
Course goals:

This course is designed to build students' computer programming skills with focus on problem solving. Students who have completed class with on-time problem set submissions and working on their own/seeking help from instructors (i.e., not relying heavily on GAI tools) have become effective programmers who can tackle most research problems.

Course format:

Each three-hour class is a mixture of lecture and lab components. The lecture introduces various commands and the lab allows students to try the commands and write their own programs.

Course Requirements

Students must:

- Be comfortable with high-school level math and linear algebra (e.g., vectors and matrices)
- Be able to [instal MATLAB on their computer](http://downloads.fas.harvard.edu/download) (MATLAB school license is available, see instructions at <http://downloads.fas.harvard.edu/download>)
- Attend class twice weekly
- Complete assignments after each class
- No textbook is required

Typical enrollees:

This course is designed for undergraduate and graduate students without computer programming experience but would like to become effective programmer for solving problems.

When is course typically offered?

Fall semester

Assignments and grading:

There will be a problem set covering material from each class that will be returned with comments and suggestions to improve for the next assignment. They also make up the bulk of the grading scheme:

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| • Problem Sets | 70% |
| • Mid-Term Project | 5% |
| • Term Project | 25% |

Students will choose their final project, ideally a project they are already working on but can be something new. The final project will be carried out over about 5-week period with weekly submission.

Absence and late work policies:

Students are expected to attend the class in person and focus on the lecture and in-class problem solving.

Students should contact the instructor if they cannot submit the assignment on time. Without prior agreement, each day the assignment is late will result in 50% penalty from the total grade the student would have gotten. For example, if an assignment is out of 10 and the student would have gotten 8 if submitted on time. If that assignment is submitted 2 days after due date, the grade will be 2/10 (first day 8-50% of 8 = 4, second day 4-50% of 4 = 2, etc.).

Generative Artificial Intelligence (GAI) Policy

This course allows students to explore the use of GAI tools such as ChatGPT for most assignments and assessments, although students in the past who relied heavily on GAI tools did relatively poorly in class. This class is designed to build skills and if one turns to GAI for solutions, the skill-building part will not be accomplished. Hence even though use of GAI is allowed, students are strongly encouraged to try the problems on their own and seek help from the instructor. Any cases in which GAI tools is disallowed will be explicitly noted at the top of each assignment when given.

Any use of these tools must be appropriately acknowledged and cited with a GAI use statement. This statement shall be included in brackets at the end of each assignment or part of assignment in which these tools are used. The statement shall clearly note the degree to which GAI was used. Examples of such statements include but are not limited to:

- "[GAI was used to better understand the problem]"
- "[GAI was used to find sources of information for research]"
- "[GAI was used to outline the text of this answer]"
- "[GAI was used to improve the clarity and grammar of this answer]"
- "[GAI was used to generate the text of this answer]"

If no statement is provided, it will be assumed that GAI was not used in any way.

When using GAI, it is the responsibility of the student to assess the validity and applicability of any output which is utilized. Students shall not be penalized for the degree to which GAI is used in cases where it is allowed; however, students shall bear the final responsibility for the quality and accuracy of any and all submitted work.

Past syllabus:

Class	Topics
1	Introduction and Course Overview <ul style="list-style-type: none"> • The computing revolution in the sciences • Data processing, visualization, algorithms, simulations of dynamic systems • Class outline
2	Introduction to Computing and MATLAB <ul style="list-style-type: none"> • Why MATLAB? • Basic arithmetic
3	Control Structures 1 <ul style="list-style-type: none"> • <i>if/then</i> • <i>switch/case</i>
4	Control Structures 2 <ul style="list-style-type: none"> • <i>for</i> & <i>while</i> loops • character strings
5/6	Vectors <ul style="list-style-type: none"> • definition • element-by-element operation
6/7	Two-Dimensional Plots <ul style="list-style-type: none"> • <i>plot</i> and its properties • formatting a plot histograms, scatter plots, log axes, &c.
8/9	String Basics <ul style="list-style-type: none"> • definition • operations

10	<p>Functions</p> <ul style="list-style-type: none"> • function file vs. program file • local and global variables • inline function
11	<p>Arrays</p> <ul style="list-style-type: none"> • definition • mathematical operations
12/13	<p>Strings and Cell Arrays</p> <ul style="list-style-type: none"> • definition • operations
14	<p>Input/Output 1</p> <ul style="list-style-type: none"> • MATLAB native .mat format
15	<p>Three-Dimensional Plots</p> <ul style="list-style-type: none"> • line plots • mesh and surface plots • slice
16/17	<p>Input/Output 2</p> <ul style="list-style-type: none"> • writing files • GUI for file selection
18	<p>Programming Elegance & Basic Efficiency</p> <ul style="list-style-type: none"> • programs for sharing • redundancy
19	<p>Data Classes & Structures</p> <ul style="list-style-type: none"> • definitions • different types of classes and structures • operations
19/20	<p>Handles</p> <ul style="list-style-type: none"> • definition • accessing and changing handle contents
21/22/23	<p>Graphical User Interface (GUI)</p> <ul style="list-style-type: none"> • basic tools (e.g., buttons, text fields, &c.) • tool functions • GUI layout • combining tools and functions

24/25/26	<div>Image Processing</div> <ul style="list-style-type: none">• basic tools• manipulating images and videos
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