Introduction to Programming

Matthew X. Curinga

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**Computer Science 0145-602 Section 002 (online), Fall 2018**

**Keywords:** computer programming, CS1, javascript, computational thinking, critical computational literacy, problem solving

**Description:** This course introduces students to programming and some core concepts of computer science, using a modern, object oriented programming language. Students learn concepts of variables, functions, selection, repetition/loops, basic data structures (arrays, lists, hashtables), and basic object oriented programming.

We are looking at a society increasingly dependent on machines, yet decreasingly capable of making or even using them effectively. ― Douglas Rushkoff, *Program or Be Programmed: Ten Commands for a Digital Age*

**Class meetings:** *fully online*

**Instructor:** [Matthew X. Curinga](https://matt.curinga.com), [mcuringa@adelphi.edu](mailto:mcuringa@adelphi.edu)

**Office hours:**

* Monday 12-2pm, online
* Wednesday 2pm-4pm, Alumnae Hall Room 226A (Garden City campus)
* *office hours by appointment*

# Learning Goals

* understand the types of problems that can be solved using computational techniques
* understand the basic concepts of computation (CPU, RAM, permanent storage, GUIs, file systems, network connections)
* learn core computer programming concepts (abstraction, variables, conditions, functions, repetition, recursion)
* think algorithmically to design and test computer programs
* master the basic syntax and idioms of the Javascript programming language
* use technical documentation, APIs, and the internet to learn new technical concepts
* develop step-by-step problem solving and debugging practices

# Required Books

None

# Required Software/Online Accounts

* Software
  + [Slack Client](http://slack.com) (recommend desktop and mobile clients)
  + Firefox or Chrome web browser
* Accounts
  + [repl.it](https://repl.it)
  + [AU Ed Tech Slack channel #code](https://auedtech.slack.com/signup)

# Class Sessions

https://www.lynda.com/C-tutorials/Algorithms/167922/181556-4.html

|  |  |  |  |
| --- | --- | --- | --- |
| Week | Date | Topic | Due |
| 1 | Aug 27 | Turtle: Coding and algorithms | - |
| 2 | Sep 3 | Problem solving in computer programming | Lab 1 |
| 3 | Sep 10 | Variables and data | Lab 2 |
| 4 | Sep 17 | Functions and testing | Lab 3 |
| 5 | Sep 24 | Conditions | Lab 4 |
| 6 | Oct 1 | Repetition with while | Lab 5 |
| 7 | Oct 8 | Strings and repetition with for | *study!* |
| 8 | Oct 15 | Midterm | - |
| 9 | Oct 22 | Arrays | - |
| 10 | Oct 29 | Objects & Sets | Lab 6 |
| 11 | Nov 5 | JSON data | Lab 7 |
| 12 | Nov 12 | Networks and files | Lab 8 |
| 13 | Nov 19 | Open Data | Lab 9 |
| 14 | Nov 26 | Graphs & Charts | Lab 10 |
| 15 | Dec 3 | Final project workshops | - |
| 16 | Dec 10 | Finals | Final project |

# Assignments and Grading

|  |  |  |
| --- | --- | --- |
| Assignment | Pct | Due date |
| Labs (10 total) | 50% | Sep 13 |
| Midterm exam | 25% | Oct 18 |
| Final project | 25% | Dec 14 |

## Labs (50%)

Most weeks there will be a programming lab due. Labs will consist of a single exercise that focuses on using the computer programming concepts we’re learning to solve a problem. Each lab will be worth 0-5 points. Roughly:

* *0 points*: for not turning in any work
* *1-2 points*: for a basic attempt, but code isn’t working or has fundamental flaws
* *4-5 points* (mostly) solution demonstrates mastery of relevant concepts
* *5 points*: solution works, demonstrates mastery of concepts, and is well formatted and clearly written

Everyone’s lowest grade will be thrown out (so your lab score will be the average of your 9 highest lab grades).

