DA 219: Data Structures for Data Analytics

Spring 2023

Intructor: Saksham Gakhar	**Time and place: Remote**
Email: saksham.gakhar@wsu.edu	**Credits: 3**
Office Hours: TBD, expect 3hrs/week	

Course Page:

- [wsu.instructure.com (Canvas)](wsu.instructure.com)

Text Books:

- **(Required)** *Introduction to Algorithms* by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein

- **(Optional)** *Data Structures & Algorithms In Python* by Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser

Course Description: This course covers programming techniques including data structures, sorting and searching, object-oriented design, and an introduction to algorithmic analysis.

Major Topics

1. Object-Oriented Design

2. Data structures including Linked Lists, Trees, Stacks, Queues, Hash Tables, Graphs, and Heaps

3. Big-O Notation

4. File I/O interfacing with common data formats (CSV, JSON, XML)

5. Automated Data Processing

6. Ethics of data storage and collection

Student Learning Outcomes and Assessment: At the end of the course, a successful student should be able to to perform the following:

1. Evaluate and Compare an algorithm's complexity and effectiveness

2. Implement and Utilize appropriate data structures

3. Identify ethical responsibilities relevant to data storage and privacy

4. Analyze datasets and use appropriate data structures to perform data analytic methods over said datasets

Assignments, Assessments, and Grading Policy: Over the course there will be multiple assignments, a midterm, and a final project. The assignments are designed to build upon the skills covered in class. There is a single midterm consisting of all topics covered before the date administered. The final project is designed to incorporate all the topics covered in the course.

Assignments:

- All assignments are weighted equally

- An assignment will be posted every 1-2 weeks

- Both written and coding assignments will be assigned

- All assignments involving code will use Python 3.9+

- Roughly one assignment per week, increasing in size and complexity over the semester

- Late submissions are accepted up to 24 hours past the due date with a 10% penalty

- After 24 hours, assignments will receive no marks

Exams:

- A single midterm. Closed book, closed notes, administered via Canvas. Date TBD.

- No final exam. Instead you will demonstrate your final project to the instructor

- During the demonstration, the instructor may ask you various questions about your code

Final Project:

- Final projects will be constructed over multiple weeks towards the end of the semester

- The final project requires a demonstration to the instructor, either during class time or offline

- Projects will be graded based on effort, quality, robustness, and completeness

Participation:

- Participation in weekly tasks, submitted via canvas will be rewarded.

- Periodic tasks (see schedule on Canvas) will involve writing short 100 word summaries of the assigned readings

- Summaries to be submitted via canvas

Grading Criteria:	
Assignments	50%
Participation	5%
Midterm	20%
Final Project	25%
Total	100%

As a general rule, you can expect the mapping below to reflect the relationship between percentages and letter grades. I will round to the nearest 4 significant figures. For example, 92.9452% will be 92.95%, which is an A-. I reserve the right to raise a grade associated with a percentage score (create a favorable curve) or adjust the value of an assignment/exam (eliminating a question). However, these changes will never result in the grade being reduced.

93 % or above	A
90% - 92%	A−
87% - 89%	B+
84% - 86%	B
80% - 83%	B−
77% - 79%	C+
74% - 76%	C
70% - 73%	C−
Below 70%	D/F

Course Policy:

- **Attendance** that does not involved practice sessions is not required but is highly encouraged. Although attendance is not required, student's are responsible for any material presented in class. This includes, but is not limited to, announcements, change in due dates, lecture material, etc.

- **Make-up Policy:** Some class time will be dedicated towards practice problems. Attending these sessions will earn students marks towards their Participation. Missed practice sessions will not count towards a students Participation grade.

  Exams will take place on the specified date on the schedule. Exams cannot be rescheduled unless there are extreme circumstances preventing you from taking the exam. Prior written communication and agreement about such an event with the professor is required. Requests for rescheduling the exam after the exam has taken place are not accepted.

- **Late assignments** will be accepted up to 24 hours past the due date. Any assignments submitted after the due date will receive a deduction of 10%. Assignments submitted later than 24 hours past the due date will not be accepted and will receive no marks.

- **Communication** will take place primarily via email. Allow 24 hours during the week for a response. Keep in mind, last minute emails about assignments due at 11:59PM may not receive a response until after the due date.

- **Written material** for assignments must be submitted as a PDF on Canvas. Some assignments may require uploading PDF images to canvas. All code should be well documented. Code that is not commented well may lose marks.

- **All assignments, programming code, etc.**, must be submitted through Canvas. For all programming assignments, include a README.txt with information on how to run and/or compile it. You must zip your code and anything else required by the assignment. If your assignment is not compressed in a ".zip" format, it may not be graded.

