**DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS**

**CSE 619 - 50 – spring 2021**

**Description:** This course covers an introduction to algorithms, spanning topics ranging from computational complexity to advanced tree and graph algorithms. Algorithms are presented for a number of application areas, including searching and sorting, divide-and-conquer strategies, string manipulation, tree structures, graph problems, and an introduction to compression algorithms.

**Prerequisites:** CECS 302 Data Structures and CECS 310 Discrete Structures

**Instructor:** Dr. Ahmed Desoky, DC 212, 502-852-0473, [ahd@louisville.edu](mailto:ahd@louisville.edu)

**Teaching Assistant:**  TBA

**Class:** Three Panopto video recordings on Blackboard will be posted every week

**Office Hours**: MWF 12:30 pm - 1:30 pm

**Textbook:** Introduction to Algorithms, 3rd Edition. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein. (2009). MIT Press, ISBN: 978-0-262-03384-8.

**Course learning outcomes**: Students who complete this course will be able to:

1. Analyze the efficiency of an algorithm in terms of run-time and memory complexity

2. Design effective solutions for divide-and-conquer problems

3. Understand the appropriate search and sort strategy for a given set of data

4. Implement appropriate graph algorithms for relevant data structure

5. Critically evaluate a programming problem to determine the most likely efficient solution

**Topics:**

1. Algorithms Overview (1 Week)

2. Asymptotic growth of functions (2 weeks)

* Big-O
* Big-Omega
* Big-Theta Notation

3. Advanced searching and sorting algorithms (2 weeks)

* Heaps
* Heap sort
* Hash tables
* Radix sort
* Alternative sorting strategies

4. Divide and conquer algorithms (2 weeks)

* Recursive backtracking
* Dynamic programming
* Horner’s rule for polynomials

5. String algorithms (3 weeks)

* Longest common subsequence
* Dynamic programming revisited
* Rabin-Karp
* Knuth-Morris-Pratt

6. Graph algorithms (4 weeks)

* Shortest cost paths (Dijkstra’s algorithms, Bellman-Ford Algorithm)
* Breadth-first search
* Depth-first search
* Kruskal’s algorithm (Minimum Spanning tree)
* Prim’s Algorithm
* Topological sort
* Maximum network flow (Ford-Fulkerson algorithm)

**Grading Policy:**

There will be two EXAMS, 4 quizzes, 3 programming projects and a COMPREHENSIVE FINAL EXAM. Scheduled time of the exams will be given in lecture notes. Arrangements must be made IN ADVANCE if for some valid reason you cannot take an exam at the scheduled time.

Exams (2) 40%

Final Exam 20%

Quizzes (4) 20%

Projects (3) 20%

Grading Scale

A = (90% & up)

B = (80%-89.99%)

C = (70%-79.99%)

D = (60%-69.99%)

F = (below 60%)

**COVID Items – wording from University**

As a Community of Care, all Cardinals are expected to abide by public health guidelines and regulations as published by the University. For fall 2020, this includes:

* Wearing of cloth/paper masks (covering nose and mouth) when in shared indoor spaces like classrooms, or when appropriate physical distancing cannot be maintained. (Per the code of student conduct--[revised July 2020](https://louisville.edu/dos/students/codeofconduct)--a student who refuses to follow these guidelines may be asked to leave a classroom)
* Staying home when sick—any UofL community member experiencing fever, consistent dry cough, or other symptoms of contagious disease should remain at home until symptoms subside or advised that it is safe to return by a medical professional.
* Practicing good hygiene and responsibility for one’s own surrounding.
* Cover sneezes and coughs
* Wash hands frequently with soap and water when possible, use hand sanitizer when soap and water are not available
* Wipe down frequently touched surfaces
* Maintain 6 feet physical distancing when possible

Faculty have the responsibility to help students meet these recommendations by:

* allowing for remote participation in class
* allowing students absent for reason of illness to make up missed work and not penalize students for these absences
* Not requiring doctor’s notes for absences of less than the equivalent of two weeks of class. If the absences occur on the day of a scheduled assessment, the student may be asked to provide documentation for the absence
* Notifying physical plant when classrooms are not adequately stocked with cleaning supplies and arranging classroom furniture or seating charts to maximize physical distancing where possible.

**Collaboration and Cheating Policy:**

Students are encouraged to cooperate in studying and to learn from each other or seeking knowledge from a variety of sources such as journals, magazines, or the web. However, all submitted assignments must be original and the result of the individual’s own work. Cheating or copying of assignments or exams will not be tolerated and will be pursued.

**Title IX/Clery Act Notification:**

Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain confidential support from the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111).

Disclosure to University faculty or instructors of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is not confidential under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University’s Title IX officer.

For more information, see <http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure>