Syllabus for CS 3333

Mathematical Foundations of Computer Science

Summer 2014

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Course Prerequisites: CS 1711, CS 1713, and MAT 1224

Course Co-requisite: CS 3331


This course introduces and reviews several mathematical and statistical tools that are useful in the design and analysis of computer algorithms and in the development of system performance models. Topics to be studied include:

- Integers (modular arithmetic, GCD, prime numbers, number systems)
- Matrices (multiplication, transpose, determinants, binary)
- Matrix Analysis (linear equations, eigenvalues and eigenvectors)
- Combinatorics (pigeonhole principle, permutations, combinations, binomial theorem)
- Probability (Bayes' theorem, random variables, expectation and variance)
- Statistics (summarizing measured data, parameter estimation, confidence intervals)
Grading:

Homework 15%
Quizzes+ 5%
Exams 40% (2 exams)
Final 40% Friday, August 15, 10:30 am -1:00 pm

Student conduct and absence. No makeup exams or assignments are given.

If you must miss an announced exam or an assignment deadline, you should inform the instructor in advance. If an exam is missed for medical or other reasons beyond a student’s control (verifiable), then the final exam score may be used to replace the missing grade. No cell phones may be used during the lectures and recitations. Students who do not want to participate in the recitations should submit a written note to the instructor so that their quiz credits will be used to substitute for participation credits. Any student who attends the recitations and engages in talking with other students, browsing the Web, using cell phones, or any other disruptive behavior will be disciplined. You should do all assignments and homework on your own, without collaborations.

Submission of homework with solutions copied from the assignments in prior semesters or other sources is academic dishonesty and may result in a failing grade for the course.

Attendance: Advisable.

Code of Conduct: Students are expected to comply with the policies and provisions of the Student Code of Conduct and the UTSA Honor Code.

Below is a very tentative course outline and list of topics.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reference</th>
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<tbody>
<tr>
<td>1-2</td>
<td>Introduction to the course. Integers: division, modular arithmetic, congruences; primes, gcd and lcm, number systems</td>
<td>Chapter 4 [KR], Sections 1-3, 5</td>
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<tr>
<td>2-3</td>
<td>Matrices and vectors: multiplication, transposes, determinants, inverses Matrix analysis: linear equations, eigenvalues and eigenvectors</td>
<td>2.6 [KR] Notes</td>
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<td>4</td>
<td>Review and Test</td>
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<tr>
<td>5</td>
<td>Combinatorics: counting, pigeonhole principle, permutations, combinations</td>
<td>6.1-6.3 [KR]</td>
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<td>Notes</td>
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<tr>
<td>6</td>
<td>Combinatorics: binomial coefficients, binomial theorem, generalized permutations and combinations, PIE</td>
<td>6.4-6.5 [KR] Notes</td>
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<td>7</td>
<td>Review and test</td>
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<tr>
<td>8</td>
<td>Probability: Basic probability, events/experiments, random variables, distribution functions</td>
<td>Ch. 6 [KR] 1-3 [S3] Notes</td>
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<td>9</td>
<td>Probability: Law of large numbers, CLT Statistics: measures, simple statistical tests, linear regression</td>
<td>5-3 [S3] Notes</td>
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<td>10</td>
<td>Review and Final Exam</td>
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