Syllabus

Catalog Description:
Introduces analysis of algorithms and basic data structures assuming basic programming knowledge. Topics include: collections, sorting, searching, graphs, strings, B-Trees, and analysis of algorithms.

Expected outcomes:
- Students understand and apply basic data structures.
- Students understand and apply methods for analysis of algorithms.
- Students understand, analyze, compare and apply sorting methods.
- Students understand, analyze, compare and apply searching methods.
- Students understand, analyze, compare and apply graphs methods.
- Students understand, analyze, compare and apply string processing methods.

Prerequisites:
IT502 or similar academic or industry experience with programming.
The course will require programming knowledge and the ability to write programs in a Java IDE. This knowledge will not be covered in class.

Sections
The course has two sections. See Blackboard for details about each of the sections, including your section instructor, graduate teaching assistant, office hours, lectures/online sessions, exam schedule and section specific requirements.

Instructors
Dr. Mihai Boicu, Ph.D.
Email: mboicu@gmu.edu (start email subject with INS – AIT 512-SSS, where SSS is the section to which you are enrolled)

Dr. Reza Hemayati, Ph.D.
Email: rhemayat@gmu.edu (start email subject with INS – AIT 512-SSS, where SSS is the section to which you are enrolled)
Course Coordinator

Dr. Mihai Boicu (Associate Professor)
Email: mboicu@gmu.edu (preferred communication method)
Email subject: CC-AIT512-sss (where sss is your sections, 001, DL1, ...)

Please contact the course coordinator only after you discussed the issue with your GTA and course instructor. In the email subject please include the course number and section.

The course coordinator will be contacted by the department or school for all the issues related to this course. Therefore, contacting first the course coordinator will determine a faster response.

Textbook


https://www.amazon.com/gp/product/0134384687/ref=as_li_tl?ie=UTF8&tag=algo4thedit-20&camp=1789&creative=9325&linkCode=as2&creativeASIN=0134384687&linkId=fe60947ead1e266980d655f386eea164

Additional readings, tutorials and online materials will be recommended during the course.

(the syllabus continues on the next page)
## Schedule (may be modified by the instructor)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Readings</th>
<th>Schedule</th>
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</thead>
<tbody>
<tr>
<td>Fundamentals</td>
<td>1. Basic Programming Model</td>
<td>Chapter 1</td>
<td>Week 1 Class Activities</td>
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<tr>
<td></td>
<td>2. Data Abstraction</td>
<td>Section 1.1</td>
<td>Weekly Assignment 1</td>
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<td>3. Bags, Queues, Stacks</td>
<td>Section 1.2</td>
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<td>4. Analysis of Algorithms</td>
<td>Section 1.3</td>
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<tr>
<td>Sorting</td>
<td>1. Elementary Sorts</td>
<td>Chapter 2</td>
<td>Week 2 Class Activities</td>
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<td>2. Merge sort</td>
<td>Section 2.1</td>
<td>Weekly Assignment 2</td>
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<td></td>
<td>3. Quick sort</td>
<td>Section 2.2</td>
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<td>Midterm 1</td>
<td>Chapter 1-2</td>
<td>Week 6 Exam 1</td>
</tr>
<tr>
<td>Searching</td>
<td>3.1 Symbol Tables</td>
<td>Section 3.1</td>
<td>Week 6 Class Activities</td>
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<td>3.2 Binary Search Trees</td>
<td>Section 3.2</td>
<td>Weekly Assignment 6</td>
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<td>3.3 Balanced Search Trees</td>
<td>Section 3.3</td>
<td>Week 8 Class Activities</td>
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<td>Weekly Assignment 8</td>
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<tr>
<td>Graphs</td>
<td>1. Undirected Graphs</td>
<td>Chapter 4</td>
<td>Week 9 Class Activities</td>
</tr>
<tr>
<td></td>
<td>2. Directed Graphs</td>
<td>Section 4.1</td>
<td>Weekly Assignment 9</td>
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<td>3. Minimum Spanning Trees</td>
<td>Section 4.2</td>
<td>Week 10 Class Activities</td>
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<td></td>
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<td>Section 4.3</td>
<td>Weekly Assignment 10</td>
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<td></td>
<td>Midterm 2</td>
<td>Chapter 3-4</td>
<td>Week 12 Exam 2</td>
</tr>
<tr>
<td>Strings</td>
<td>1. String Sorts</td>
<td>Chapter 5</td>
<td>Week 12</td>
</tr>
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<td>2. Tries</td>
<td>Section 5.1</td>
<td>Weekly Assignment 12</td>
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<td>Section 5.2</td>
<td>Week 13</td>
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<td>3. Hash Tables</td>
<td>Section 3.4</td>
<td>Week 14 Class Activities</td>
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<td>Weekly Assignment 14</td>
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<tr>
<td>Final exam</td>
<td>Cumulative exam</td>
<td>Chapter 1-5</td>
<td>Week 15 (Final exam based on the university schedule)</td>
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</table>

