays and Thursdays

Location: Guiliano Global Ctr. Rm. 319

Instructor: Dr. Andrew Hofstrand

Office: 16 West 61st St. Rm. 715

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Course Description: This course gives students an introduction to computational methods commonly used in applications. We do not assume that the student is familiar with programming, so the course begins with a brief exposition on data structures, conditional statements, loops, etc. We will use *Mathematica* for both writing programs and visualization of results. All NYIT students can download the latest version of Mathematica on personal devices for free (https://www.nyit.edu/its/software?sid=64).

The primary part of the course will consist of several projects, where the student will write programs geared toward a particular numerical algorithm, such as root-finding, optimization, integration, etc. There is no official textbook, but the students will be given a routinely updated PDF file of instructor notes on the course Canvas page, along with solutions to previous projects. Students may work together on projects and we will be spending about half of the class meeting times working on projects and becoming familiar with coding and algorithms.

As this is a math course, emphasis will be placed on the understanding of numerical methods, not just programming practices.

Course Topics: symbolic manipulation, calculus, and visualization in Mathematica; basic programming concepts; numerical integration; root-finding algorithms; gradient descent; polynomial interpolation; splines; least-squares fitting; quadratures; logistic regression and classification techniques in machine learning.

Projects: Students will email their projects to instructor in a written report format by the beginning of class on the due date. Late projects will NOT be accepted; however, the lowest project grade will be dropped. Along with content, students will be graded on the organization and clear layout of their project writeups. Students are encouraged to use Microsoft Word, or something similar, to present their results in addition to Mathematica Notebooks and hand-written notes.

Grading: The final grade will be determined as follows: **Projects 50%; Midterm (3/16) 25%; Final Exam (5/15-5/20) 25%.** Final grades follow: A ≥92%; A-≥88%; B+≥85%; B≥80%; B-≥77%; C+≥75%; C≥70%;C- C-≥ 66%. Failing grades and D's will be given accordingly below these percentages.