Data Structures and Algorithms

This class is all about getting you ready to handle the basics of data structures and algorithms to prepare you to solve the interesting problems in computer science.

Catalog Description
Specification and implementation of basic abstract data types and their associated algorithms: stacks, queues, lists, sorting and selection, searching, graphs, and hashing; performance tradeoffs of different implementations and asymptotic analysis of running time and memory usage; includes the execution of student programs written in C++.

Americans with Disabilities Act (ADA) Policy Statement
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu.

Lecture
TR 9:35-10:50 AM
EABA 108

Lab
- 505: MW 1:50-2:40 PM, RDMC 111H
- 506: MW 4:10-5:00 PM, RDMC 111H
- 507, TR 3:55-4:45 PM, RDMC 111C
- 508: MW 8:00-8:50 AM, RDMC 111C

Prerequisites
- CSCE 121 OR (CSCE 112 AND CSCE 113)
- CSCE 222 (Can be taken concurrently with CSCE 221)
People

Instructor

Dr. J. Michael Moore, PhD

- Email: jmichael@cse.tamu.edu
- Office: HRBB 325
- Phone: 979-845-5475
- Office Hours: Monday – Thursday, 11 AM – 12 PM or by appointment
  
  Note: I teach until 10:50 on Tuesday/Thursday so I might be a few minutes late on those days.
- Web: http://faculty.cse.tamu.edu/jmichael/

Teaching Assistants (TA)

Keishla D. Ortiz Lopez

- Email: keishla.ortiz4@tamu.edu
- Office: HRBB 410A
- Office Hours: Monday/Wednesday, 1 – 3 PM or by appointment
- Web: http://students.cse.tamu.edu/kortiz91/

Ala Altaweel

- Email: altaweel@cse.tamu.edu
- Office: HRBB 324
- Office Hours: TBA or by appointment

Peer Teachers

- Location: HRBB 129
- Web: http://engineering.tamu.edu/cse/academics/peer-teachers/

Peer teachers can help you with most of your questions.
Learning Outcomes

At the end of the course, under ABET outcomes, students should demonstrate:

1. An ability to apply knowledge of mathematics, science, and computing.
2. An ability to design and conduct experiments and to analyze and interpret data.
3. A recognition of the need for, and an ability to engage in lifelong learning.
4. A knowledge of contemporary issues.
5. An ability to use the techniques, skills, and modern computing tools necessary for computer science practice.

Students should also be able to:

1. Design and implement different data structures and algorithms that allow easy access and manipulation of data using the C++ programming language. These structures and algorithms include stacks, queues, lists, tree, graph, hashing and sorting, selection and searching.
2. Apply the Big-O asymptotic notation to analyze and select efficient algorithms for solving a given problem with respect to time and memory usage. To do so, students will need to analyze performance trade-offs of different algorithms/implementations.

Tentative* Schedule

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPIC(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/19</td>
<td>Introduction; Analysis Tools</td>
</tr>
<tr>
<td>1/26</td>
<td>Stacks, Queues, and Deques</td>
</tr>
<tr>
<td>2/2</td>
<td>List and Iterator ADTs</td>
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<tr>
<td>2/9</td>
<td>Trees</td>
</tr>
<tr>
<td>2/16</td>
<td>Heaps and Priority Queues</td>
</tr>
<tr>
<td>2/23</td>
<td>Maps</td>
</tr>
<tr>
<td>3/2</td>
<td>Hash Tables</td>
</tr>
<tr>
<td>3/9</td>
<td>Skip Lists</td>
</tr>
<tr>
<td>3/16</td>
<td>Spring Break</td>
</tr>
<tr>
<td>3/23</td>
<td>Binary Search, AVL and Splay Trees</td>
</tr>
<tr>
<td>3/30</td>
<td>(2,4) and Red-Black Trees</td>
</tr>
<tr>
<td>4/6</td>
<td>Merge-Sort and Quick-Sort</td>
</tr>
<tr>
<td>4/13</td>
<td>Studying Sorting</td>
</tr>
<tr>
<td>4/20</td>
<td>Graphs: Data structure, traversals</td>
</tr>
<tr>
<td>5/4</td>
<td>Graphs: Directed, Shortest Paths, MST</td>
</tr>
</tbody>
</table>

Important Dates

- Midterm Exam: March 5, 2015
- Final Exam: May 7, 2015, 12:30 – 2:30 PM
- Project Due: May 1, 2015

See the course website for details, reading, slides, assignments, etc.:

http://courses.cse.tamu.edu/jmichael/sp15/221/

* tentative means it can change...
Required Resources

**TEXTBOOK**


You may find a textbook on C++ from the previous semester or any good C++ reference book helpful as well.

**ICLICKER2**

ISBN 1429280476

You will be using an i-clicker2 daily in class. It will be used for quizzes and to foster class interaction during lecture.

You cannot use iclickergo.

You are responsible for bringing your remote daily. If you forget your i-clicker2 or if your batteries are dead, I will not collect hard copy information to replace i-clicker2 data.

You need to register your i-clicker2 or you will not receive any credit for information collected with the remotes. Follow the following link and use your UIN for the Student ID.

[https://www1.iclicker.com/register-clicker/](https://www1.iclicker.com/register-clicker/)

If you have lost or broken your i-clicker2 remote, you will have to replace it. Please email me with your new remote ID so that I can manually register your new remote.

**WEB**

Course Website: [http://courses.cse.tamu.edu/jmichael/sp15/221](http://courses.cse.tamu.edu/jmichael/sp15/221)

Piazza:

eCampus: Access via [https://howdy.tamu.edu/](https://howdy.tamu.edu/)
Grading

| EXAMS          | Midterm Exam (20%) – March 5, 2015, during lecture time |
|               | Final Exam (20%) – May 7, 2015, 12:30 – 2:30 PM |
|               | Exams will require 8½ by 11 inch Scantron forms from Measurement and Research Services; **you must purchase your own forms prior to each test!** Missed exams will be rescheduled only for excused absences. See **Attendance section**. Exams are closed book and closed notes. |
| 40%                | |

| QUIZZES | Quizzes will be done at the beginning of every class (~25). Sometimes additional quiz questions will be added at the end of class. Quizzes will cover material from assigned readings and information covered in lecture. Quizzes are closed book and closed notes. There will be no make-up quizzes. See **Make Up under Attendance section**. |
| 10%             | |

| HOMEWORK | Homework will be a combination of programming assignments (25%), labs(2%), and homework questions(10%). See the **course website** for details for each type. Lab attendance is extremely beneficial for completing assignments. Can be submitted late for a penalty. See **Late Work under Attendance section**. Submit to eCampus and provide a hard copy to your TA with the signed cover sheet at the next lab meeting. Must be typed. All code must be written in C++. |
| 37%                | |

| PROJECT | The project is an opportunity to tackle a more challenging programming assignment in small teams. Teams will be assigned by the instructor and teaching assistants. This will happen near the end of the semester. Details will be provided on the **course website**. Can be submitted late for a penalty. See **Late Work under Attendance section**. Submit to eCampus and provide a hard copy to your TA with the signed cover sheet within one day. Must be typed. |
| 8%                  | |

| CULTURE REPORT | Culture reports will broaden your exposure to computer science. You will attend a seminar and read a journal paper. The journal paper report is due March 13, 2015. The seminar report is due within 2 days of the seminar and no later than May 1, 2015, otherwise it will not be accepted. Submit each to eCampus and provide a hard copy to your instructor with the signed coversheet at the next lecture. More details for selecting an acceptable seminar and the report format can be found on the **course website**. Must be typed. Cannot be submitted late. |
| 4%                 | |

| PARTICIPATION | 1%+boost 1. **Piazza** will facilitate class interaction and help. To get the 1% you will need to make at least 4 posts (not anonymous). To receive credit, the post must explain something relevant to C++ and/or program design. A count of appropriate responses will be posted in eCampus so you will know your status. You cannot count more than 2 posts in a month. 2. At the end of the semester, I will use attendance and interaction data from your i<clicker2, lab attendance, interactions with me during office hours, piazza activity beyond the minimum, and completeness of graded work to potentially boost borderline grades to the next level. |
| 1%+boost |
Attendance & Make Up

Please review Texas A&M student rule 7: http://student-rules.tamu.edu/rule07

Attendance is expected. If you do miss class for any reason, it is your responsibility to find out what you missed. While assignment information will be posted online, it is a good idea to talk to classmates to see if additional information was discussed.

