CS 325 – Analysis of Algorithms

Catalog Description: Recurrence relations, combinatorics, recursive algorithms, proofs of correctness.

Credits: 4  Terms Offered: Every Term

Prerequisites: CS 261 and (MTH 231 or CS 225)

Courses that require this as a prerequisite: CS 331, CS 420, CS 434, CS 475

Structure:
On Campus: Three 50-minute lectures per week
Ecampus: Term totals: This course combines approximately 120 hours of instruction, online activities, and assignments for 4 credits (30 hours of online instruction, 10 hours of online participation, 2 hours of online quizzes, 30 hours of offline reading/study, 15 hours of offline homework/lab assignments, 30 hours of offline programming projects, and 3 hours of proctored exams).

Instructors: Paul Cull, G. Borradaile, X. Fern

Course Content:
• Recursive algorithms
• Using difference equations
• Inductive proofs of correctness
• Timing of algorithms
• Search of algorithms
• NP completeness
• Divide and conquer algorithms
• Heuristics for hard problems

Learning Resources: [Revised Fall 2009]
• Dasgupta, Papadimitriou, Vazirani. *Algorithms* (required)
• Kleinberg and Tardos. *Algorithmic Design* (reference)
• Cormen, Leiserson, Rivest, Stein. *Algorithms* (reference)
• A Brief Introduction to Algorithms, by Paul Cull, on class web site (class notes)

Measurable Student Learning Outcomes:
At the completion of the course, students will be able to…
1. Define $O$, $\Omega$, and $\Theta$ in a rigorous way (Level 1; ABET Outcomes: a, j)
2. Compute the time complexity of polynomial-time and exponential-time iterative and recursive algorithms (Level 3; ABET Outcomes: A, B, j)
3. Solve simple recurrence equations (Level 3; ABET Outcomes: A, j)
4. **Implement** a recursive algorithm to solve a simple problem (Level 3; ABET Outcomes: C, j)
5. **Prove** the correctness of algorithms using induction (Level 3; ABET Outcomes: A, J)
6. **Implement** a divide-and-conquer algorithm to solve a problem of intermediate difficulty (Level 3; ABET Outcomes: C, J)
7. **Implement** a polynomial-time heuristic algorithm to solve an NP-hard problem (Level 3; ABET Outcomes: C, J)
8. **Explain** how a problem is shown to be NP-complete (Level 2; ABET Outcomes: B, J)

**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**, i.e., cheating policies [http://oregonstate.edu/studentconduct/offenses-0](http://oregonstate.edu/studentconduct/offenses-0)

Revised: Fall 2014