**Note:** The schedule may be changed during the semester to accommodate specific class needs. All changes will be posted on the Blackboard and communicated by email.
Grading:

The students will be assigned a grade based on the following types of assignments:

- Weekly Assignments (70% required = 5%*14)
- Midterms exams (2 * 5% = 10%)
- Final exam (10%)
- Research Project (10%)
- Additional bonus points might be provided during class for participation, extra assignments, extracurriculum activities, enrichment activities at the discretion of the instructor, but not to exceed 3% per student

The grading scale for this course is:

<table>
<thead>
<tr>
<th>Numeric Grade</th>
<th>Letter Grade</th>
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<tbody>
<tr>
<td>97 – 100%</td>
<td>A+</td>
</tr>
<tr>
<td>93 – 96%</td>
<td>A</td>
</tr>
<tr>
<td>90 – 92%</td>
<td>A-</td>
</tr>
<tr>
<td>87 – 89%</td>
<td>B+</td>
</tr>
<tr>
<td>83 – 86%</td>
<td>B</td>
</tr>
<tr>
<td>80 – 82%</td>
<td>B-</td>
</tr>
<tr>
<td>70 – 79%</td>
<td>C</td>
</tr>
<tr>
<td>0 – 69%</td>
<td>F</td>
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</tbody>
</table>

Late Policy

For full grade, students must submit all the work based on the due dates published on Blackboard. There are two exceptions to this rule.

**Non-academic exception:** The student must provide a documented case for a non-academic exception (e.g. doctor notice if an illness prevented the student to perform the course assignments). Contact information for any third party must be provided and written approval for the instructor to contact the third party for confirmation. A new due date must be requested by the student. If the exception is approved by the instructor, the student may submit the work with no penalty.

**Late submission penalty:** For all submissions there is one day grace period, followed by a 10% of assignment points penalty each day (full or partial). For instance, a 4-point assignment submitted 2 days and 4 hours late that obtained 3 points will have an additional 0.8 penalty (one day grace period for first day, 0.4 penalty for the second day and 0.4 penalty for the partial third day). Therefore the grade for the assignment is 2.2 points.
Hardware and Software requirements

For all sections you must have a personal computer with internet connection. It is strongly recommended that you have a powerful enough laptop on which you can perform code development that you can bring to class.

For the online section you must have a personal computer with internet connection, with speakers and microphone.

We require either a Mac OS X or Windows 10 computer.

Exams (during COVID)

There are three main exams (two midterms and final). The exams must be taken at the schedule date. Exceptions must be well documented and approved based on MASON exams guidelines.

The exams must be taken during online session at the scheduled date. The student must have 2 devices.

- A computer prepared for a Blackboard Respondus with monitor exam (you must have microphone and video camera connected to the computer)
- A ZOOM connection (may be on a mobile device – phone, iPad or on another computer)

The exam must be taken in a quiet, isolated room. The ZOOM device must point from a short distance to the workplace showing, the computer monitor, student hands and face.

A pool of students may be selected for an oral examination based on the exam. The students in the pool will be selected on 2 criteria. (i) 3 students randomly (ii) around 7 based on the analysis of the monitor video and ZOOM connection. The students who are not able to explain correct solutions provided in the exam will have the grade for the exam changed to 0 and may be referred to the honor committee.

Hardware and Software requirements

For all sections you must have a personal computer with internet connection. It is strongly recommended that you have a powerful enough laptop on which you can perform code development that you can bring to class.

For the online section you must have a personal computer with internet connection, with video camera, speakers and microphone. Also you must have a mobile device with ZOOM installed, and having a video camera and microphone.

We require either a Mac OS X or Windows 10 computer.

