

AMS 595/DCS 525 - FUNDAMENTALS OF COMPUTING

Fall 2023

Instructors:	Abdul Rahimyar & Wenhan Gao
Time:	Tuesday & Thursday, 7:00 – 8:20 PM
Location:	ESS 069
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Office Hours:	<u>Abdul</u> : Tuesday, 4:00 – 6:00 PM, Harriman 352 <u>Wenhan</u> : Wednesday, 6:00 – 8:00 PM, Zoom

Course Description: This is a project-based, 3-credit course that provides an introduction to several modern approaches for developing computer programs and their use to solve mathematical problems. It will cover the fundamentals of programming in MATLAB, Python, and C/C++, including scripting, basic data structures, algorithms, scientific computing, performance optimization, software engineering and program development tools. Homework projects will focus on using computation to solve mathematical problems (e.g. linear algebra and differential equations), data management, data analysis, etc. The content is divided into three parts (outlined below). No previous programming experience is required.

Prerequisites: Familiarity of linear algebra and discrete mathematics at undergraduate level are expected. No previous programming experience is required.

Required Textbook: None.

Learning Outcomes: The objective of this course is to introduce programming skills, including scripting in MATLAB and Python, as well as object-oriented programming (OOP) using Python and C++, and to introduce best practices in software engineering for scientific computing, including documentation, debugging and testing, version control, etc. The key learning outcomes include the following:

1. Proficiency in MATLAB programming: including scripting, procedural programming, GUI, debugging, plotting, and profiling.
2. Proficiency with Python programming including scripting, basic data types and structures, OOP, commonly used Python libraries, and basic machine learning with PyTorch.
3. Fundamentals of programming in C and C++, intro to Linux command line interface, file systems and management, GCC and compiler basics, modularization libraries and makefiles.
4. Best practices in scientific software engineering including code modularization, debugging and testing, version control, documentation... etc.

Tentative Course Outline:

- MATLAB (~ 3 weeks)
- Python (~ 5 weeks)
- C/C++ (~ 4 weeks)

Grading Policy: The course involves both individual and group projects. The grades are assigned based on the quality of the codes and the reports. There will be no other written homework assignments or exams.

Individual Projects	75%
Final Project	25%

Student Accessibility Support Center: If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Academic Integrity: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Professions, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at https://www.stonybrook.edu/commcms/academic_integrity/index.html.

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook..