Course Name: Advanced Algorithm Design and Complexity

Course Number: CIS 522

Semester: Fall 2019 [Sept. 3, 2019 – Nov. 18th, 2018]

Mode: Online

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Dr. Shelley Zhang</th>
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<tbody>
<tr>
<td>Email:</td>
<td><a href="mailto:shelley.zhang@umassd.edu">shelley.zhang@umassd.edu</a></td>
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<td>Phone:</td>
<td>508-999-8294</td>
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Course Description

Course Description: Advanced topics in the design of efficient algorithms and the evaluation of algorithms with regard to their time and space complexity.

Prerequisite: CIS 360 Algorithms and Data Structures or equivalent, or permission of instructor

Course Credits: 3


Required Proctored Final Exam: For remote students, final exam (Sat. Nov 16, 2019) will be proctored virtually using a Remote Proctor service. This software will record your Exam session using a webcam and microphone. The cost is about $40/exam. On-campus students must attend an in-classroom exam on the same date.

Course Objectives

- Analyze and compare complex algorithms in terms of both time and space complexity.
- Build clear algorithmic formulations of complex problems in different areas of computing.
- Apply algorithm design techniques to design and develop efficient algorithmic solutions.
- Evaluate alternative approaches to problem-solving and make proper choice to achieve desired outcomes.

Communication Plan

Expectations for electronic communication within this course: We will communicate through discussions and assignment feedback throughout the course.

- Questions related to course content should be posted to the Ask Questions Here Discussion Forum. The instructor reviews the discussion board twice a week.
- Questions related to personal issues (i.e. need extra time for assignment) should be emailed to instructor. The instructor responds email message within 48 business hours [Mon-Fri, 9:00 a.m.-5:00 p.m. EST].
- You may also email the instructor to schedule a consultation appointment by phone or other remote communication methods.
- For technical assistance (i.e. how to use MyCourse, assess problem), email myCoursesHelp@umassd.edu or call 508-999-8505 during normal business hours.
- During off-hours, weekends, and holidays, technical assistance is available for students at http://umd.echelp.org/.
Time Considerations

Students should be prepared to spend a minimum of 9 hours a week on reading and on course assignments.

The Online Weekly Schedule Electronic weeks begin on Monday and end on Sunday.

Day 1 - Monday
Day 2 – Tuesday (Due date of the assignment of the previous week)
Day 3 – Wednesday
Day 4 - Thursday
Day 5 – Friday
Day 6 - Saturday
Day 7 – Sunday

Evaluation and Grading Breakdown

- 10% Participation (answer questions, discussions)
- 50% Assignments
- 40% Exams

Late Assignments

Complete all assignments on time. Assignment of the week is due by the following Tuesday unless otherwise specified. When extension is needed, please ask permission prior to due date with specific reasons.

Incomplete Policy

According to the university catalogue, an incomplete may be given only in exceptional circumstances at the instructor’s discretion. The student must be passing at the time of the request or be sufficiently close to passing. If the work is not completed within one year of the recording of the incomplete grade, the grade will become an F(I). The incomplete policy for this course is that at least 70% of the course must be already completed and an exceptional circumstance (i.e. medical issue) must exist. If you feel you require an incomplete for an exceptional reason, you need to email me and state your reasons for the incomplete in writing. We will then decide on a course of action. http://www.umassd.edu/nfi/teachingandadvising/coursesyllabus/sampleincompletestatement/

Student Academic Integrity Policy

You must individually design and write your own solutions / code except team assignments. Furthermore, you should explicitly acknowledge any sources of ideas used that are not your own; this includes books, web pages, etc. Utilizing (read, copy or modify) existing problem solutions and “Sharing” of solutions are strictly prohibited. Submitting modified versions of other people’s work as your own is considered plagiarism. SafeAssign plagiarism detection software will be used to check your submitted work. Academic dishonesty will be “rewarded” with a grade of “F”. *For additional information on violations, infractions, and consequences visit the UMass Dartmouth Student Academic Integrity Policy at the link below.*

http://www.umassd.edu/policies/activepolicylist/academicaffairs/academicintegritypolicyandreportingform/

