

COP 5536 Advanced Data Structures

Spring 2023

Class Period:M,W,F | **Period 5 (12:50 PM - 1:40 PM)** **Location:** NRN 1020

Instructor: Dr. Sartaj K Sahni (sahni@cise.ufl.edu)

Office Hours: Monday and Wednesday 11 am to 12 noon

Phone: 352-294-6666

Office: E536 Computer Science and Engineering Building

TA (Office Hours):

Neha Rani (neharani@ufl.edu): Monday 3-5 pm, Tuesday 3-5 pm, at E520 alternate [Link](#)

Jayetri Bardhan (jayetri.bardhan@ufl.edu): Wednesday 2PM-4PM and Thursday 2-4PM at E 312 [Link](#)

Jingzhou Hu (jingzhouhu@ufl.edu): Monday 2-4 PM and Tuesday 9-11 AM, at E335 [Link](#)

Prashant D. Kari (kapri.prashant@ufl.edu): Friday 3-5PM, at E312 alternate [Link](#)

Nooshin Yousefzadeh (nooshinyousefzad@ufl.edu): Friday 12:30-2:30PM alternate [Link](#)

Tentative Course Schedule:

Week 1(Jan 9 - Jan 13) : Lecture 1 - Lecture 3

Week 2 (Jan 18 – Jan 20) : Lecture 4 - Lecture 5

Holiday: Jan 16

Week 3 (Jan 23 – Jan 27) : Lecture 6 - Lecture 8

Week 4 (Jan 30 – Feb 3) : Lecture 9 - Lecture 11

Week 5 (Feb 6 – Feb 10) : Lecture 12 - Lecture 14

Week 6 (Feb 13 - Feb 17) : Lecture 15 - Lecture 17

Exam 1: Feb 13 (Lecture 1-13)

Week 7 (Feb 20 – Feb 24) : Lecture 18 - Lecture 20

Week 8 (Feb 27 - Mar 3) : Lecture 21 - Lecture 23

Week 9 (Mar 6 – Mar 10) : Lecture 24 - Lecture 26

Spring break: Mar 11- 18

Week 10 (Mar 20 – Mar 24) : Lecture 27 - Lecture 29

Week 11 (Mar 27 – Mar 31) : Lecture 30 - Lecture 32

Exam 2: Mar 28 (Lecture 14-28)

Week 12 (Apr 3 – Apr 7) : Lecture 33 - Lecture 35

Week 13 (Apr 10 – Apr 14) : Lecture 36 - Lecture 38

Week 14 (Apr 17 – Apr 19) : Lecture 39 – Lecture 40

Exam 3: May 4 (Lecture 29-40)

Final exam - 5/4/2023 @ 7:30 AM - 9:30 AM (Lecture 29-40)

Note:- The exam dates are tentative. All exams will be online using Honorlock and will be held in the evening.

Pre-requisites:

You should know the following:

1. C, C++, or Java. Since the text is in C++, you should at least be able to read C++.
2. Algorithm analysis methods (in particular asymptotic complexity).
3. Basic data structures such as stacks, queues, linked lists, trees, and graphs. Basic sorting methods such as insertion sort, heap sort, merge sort, and quick sort.

Course resources:

Course slides and sample exam papers with solution can be found on Dr. Sahni's website - [Link](#)

Course Requirements:

There will be two assignments and three exams. The exams will be closed book exams. The programming assignment(s) may be done in any high level language. Some possibilities are C, C++, and Java. Please have the use of any other language approved by the instructor or the TA. C++ is the preferred language.

Grading:

Exam 1: 25%

Exam 2: 25%

Exam 3: 25%

Assignment 1: 20% (will be available on 10th March and will be due on 11th April)

Assignment 2: 5% (will be available on 8th April and will be due on 22nd April)

The cutoffs are approximately: A 85%; A- 81%; B+ 77%; B 72%; B- 67%; C+ 63%; C 60%; C- 55%; D+ 50, D 45, D- 40. The cutoffs this semester may differ slightly from those just given. Yet, you can get a good estimate using these cutoffs. Note that percentages are computed to one decimal digit. So, for example, while 84.95 will round to 85.0, 84.91 will round to 84.9.

NOTE: A C- will not be a qualifying grade for major, minor, Gen Ed, Gordon Rule or College Basic Distribution credit. For more information on grades and grading policies, please visit: <http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>

More information on UF grading policy may be found at:

[UF Graduate Catalog](#)

[Grades and Grading Policies](#)

Course Outline:

The specific topics are:

- Amortized complexity
- External sorting & tournament trees

- Buffering
- Run generation & optimal merge patterns
- Priority queues and merging
- Leftist trees, Binomial heaps and Fibonacci heaps
- Pairing heaps
- Double ended priority queues
- Static and dynamic weighted binary search trees
- AVL-trees
- Red-black trees
- Splay trees
- B-, B+- and B*-trees
- Tries and digital search trees
- Tries and packet forwarding
- Suffix trees
- Bloom filters
- Segment trees
- Interval trees
- Priority search trees
- k-d trees
- Quad and oct trees
- BSP trees
- R-trees

Lecture	Content
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1	Amortized complexity.
2	Amortized Complexity.
3	Introduction to external sorting.
4	Introduction to external sorting.
5	Selection trees & k-way merging.
6	Run generation.
7	Optimal merging of runs.
8	Buffering.
9	Double-ended priority queues. General methods.
10	Double-ended priority queues. Interval heaps.
11	Leftist trees.
12	Binomial heaps.
13	Binomial heaps.
14	Fibonacci heaps.
15	Pairing heaps.

16	Dictionaries.
17	Optimal binary search trees.
18	AVL trees.
19	AVL trees
20	Red-black trees.

21	Red-black trees.
22	B-Trees.
23	B-trees.
24	B+ and B*-trees.
25	Splay Trees.
26	Splay Trees.
27	Binary Tries.
28	Compressed Binary Tries.
29	High-order Tries.
30	Tries and Packet Forwarding.
31	Suffix Trees.
32	Bloom Filters.
33	Segment Trees.
34	Interval Trees.
35	Priority Search Trees.
36	Priority Search Trees.
37	Multidimensional Search Trees.
38	Quad Trees.
39	BSP Trees.
40	R-trees.

Course Policies:

1. Every student is expected to follow the University of Florida Honor Code. (See <http://www.dso.ufl.edu/STG/default.html>)
2. Handouts, assignments, solutions, and others will be posted on Canvas. Students should check Canvas regularly, at least once per week.
3. When submitting homework for grading, your answers should be written neatly and contain an explanation that is clear and reasonably concise.
4. All requests for re-grading must be made to a teaching assistant within 1 week of the date that scores are posted.

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the [Disability Resource Center](#). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. [Click here for guidance on how to give feedback in a professional and respectful manner](#). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/. [Summaries of course evaluation results are available to students here](#).

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” [The Honor Code](#) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see the [Notification to Students of FERPA Rights](#).

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or police.ufl.edu.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling.

Library Support, Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints Campus

On-Line Students Complaints