# CSE 5314 (Online Computation) SYLLABUS

Spring 2004:  T R  3:30-4:50, Nedderman 229

Instructor:  Bob Weems, Associate Professor (`weems@uta.edu, http://reptar.uta.edu`)
Office:  344 Nedderman, 817/272-2337
Hours:  T R 1:00-3:00

Prerequisites:  Advanced Algorithms (CSE 5311)

Objectives:  Introduction to online computation and related research issues.

Goals:  1. Exposure to problems and their online algorithms.
2. Exposure to analysis techniques for online algorithms.
3. Exposure to randomization as a tool for developing online algorithms.

Textbook:  A. Borodin and R. El-Yaniv, *Online Computation and Competitive Analysis*,  Cambridge Univ. Press, 1998.

References:  A. Fiat and G. Woeginger, eds., *Online Algorithms: The State of the Art* (LNCS 1442), Springer-Verlag, 1998.

D.S. Hochbaum, ed., *Approximation Algorithms for NP-Complete Problems*, PWS, 1997.

R. Motwani and P. Raghavan, *Randomized Algorithms*, Cambridge Univ. Press, 1995.

C.H. Papadimitriou,  *Computational Complexity*, Addison-Wesley, 1994.

Grade:  Based on the following weights:

30%  Homework Presentations (slides and 5-15 minute talk)

25%  Semester Project (slides and 20 minute talk)

25%  Participation in Software Development Exercises

≤ 20%  "Discretionary" Quizzes (2-5% each) and Exams (10-20% each)

Policies:

1.  Attendance is not required, but is highly encouraged.  Consult me in advance if you must miss class for a good reason.

2.  CHEATING - YOU ARE EXPECTED TO KNOW UNIVERSITY POLICIES.  All cases of plagiarism will be processed through University channels outside the CSE department.

   a.  **Academic Integrity Policy:**  It is the policy of the University of Texas at Arlington to uphold and support standards of personal honesty and integrity for all students consistent with the goals of a community of scholars and students seeking knowledge and truth.  Furthermore, it is the policy of the University to enforce these standards through fair and objective procedures governing instances of alleged dishonesty, cheating, and other academic/non-academic misconduct.

   You can assume responsibility in two ways.  **First**, if you choose to take the risk associated with scholastic dishonesty and any other violation of the Code of Student Conduct and Discipline, you must assume responsibility for your behaviors and accept the consequences.  In an academic

community, the standards for integrity are high.  **Second**, if you are aware of scholastic dishonesty and any other conduct violations on the part of others, you have the responsibility to report it to the professor or assistant dean of students/director of student judicial affairs.  The decision to do so is another moral dilemma to be faced as you define who you are.  Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and dismissal from the University.  Since dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced.

b. **Statement on Ethics, Professionalism, and Conduct of Engineering Students**:  The statement is attached.

3. Any request for special consideration must be appropriately documented **in advance**.  (Special consideration does not include giving a higher grade than has been earned.)

4. Phone calls.  I will not answer my phone during office hours if someone is in my office.  After the third ring the call is switched to the CSE office, so please leave a message with the secretary.

5. Please email the following information to `weems@uta.edu` by Thursday, January 29:

a. Name (as listed by the university).
b. Additional email addresses.
c. Special circumstances affecting your performance.


# Course Outline

Readings from Borodin & El-Yaniv and other sources are in ().

0. Surveys (Hochbaum, Chap. 13:  Motwani & Raghavan, Chap. 13)
1. Deterministic List Accessing (1;  Albers & Westbrook)
   Algorithms - MTF, TRANSPOSE, etc.
   Amortized Analysis
   List Factoring
   Phase Partitioning and TIMESTAMP Algorithm
2. Randomized List Accessing (2;  Albers & Westbrook)
   BIT Algorithm
   Random MTF
   COMB Algorithm
3. Deterministic Paging (3)
   Algorithms
   Optimal Offline
   Marking and Conservative Paging
4. Randomized Paging (4; Raghavan & Snir)
   Adversaries and Their Relative Power
   RANDOM Paging
   MARK Paging
5. Access Graphs and Uniform Competitiveness (5.1)
6. Bipartitite Matching (Karp, Vazirani, & Vazirani)
   Input
   RANDOM Algorithm
   RANKING Algorithm
   EARLY Algorithm

