

University of Oklahoma
Data Science and Analytics
DSA/CS 5005: Computing Structures
Course Syllabus
Fall 2023 – 5 credit hours

Data Structures (DS) Instructor

Dr. Sridhar Radhakrishnan

Email: sridhar@ou.edu

Office Hours:

Will be held on [Zoom](#)(click to join)

Every Tuesday and Friday

By appointment from 4:00 pm and 5:00 pm

Discrete Mathematics (DM) Instructor

Dr. Sudarshan Dhall

Email: sdhall@ou.edu

Office Hours:

Will be held on [Zoom](#)(click to join)

Every Tuesday and Thursdays

By appointment from 7:00 pm and 8:00 pm

Teaching Assistant: Ashesh Gaur, asheshgaur@ou.edu, Office Hours: Will be held online on [Zoom](#)(click to join) and in person – Every Monday and Wednesday – 6:00 PM – 7:30 PM, Carson 441

Learning Management System: canvas.ou.edu and gradescope.com

Course Meeting Time and Location

Online. See course schedule below.

Course Prerequisite

For students enrolled in MS in DSA Program; all other students need special permission.

Course Description

This course addresses discrete mathematics, object-oriented programming in C++, and data structures in C++. As part of the discrete mathematics students will be introduced to combinatorics, logic, relations, functions, computational complexity, automata, and graph theory. Students will be introduced to the fundamentals of object-oriented programming and learn to design, build, and analyze data structures using object-oriented principles and techniques.

Course Overview

This course is organized by week and is divided into two main sections: (1) Data Structures (DS) and (2) Discrete Mathematics (DM). In addition to watching recorded videos, reading texts and taking notes, you will have weekly homework assignments (DM), four programming projects (DS), a DM final exam and a DS final exam.

Texts:

1. For Data Structures (you can get the book here: [purchase this book](#))
Radhakrishnan, S., Wise L., and Sekharan, N. 2013. *Data Structures Featuring C++: A Programmer's Perspective*.
2. For Discrete Mathematics (this content is available for free on the Canvas platform)
Doerr, A. and Lévassieur, K. 2013. *Applied Discrete Mathematics*.

Materials

To get the most out of this course, you will need to make sure that you have the following hardware, software, or web accounts:

<ul style="list-style-type: none">• Webcam• Calculator• Wolfram CDF Player• Access to scanner or scanning App to PDF• C++ Compiler	<ul style="list-style-type: none">• Zoom account from OU• Respondus LockDown Browser.• Adobe Acrobat PDF reader• Updated browser
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Expectations

This is a very intensive course. You are expected to reserve AT LEAST three to four hours *every day* to watch the lectures, take notes, read the texts, do the self-checks, and complete the homework assignments and projects.

All assignments and exams must be uploaded in the GradeScope system by the due date and time stipulated in the platform. Ensure your familiarity with the GradeScope system in advance and allot sufficient time for assignment submission and any technical difficulties that may arise.

If you need to reach either of us, you can email or join us during our office hours. Messaging on Canvas is not advised, and direct email is preferred. Please put “CS 5005-” in your subject line as a prefix if you need to email us. For example, your subject line could be “CS 5005-Syllabus” or “CS 5005-Project Question”.

DM Homework

You will have weekly homework assignments for Discrete Mathematics. You may work out your homework assignments by hand, with a pen/pencil and paper. Submitting handwritten homework assignments will require a scanner or smartphone-scanning app. Each device is hyperlinked.

- Native Notes App on iOS can scan directly.
- Evernote Scannable ([iOS](#))
- Tiny Scan ([Android](#) & [iOS](#))
- Genius Scan ([Android](#) & [iOS](#))
- Handy Scan ([Windows Phone](#))
- You may also use iOS’s scanning feature on the native Notes app

There are tutorials for the scanning apps available on Lynda.com, which you can access for free. Just sign in with your OU 4x4 and password (<http://www.lynda.com/Android-tutorials/Using-PDF-scanner-mobile-apps/183383/367929-4.html>).

A specific naming convention is required for homework submissions, where X is the assignment number: **hwX_lastname_firstname.pdf**. Handwriting should be legible and easy to understand (e.g. not too small, light, dense, or close to the margin). Be sure to label each problem clearly.

The instructor should not have difficulty interpreting the problem being graded, solution techniques or answers due to a lack of organization or neatness. Further, the technology used to scan the submission (a scanner or scanning app for smartphone or tablet) should effectively

provide legible results. Any confusion in interpreting the answer to a problem (whether the fault of the student or technology) will result in zero credit for that problem.

DS Programming Projects

Projects have to be coded in C++. Ensure the C++ code you write and submit can be compiled using a C++ compiler. Microsoft provides a free version of the development environment (Visual Studio Express).

You can download the VS Express for Windows Desktop by clicking on the link <https://www.visualstudio.com/en-US/products/visual-studio-express-vs>. For Mac users you can follow the link <http://www.stroustrup.com/compilers.html>. This provides access to several free compilers. **Mac does come with a C++ compiler if the xcode developer tools are installed.**

Your programming projects will be evaluated as follows:

1. For every 24 hours late, you will be deducted 10% of the grade of the programming project. Any project that is more than five days late will not be evaluated.
2. A programming project that does not meet the specifications will receive an automatic deduction of 50% of the grade.
3. You are better off submitting a working project on the fifth day rather than one that does not on the day it is due.
4. Programs have to be documented clearly. Programs that lack sufficient documentation will receive a deduction of up to 30% of the grade. Follow the documentation methods used in programs in your data structures book.
5. The specification for the projects presented by the instructor may contain only some of the implementation details. It is your responsibility to understand the specifications thoroughly.
6. Copying programs or consulting others for coding is strictly prohibited.
7. Apart from the above general policies for evaluation, each programming project will also have a set of specifications that should be met.
8. All programming projects will be checked for plagiarism using an automated tool.

Quizzes

There will be 4 quizzes in the coursework. The quizzes will be conducted on Canvas. You will have a 1 day window for each quiz. The quizzes will be timed from the moment of starting the quiz. The duration of the quizzes will be 40 minutes each, unless you have DRC accommodation.

Exams

There will be two final exams, one for DS and the other for DM. The DM exam will happen mid session and the DS exam will be at the end of the session. Failure to take the final exams may result in an "F" for the course. Exams will be online, open book and 2 hours in duration. Exams will be taken through the Canvas platform on Zoom.

Once the exam is activated on Canvas, students will have a limited amount of time to complete it. Please note the exam period INCLUDES the scanning and uploading of handwritten notes, so allow sufficient time to upload these documents to the Canvas platform. The system will record the time a student retrieves the exam and when the exam is finally submitted, but the platform offers no timekeeping function for the student. As such, it is incumbent upon you to monitor your own examination pace and ensure that submission is on time. We reserve the right to release the final exam scores. You can request if you are wanting to know your score.

Class Participation

Since this is an online course, class participation means watching the videos. Comprehensively watching all lectures is essential. Your engagement with the video lectures, which we will track through our media analytics where the videos are hosted, will account for 15% of your total grade in the class. Make sure to view them in their entirety. This participation will be documented in your Canvas Gradebook. You are more than welcome to ask questions regarding the videos in the TA's office hours, or through email.

Course Grading

The course letter grade will be assigned based on the overall percentage: 90-100 (A), 80-89 (B), 70-79 (C), 60-69 (D), and < 60 (F). The allocation of percentages is given below:

	Percentages
Discrete Math Homework Assignments	17%
Discrete Math Final Exam	17%
Data Structures Projects	27%
Data Structures Quizzes	7%
Data Structures Final Exam	17%
Class Participation	15%

Technical Support

The instructor and teaching assistant will not be able to help with issues related to the platform. Requests for platform assistance should be directed to the Canvas Support [Live Chat](#). For OU IT support, please phone (405) 325-HELP or email needhelp@ou.edu.

Course Policies

Late Policy

Work submitted *five days* or more after the due date will NOT receive credit. You will earn 0 points for the assignment or exam.

Attendance

Since this is a fully online class. You are expected to view all lectures and complete all readings throughout the course.

