Introduction to CS 106AJ

Jerry Cain
CS 106AJ
September 25, 2017
CS 106AJ: Programming Methodology in JavaScript
Introduction to the engineering of computer applications emphasizing modern software engineering principles: object-oriented design, decomposition, encapsulation, abstraction, and testing. Emphasis is on good programming style. This course covers the same material as CS 106A but does so using JavaScript, the most common language for implementing interactive web pages, instead of Java. No prior programming experience required. Enrollment limited to 85.

Terms: Aut | Units: 3-5 | UG Reqs: WAY-FR | Grading: Letter or CR/NC

CS 106AJ covers the same material and meets the same WAYS requirements as any other CS 106A section.
Why JavaScript?

• When Stanford adopted Java a little over a decade ago, we expected—along with its designers—that it would become the “language of the web.” That didn’t happen.

• Today, the “language of the web” is JavaScript, which has become the most widely used language in industry.

• Along with JavaScript expert Douglas Crockford, we believe that, as long as you avoid some of its most commonly abused features, JavaScript is “a beautiful, elegant, highly expressive language” that is ideal for a first course in programming.
  – It is considerably easier to learn than Java.
  – There are far fewer details to memorize.
  – It offers cleaner implementations of modern language features.
  – It is universally supported on the web.
JavaScript is the Most Popular Language
Why Study Computer Science?

We are very happy with the students that we get from this university. . . . We just wish we could hire two to three times as many of them.

— Bill Gates at Stanford, February 19, 2008
Everyone Needs Some Programming

Half of all jobs in the top income quartile value coding skills.

CS 106AJ Course Staff

Jerry Cain  
jerry@cs.stanford.edu  
Office Hours (Gates 192):  
Fridays: 1:00 – 3:00 P.M.

Kat Gregory  
katg@stanford.edu  
Office Hours: TBD
<table>
<thead>
<tr>
<th>September 25</th>
<th>27</th>
<th>29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>Simple Karel programs</td>
<td>Problem-solving in Karel</td>
</tr>
<tr>
<td>Course overview</td>
<td>Control structures in Karel</td>
<td>Program decomposition</td>
</tr>
<tr>
<td>Meet Karel the Robot</td>
<td>Read: Sections 1.1-1.3</td>
<td>The idea of an algorithm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read: Sections 1.4-1.5</td>
</tr>
</tbody>
</table>
## Syllabus—Week 2

<table>
<thead>
<tr>
<th>October 2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables and values</td>
<td>Programs in JavaScript</td>
<td>Control statements</td>
</tr>
<tr>
<td>Arithmetic expressions</td>
<td>JavaScript and the web</td>
<td>Boolean data</td>
</tr>
<tr>
<td>Functions</td>
<td>Simple graphics</td>
<td></td>
</tr>
<tr>
<td>Strings and concatenation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Read: Sections 2.1-2.5

Read: Sections 3.1-3.5

Read: Sections 4.1-4.5
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Due</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 9</td>
<td>Arguments and parameters</td>
<td></td>
<td>Sections 5.1-5.2</td>
</tr>
<tr>
<td></td>
<td>Libraries</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Random numbers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>The mechanics of functions</td>
<td>Karel contest</td>
<td>Sections 5.3-5.4</td>
</tr>
<tr>
<td>13</td>
<td>First-class functions</td>
<td></td>
<td>Sections 6.1-6.4</td>
</tr>
<tr>
<td></td>
<td>Event-driven programming</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responding to mouse events</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Due: HW #1 (Karel)  
Read: Sections 5.1-5.2*
### Syllabus—Week 4

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic 1</th>
<th>Topic 2</th>
<th>Topic 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 16</td>
<td>Simple animation</td>
<td>The <code>Garc</code> class</td>
<td>Binary representation</td>
</tr>
<tr>
<td></td>
<td>Timers</td>
<td>The <code>GPolygon</code> class</td>
<td>Representing characters</td>
</tr>
<tr>
<td></td>
<td><strong>Due: HW #2 (Simple JS)</strong></td>
<td>The <code>GCompound</code> class</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Read: Section 6.5</strong></td>
<td><strong>Read: Section 6.6</strong></td>
<td><strong>Read: Section 7.1</strong></td>
</tr>
</tbody>
</table>

- **October 16**: Simple animation, Timers
- **Due: HW #2 (Simple JS)**
- **Read: Section 6.5**

- **18**: The `Garc` class, The `GPolygon` class, The `GCompound` class
- **Read: Section 6.6**