## Midterm (25%)

The midterm will consist of 5 “short answer” styled problems where you write a function for each prompt to solve a specific problem. The short answer prompts will be very similar to the textbook exercises from *Think JS*. This section is worth 10 points.

Part 2 of the exam will require writing a longer program that consists of several functions. Students will choose to answer 1 of 3 possible problems. The program should demonstrate the students ability to break down a problem and write a working computer program that provides a solution.

## Final project (25%)

For the final project you will work in a team of 2-3 people to create your own data analysis and visualization of the data available for the New York City (NYC) school system.

NYC publishes a wealth of information regarding their schools on the schools website and the open data portal. Data includes student demographic and geographic information, test results, attendance, survey data, building and physical information, employee data, and more.

Your team must decide what interesting insights this data might afford, and then present your results through a series of tables and graphs.

To submit your work, please copy the link to your repl and the names of each team member. Your team only needs to submit their work one time.

You can work from the data sets that we have been using, however you may want to incorporate new data that you gather directly. You can explore the data released at:

* [NYC DOE Test Results](https://infohub.nyced.org/reports-and-policies/citywide-information-and-data/test-results)
* [NYC Open Data](https://opendata.cityofnewyork.us/)
* [New York State Education Data Portal](https://data.nysed.gov/)

Of course, you may incorporate other data sets as you see fit.

The final solution will be scored using the following guide:

**Solution (7 points)**

How well does the program written solve the problem? Does the project seriously engage with the data? Does it use computer analysis to provide interesting insights? Is the data presented in a meaningful and usable way?

Your team’s ability to design a solution to the problem is evaluated by this measure.

**Elegance & Robustness (8 points)**

This area evaluates the quality of the computer code produced by the team. An elegant program provides a parsimonious solution that is both efficient and clear. A robust program is flexible and able to change. In the case of data analysis, it would be easy to modify if the input data changed or the output requirements are updated. It wouldn’t “break” if it encountered unexpected data, and would continue to operate even if the amount of data were increased dramatically. Often, both elegance and robustness are achieved through refactoring: the process of reflecting on code and revising it after an initial working solution is achieved.

**Risk Taking (5 points)**

Learning should be an adventure. One of the most exciting things about writing software is the sense of new possibilities and discovery. The “risk taking” aspect of your team’s grade will reflect the chances that you take with your project. Even if your solution isn’t quite what you hoped for, or your code isn’t as elegant as you’d like, it’s important that you take chances and try new things. To do well in this section, you might want to shoot for an ambitious, or complex analysis; or integrate some Javascript analysis that hasn’t been explicitly covered in the course.

**Code Style (5 points)**

Your code should be well formatted and easy to read. Your functions and variables (aka “identifiers”) should have clear, meaningful names. Comments should be used sparingly, but appropriately to guide the human reader through your code.

All project members will receive the same grade.

## Javascript Documentation and References

* [Mozilla Developer Network](https://developer.mozilla.org/en-US/docs/Web/javascript)
* [W3 Schools](https://www.w3schools.com/js/default.asp)
* [OverAPI](http://overapi.com/javascript)
* [ES6 Lang Spec](https://www.ecma-international.org/ecma-262/6.0/index.html)

## Books & Tutorials

* [Javascript the Right Way](http://jstherightway.org/)
* [You Don’t know JS (book series online)](https://github.com/getify/You-Dont-Know-JS)
* [Eloquent JavaScript](https://eloquentjavascript.net/)
* [Understanding Programming through JavaScript](https://cs.stanford.edu/people/eroberts/CS106AJ-Reader.pdf)
* [Mastering Regular Expressions](http://shop.oreilly.com/product/9780596528126.do)
* [JavaScript & jQuery: Interactive Front-End Web Development Hardcover](http://www.wiley.com/WileyCDA/WileyTitle/productCd-1118871650.html), also J. Duckett, same series