University Policies

Academic Integrity

Cheating is strictly prohibited at the University of Oklahoma because it devalues the degree you work hard to get. As a member of the OU community, you are responsible for protecting your educational investment by knowing and following the rules. For specific definitions of what constitutes cheating, review the Student's Guide to Academic Integrity at http://integrity.ou.edu/students_guide.html and <https://www.ou.edu/integrity/students#OU-and-Integrity>.

To be successful in this class, all work on exams and quizzes must be yours and yours alone. If you become aware of a fellow student engaging in suspicious behavior, I encourage you to report it to us or the Office of Academic Integrity Programs. That student is devaluing not only their degree but yours, too. Be aware that our professional obligation is to report academic misconduct, which we will not hesitate to do. Sanctions for academic misconduct can include expulsion from the University and an F in this course, so don't cheat. It's simply not worth it.

Religious Observance

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty.

Reasonable Accommodation Policy

The Accessibility and Disability Resource Center is committed to supporting students with disabilities to ensure they can enjoy equal access to all components of their education. This includes your academics, housing, and community events. If you are experiencing a disability, a mental/medical health condition that significantly impacts one or more life functions, you can receive accommodations to provide equal access. Possible disabilities include, but are not limited to, learning disabilities, AD(H)D, mental health, and chronic health. Additionally, we support students with temporary medical conditions (broken wrist, shoulder surgery, etc.) and pregnancy. To discuss potential accommodations, please get in touch with the ADRC at 730 College Avenue, (ph.) 405.325.3852, or adrc@ou.edu.

Title IX Resources and Reporting Requirement

Anyone impacted by gender-based violence, including dating violence, domestic violence, stalking, harassment, and sexual assault, deserves access to resources so that they are supported personally and academically. The University of Oklahoma is committed to offering resources to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you would like to speak with someone confidentially, please contact [OU Advocates](#) (available 24/7 at 405-615-0013) or another confidential resource (see "[Can I make an anonymous report?](#)"). You may also choose to report gender-based violence and discrimination through other means, including by contacting the [Institutional Equity Office](#) (ieo@ou.edu, 405-325-3546) or police (911). Because the University of Oklahoma is committed to the safety of you and other students, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. For more information, please visit the [Institutional Equity Office](#).

Adjustments for Pregnancy/Childbirth Related Issues

Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please get in touch with your professor or the Accessibility and Disability Resource Center at 405/325-3852 as soon as possible. Also, see the Institutional Equity Office [FAQ on Pregnant and Parenting Students' Rights](#) for answers to commonly asked questions.

Final Exam Preparation Period (required)

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy, please refer to OU's [Final Exam Preparation Period policy](#).

Emergency Protocol (required)

During an emergency, there are official university [procedures](#) that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather.

1. Look for severe weather refuge location maps located inside most OU buildings near the entrances.
2. Seek refuge inside a building. Do not leave one building to seek shelter in another that you deem safer. If outside, get into the nearest building.
3. Go to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in the innermost room. Avoid outside doors and windows.
4. Get in, Get Down, Cover Up
5. Wait for official notice to resume normal activities.

Additional [Weather Safety Information](#) is available through the Department of Campus Safety.

Armed Subject/Campus Intruder: (required)

If you receive an OU Alert to shelter-in-place due to an active shooter or armed intruder situation or you hear what you perceive to be gunshots:

1. *Avoid:* If you believe you can get out of the area WITHOUT encountering the armed individual, move quickly towards the nearest building exit, move away from the building, and call 911.
2. *Deny:* If you cannot flee, move to an area that can be locked or barricaded, turn off lights, silence devices, spread out, and formulate a plan of attack if the shooter enters the room.
3. *Defend:* As a last resort fight to defend yourself.

For more information, visit [OU's Emergency Preparedness site](#).

[Shots Fired on Campus Procedure – Video](#)

Fire Alarm/General Emergency: (required)

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates: 1. *LEAVE* the building. Do not use the elevators. 2. *KNOW* at least two building exits 3. *ASSIST* those that may need help 4. *PROCEED* to the emergency assembly area 5 *ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues.* 6. *WAIT* for official notice before attempting to re-enter the building.

