CMSC 401
Algorithm Analysis with Advanced Data Structures
Syllabus

Catalog listing:	CMSC 401
Course Level:	Undergraduate
Prerequisites:	CMSC 256 and CMSC 302
Instructor:	Tom Arodz
Office:	E4252
Phone:	804-827-3989
Fax:	804-828-2771
email:	tarodz@vcu.edu (start subject line with CMSC401)
Classroom:	MWF 11:00 AM – 11:50 PM (ONLINE, zoom link in Canvas)
Class website:	Canvas
Office Hours:	WF 10:00-11:00 AM (ONLINE, zoom link in Canvas)
TAs:	Mia Mohammad Imran (imranm3@vcu.edu)
	– Office hour: Monday 1-3pm (ONLINE)

1.0 – Overview (Catalog Course Description):

Semester course; 3 lecture hours. 3 credits. Prerequisites: CMSC 256 with a grade of C or better and CMSC 302 with a grade of C or better. Topics covered include foundations of algorithm and complexity analysis, advanced data structures including multiple linked lists, balanced trees, and B-trees, hashing and graph representation; incorporating data structures into object-oriented design, analysis of various searching and sorting algorithms. Algorithm design topics include divide-and-conquer, dynamic programming and greedy methods.

2.0 – Course Structure:

Lecture hours/week –	3
Lab hours/week –	0

3.0 – Course Goals

Upon successful completion of this course, the student will be able to:

- Apply mathematical knowledge to analyze algorithm's computational complexity
- Use knowledge of computing to prove correctness of algorithms

- Make correct design choices on the type of data structures and the type of the algorithms to use to solve given problems

4.0 – ABET Criteria Addressed:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

Other Criteria Addressed:

- Substantial coverage of algorithms and complexity, computer science theory, concepts of programming languages, and software development.

5.0 – Major Topics Covered:

Week 0 (Jan 25): Algorithm Correctness
Week 1 (Feb 1): Algorithm Efficiency, Asymptotic notation
Week 2 (Feb 8): Sorting Recap, Solving recurrences
Week 3 (Feb 15): Quicksort, Randomized Quicksort - Decision Tree Model
Week 4 (Feb 22): Heapsort, Priority Queues, Disjoint Sets
Week 5 (Mar 1): Graphs: Search and Single-Source Shortest Paths
Week 6 (Mar 8): Spanning Trees, All-pairs shortest paths
Week 7 (Mar 15): Maximum flow
Week 8 (Mar 22): Hash Tables,
Week 9 (Mar 29): Search Trees and B-Trees
Week 10 (Apr 5): Greedy algorithms
Week 11 (Apr 12): Dynamic programming
Week 12 (Apr 19): Dynamic programming (cont'd)
Week 13 (Apr 26): Optimization techniques, P vs NP

6.0 – Textbook(s):

Recommended textbook:
Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms, Third Edition"

The book is available online at VCU library

- https://proxy.library.vcu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=343613

7.0 – Class Schedule:

- Lecture: MWF 11:00 AM – 11:50 PM (ONLINE, zoom link in Canvas)
  Lab: None

8.0 – Evaluation:

General Instructions:

Tests: There will be 3 tests.

Course assignments:

- 1 introductory programming assignment
- 4 programming assignments
- 2 theory assignments

Late submissions: 1 day: 20% penalty, 2 days 40% penalty, after 2 days not accepted.

Grading:

Category	**% weight**
Introductory Programming Assignment	**5%**
Programming Assignments	**40% (10% each)**
Theory Assignments	**10% (5% each)**
Tests	**45% (15% each)**

Final grade:
A (85% - 100%),
B (70% - 84.99%),
C (60% - 69.99%),
D (50%-59.99%),
F (0%-49.99%)

9.0 – Resources needed:

Java compiler - required
Zoom (with webcam during tests) - required
Canvas - required
Piazza - recommended, for asynchronous Q&A outside of office hours
Standard computing resources (computer, operating system, editor, PDF viewer, email client, web browser etc.) - required

Technology Support
Engineering & VCU Resources:

- **Personal Computer Requirement**: For our current system requirements and recommendations, see: https://egr.vcu.edu/admissions/accepted/computer-recommendations/
- **Remote Access to Public Lab computers**: To provide remote access, we use the Citrix App2Go environment to provide full and exclusive control over "the next available" computer in the lab. See this link for more details: https://wiki.vcu.edu/x/Oa0tBg
- **VCU provides a lot of software available for students to download to their personal computers.** For a list of software and the specifics for each, see: https://ts.vcu.edu/software-center/. In particular, Microsoft Office is available free to students.
- **VCU is transitioning to Canvas.** See the Canvas Student Guide at this link: https://community.canvaslms.com/t5/Student-Guide/tkb-p/student
- **For IT help in the College of Engineering**, see our Wikipedia for "student" help at: https://wiki.vcu.edu/display/EGRITHELP
- **VCU's Technology Services (TS) provides support for "central IT" services**. If you have a technical issue with any of the following services, please submit a ticket with VCU Technology Services at https://itsupport.vcu.edu/ or call (804) 828-2227. VCU TS maintains and supports these services and will be able to provide assistance to you.
    - VCU Cisco VPN
    - 2Factor or Dual Authentication (DUO)
    - Blackboard/Canvas
    - Gmail or other Google Apps
    - Zoom videoconferencing
    - VCU App2Go (Application server)
    - Resetting VCU password
- **For IT issues related to College of Engineering teaching and research, email egrfixit@vcu.edu**
  For loaner Chromebooks for emergency purposes: See this link for more details: https://vcutsmpc.getconnect2.com/

Students should also visit **http://go.vcu.edu/syllabus** and review all syllabus statement information. The full university syllabus statement includes information on safety, registration, the VCU Honor Code, student conduct, withdrawal and more.