CMSC 451 6380 Design and Analysis of Computer Algorithms (2148)

CMSC-451

Fall 2014 Section 6380 3 Credits 08/18/2014 to 10/12/2014

Faculty Contact

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Course Description

Prerequisites: CMSC 150 and CMSC 350 (or 230). A presentation of fundamental techniques for designing and analyzing computer algorithms. The aim is to apply Big-O estimates of algorithms and proof-of-correctness techniques and to design algorithms. Basic methods include divide-and-conquer techniques, search and traversal techniques, dynamic programming, greedy methods, and induction. Programming projects are included.

Course Introduction

Different algorithms can often be written to perform the same task. In such cases, some criteria should be used to select one of the competing methods. Usually, the important criteria are space (i.e., memory) requirements and time requirements. Time requirements can be estimated based on a worst-case or an average-case basis.

In this course, we will focus on the analysis of important algorithms used in a wide variety of applications (including sorting, searching, string matching, and graph-theoretic algorithms). There are classes of algorithms for which it is likely that no efficient algorithms exist. In dealing with such problems, it is useful to know in advance that no efficient algorithms exist. We will introduce the theory (NP-completeness) behind these algorithms. We will also include programming projects to empirically compare algorithm performance.

Course Outcomes

After completing this course, you should be able to

- apply Big-O estimates of algorithms, using techniques such as activation trees, recurrence relations, the Little Master Theorem, and summations
- design algorithms, using techniques such as brute force, divide and conquer, and greedy
- compare algorithms experimentally to select the most efficient implementations
- categorize the NP-completeness of problems to determine their fundamental complexity
- apply proof-of-correctness techniques to verify correctness of algorithms

Course Materials

Click to access your course materials information (http://webapps.umuc.edu/UgcmBook/BPage.cfm?C=CMSC%20451&S=6380&Sem=2148)

Grading Information

This course consists of the following graded items:

Online discussions (weekly)	15%
Homework (6 @5%)	30%
Project 1	25%
Project 2	30%
Total	**100%**

The grading scale, based on 100 points, is as follows:

A	90-100
B	80–89
C	70–79
D	60–69
F	0–59

Definition of Academic Rigor

UMUC defines academic rigor as the degree to which students demonstrate content mastery, application of critical thinking skills and adherence to UMUC's code of academic integrity.

This definition implies three components to academic rigor:

1. Content mastery to include the subject matter of the course as well as mastery of those core curriculum goals established for the course (for example, information literacy, effective writing).
2. Application of critical thinking skills to include the degree to which the student can present and defend original thinking on the subject matter, including synthesis and analysis of key concepts.
3. Academic integrity to include the degree to which student demonstrates academic honesty defined in UMUC's code of academic integrity.

Grade Descriptions

Grade	Description
A	Outstanding - Performance excels far above established standards for university-level performance
B	Superior - Performance above established standards
C	Good - Performance meets established standards
D	Substandard - Performance is below established standards

F	Failure - Performance does not meet minimum requirements

Participation

By registering for a Web-based course, you have made a commitment to participate in course conferences as well as other online activities. Participation for this course is defined as proactive discussion in weekly discussion activities. This requires you to actively reflect on weekly readings and to develop original ideas in your responses. You are expected to demonstrate critical thinking and your understanding of the content in the assigned readings as they relate to the issues identified in the conference discussion.

You are expected to respond to the main discussion topic(s) each week and read and respond to other student posts to contribute additional knowledge to the class. Note that your online conference participation counts significantly toward your final grade. Interacting and responding to discussion items earlier in the week as opposed to the end of the week is encouraged and rewarded.

When communicating with others in this class always work to be respectful.

The rubric used to grade your online discussion contributions is shown below:

Criteria	Exceeds (5 points)	Meets (3-4 points)	Does not Meet (0-2 points)
Completeness of Submission	Responses thoroughly addressed all parts of the discussion question adding depth to the overall conversation. Responses were clear and of the highest quality demonstrating mastery of writing. References were properly cited.	Responses addressed some of the question but additional clarification and details would have strengthened the discussion. Responses were well organized with rare spelling or grammar distractions. References were properly cited.	No responses or responses were incorrect, or missing significant details. No responses or responses were poorly written, disorganized with many spelling and grammatical errors.
Submitted on time	Initial responses submitted at least 3 days before the due date.	Initial responses submitted on or within 2 days before the due date.	No responses or responses submitted after the due date.
Interaction with Others	Responded to student posts providing additional contributions clearly supporting learning and successful accomplishment of assignments and classroom activities.	Responded to student posts providing additional contributions.	No responses to other students or responses to other students do not provide additional insight and are not substantive.

Late Assignments

Late assignments will only be accepted for valid and verifiable reasons and only if a request was made to the instructor at least one full day before the due date of the assignment. If accepted, late penalties of 15% per day may be applied.

Extra Credit

There are no extra credit opportunities for the class.

Project Descriptions

Descriptions and details for all homework and projects are listed in the assignments area found in the Navigation bar under assignments and in the content area.