[OU Fire Safety on Campus](#)

Mental Health Support Services: (required)

If you are experiencing any mental health issues that are impacting your academic performance, counseling is available at the University Counseling Center (UCC). The Center is located on the second floor of the Goddard Health Center, at 620 Elm Rm. 201, Norman, OK 73019. To schedule an appointment call (405) 325-2911. For more information, please visit [University Counseling Center](#).

COVID - 19 policies

For information about the changes to the course from the University side, please keep yourself updated from OU's learn anywhere website - <https://www.ou.edu/learnanywhere> .

Tentative Schedule – Fall 2023

Week	Type	Topic	Assigned	Due
Week 0 and 1: August 21 - August 25		Week 0: Introduction and Week 1: Introducing C++ and Object-Oriented Programming		
		0 Course Introduction		
	DS	1.1 Introducing C++	Project 1	Sept. 15
	DS	1.2 Intro to Object-Oriented Programming		
Week 2: August 28 – September 1	DM	Week 2: Set Theory and Combinatorics	DM HW-1	Sept. 8
	DM	2.1 Set Theory		
	DM	2.2 Combinatorics		
Week 3: Sept. 4 -Sept. 8	DM	Week 3: Logic and More on Sets	DM HW-2	Sept. 15
	DM	3.1 Logic		
	DM	3.2 More on Sets		
Week 4: Sept. 11 - Sept. 15	DM	Week 4: Relations, Graphs, and Trees	DM HW-3	Sept. 22
	DM	4.1 Relations and Graphs		
	DM	4.2 Graph Theory		
	DM	4.3 Trees	Project 2	Oct. 13
Week 5: Sept. 18- Sept. 22	DM	Week 5: Functions, Recursion, and Recurrence Relations	DM HW-4	Sept. 29
	DM	5.1 Functions		
	DM	5.2 Recursion and Recurrence Relations		
Week 6: Sept. 25 – Sept. 29	DM	Week 6: Generating Functions and Number Theory	DM HW-5	Oct. 3
	DM	6.1 Generating Functions		
	DM	6.2 Number Theory		
Week 7: Oct. 2 - Oct. 6	DM	Week 7: Final Exam Review and Exam		
	DM	Discrete Math Final Exam Those Enrolled in DSA 5005 Section 001 Must take the exam in person in CEC 441		Oct. 4
Week 8: Oct. 9 - Oct. 13	DS	Week 8: Algorithms and Recursion		
	DS	8.1 Algorithms and Recursion	Project 3	Nov 10
Week 9: Oct. 16 - Oct. 20	DS	Week 9: Arrays, Strings, Matrices, and Vectors		
	DS	9.1 Arrays, Strings, Matrices and Vectors	Quiz 1	Oct. 22
Week 10: Oct. 23 - Oct. 27	DS	Week 10: Linked Lists and Stacks and Queues		
	DS	10.1 Linked List Structures	Project 4	Nov. 4
	DS	10.2 Stacks and Queues		
Week 11: Oct. 30 - Nov. 3	DS	Week 11: Simple Search Trees		
	DS	11.1 Simple Search Trees	Quiz 2	Nov. 5
Week 12: Nov. 6 - Nov. 10		Week 12: Self-Modifying Search Trees		
	DS	12.1 Self-Modifying Search Trees	Project 4	Dec. 1
Week 13: Nov. 13 – Nov. 17		Week 13: Priority Search Trees and Sorting		
	DS	13.1 Priority Structures		
Week 14: Nov. 20 - Nov. 24		13.2 Sorting	Quiz 3	Nov. 19
		Thanksgiving week		
Week 15: Nov. 27 - December 1		Week 15: Hashing and Graphs		
	DS	15.1 Hashing		
	DS	15.2 Graphs	Quiz 4	Dec 3
Week 16: Dec. 4 - Dec. 8		Week 16: Final Week (Evening Class and Online)		
	DS	Data Structures Final Exam Those Enrolled in DSA 5005 Section 001 Must take the exam in person in CEC 441		Dec. 6 – 6:00 PM – 8:00 PM (CST)