CS 638/738 Advanced Computer Algorithms
Spring 2018
Time: 06:30 PM-09:15 PM T
Location: FEC 303, Scianna Hall 2009 (via IVN), Credit: 3 units

Contacting Your Instructor(s)
Instructor: Dr. Bo Li
Office: Science Building, Room 105D
Office hours:
   Mondays: 10:30-12:00 AM, 2:30-4:30 PM, Tuesdays: 10:30-12:00 AM, 2:30-5:30 PM,
   Wednesdays: 2:30-4:30 PM, or by appointment
Email: bo.li@usm.edu
Phone: 228-214-3306

Course coordinator: Mr. Tom Rishel
Email: Tom.rishel@usm.edu

Catalog Description
CSC 638 - 3 hrs. Prerequisite: CSC 413. Study of recent advances in algorithm design and analysis.

CSC 738 - 3 hrs. Prerequisites: Knowledge of sequential algorithm design and analysis, NP-completeness, proficiency in high level language programming including pointer manipulation. Topics include models of parallel computation, general techniques, graph algorithms, expression evaluation, parallel sorting, parallel string matching, and P-completeness.

Course Description and Objectives
Course Description
This course is designed for graduate students in computer science and is intended to introduce them to the standard techniques used in analyzing algorithms. Examples from a variety of computer science sub-disciplines will be presented. The relationships between these sub-disciplines will be shown through the study of NP-completeness.

Textbook

Topics:
A. Foundations
   1. The Role of Algorithms in Computing (ch1)
   2. Getting Started (ch2)
   3. Growth of Functions (ch3)
4. Divide-and-Conquer (ch4)

B. Sorting and Search
5. Heapsort (ch6)
6. Binary Search Trees (ch12)
7. B-Trees (ch18)

C. Advanced Design and Analysis Techniques
8. Dynamic Programming (ch15)
9. Greedy Algorithms (ch16)

E. Graph Algorithms
10. Minimum Spanning Trees (ch23)
11. Single-Source Shortest Paths (ch24)

F. Optional (according to course progress)
11. NP-Completeness (ch34)
12. String Matching (ch32)
13. Computational Geometry (ch33)

Course Outcomes
Upon completion of this course the student should be able to:

- Analyze algorithms with respect to both their time complexity and space complexity
- Compare algorithms using established analysis techniques
- Determine an appropriate strategy for utilizing an algorithm, given both time and monetary constraints
- Understand the notions of class P and class NP problems

Course Workload Statement
Students are expected to invest considerable time outside of class in learning the material for this course. The expectation of the University of Southern Mississippi is that each week students should spend approximately 2-3 hours outside of class for every hour in class working on reading, assignments, studying, and other work for the course. We realize that most students work and have family or other obligations. Time management is thus critical for student success. All students should assess their personal circumstances and talk with their advisors about the appropriate number of credit hours to take each term. Resources for academic support can be found at https://www.usm.edu/success.

Grading Policies and Calculation
A list of possible grades at the University can be found in the Bulletin (http://catalog.usm.edu). Note that students will receive an “interim grade” at the six-week point to give them an indication of their performance at that point in the semester.
Students may drop a course with no penalty in the first week of the semester. If students wish to leave a course with a grade of “W” (for “withdrawal”), they may request to do so before the 50th day (specific dates can be found here: https://www.usm.edu/registrar/calendars).

Important note: Students who receive a grade of W do not receive any money back and that grade is permanently included on their transcripts.

Students should be aware that “Incompletes” can only be assigned in cases of “extraordinary circumstances” beyond the student’s control.

