General Information

Class Website:  http://cs.uni.edu/~schafer/DSA/
Zoom Office/Classroom Link:  https://uni.zoom.us/j/3192732187 (password is mailed to you to prevent spam bots from harvesting and disrupting the meetings).

Time and Place:

- This primary delivery of this course is online and asynchronously.
- However, I will set aside Monday evenings at 7:00 PM for "weekly" meetups via Zoom. At these sessions, we will both answer questions and, sometimes, talk through material that goes beyond the recorded lectures.
- Attendance at these meetings is strongly encouraged but they will be recorded and published to the website for those who can't attend live.

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.

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 recursive functions to traverse data structures
- Write and analyze simple and advanced sorts: bubble, selection, insertion, merge, and quick sorts.
- 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
- Explain the implementation of common "tree" data structures
- 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.

Course Grading
NOTE: This description of course grading is based on the assumptions I am making about this course as we start the "semester" and based on the previous offering. However, with the uncertainty of Covid-19 still hanging over our head, I feel that it is worth putting down in writing that I reserve the right to modify (in consultation with you) the schedule and grading of this semester. Any such modifications would almost certainly be to lighten the load and expectations (in other words, in your favor). If it comes to this, I will clearly republish my expectations on the class website and communicate with you via email.

This course will consist of three 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.
  - While these are not formally graded, repeated failure to attempt and submit these activities may result in the decrease of a grade to a "minus" grade. That is, failure to make a good faith effort at these may drop an A grade to an A-.
    - This is at my discretion rather than some set number of missed activities.
    - I will discuss this with you when I feel we are approaching this situation
- Graded Projects (3, all towards the end of the course)
  - Once you have had a chance to fully engage with the content of this course I will ask you to complete three graded projects:
    - 2 research and writing based projects. These will likely be completed as an individual.
    - 1 programming project. This will likely be completed with a partner.
  - I anticipate that you will be able to submit each for an initial grade. If you do not like the grade you earned, you will be provided an opportunity to ask questions, and revise the project(s).
- Competency Demos (3)
  - You can think of these like exams.
  - These will follow the same format as those offered in our recent Methods course.
  - Each will be administered using Blackboard.
  - If you do not like the grade you earned on the original CD, you will be provided an opportunity to ask questions, re-study the material, and attempt a second CD to improve your grade. Details on this will be provided when it becomes an option.

I will be using a grading system drawn from the philosophies of "standards-based" and "equitable" grading (https://gradingforequity.org/). The main idea is that I WANT you to succeed in the course by you showing me that you have learned the necessary material. In most cases, if you can't do this the first time you should be able to re-study and try again. You will earn multiple (6?) "grades" in this course. Each of these is a category of understanding that, for simplicity, is recorded as a score from 1-4 with the following meaning:
<table>
<thead>
<tr>
<th>Score</th>
<th>Meaning</th>
</tr>
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</table>
| 1     | You submitted the deliverables or attempted the activity but you show little understanding of the standards of the activity.  
       | [NOTE, you can not pass this course (grade of C or higher) with any 1s in your grades] |
| 2     | You have made significant progress towards demonstrating competency but there are limited items that remain unsatisfied. |
| 3     | You have "met" the standards of the activity.                            
       | [You have displayed minimum acceptable competency on this activity.] |
| 4     | You have "exceeded" the standards of the activity.                       
       | [You have met the standards of competency and shown considerable depth of knowledge, personal insight, or have demonstrated competency multiple times] |

End of semester grades will be assigned based on the following evaluation criteria

<table>
<thead>
<tr>
<th>Grade</th>
<th>Criteria</th>
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<tbody>
<tr>
<td>A</td>
<td>All scores are 3 or 4 AND equal or more 4s than 3s</td>
</tr>
<tr>
<td>B</td>
<td>All scores are 3 or 4</td>
</tr>
<tr>
<td>C</td>
<td>No scores of 1. No more than one score of 2. [all remaining scores are 3 or 4]</td>
</tr>
<tr>
<td>D</td>
<td>More (3s and 4s) than (1s and 2s). No zeros.</td>
</tr>
<tr>
<td>F</td>
<td>Any situation not handled above.</td>
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In most situations, grades earned are straight letter grades – no plusses or minuses. Because you have multiple opportunities to retake and earn better grades this isn't as rough as it might sound. However, I DO reserve the right to raise grades slightly (take a B grade to a B+) if I feel there are specific and individual circumstances that warrant this change from the above criteria. Similarly, as outlined above, I reserve the right to drop a grade to a minus if I feel that you aren't making an honest attempt to learn from the course.

**Accessibility**
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.