1 Course Summary

Survey and development of mathematical and statistical tools suitable for describing algorithmic applications. Vectors, matrices, combinatorics, probability and statistical 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)

Prerequisites: CS 1713/1 Introduction to CS and MAT 1223 Calculus II.
Co-requisite: Must enroll in CS 3331.

2 Instructor and TAs

Instructor:
- Matt Gibson
  - Office: SB 4.01.34
  - Phone: 210-458-8732
  - Email: gibson[at]cs.utsa.edu
  - Office Hours: TWR 3:30 - 4:30 or by appointment

TA:
- Jie Xiao
  - Office: SB 1.04.06
  - Email: jxiao[at]cs.utsa.edu
  - Office Hours: W 10:00 - 11:00

Grader:
- K. M. Sbidur Rahman
  - Office: TBA
  - Email: kmsabidurrahman[at]gmail.com
  - Office Hours: M 2:30 - 3:30
3 Meeting Times

Lectures: TR 2:00 - 3:15, MH 3.04.26
Recitations:

- CS 3331-001 T 12:30-1:20, SB 3.02.10A
- CS 3331-002 R 12:30-1:20, SB 3.02.10A

4 Required Textbooks

- Spiegel, Schiller and Srinivasan, Probability and Statistics (Schaum's Outline Series), McGraw-Hill 2008. [S3]

5 Grading

- 20% Homeworks (about 8)
- 5% Quizzes (about 15)
- 35% Tests (2)
- 40% Final (Thursday Dec 13, 10:30am - 1:00pm)

No makeup exams or assignments are given. If you must miss an announced exam or an assignment deadline, you should let me know in advance. Pop quizzes may be given depending on class participation and progress.

Homeworks must be completed individually. Submission of homeworks with solutions copied from prior semesters or obtained from the Internet is academic dishonesty and will result in a failing grade for the course.
### 6 Schedule

<table>
<thead>
<tr>
<th>Dates</th>
<th>Topic</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Aug 30 - Sept 11</td>
<td>Introduction to the course. Integers: division, modular arithmetic, congruences; primes, greatest common divisors, number systems.</td>
<td>Chapter 4 (except 4.4) from [KR]</td>
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<tr>
<td>Sept 13 - Sept 27</td>
<td>Matrices and Vectors: multiplication, transposes, determinants, inverse matrices. Matrix analysis: linear equations, eigenvalues and eigenvectors.</td>
<td>Section 2.6 from [KR]</td>
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<td>Oct 2</td>
<td>Review</td>
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<td>Oct 4</td>
<td>Test 1</td>
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<tr>
<td>Oct 9 - Nov 1</td>
<td>Combinatorics: counting, pigeonhole principle, permutations, combinations, binomial coefficients, binomial theorem, generalized permutations and combinations.</td>
<td>Sections 6.1-6.5 and 8.5-8.6 from [KR]</td>
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<tr>
<td>Nov 6</td>
<td>Review</td>
<td></td>
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<td>Nov 8</td>
<td>Test 2</td>
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<td>Nov 13 - Nov 20</td>
<td>Probability theory: Bayes’ theorem, expectation and variance, random variables, distribution functions. Probability: law of large numbers, central limit theorem, tail probability estimations.</td>
<td>Chapters 1-3 of [S3], Chapter 7 of [KR]</td>
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<td>Nov 27 - Dec 4</td>
<td>Statistics: summarizing measured data, parameter estimation, confidence intervals, linear regression models.</td>
<td>Chapters 5-6 from [S3]</td>
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<td>Dec 6</td>
<td>Review</td>
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<td>Dec 13</td>
<td>Final Exam</td>
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