CS 517 Theory of Computation

Catalog Description: Turing machines, decidability, NP-completeness, complexity classes, randomized computation, relativization, circuit complexity, interactive proof systems, lower bounds, cryptography.

Credits: 4   **Terms Offered:** Spring

Prerequisites: Graduate Standing in Computer Science

Courses that require this as a prerequisite: None

Structure: Three 70-minute lectures per week.

Instructor: Prasad Tadepalli

Course Content:
1) Turing Machines, Church-Turing Thesis
2) Decidability, Reducibility
3) Time and Space complexity measures, hierarchy theorems
4) Complexity classes P, NP
5) NP-Completeness, Polynomial-time Reductions
6) Space Complexity, Polynomial Hierarchy, PSPACE-completeness
7) L, NL, and NL-completeness
8) Relativization, Circuit Complexity
9) Randomization, BPP and RP
10) Advanced Topics (e.g., Interactive Proof Systems, Cryptography, Lower Bounds)

Measurable Student Learning Outcomes:
At the completion of the course, students will be able to…
1. **Show** equivalence of different kinds of Turing Machines
2. **Prove** undecidability of computational problems
3. **Prove** NP-completeness through polynomial-time reductions
4. **Prove** PSPACE-completeness and NL-completeness results
5. **Prove** results that involve relativization and randomization
6. **State** the fundamental results in complexity theory
7. **Explain** the notions of interactive proofs, lower bounds, cryptosystems, etc.

Learning Resources:

- Text: Computational Complexity – A Modern Approach, Sanjeev Arora and Boaz Barak, 2009, Cambridge University Press.
- Computational Complexity, Christos Papadimitriou, 1995, Addison Wesley.
- Introduction to the Theory of Computation, M. Sipser, Second Edition, 2006, MIT Press.
- Class Notes.

Evaluation of Student Learning:

- Weekly Quizzes and Homeworks (30%)
- Mid Term (30%)
- Final Exam (40%)

Students with Disabilities:
Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098.

Link to Statement of Expectations for Student Conduct:
http://oregonstate.edu/admin/stucon/achon.htm

3/26/2013