- **Extra credit** may be offered throughout the course. Attend class or discuss with classmates to find out about it.

- **Expectations for Student Effort:** Students should expect to spend a minimum of 9 hours per week in the following types of activities: reading, discussion, completing assignments, reviewing instructor feedback, studying for assignments, etc.

- **Working in groups** is only acceptable on team projects. Other projects must be done **individually**. It is acceptable to discuss general concepts and design ideas; it is unacceptable to share code, with your classmates. If you want to use third party materials (e.g., code, data, images, libraries, etc.) **you must clear this in advance with the professor, and you must give credit to these external sources.** Be sure you understand the plagiarism policy before you begin your work.

- **Academic Integrity Statement:** Plagiarism or cheating *will not be tolerated.* University policy will be strictly adhered to in all such cases. There is a difference between collaboration and plagiarism. Plagiarism is the act of using another's work without giving them credit for it. Collaboration is the exchange of ideas, the debate of issues and the examination of readings among each other that enables you to arrive at your own independent thoughts.

  Academic integrity is the cornerstone of higher education. As such, all members of the university community share responsibility for maintaining and promoting the principles of integrity in all activities, including academic integrity and honest scholarship. Academic integrity will be strongly enforced in this course. Students who violate WSU's Academic Integrity Policy (identified in Washington Administrative Code (WAC) 504-26-010(4) will fail the assignment, will not have the option to withdraw from the course pending an appeal, and will be reported to the Center for Community Standards.

  Cheating includes, but is not limited to, plagiarism and unauthorized collaboration as defined in the Standards of Conduct for Students, WAC 504-26-010(3). Read and understand all of the definitions of cheating. If you have any questions about what is and is not allowed, ask your course instructor.

  If you wish to appeal a instructor's decision relating to academic integrity, please use the form available at communitystandards.wsu.edu. Make sure you submit your appeal within 21 calendar days of the instructor's decision.

- **COVID-19 Policy:** Students are expected to abide by all current COVID-19 related university policies and public health directives at https://wsu.edu/covid-19/. Students who do not comply with these directives may be required to leave the classroom; in egregious or repetitive cases, students may be referred to the Center for Community Standards for university disciplinary action.

- **Students with disabilities:** Reasonable accommodations are available for students with documented disabilities or chronic medical conditions. If you have a disability and need accommodations to fully participate in this class, please visit the Access Center website to follow published procedures to request accommodations: https://studentaffairs.vancouver.wsu.edu/access-center. Students may also call or email the Access Center to schedule an appointment with an Access Advisor; Phone: 360-546-9238; Email: . All disability related accommodations MUST be approved through the Access Center. If you have a disability and need accommodations, we recommend you begin the process as soon as possible. It is a university expectation that students with approved accommodations visit with instructors (via email or Zoom) within two weeks of requesting their accommodations to discuss logistics.

  For more information contact a Disability Specialist on your home campus:

  - Pullman or WSU Online: 509-335-3417, http://accesscenter.wsu.edu, Access.Center@wsu.edu
  - Spokane: http://spokane.wsu.edu/students/current/studentaffairs/disability/
  - Tri-Cities: http://www.tricity.wsu.edu/disability/
  - Vancouver: 360-546-9238, http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services

- **Policy Prohibiting Discrimination and Harassment (Executive Policy 15)** This policy expresses WSU's commitment to maintaining an environment free from discrimination, including sexual harassment. This policy applies to all students, faculty, staff, or others having an association with the University.

  Discrimination, including discriminatory harassment, sexual harassment, and sexual misconduct (including stalking, intimate partner violence, and sexual violence) is prohibited at WSU (See WSU Policy Prohibiting Discrimination and Harassment (Executive Policy 15) and WSU Standards of Conduct for Students).

  If you feel you have experienced or have witnessed discriminatory conduct, you can contact the WSU Office of Civil Rights Compliance & Investigation (CRCI) and/or the WSU Title IX Coordinator

at 509-335-8288 to discuss resources, including confidential resources, and reporting options. (Visit crci.wsu.edu for more information).

Most WSU employees, including faculty, who have information regarding sexual harassment or sexual misconduct are required to report the information to CRCI or a designated Title IX Coordinator or Liaison. Visit https://crci.wsu.edu/reporting-requirements/ for more information.

