Master Course Syllabus

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/

Semester: Spring
Year: 2025
Course Prefix: CS
Course and Section #: 2420-002
Course Title: Introduction to Algorithms and Data Structures
Credits: 3

Course Description

Uses data abstraction to design and implement modular programs of medium size and complexity. Structures solutions to problems using common data structures and algorithms such as advanced arrays, lists, stacks, records, dynamic data structures, searching and sorting, vectors, trees, linked lists, and graphs. Evaluates alternative solutions to problems. Analyzes algorithmic complexity metrics in Big-O notation. Lab access fee of $45 for computers applies.

One of the requirements for a student to take upper-division Computer Science classes is to complete this course with a minimum grade of C+

Students are screened for matriculation while taking CS 2420 (this class). Students will be notified approximately halfway through the semester as to their status.

Course Attributes

This course has the following attributes:
☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
☒ Discipline Core Requirements in Program
☐ Elective Core Requirements in Program
☐ Open Elective
Other: *Click here to enter text.*

Instructor Information

Instructor Name: Frank Jones

Student Learning Outcomes

- Develop algorithms and programs of medium size or complexity.
- Design programs using good modular analysis and design principles.
- Evaluate the design and implementation of programs using a methodical approach.
- Implement linear and non-linear data structures, such as arrays, lists, stacks, queues, hashmaps, trees and graphs

- Select and use appropriate data structures for a particular task using algorithmic complexity metrics with Big-O notation.

Course Materials and Texts

I. Access to Python 3.8 or later interpreter/environment zyBooks uses 3.8.5 currently.
II. Textbook zyBooks Introductions to Algorithms and Data Structures

Course Requirements

Course Assignments, Assessments, and Grading Policy
This course is organized into **8 modules**, as follows.

- Module 1: Review, zyBooks and Big-O
- Module 2: Recursion, Search
- Module 3: Sorting
- Module 4: Linked List
- Module 5: Stacks, Queues and Deques
- Module 6: Trees
- Module 7: Dictionaries and Hashing
- Module 8: Graphs

There are 8 **programming projects** (45% of overall grade), corresponding to modules 1–8.
Weekly homework (20% of overall grade) is assigned in zyBooks in the form of a mix of Practice Activities (PAs), Challenge Activities (CAs) and Labs.

There is 1 midterm exam and a final exam (each 15% of overall grade). All exams are administered in Canvas**.** You must be **alone** when taking exams. You have only one attempt for each exam. Exams are **timed.** The final exam is **comprehensive.**

Students are also scored on **professionalism** (5% of overall grade). Classroom learning is a "group activity" - one wherein the active participation of each member of the class is important to the efficient use of time for all parties involved. As such, a certain degree of professionalism is expected from all students. In this context "professionalism" does not mean a stiff and formal environment, such is not necessary or even ideal for what we are trying to accomplish. Rather, professionalism involves behavior that extends common courtesy and consideration to everyone else in the room (including the instructor). This includes being polite and respectful of each other (including other people's questions and comments), as well as being respectful of each other's time.

A great deal of time and energy are wasted by students who are not present, unprepared, or acting in a distracting manner (such as having side-bar conversations or being distracted themselves). In an effort to encourage professional behavior, daily attendance is taken in the form of a simple participation quiz, and points are recorded for being in class (attending class is the lowest bar of professional behavior). Beyond "being there" a student may lose their professionalism point for a day through unbecoming or unacceptable behavior. Generally, if an issue arises the instructor with discuss the issue with the student(s) involved and issue and document a warning in private. If the behavior continues then the

instructor will be forced to begin deducting points. In serious cases points may be deducted without a warning.

The following grading scale will be used in this class:

A = 94-100	B- = 80-82	D+ = 67-69
A- = 90-93	C+ = 77-79	D = 63-66
B+ = 87-89	C = 73-76	D- = 60-62
B = 83-86	C- = 70-72	E = 0-59

All work is due at **11:59pm** on its respective due date.
Due dates are in Canvas.

Traditional Late Policy:
A 20% late penalty is applied PER-DAY to late work for up to two days; work that is more than two days late can receive a maximum of 60%.

Non-Late Policy:

Students in this class have the option of utilizing what I refer to as the "non-late" policy. This is an OPTIONAL policy that (when properly applied) supersedes the more traditional late policy just described. The non-late policy is meant to do several things:

1) Emulate/reduce as much as possible the artificial constraints that academic schedules impose on the learning process.

2) Encourage good habits/practices that will benefit students in this class and in life.

3) Prevent students from hitting a "wall" by running out of time, not completing an assignment on time, giving up on it, and subsequently not being able to complete any of the successive coursework that depends upon the concepts explored in the uncompleted assignment.

In the real world professional people work consistently and diligently to meet practical deadlines. Even under the best of circumstances we sometimes miss these deadlines. When this happens as students this often means "all hope is lost" and we just turn in what we have. In the real world we don't do this. Among other actions that may be appropriate, we generally keep working - HARDER - and push through until the project is completed. This is often not only the right and best thing to do, but also the REQUIRED thing to do.

