

## CS 420 – Graph Theory with Applications to Computer Science

**Catalog Description:** Directed and undirected graphs; paths, circuits, trees, coloring, planar graphs, partitioning; computer representation of graphs and graph algorithms. Applications in software complexity metrics, program testing, and compiling.

**Credits:** 3                    **Terms Offered:** Winter

**Prerequisites:** CS 325, MTH 232

**Courses that require this as a prerequisite:** None

**Structure:** Three 50-minute lectures per week

**Instructors:** Paul Cull

### Course Content:

- Introduction to algorithm analysis
- Computer representation of directed and undirected graphs
- Trees
- Paths and distance
- Types of graphs (Eulerian, Hamiltonian, planar)
- Graph parameters (connectivity, matching, factorization, coloring)
- Applications in computer science (software complexity measures, program testing)

### Measurable Student Learning Outcomes:

At the completion of the course, students will be able to...

1. **Describe** several practical applications of graph theory (Level 1; ABET Outcomes: A)
2. **Select** the most appropriate type of graph to represent a particular problem (Level 3; ABET Outcomes: B, J)
3. **Select** the most appropriate data structure to represent a particular graph (Level 3; ABET Outcomes: B, a, j)
4. **Design** a program implementing a polynomial-time algorithm manipulating a tree (Level 4; ABET Outcomes: C, j)
5. **Design** a program implementing a polynomial-time algorithm manipulating a weighted graph (Level 4; ABET Outcomes: C, j)
6. **Design** a program that employs a graph to find an approximate solution to an NP-hard optimization problem in polynomial time (Level 4; ABET Outcomes: B, C, j)

### Learning Resources:

- G. Chartrand and O. R. Oellermann, *Applied and Algorithmic Graph Theory*. McGraw-Hill, New York, 1993 (required)
- Papers that illustrate application of graph theory to computer science

### Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD 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 SSD should contact SSD immediately at 737-4098.

**Link to Statement of Expectations for Student Conduct:**

<http://oregonstate.edu/admin/stucon/achon.htm>

Revised: 8/15/07