Academic Policies

Academic Policies and Guidelines

ACADEMIC INTEGRITY

As a member of the University of Maryland University College (UMUC) academic community that honors integrity and respect for others you are expected to maintain a high level of personal integrity in your academic work at all times. Your work should be original and must not be reused in other courses.

CLASSROOM CIVILITY

Students are expected to work together cooperatively, and treat fellow students and faculty with respect, showing professionalism and courtesy in all interactions. Please review the Code of Civility for more guidance on interacting in UMUC classrooms: http://www.umuc.edu/students/support/studentlife/conduct/code.cfm (http://www.umuc.edu/students/support/studentlife/conduct/code.cfm).

POLICIES AND PROCEDURES

UMUC is committed to ensuring that all individuals are treated equally according to Policy 040.30 Affirmative Action, Equal Opportunity, and Sexual Harassment.

Students with disabilities who need accommodations in a course are encouraged to contact the Office of Accessibility Services (OAS) at accessibilityservices@umuc.edu, or call 800-888-UMUC (8682) or 240-684-2287 (tel:240-684-2287).

The following academic policies and procedures apply to this course and your studies at UMUC.

150.25	Academic Dishonesty and Plagiarism – UMUC defines academic dishonesty as the failure to maintain academic integrity. All charges of academic dishonesty will be brought in accordance with this Policy. ***Note:*** Your instructor may use **Turnitin.com**, an educational tool that helps identify and prevent plagiarism from Internet resources, by requiring you to submit assignments electronically. To learn more about the tool and options regarding the storage of your assignment in the Turnitin database go to: http://www.umuc.edu/library/libresources/turnitin.cfm.
170.40 170.41 170.42	The following policies describe the requirements for the award of each degree: Degree Completion Requirements for the Graduate School Degree Completion Requirements for a Bachelor's Degree Degree Completion Requirements for an Associate's Degree
170.71	Policy on Grade of Incomplete - The grade of I is exceptional and only considered for students who have completed 60% of their coursework with a grade of B or better for graduate courses or C or better for undergraduate courses and request an I before the end of the term.
170.72	Course Withdrawal Policy - Students must follow drop and withdrawal procedures and deadlines available at http://www.umuc.edu/ under Academic Calendar.
130.80	Procedures for Review of Alleged Arbitrary and Capricious Grading– appeals may be made on final course grades as described herein.
205.06	Calculation Of Grade-Point Average (GPA) for Inclusion on Transcripts and Transcript Requests– Note: Undergraduate and Graduate Schools have different Grading Policies (i.e. The Graduate School does not award the grade of D). See Course Syllabus for Grading Policies.

COURSE EVALUATION SURVEY

UMUC values its students' feedback. You will be asked to complete an online evaluation toward the end of the term. The primary purpose of this evaluation process is to assess the effectiveness of classroom instruction in order to provide the best learning experience possible and make continuous improvements to every class. Responses are kept confidential. Please take full advantage of this opportunity to provide your feedback.

LIBRARY SUPPORT

Extensive library resources and services are available online, 24 hours a day, seven days a week at http://www.umuc.edu/library/index.cfm to support you in your studies. The UMUC Library provides research assistance in creating search strategies, selecting relevant databases, and evaluating and citing resources in a variety of formats via its Ask a Librarian service at https://www.umuc.edu/library/libask/index.cfm, which includes 24/7 chat and e-mail.

LEARNING MANAGEMENT SYSTEM SUPPORT

To successfully navigate the online classroom new students are encouraged to view the Classroom Walkthrough under Help in the upper right menu of the LEO classroom. Those requiring technical assistance can access Help@UMUC Support directly in LEO under the Help menu. Additional technical support is available 24 hours a day, seven days a week via self-help and live chat at http://www.umuc.edu/help or by phone toll-free at 888-360-UMUC (8682).

SYLLABUS CHANGES

All items on this syllabus are subject to change at the discretion of the Instructor and the Office of Academic Affairs.

Class & Assignment Schedule

SESSION	TOPICS	ASSIGNMENTS
Week 1 8/12-8/24	• Introductions • Getting Started • The Role of Algorithms	• Week 1 discussions • Homework 1
Week 2 8/25-8/31	• Growth of Functions • Divide and Conquer	• Week 2 discussions • Homework 2
Week 3 9/1-9/7	• Heap Sort • Quick Sort	• Week 3 discussions • Homework 3
Week 4 9/8-9/14	• Dynamic Programming	• Week 4 discussions • Project 1
Week 5 9/15-9/21	• Graph Algorithms	• Week 5 discussions • Homework 4
Week 6 9/22-9/28	• Minimum Spanning Trees • Single Source Shortest Paths	• Week 6 discussions • Homework 5
Week 7 9/29-10/5	• All Pairs Shortest Paths	• Week 7 discussions • Homework 6

Week 8 10/6-10/12	• NP-Completeness • Project 2	• Week 8 discussions • Project 2

Students can access their complete list of assignments and their corresponding due dates within the **Assignments** section of the classroom by navigating to the **Assignments** section of the class from the main navigation bar. Follow the link below, and then click **Assignments**, for a video demonstration on how to utilize this feature.

Classroom Walkthrough Videos Link

Students also have access to a calendar tool on the course homepage within the classroom.