Instructor:
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Campus office: ESH 313

Office Hours: M 1500-1550, T 1100-1200, W 1730-1830, Th 1400-1500, or by appt.

Grading: Assignments/Projects 40%
Midterm 30% about 4 Mar
Final 30% 1445-1645, M 08 May

Course Description: This course addresses the design and analysis of fundamental algorithms in computer science. Studies basic sorting algorithms, priority queues, order statistics, search trees, and hash tables. Analysis techniques may involve time and space complexity analysis of both iterative and recursive algorithms, analysis of algorithm correctness, and amortized complexity analysis. Additional topics may include data compression, string manipulation, greedy algorithms, dynamic programming, and graph traversal.

Prerequisites: CMP SCI 2250, MATH 1320, and MATH 3000.


Course Topics:
- Principles of algorithm analysis;
- Growth of functions;
- Basic methods for solving recurrences;
- Elementary sorting methods;
- Priority queues and heapsort;
- Randomized algorithms;
- Quicksort and mergesort;
- Counting sort and Radix sort;
- Selection problem;
- Hash tables;
- Binary search trees;
- Red-black trees;
- Dynamic Programming (if time permits);
- Greedy Algorithms (if time permits).

Attendance:
Announcements of any changes in the syllabus, test dates or assignments will be made in class. You are entirely responsible to the material as well as any other information you missed while missing classes. I don't give makeup lectures.
Schedule *(Tentative)*

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<th>Week</th>
<th>Chapter</th>
<th>Topic</th>
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<td>1</td>
<td>Algorithms, Sorting problems</td>
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<td>2</td>
<td>2.1, 2.2</td>
<td>Elementary sorting algorithms; Loop invariant and correctness</td>
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<td>3</td>
<td>3</td>
<td>Growth of functions: basic definitions, properties, examples, proofs</td>
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<td>4</td>
<td>3, B4, B5</td>
<td>Trees: classification, properties, traversal of binary trees</td>
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<td>5</td>
<td>4</td>
<td>Mathematical properties of binary trees; Recurrences</td>
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<td>6</td>
<td>4, 2.3</td>
<td>Recursion tree; Master Theorem; Mergesort</td>
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<td>7</td>
<td>5, 7</td>
<td>Hiring Problem, randomized algorithms. Quicksort</td>
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<td>8</td>
<td>7</td>
<td>Quicksort vs mergesort; Analysis of quicksort</td>
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<td>6</td>
<td>Heaps and algorithms on heaps; Heapsort</td>
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<td>10</td>
<td>6, 8, 9</td>
<td>Priority Queues; statistics for sorting, Selection in expected linear time</td>
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<td>11</td>
<td>10, 12</td>
<td>Binary search trees; Rotations; Insertion at the root of BST</td>
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<td>2-3-4 trees, red-black trees</td>
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<td>13</td>
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<td>Hash tables</td>
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<td>14</td>
<td>15, 16</td>
<td>Dynamic programming and greedy algorithms</td>
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<td>15</td>
<td>22, 24</td>
<td>Graph algorithms; Shortest path</td>
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**Dropping:**
You need to follow the proper drop procedure for getting excused from the course. A grade of F will be assigned to a student whose name is still on the final class roster and has not dropped the course officially. Delayed grades can be given only for a situation where a student has completed all the work and has to miss the final exam because of an emergency. The emergency has to be documented and valid. Delayed grades have to be approved by the Department of Mathematics and Computer Science.

**In my experience** there are 2 major reasons that students don’t pass: 1) they don’t come to class and they don’t drop, or 2) they don’t ask for help. If you drop, I can give you an EX grade; if you don’t, I have to give either F of FN, and both count in the GPA. If you need help, don’t be afraid to ask for it; that’s why there are office hours and tutors in the lab.
Course Policies

1. Participation (expectations)
   - It is vitally important that our classroom environment promote the respectful exchange of ideas. This entails being sensitive to the views and beliefs expressed during discussions whether in class or online. Please speak with me before recording any class activity. It is a violation of University of Missouri policy to distribute such recordings without my authorization and the permission of others who are recorded.
   - Your success in this course will heavily depend on your ability to communicate, engage and participate in all course activities. Successful completion of this course requires that a student keep up with all assignments, quizzes, projects and tests.
   - If you are unable to participate in the scheduled class activities, you must notify the instructor within the week of that class module. **An unexcused failure to engage or participate with the class will be counted as an absence; unexcused absences may result in failure.** The instructor reserves the right to make judgment to accept and/or make–up assignments missed because of failed participation in the course activities.

2. Academic Integrity/Plagiarism
   - You are responsible for being attentive to and observant of University policies about academic honesty as stated in the [University’s Student Conduct Code](http://www.umsl.edu/services/academic/policy/academic-dishonesty.html).
   - Academic dishonesty is a serious offense that may lead to probation, suspension, or dismissal from the University. One form of academic dishonesty is plagiarism – the use of an author’s ideas, statements, or approaches without crediting the source. Academic dishonesty also includes such acts as cheating by copying information from another student. Plagiarism and cheating will not be tolerated.
   - Academic dishonesty must be reported to the Office of Academic Affairs for possible action. The instructor shall make an academic judgment about the student’s grade on that work and in that course. The campus process regarding academic dishonesty is described in the “Policies” section of the Academic Affairs website: [http://www.umsl.edu/services/academic/policy/academic-dishonesty.html](http://www.umsl.edu/services/academic/policy/academic-dishonesty.html)
3. Access, Disability and Communication

- Students who have a health condition or disability, which may require accommodations in order to participate effectively in this course, should contact the **Disability Access Services Office**. Information about your disability is confidential.
  - 144 Millennium Student Center
  - Phone: (314) 516-6554
  - Website: [http://www.umsl.edu/services/disabled/](http://www.umsl.edu/services/disabled/)

- If you have difficulty communicating in English with the instructor of this course, contact the **Office of International Students and Scholar Services**:
  - Phone: (314) 516-5229
  - Email: iss@umsl.edu
  - Website: [http://www.umsl.edu/~intelstu/index.html](http://www.umsl.edu/~intelstu/index.html)
Student Support and Services

- **Technical Support**
  - My Gateway (Blackboard): If you have problems logging into your online course, or an issue within the course site, please contact the Technology Support Center:
    - Phone: (314) 516-6034
    - Email: helpdesk@umsl.edu
    - Website: http://www.umsl.edu/technology/tsc/

- **Academic Support**
  - The Online Writing Lab: At our My Gateway site, students can send their papers to our tutors, who will read them and send them back with suggestions. Students can also access SafeAssign, which identifies quoted material in their essays.
    - Visit the online Writing Lab page on MyGateway to submit drafts online.
    - We try to respond within 48 hours, but it may take longer, so allow ample time.
  - NetTutor: Online tutoring in many subjects is now available through NetTutor. In your courses on MyGateway, click on Tools and select NetTutor® to log in.

- **Student Services**
  - The Center for Student Success offers assistance tailored to specific student needs.
    - 225 Millennium Student Center
    - Phone: (314) 516-5300
    - Email: css@umsl.edu
    - Website: http://www.umsl.edu/services/css/