General Information

Class Website: http://csed.uni.edu/DSA/
Zoom Office Link: https://uni.zoom.us/j/133729722

Time and Place: This primary delivery of this course is done asynchronously and online. However, we will meet face-to-face on six occasions:

- Saturday, September 7, 8:30 AM - 12:30 PM, Cedar Falls
- Saturday, October 19, 8:30 AM - 12:30 PM, Cedar Falls
- Saturday, November 16, 8:30 AM - 12:30 PM, Cedar Falls
- Saturday, January 25, 8:30 AM - 12:30 PM, Cedar Falls
- Saturday, March 7, 8:30 AM - 12:30 PM, Cedar Falls
- Saturday, April 25, 8:30 AM - 12:30 PM, Cedar Falls

Credit Hours: Three (3). This course meets the Course Credit Hour Expectation outlined in the Course Catalog. Since this course takes place over the equivalent of two semesters students should expect to work approximately 4-5 hours per week on this course.

Instructor: Ben Schafer
Email: schafer@cs.university.edu [Note, please use this address instead of my @uni.edu address]
Office: 316 ITTC, phone 273-2187
Office Hours: There are no regularly scheduled office hours at this time. That may change based on course needs.

Course Information:

Course Description
Introduction to the structure and application of common data structures used in computer science and the algorithms used with/for these structures. Includes an ongoing discussion on algorithm analysis. Also includes significant elements of algorithms, program design, techniques for data storage and retrieval, and data beyond a local text file.

General Course Goals/Outcomes
The course has three general goals.
1. That students are able to analyze their programs to evaluate computational complexity and use studied algorithms to provide efficient solutions. Such algorithms include: searching and sorting, graphing problems, and string problems.
2. That students are able to explain and use efficient data structures include: stacks, queues, lists, hash tables, trees, and graphs.
3. That students are able to design and implement "medium" sized programs using functional decomposition and be able to select appropriate data structures.

Specific Outcomes/Assessments
By the end of the course students should be able to complete the following:
- Analyze code to determine its execution-time (big-oh notation) and storage utilization.
- Write and analyze searching techniques: linear search, binary search, closed-address hashing.
- Use common “linear” data structures using an “array” (i.e., contiguous block of memory) and “linked nodes” as appropriate: stack, queue, and lists
- Implement common “tree” data structures
- Implement graphs using “adjacency matrix” and “adjacency lists” representations.
- Trace and program graph algorithms: depth-first search, breadth-first search, Prim's algorithm, Dijkstra's algorithm, and topological sort.
**Required Materials**
- Course participants will need access to a computer for many course activities. This computer will need to be able to access websites, play embedded videos, program in Python, and allow for online collaboration with faculty/other students.

**Grading/Evaluation:**
Most graded activities in this course will be factored in some fashion to a "final grade unit." Each of these is a score from 0-5. At the start of the course I anticipate your final grade being calculated based on 8 final grade units (in other words, a total of 40 possible points). However, I reserve the right to factor in an additional 2 "final grade units" depending on how much graded homework is actually assigned.

This course will contain four types of activities:

**Ungraded Activities**
- Most "homework" in this course is assigned to enhance your learning. In most cases it is the process that I am after rather than the results. As such, I may ask you to submit your results, but I prefer not to assign a grade to this.
- Please keep an eye on the course website and submit these activities when requested.

**Graded Activities (I anticipate assigning the equivalent of 1 "final grade unit" during this course. However, I reserve the right to assign more than originally planned and to increase this to as many as 3 "final grade units" depending on how much is actually assigned)**
- At various times during the course we will assign you homework that is clearly marked as "graded"
- In these situations we will evaluate your results

**Competency Demos (Five CDs worth 1 "final grade unit" each)**
- At each F2F meeting (except for September) you will sit for a "competency demo" over the material discussed since the previous meeting.
- Each CD will consist of several questions based on a "study guide" published online approximately one week before the F2F meeting.
- Each question on the CDs will be graded using a 0-5 scale based on:

<table>
<thead>
<tr>
<th>Points</th>
<th>Rough Description</th>
<th>Letter Grade Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Your answer is correct and covers all components expected of the question.</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>Your answer is correct but is missing one or two expected elements.</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>Your answer is mostly correct but contains one or two inaccurate statements.</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>Your answer is lacking in several important details or contains multiple inaccuracies.</td>
<td>D</td>
</tr>
<tr>
<td>1</td>
<td>Your answer shows you do not understand the question.</td>
<td>F</td>
</tr>
<tr>
<td>0</td>
<td>You fail to provide an answer.</td>
<td>F</td>
</tr>
</tbody>
</table>

- While most questions will be given equal weight I reserve the right to weight some questions more heavily than others. These will be clearly marked on the exam.
- The exam will be given an overall score based on the weighted average of the individual questions. Thus, your individual questions will be averaged to a single grade of 0-5 points for the CD.
- If you do not like the grade you earned on the original CD you will be provided one opportunity to attempt a second version of the CD to improve your grade. This retake will replace your original grade regardless of whether it went up or down

**Final Deliverable (2 final grade units)**
- At the May meetup we will distribute the specifics for the "Final Deliverable."
- You will be given approximately two weeks to complete and submit the final deliverable.
- You will receive a score of 0-10 points on this overall deliverable (the equivalent of two "final grade units"
- You will NOT have an opportunity to revise and resubmit this project.

At the end of the course these "final unit grades" will be averaged and letter grades assigned.
Accessibility
Please read the online version of this syllabus for the full disability/accessibility statement.

The University of Northern Iowa (UNI) complies with the Americans with Disabilities Act Amendments Act of 2008 (ADAAA), Section 504 of the Rehabilitation Act of 1973, the Fair Housing Act, and other applicable federal and state laws and regulations that prohibit discrimination on the basis of disability. To request accommodations, it is the policy of the University for students with disabilities to register with Student Accessibility Services (SAS). UNI faculty are not obligated to provide accommodations for students with disabilities without proper notification from SAS and the student. Students may initiate the accommodation process at any time. However, accommodations are not retroactive, and the registration process takes time. Therefore, SAS staff always recommends that students initiate the process as soon as possible rather than wait for academic and social-emotional responsibilities to become overly stressful and/or overwhelming. Please contact SAS, located at ITTC 007, for more information either at (319) 273-2677 or accessibilityservices@uni.edu.