Course Delivery Methods

The course will be delivered using various methods. You must have your MASON email account activated and you must check your email daily for announcements related to the course. You must have access to Blackboard Learning System and to know how to use its features.
There are video presentations posted on the Blackboard. You must have an environment in which you can watch these videos.

You will have several assignments and assessments to be performed each week. A summary of weekly requirements will be sent at the beginning of the week.

**COURSE CANCELED (SNOW DAYS)**

If the courses are canceled the first option is to have a synchronous meeting online during the same times. If you cannot be online the course will be recorded and posted on the course Blackboard site.

**Intellectual Property**

There is a strong recommendation that all work in the class projects to be done based on an open source license (e.g. Academic Free License [http://en.wikipedia.org/wiki/Academic_Free_License](http://en.wikipedia.org/wiki/Academic_Free_License)). This will allow a rich, shared exchange of ideas and will allow each member of the class to further benefit with no restriction from the work performed in the class.

**Privacy**

Instructors respect and protect the privacy of information related to individual students. Specific issues relating to an individual student will be discussed via email, telephone or in person. Instructors will not discuss issues relating to an individual student with other students (or anyone without a need to know) without prior permission of the student. There is no guarantee related to the security of email and telephone conversations.

Assessable work other than final exams will be returned to individual students directly by the Instructor (or by a faculty or staff member or a Teaching Assistant designated by the Instructor, or via another secure method). Under no circumstances will a student's graded work be returned to another student.

Faculty and staff will take care to protect the privacy of each student's scores and grades.

Because of the nature of this class, some work performed by the student will be published and discussed in the class. Other students will be able to make comments and suggestions related to the published work, without seeing the actual grade the student earned for the work.

**Disability Accommodations**

The Office of Disability Services (ODS) works with disabled students to arrange for appropriate accommodations to ensure equal access to university services. Any student with a disability of any kind is strongly encouraged to register with ODS as soon as possible and take advantage of the services offered.

Accommodations for disabled students **must** be made in advance – ODS cannot assist students retroactively, and at least one week's notice is required for special accommodations related to exams.
Any student who needs accommodation should contact the Instructor during the first week of the semester so the sufficient time is allowed to make arrangements.

**Honor Code**

All members of the Mason community are expected to uphold the principles of scholarly ethics. Similarly, graduating students are bound by the ethical requirements of the professional communities they join. The ethics requirements for some of the communities relevant to Applied IT graduates are available via the following links:

- ACM Code of Ethics and Professional Conduct
- IEEE Code of Ethics
- EC-Council Code of Ethics

On admission to Mason, students agree to comply with the requirements of the Mason Honor System and Code\(^1\). The Honor Code will be strictly enforced in this course. Honor Code cases are heard by a panel consisting of students – students who meet the requirements are encouraged to nominate themselves to serve on the Honor Committee.

Any use of the words or ideas of another person(s), without explicit attribution that clearly identifies the material used and its source in an appropriate manner, is plagiarism and will not be tolerated. There is a "zero tolerance" policy for plagiarism within The Volgenau School. The Instructor reserves the right to use manual and/or automated means (including such services as Turnitin.com) to detect plagiarism in any work submitted by students for this course, and to direct Teaching Assistants and/or other faculty and/or staff members to do likewise in support of this course.

For this course, the following requirements are specified:

- All assessable work is to be prepared by the individual student, unless the Instructor explicitly directs otherwise.

- All work must be newly created by the individual student for this course for this semester. Any usage of work developed for another course, or for this course in a prior semester, is strictly prohibited without prior approval from the instructor.

- For team work a summary at the end of the submission must identify mutually agreed individual contributions.

Students may seek assistance with assigned work (and are encouraged to do so if they feel the need), provided:

- The directions for the assigned work do not prohibit such assistance.

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\(^1\) Available at [http://catalog.gmu.edu/](http://catalog.gmu.edu/) and related Mason Web pages.
Such assistance is acknowledged in the submitted work, clearly identifying the person(s) giving assistance and the nature of the assistance given.

Any work to be submitted is prepared entirely an exclusively by the student submitting it. Students are expressly prohibited from sharing any assessable work for this course in any manner with other students (except students assigned as Teaching Assistants or Undergraduate Peer Mentors to this course and the student's section), unless all students involved have had their work graded and returned by the Instructor, or the Instructor has explicitly approved such sharing.