X033533 -- Algorithm: Analysis and Theory

Course Syllabus -- Spring 2016

COURSE INFORMATION:

Time: 12:55pm--3:40pm, Thursday
Location: Chen Rui Qiu Building 219（陈瑞球楼 219）

February 2016

March 2016

April 2016

May 2016

June 2016

Total: 18 weeks, 16 classes

INSTRUCTOR INFORMATION:

Name: Xiaofeng Gao（高晓沨）
Office: Telecom Building 3-543
Phone: 021-34207407
Email: gao-xf@cs.sjtu.edu.cn (best way to contact with me)
Office Hour: By appointment (Please mention your class ID and purpose in email beforehand)
Teaching Assistant: Zhiyin Chen (陈智殷), Email: cknight(at)foxmail.com

COURSE PREREQUISITES:

Discrete Mathematics, Data Structure, Programming Language
REFERENCE:

- **Algorithm:**

- **Computational Complexity:**

- **Approximation:**

EVENTS AND GRADING:

The final grade will be derived from your performance on the tests, and assignments. The class participation is shown as follows:

<table>
<thead>
<tr>
<th>Events</th>
<th>Grading Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Exam</td>
<td>90-100%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>80-89%</td>
</tr>
<tr>
<td>Assignments</td>
<td>70-79%</td>
</tr>
<tr>
<td>Projects</td>
<td>60-69%</td>
</tr>
<tr>
<td>Class Participation</td>
<td>59% and below</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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</tbody>
</table>

WEBPAGE AND MATERIALS:

- All the class materials (slides, references), homework assignments, announcements, and other information can be seen from [http://cs.sjtu.edu.cn/~gao-xf/algorithm/](http://cs.sjtu.edu.cn/~gao-xf/algorithm/)
- Please check the webpage often to get the up-to-date information.
INSTRUCTOR/COURSE POLICIES

Common Sense Notices

- Please attend every class and do not be late. **15-minute** late attendance is considered absent.
- Please turn off all cell phones, buzzers, and other noisy electronic devices during class time.
- Please show common courtesy to your fellow classmates and professor.

Homework

- **English only.** Each takes 5%, Bonus for Electronic Submission.
- **Late assignments.** Every effort should be made to hand assignments by the due date and time. NO late submission is accepted. Missed work will result in a grade of ZERO.
- **Academic dishonesty.** Your work must be your own. Cheating will result in a grade of 0 for the applicable assignment; further disciplinary action, including assigning a failing grade for the entire course and reporting your name to the department may also be taken.

Email Netiquette

- My response will be irregular on the weekend or when I am away from campus.
- When you email me you should consider the email as official correspondence. As such, the email should not appear as a text message but should have proper grammar and punctuation. The email title should include: **Class ID/Your Purpose.** An example is below.

```
(Email Title: [X033533]Want a material for midterm)

Dear Dr. Gao,

My name is John Smith. I’m from your class X033533-Algorithm. I will not attend tomorrow’s class due to sickness. Can you send me a copy of the midterm review so I may use it as a study tool? Thanks a lot.

Sincerely Yours,

John Smith
SID: 509030XXXX
Department of Computer Science and Engineering
Shanghai Jiao Tong University
Email: JohnASmith@gmail.com
```
TENTATIVE SCHEDULE: (These dates could be changed depending upon the pace of the course)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>HW</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tue.25</td>
<td><strong>Syllabus, Preliminary, Introduction to Algorithm</strong>&lt;br&gt;Syllabus, Schedule, Grading Policy, Preliminary, Basic Introduction, etc.</td>
<td>Lab-01</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Mar.03</td>
<td><strong>Data Structure, Math Functions</strong>&lt;br&gt;Data Structure, Graph, Disjoint Set, Mathematical Fundamentals, etc.</td>
<td>Lab-02</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Mar.10</td>
<td><strong>Divide-and-Conquer</strong>&lt;br&gt;Mergesort, Selection, Sorting Network, etc.</td>
<td>Lab-03</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Mar.17</td>
<td><strong>Greedy Approach (1)</strong>&lt;br&gt;Activity Selection, Minimum Spanning Tree, Huffman Code, etc.</td>
<td>Lab-04</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Mar.24</td>
<td><strong>Greedy Approach (2)</strong>&lt;br&gt;Interval Partitioning, Task Scheduling, Shortest Path, Cache, Matroid, etc.</td>
<td>Lab-05</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mar.31</td>
<td><strong>Dynamic Programming (1)</strong>&lt;br&gt;Matrix-Chain, Longest Common Subsequence, 0-1 Knapsack, etc.</td>
<td>Lab-06</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Apr.07</td>
<td><strong>Dynamic Programming (2)</strong>&lt;br&gt;Optimal Substructure, Weighted Interval Scheduling, Sequence Alignment</td>
<td></td>
<td>Midterm</td>
</tr>
<tr>
<td>9</td>
<td>Apr.21</td>
<td><strong>Graph Algorithms (1)</strong>&lt;br&gt;Single Source Shortest Paths, All-Pairs Shortest Paths, etc.</td>
<td>Lab-07</td>
<td>Project-01</td>
</tr>
<tr>
<td>10</td>
<td>Apr.28</td>
<td><strong>Graph Algorithms (2)</strong>&lt;br&gt;Maximum Flow, Minimum Cut, etc.</td>
<td>Lab-08</td>
<td></td>
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<tr>
<td>11</td>
<td>May 07</td>
<td><strong>Graph Algorithms (3)</strong>&lt;br&gt;Computational Geometry, Real-World Applications</td>
<td>Lab-09</td>
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<tr>
<td>12</td>
<td>May 14</td>
<td><strong>Amortized Analysis</strong>&lt;br&gt;Aggregate Analysis, Accounting Method, Potential Method</td>
<td>Lab-10</td>
<td></td>
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<tr>
<td>13</td>
<td>May 21</td>
<td><strong>NP-Completeness (1)</strong>&lt;br&gt;NP class, Polynomial time, etc.</td>
<td>Lab-11</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>May 28</td>
<td><strong>NP-Completeness (2)</strong>&lt;br&gt;Reducibility, Proofs, etc.</td>
<td>Lab-12</td>
<td></td>
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<tr>
<td>15</td>
<td>Jun.04</td>
<td><strong>Approximation Design (1)</strong>&lt;br&gt;Approximation Ratio, Approximation Class, Examples</td>
<td>Lab-13</td>
<td></td>
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<tr>
<td>16</td>
<td>Jun.11</td>
<td><strong>Approximation Design (2)</strong>&lt;br&gt;Sequential Algorithm, Local-Search, LP, Primal-Dual Technique, etc.</td>
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<tr>
<td>17-18</td>
<td>TBD</td>
<td><strong>Review. Exercises. Tutoring. Final Exam</strong></td>
<td></td>
<td>Final</td>
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