7. Metrical Task Systems (9.1-9.5)
   Transition Cost vs. Processing Cost in MTSs
   Traversal Algorithm - 8(N - 1)-Competitive
   Lower Bound
   Optimal MTS Algorithm Based on Work Function
   Randomized MTS Algorithms for Unit State-Transition Cost
8. K-Server Problem (10)
   Offline Approaches
   Practical Special Cases
   K-Server Conjecture
   Line and Tree Metrics
   (2k - 1)-Competitiveness of Work Function Algorithm
9. Game Theory (6)
   Abstractions
   Randomized Strategies
10. Request-Answer Games (7)
11. Zero-Sum Games (8;  Motwani & Raghavan, Chap. 2)
    Yao's Principle
12. Randomized Approaches to K-Server (11.1-11.5; Motwani & Raghavan, Chap. 6)
    Circle as Metric Space
    Cat and Rat Game on Graphs
    HARMONIC Algorithm
       Graphs
       Arbitrary Metric Spaces

## Calendar/Topics

| January | | | | February | | | |
|---|---|---|---|---|---|---|---|
| 20 | Syllabus | 22 | 1. | 3 | 3. | 5 | 3. |
| 27 | 1. | 29 | 2. | 10 | 4. | 12 | 4. |
| | | | | 17 | 5. | 19 | 6. |
| | | | | 24 | | 26 | |

| March | | | | April | | | |
|---|---|---|---|---|---|---|---|
| 2 | 7. | 4 | 7. | | | 1 | |
| 9 | 8. | 11 | 8. | 6 | 9. | 8 | 9. |
| 16 | SPRING | 18 | BREAK | 13 | 10. | 15 | 11. |
| 23 | 8. | 25 | 8. | 20 | 12. | 22 | 12. |
| 30 | | | | 27 | | 29 | |

| May | | | |
|---|---|---|---|
| 4 | | 6 | |

April 16 is the last day to withdraw.

# Statement of Ethics - Student Confirmation
## (CSE 5314, Spring 2004)

The following is an excerpt from the College of Engineering's statement on Ethics, Professionalism, and Conduct of Engineering Students.  The notes are modifications appropriate for Computer Science and Engineering courses.  Read the statement carefully, sign it, and return it to your instructor  Additional copies of this statement can be obtained from your course web page.

## Statement on Ethics, Professionalism, and Conduct of Engineering Students
## College of Engineering
## The University of Texas at Arlington

The College cannot and will not tolerate any form of academic dishonesty by its students.  This includes, but is not limited to 1) cheating on examination, 2) plagiarism, or 3) collusion.

Definitions:

A.  **Cheating on an examination** includes:

 1. Copying from another's paper, any means of communication with another during an examination, giving aid to or receiving aid from another during an examination;
 2. Using any material during an examination that is unauthorized by the proctor;
 3. Taking or attempting to take an examination for another student or allowing another student to take or attempt to take an examination for oneself.
 4. Using, obtaining, or attempting to obtain by any means the whole or any part of an unadministered examination.

B.  **Plagiarism** is the unacknowledged incorporation of another's work into work which the student offers for credit.
C.  **Collusion** is the unauthorized collaboration of another in preparing work that a student offers for credit.
D.  Other types of **academic dishonesty** include using other student's printouts from the ACS labs or students' disk, etc.

 1. The use of the source code of another person's program, even temporarily, is considered **plagiarism**.
 2. Allowing another person to use your source code, even temporarily, is considered **collusion**.
 3. Use of another person's source code with your modification is considered **plagiarism.**
 4. Taking material verbatim (without quoting the source) for reports and/or presentations is considered **plagiarism**

The penalty assessed for cheating on a given assignment will be the entire weight of the assignment and will include notification of the proper authorities as stipulated in the **UTA Handbook of Operating Procedures** and on the web at *http://www2.uta.edu/discipline*

You may be entitled to know what information UT Arlington (UTA) collects concerning you.  You may review and have UTA correct this information according to procedures set forth in UT System BPM #32.  The law is found in sections 552.021, 552.023 and 559.004 of the Texas Government Code.

**I have read and I understand the above statement.**

**Student's signature:** _____

**Student's name (printed):** _____

**Student's ID number:** _____