Center for Access and Success

In accordance with University policy, if you have a documented disability and require accommodations to obtain equal access in this course, please meet with the instructor at the beginning of the semester and provide the
appropriate paperwork from the Center for Access and Success, which is located in Pine Dale Hall, Room 7136; phone: 508.999.8711. http://www.umassd.edu/dss/

**Resources**

Links to all student resources can be found at: http://www.umassd.edu/extension/studentresources/

**Tutoring** If you are having difficulty with the class please:

- Post a message on the Discussion Board – be sure to use your classmates for troubleshooting and problem solving.
- Email the instructor or make an appointment for a meeting (by phone or online).

**Technical Help** If you are in need of technical assistance, please visit the link below for a list of technical support resources. http://www.umassd.edu/extension/technicalresources/

**Schedule**

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<th>Week/Date Beginning</th>
<th>Unit of Instruction Topic</th>
<th>Responsibilities</th>
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<tr>
<td>Week 1 9/3</td>
<td>Algorithm Analysis</td>
<td>Reading: K&amp;T Sections 1.1, 2.1-2.4, and solved exercises&lt;br&gt;<strong>Evaluation:</strong> Week 1 Homework</td>
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<tr>
<td>Week 2 9/9</td>
<td>Graphs</td>
<td>Reading: K&amp;T Sections 3.1-3.6 and solved exercises&lt;br&gt;<strong>Evaluation:</strong> Week 2 Homework</td>
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<td>Week 3 9/16</td>
<td>Greedy Algorithms</td>
<td>Reading: K&amp;T Sections 4.1, 4.2, 4.4, 4.5 and solved exercises&lt;br&gt;<strong>Evaluation:</strong> Week 3 Homework</td>
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<td>Week of 4 9/23</td>
<td>Divide and Conquer</td>
<td>Reading: K&amp;T Sections 5.1, 5.3, 5.4, 5.5 and solved exercises&lt;br&gt;<strong>Evaluation:</strong> Week 4 Homework</td>
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<td>Week 5 9/30</td>
<td>Dynamic Programming</td>
<td>Reading: K&amp;T Sections 6.1, 6.2, 6.4, 6.6, 6.7, 6.8, and solved exercises&lt;br&gt;<strong>Evaluation:</strong> Week 5 Homework</td>
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<td>Week 6 10/7</td>
<td>Network Flow and Applications</td>
<td>Reading: K&amp;T Sections 7.1 - 7.3, 7.5 – 7.7&lt;br&gt;<strong>Evaluation:</strong> Week 6 Homework</td>
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<td>Week 7 10/14</td>
<td>Network Flow Applications Continue;</td>
<td>Reading: K&amp;T Sections 7.8, 7.10-7.11 and solved exercises&lt;br&gt;<strong>Evaluation:</strong> Week 7 Homework</td>
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<td>Week 8 10/21</td>
<td>NP Completeness and Intractability</td>
<td>Reading: K&amp;T Sections 8.1-8.4 and solved exercises&lt;br&gt;<strong>Evaluation:</strong> Week 8 Homework</td>
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<td>Week 9 10/28</td>
<td>Extending the Limits of Tractability</td>
<td>Reading: K&amp;T Sections 10.1-10.3 and solved exercises&lt;br&gt;<strong>Evaluation:</strong> Week 9 Homework</td>
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<td>Week 10 11/4</td>
<td>Approximation Algorithm</td>
<td>Reading: K&amp;T Sections 11.1, 11.4 and 11.8 and solved Exercises on pages 649-651 after Chapter 11 in <em>Algorithm Design</em> by Kleinberg and Tardos.&lt;br&gt;<strong>Evaluation:</strong> Week 10 Homework</td>
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<td>Week 11 11/11</td>
<td>Review and Final Exam</td>
<td><strong>Final Exam</strong> Saturday, Nov 16, 2019</td>
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