<table>
<thead>
<tr>
<th>Items</th>
<th>Percentage</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Attendance</td>
<td>5% (extra credits)</td>
<td>Every class</td>
</tr>
<tr>
<td>Assignments</td>
<td>25%</td>
<td>Five times, each one due within one week</td>
</tr>
<tr>
<td>Midterm</td>
<td>25%</td>
<td>March 6, 6:30 PM-9:15 PM</td>
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<tr>
<td>Course project</td>
<td>25%</td>
<td>May 1 (additional requirements for CSC 738)</td>
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<tr>
<td>Final</td>
<td>25%</td>
<td>May 1, 6:30 PM-9:15 PM</td>
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<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A grade</td>
<td>&gt;= 90%</td>
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<tr>
<td>B grade</td>
<td>80%-89%</td>
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<tr>
<td>C grade</td>
<td>70%-79%</td>
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<tr>
<td>D grade</td>
<td>60-69%</td>
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<tr>
<td>F grade</td>
<td>&lt; 60%</td>
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**Academic Integrity Statement**

All students at the University of Southern Mississippi are expected to demonstrate the highest levels of academic integrity in all that they do. Forms of academic dishonesty include (but are not limited to):

- Cheating (including copying from others’ work)
- Plagiarism (representing another person’s words or ideas as your own; failure to properly cite the source of your information, argument, or concepts)
- Falsification of documents
- Disclosure of test or other assignment content to another student
- Submission of the same paper or other assignment to more than one class without the explicit approval of all faculty members involved
- Unauthorized academic collaboration with others
- Conspiracy to engage in academic misconduct

Engaging in any of these behaviors or supporting others who do so will result in academic penalties and/or other sanctions. If a faculty member determines that a student has violated our Academic Integrity Policy, sanctions ranging from resubmission of work to course failure may occur, including the possibility of receiving a grade of “XF” for the course, which will be on the student’s transcript with the notation “Failure due to academic misconduct.” For more details, please see the University’s Academic Integrity Policy: https://www.usm.edu/institutional-policies/policy-acaf-pro-012
Note that repeated acts of academic misconduct will lead to expulsion from the University.

**Academic Support Resources**

Please see our Student Success Website: [http://www.usm.edu/success](http://www.usm.edu/success) for information on where you can find tutoring and other academic assistance, as well as the location of key resources on campus.

If a student has a disability that qualifies under the Americans with Disabilities Act (ADA) and requires accommodations, he/she should contact the Office for Disability Accommodations (ODA) for information on appropriate policies and procedures. Disabilities covered by ADA may include learning, psychiatric, physical disabilities, or chronic health disorders. Students can contact ODA if they are not certain whether a medical condition/disability qualifies.

**Address:**
The University of Southern Mississippi  
Office for Disability Accommodations  
118 College Drive # 8586  
Hattiesburg, MS 39406-0001  
Gulf Coast: 228-214-3232  
Voice Telephone: 601.266.5024 or 228.214.3232  
Fax: 601.266.6035  
Individuals with hearing impairments can contact ODA using the Mississippi Relay Service at 1.800.582.2233 (TTY) or email ODA at oda@usm.edu.

**Important Class Policies**

**Class Attendance**

Attendance will be taken every class period. Students who are excessively absent (30% of all the lectures, not including exams) and/or tardy will be assigned a grade of NA (Not Attending) according to the University’s Class Attendance Policy. Coming to class unduly late and leaving class unduly early is treated the same as being absent.

**Plagiarism**

**Plagiarism or cheating of any type will not be tolerated.** This includes, but is not limited to, copying programs, projects, assignments, abstracts, documentation, wandering eyes/copying on tests, turning in previously submitted term papers or projects (in whole or part), using other person’s USM computer accounts to do projects, programs, etc., getting other people to do your assignments, etc. Copying from the internet of any type is not allowed.

**Missing Exams**

If you should miss an exam, you must let me know why you will be missing the exam before the exam is administered to the class (at least a couple of days before). You may send me an e-mail, or come by my office to explain why you will be missing the exam. If the excuse is reasonable, (I am the sole judge of reasonability) I will allow you to retake
the exam. Please be aware that I am not responsible for lost e-mail. It is your responsibility to make sure that I know you are missing the exam.

**Once I agree upon your excuse, please furnish me with a confirmation of your reason(s) for missing the exam.** This confirmation must be in my hands by a maximum of 5 days after the exam is administered.

**Tardiness for Tests**
It is your responsibility to make it to class on time for all scheduled examinations. If you are late for an examination, you will be allowed only the remainder of the scheduled period to complete the examination.