- **20**: Binary representation, Representing characters
- **Read: Section 7.1**
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Read: Section(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 23</td>
<td>JavaScript’s <strong>String</strong> class Common string patterns</td>
<td>Sections 7.2-7.3</td>
</tr>
<tr>
<td>25</td>
<td>Problem solving with strings String applications</td>
<td>Section 7.4</td>
</tr>
<tr>
<td>27</td>
<td>Cryptography</td>
<td><em>Due: HW #3 (Breakout)</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read: Section 7.5</td>
</tr>
</tbody>
</table>
# Syllabus—Week 6

<table>
<thead>
<tr>
<th>October 30</th>
<th>November 2</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debugging strategies</td>
<td>Simple arrays</td>
<td>Using arrays for tabulation</td>
</tr>
</tbody>
</table>

**Due: Graphics contest**

**Read: Sections 8.1-8.2**

**Read: Section 8.3**

**Midterm Exam**  
Tuesday, October 31  
3:30 P.M.
<table>
<thead>
<tr>
<th>November 6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multidimensional arrays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pixel arrays</td>
<td>Objects as aggregates</td>
<td></td>
</tr>
<tr>
<td>The <strong>GImage</strong> class</td>
<td></td>
<td>Objects as maps</td>
</tr>
</tbody>
</table>

*Due: HW #4 (HangKarel)*

*Read: Sections 8.4-8.5*  
*Read: Sections 9.1-9.2*  
*Read: Section 9.6*
<table>
<thead>
<tr>
<th>November 13</th>
<th>15</th>
<th>17</th>
</tr>
</thead>
</table>
| JavaScript and OOP  
Libraries and interfaces  
Defining classes and methods | Large-scale data structures  
Data-driven programs | Overview of Adventure! |
| Read: Sections 9.3-9.5 | Read: Section 9.7 | Due: HW #5 (Enigma)  
Read: Adventure handout |
## Syllabus—Week 9

<table>
<thead>
<tr>
<th>November 27</th>
<th>29</th>
<th>December 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>JavaScript and the web</td>
<td>JavaScript and the web</td>
<td>Using web interactors</td>
</tr>
</tbody>
</table>

Read: (handouts for the day)
# Dead Week and Beyond

## Review Session
- **Date:** Sunday, December 10
- **Time:** 1:00 P.M.

## Frontiers of computing

**Due:** HW #6 (Adventure)
**Due:** Adventure contest

---

## Final Exam
- **Date:** Thursday, December 14
- **Time:** 8:30 A.M.
Assignments in CS 106AJ

• Assignments in CS 106AJ are due at 5:00 PM. Assignments that come in after 5:00 will be considered late.

• Everyone in CS 106AJ starts the quarter with two “late days” that you can use at any point you need some extra time. In my courses, late days correspond to class meetings, so that, if an assignment is due on Wednesday and you turn it in on Friday, that counts as one late day.

• Extensions can be approved only by the TA, Kat Gregory.

• Assignments are graded by your section leader, who discusses your work in an interactive, one-on-one grading session.

• Each assignment is given two grades: one on functionality and one on programming style. Style matters. Companies in Silicon Valley expect Stanford graduates to understand how to write code that other programmers can maintain.
The CS 106AJ Grading Scale

• Functionality and style grades for the assignments use the following scale:

++ A submission so good it “makes you weep.”
+
Satisfies all requirements of the assignment.

✓+ Meets most requirements, but with some problems.

✓− Some more serious problems.

− Even worse than that.

--- Why did you turn this in?
Contests

• CS 106AJ will have three contests as follows:
  – The Karel Contest associated with Assignment #1
  – The Graphics Contest associated with Assignment #3
  – The Adventure Contest associated with Assignment #6

• The grand prize in the contest is a score of 100% on one of the graded components of the course, typically the final exam.

• As an additional incentive, entering any of the contests gives you a virtual ticket to win an additional grand prize in a random drawing at the end of the quarter. So does receiving a runner-up or honorable mention on a contest and finding errors in the text.

• Entering a contest also earns “house points” for your class in the style of the Hogwarts School from Harry Potter.
Honor Code Rules

Rule 1: You must not look at solutions or program code that is not your own.

Rule 2: You must not share your solution code with other students.

Rule 3: You must indicate on your submission any assistance you received.
Meet Karel the Robot

• Initially, Karel understands only four primitive commands:

  move()  Move forward one square
  turnLeft()  Turn 90 degrees to the left
  pickBeeper()  Pick up a beeper from the current square
  putBeeper()  Put down a beeper on the current square
Your First Challenge

- How would you program Karel to pick up the beeper and transport it to the top of the ledge? Karel should drop the beeper at the corner of 2nd Street and 4th Avenue and then continue one more corner to the east, ending up on 5th Avenue.
The End