Attendance will not be taken for a grade, and you will not be penalized for excused absences. However, graded activities will be tied to your attendance. It will also indicate whether you utilized course resources such as the instructor and teaching assistants.

Make Up

- **Exams**: Missed exams will only be rescheduled for excused absences. Note that if advanced notice is not feasible, you have 2 business days provide me notification. See student rules. A zero will be assigned for exams due to an unexcused absence. Documentation must be submitted prior to taking a missed exam.

- **Quizzes**: There will be no make ups for quizzes, and a zero will be recorded for all missing quiz grades. However, to accommodate illness and other things that life can throw at you, I will drop at least 4 quiz grades. If you have more than 4 excused absences, we will address what to do. When exceeding the 4 automatic drops you must present documentation for all absences at that time (i.e. 4 for the automatic drops plus the additional ones that need to be addressed). Do not submit documentation before exceeding 4 excused absences for quizzes.

Late Work

Submission time is determined by the timestamp recorded for your submission on eCampus. Assignments that can be accepted late will receive a grading penalty. The number of minutes late the work is turned in (m) will be used to compute the penalty. Your overall grade for the assignment will be multiplied by $0.9998^m$. Note: Late work cannot be accepted once solutions are shared or discussed.

In eCampus, grades for assignments that can be submitted late will be recorded in three columns:

1. Your overall grade (without penalty)
2. The number of minutes late (zero if submitted on time)
3. Final grade used for grade calculation. This will be your overall grade times $0.9998^m$ where $m$ is the recorded number of minutes late. Note that $0.9998^0$ is 1, so on time submissions will get full credit.

Here is how turning in late work can affect your grade:

<table>
<thead>
<tr>
<th>Minutes Late</th>
<th>Max Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>99.9%</td>
</tr>
<tr>
<td>60</td>
<td>98.8%</td>
</tr>
<tr>
<td>1440 (1 day)</td>
<td>75%</td>
</tr>
<tr>
<td>4320 (3 days)</td>
<td>42.1%</td>
</tr>
</tbody>
</table>
Academic Integrity

“An aggie does not lie, cheat or steal, or tolerate those who do.”

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.

Aggie Honor System Office
You should be familiar with the Aggie Honor System Office. Their website provides more information on academic integrity, plagiarism, etc.
http://aggiehonor.tamu.edu/

- Definitions of academic misconduct, including plagiarism
  http://aggiehonor.tamu.edu/RulesAnd Procedures/HonorSystemRules.aspx#definitions
- Potential sanctions

Plagiarism
Individual programming MUST be done on your own. You must write assignments in your own words. Plagiarism will not be tolerated.

To help identify possible instances of plagiarism, we may use the Stanford Moss system. Students found to have engaged in plagiarism will be punished. A typical result is an F in the course and submission of the incident to the Aggie Honor System.

Walk the Line
Collaboration and team work are important for facilitating learning, and your peers can be a great resource. So you are encouraged to discuss problems and general approaches with each other (but not actual solutions). Regardless, unless stated otherwise, all assignments must be done on your own. The basic rule is that no student should explicitly share a solution with another student (and thereby circumvent the basic learning process), but it is okay to share general approaches, directions, and so on. If you have an issue that needs clarification, contact the instructor or TA.

Cover Sheet
Every assignment must be turned in with a cover sheet, available on the course website. The cover sheet lists all references that you used and a signed Aggie Honor Code. If you use any source, reference it/her/him. Sources can include a person, a book, a solution set, a web page, etc. For example if you chat with another student about an assignment, then document it, including classmates, e.g. “Sally pointed me to the relevant information for problem 5.”

Submit the cover sheet as a separate document on eCampus, e.g. don’t include it as the first page of your culture report document.