**Cell Phones/Beepers/Pagers/etc.**
Please make sure you switch off all cell phones/beepers/pagers while you are in class. I may ask you to leave the class under such circumstances.

**Turning in Work**
Pop up quizzes **cannot** be made up. Assignments not turned on time will not receive full credit. All assignments as well as the course project will be submitted via **Canvas**, due on 11:59 PM of the submission day.

**Test Regrading Policy**
I will be glad to review any test for possible grading errors. Any requests for regrading of tests must be made within one calendar week upon the return of the test to the class, regardless of when you received your test back. If you submit your test for regrading, **I reserve the right to regrade your entire test.**

**More Than 2 Finals on the Same Day**
If you have two or more final examinations scheduled for the same day and you wish to reschedule my examination, please inform me.

**E-mail Addresses**
I may contact you during the whole semester and will use the email address provided on SOAR.

**Mental Well-Being Statement**
USM recognizes that students sometimes experience challenges that make learning difficult. If you find that life stressors such as anxiety, depression, relationship problems, difficulty concentrating, alcohol/drug problems, or other stressful experiences are interfering with your academic or personal success, consider contacting Student Counseling Services on campus at 601-266-4829. More information is also available at [https://www.usm.edu/student-counseling-services](https://www.usm.edu/student-counseling-services). All students are eligible for free, confidential individual or group counseling services. **In the event of emergency, please call 911 or contact the counselor on call at 601-606-HELP (4357).**
# Tentative schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings and assignments</th>
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<tbody>
<tr>
<td>January 23</td>
<td>CSC 638/738 Course Syllabus</td>
<td><strong>Reading:</strong> Syllabus</td>
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<tr>
<td></td>
<td>Ch. 1 Role of Algorithms</td>
<td><strong>Reading:</strong> Ch. 1 (so on so forth)</td>
</tr>
<tr>
<td>January 30</td>
<td>Ch. 2 Getting Started</td>
<td><strong>Assignment 1:</strong> Due at 11:59 PM, Feb 5 (5% for each assignment)</td>
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<tr>
<td>February 6</td>
<td>Ch. 3 Growth of Functions</td>
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<tr>
<td>February 13</td>
<td>Ch.4 Divide-and-Conquer</td>
<td><strong>Assignment 2:</strong> Due at 11:59 PM, Feb 19</td>
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<tr>
<td>February 20</td>
<td>Ch.6 Heapsort</td>
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<tr>
<td>February 27</td>
<td>Ch.12 Binary Search Trees</td>
<td><strong>Assignment 3:</strong> Due at 11:59 PM, March 5</td>
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<td></td>
<td>Ch.18 B-Trees</td>
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<td></td>
<td>Midterm Exam Review</td>
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<tr>
<td>March 6</td>
<td><strong>Midterm</strong></td>
<td><strong>Time:</strong> 6:30 PM-9:15 PM (Contents covered in the first half semester)</td>
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<tr>
<td>March 13</td>
<td><strong>Spring Break</strong></td>
<td>No class</td>
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<tr>
<td>March 20</td>
<td>Ch. 15 Dynamic Programming</td>
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<tr>
<td>March 27</td>
<td>Ch. 16 Greedy Algorithms</td>
<td><strong>Assignment 4:</strong> Due at 11:59 PM, April 2</td>
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<tr>
<td>April 3</td>
<td>Ch. 23 Minimum Spanning Trees</td>
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<tr>
<td>April 10</td>
<td>Ch. 24 Single-Source Shortest Paths</td>
<td><strong>Assignment 5:</strong> Due at 11:59 PM, April 16</td>
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<td>April 17</td>
<td>Ch. 34 NP-Completeness</td>
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<td>Ch. 32 String Matching</td>
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<td>April 24</td>
<td>Ch. 33 Computational Geometry</td>
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<tr>
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<td>Final Exam Review</td>
<td><strong>Time:</strong> 6:30 PM-9:15 PM (Contents covered in the second half semester)</td>
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<tr>
<td>May 1</td>
<td><strong>Final Exam</strong></td>
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