- **Accommodation for Religious Observances or Activities** Washington State University reasonably accommodates absences allowing for students to take holidays for reasons of faith or conscience or organized activities conducted under the auspices of a religious denomination, church, or religious organization. Reasonable accommodation requires the student to coordinate with the instructor on scheduling examinations or other activities necessary for course completion. Students requesting accommodation must provide written notification within the first two weeks of the beginning of the course and include specific dates for absences. Approved accommodations for absences will not adversely impact student grades. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who feel they have been treated unfairly in terms of this accommodation may refer to Academic Regulation 104 – Academic Complaint Procedures.

- **Safety and Emergency Notification (Put local resources here)** Please sign up for emergency alerts on your account at MyWSU. For more information on this subject, campus safety, and related topics, please view the FBI's Run, Hide, Fight video and visit the classroom safety page https://provost.wsu.edu/classroom-safety/.

  Emergency Closure/Adverse Weather Bus Information for WSU Vancouver Campus:

  - WSU Vancouver VanCoug ALERTS: www.vancouver.wsu.edu/alerts
  - Weather Closure Media Web Sites: http://www.oregonlive.com/
  - During adverse weather conditions when C-Tran is operating on snow routes, the WSU Vancouver campus will not be served as the snow route ends at 20th Ave.

  For more information on bus routes and C-Tran scheduling, please visit their website at: http://www.c-tran.com/

  WSU Vancouver Home Page (Announcements and Alerts): http://www.vancouver.wsu.edu/

  WSU Vancouver Police: http://www.vancouver.wsu.edu/police

  Campus Safety Plan: http://admin.vancouver.wsu.edu/clery-act/annual-security-report

  Hostile Intruder:

  - Campus Lock Down – Exterior doors will lock
  - Apply "RUN-HIDE-FIGHT" personal safety protocol
  - If sheltered or hiding; silence electronics, turn out lights, stay away from windows, barricade or lock doors, make a plan to fight if necessary
  - Active Shooter Training links: https://oem.wsu.edu/emergency-procedures/active-shooter/
  - WSU Vancouver VanCoug ALERTS: www.vancouver.wsu.edu/alerts
  - Mass notification system: WSU Vancouver Home Page – myWSU (under the PROFILE Tab) to update info

- **Inclement weather policy (Put local resources here)** In the event that an adverse weather event (e.g., snow or ice) or natural hazard that poses a safety risk occurs, you should take personal safety into account when deciding whether you can travel safely to and from campus, taking local conditions into account. If campus remains open and your instructor decides to cancel the face-to-face meeting and substitute an alternative learning activity, you will be notified by your instructor via email or

through Blackboard within a reasonable time after the decision to open or close campus has been made. Instructions regarding any alternative learning options or assignments will be communicated in a timely manner. If travel to campus is not possible due to adverse regional conditions, allowances to course attendance policy and scheduled assignments, including exams and quizzes, will be made. Students who attempt to gain advantage through abuse of this policy (e.g., by providing an instructor with false information) may be referred to the Office of Community Standards for disciplinary action. If a student encounters an issue with an instructor, the student should first talk with the instructor. If the issue cannot be resolved, the student should follow the reporting violations of policies outlined on the student affairs website. Finally, in case of class cancellation campus-wide, please check local media, the WSU Vancouver web page (https://www.vancouver.wsu.edu) and/or http://www.flashalert.net/. Individual class cancellations may be made at the discretion of the instructor.

- **Cougar Food Pantry (Put local resources here)** We know that it can be hard to make ends meet when you're paying for college and living on a tight budget. If you are struggling to feed yourself or your family, the Cougar Food Pantry can help. The pantry provides free, nonperishable food items for WSU Vancouver students in need. The process is simple, anonymous and judgement-free. Learn more and request food at vancouver.wsu.edu/fooddrive or stop by the Cougar Center in the Student Services Center. Help your fellow Coug; refer a friend in need!

Schedule (Subject to Change)

Week #	Topics	Assignments	Due Dates
Week 1-2	Getting Python running Python Types Debugging Techniques Assertions Scope and Namespace	HW 1	
Week 3-4	Object Oriented Design Modules and Libraries Values vs. References	HW 2	HW 1
Week 5	Pandas Numpy Spark	HW 3	HW 2
Week 6	What is a data structure Linked Lists Doubly Linked Lists		
Week 7	Trees Recursion Tree Traversal		HW 3
Week 8	Review Midterm		
Week 9	Stacks Queues	HW 4	
Week 10	Maps (in Python) Hash Tables Hash Functions		
Week 11	Heaps	HW 5 (Final Prep)	HW 4
Week 12-13	Big-O Notation Sorting Algorithms Searching Algorithms	Final	HW 5
Week 13-14	JSON and XML File I/O		
Week 15	Ethics of Data Collection Ethics of Data Privacy		Final