The non-late policy offers a student the opportunity to continue working on an assignment past the due-date, and to turn it in without late point deductions if three conditions are met. The conditions are as follows:

1) Prior to the due date the student must have met a minimum threshold in number of **out of class** hours worked towards the completion of the assignment. "Work towards completion of the assignment" can include time spent studying relevant material in the course textbook (i.e. the reading assignments associated with the module the assignment is part of), spending time studying related concepts and issues online, and of course - time spent actually working on the assignment.

The minimum threshold of hours worked for an assignment will be specific to, and indicated for, each assignment.

Hours worked must be recorded in a simple "work log" that will be described shortly.

2) Prior to the due date the student must have met a minimum threshold in number of "work days" for the assignment. A "work day" is a day in which the student invested AT LEAST 1 hour of **out of class** time working towards the completion of the assignment. See the previous requirement for a description of what activities qualify as "time working".

3) Once the due date for an assignment has passed, the student must work at least 2 hours DAILY on the assignment until the day the assignment is completed and turned in (excluding Sundays). Obviously this requirement doesn't apply to the day the student turns in the assignment as they may finish before reaching the 2 hour mark (and that is perfectly fine)

Failure to meet any of these three requirements for an assignment will invalidate the non-late policy for the assignment.

Work Logs and Invoking the Non-Late Policy

In order for a student to invoke the non-late policy they need only leave a comment with their submission that states "Invoking the non-late policy." Accompanied by a copy of their work log showing that they have met the three requirements. Work logs should be a simple listing of the days, amounts of time, and activities invested. Here is a simple example

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Jan 31st, Worked on chapter 3 PAs in zyBooks - 0.5 hour : 0.5 hours total

Feb 2nd, Worked on chapter 3 PAs in zyBooks - 1 hour, Started work on project 2 (design work) 0.5 hours : 1.5 hours total

Feb 3rd, Designing and coding on project 2 - 2 hours : 2 hours total

Feb 4th, Coding and debugging on project 2 - 3.5 hours : 3.5 hours total

Feb 5th, Coding and debugging on project 2 - 2 hours : 2 hours total

Feb 6th, Coding and debugging on project 2 - .25 hours : .25 hours - project completed.

Due date: Feb 4th

Work days before project due: 3

Hours worked before project due: 7.5

If the minimum number of days worked for this project was 3 or less - AND the minimum number of hours worked was less than 7.5 - then this student would be able to invoke the non-late policy and not face any late penalties even though they finished on the second day after the due date.

Speak with your instructor or a course IA for more information or with any questions concerning this policy.

NOTE: ALL coursework (with the exception of the final exam) is due by 11:59pm on the last day of class. No late work will be accepted beyond this day and time.

Required or Recommended Reading Assignments
All required readings use chapters from the course text that align with the lecture schedule outlined below.

General Description of the Subject Matter of Each Lecture or Discussion

Week	Module	Readings	Topics
Week 1	Module 1	Ch 1 PAs	Course introduction. What is an algorithm? What is a data structure? Intro to Big-O notation.
Week 2	Module 2	Ch 2 PAs	Intro to Project 2. Search algorithms (linear, binary, jump, etc)
Week 3	Module 2 **MLK Jr. Day** (No Class Monday)		Recursion, Intro to Project 3
Week 4	Module 3	Ch 3 PAs	Sorting algorithms (bubble sort, insertion sort, selection sort)
Week 5	Module 3		Sorting algorithms (merge sort, quicksort), divide and conquer algorithms, Intro to project 4
Week 6	Module 4	Ch 4 Part 1 PAs	Linked data structures. Linked lists. Linked list operations
Week 7	Module 4 **Presidents Day**(No Class Monday)		Intro to project 5, Stacks, Queues
Week 8	Module 5	Ch 4 Part 2 PAs	Stacks, Queues, Dequeues, using stacks to perform computation
Week 9	Module 5		Midterm, intro to trees/binary trees, intro to project 6
Week 10	**Spring Break**		
Week 11	Module 6	Ch 5 PAs	Binary Search Trees (BSTs), BST operations/algorithms
Week 12	Module 6	Ch 6 PAs	Balanced Trees, intro to project 7
Week 13	Module 6/7	Ch 7/8 PAs	Hash tables and hash table operations

Week	Module	Readings	Topics
Week 14	Module 7	Ch 7/8 PAs	Heaps (min/max), intro to graphs, intro to project 8
Week 15	Module 8	Ch 10 PAs	Graph traversals, Depth/breadth first search, Dijkstra's Algorithm
Week 16	Module 8		Topological sort, minimum spanning trees
Week 17	**Final Exams**		Final Exam

All chapters or sections refer to zyBooks Introduction to Algorithms and Data Structures Python unless otherwise noted.

*Note: At times variations/modifications to pacing are necessary. As such, the instructor reserves the right to make **minor** modifications to due dates as needed/necessary for the benefit/well-being of the class.

Required Course Syllabus Statements

Generative AI
ChatGPT (and similar Tools) in This Course
Use ChatGPT as a learning assistant, not as a crutch. If you use it, cite it at the top of your code. You are responsible to make sure that any code or content does what it is supposed to do and says what you want it to say. Don't accept anything it generates at face value without checking it critically. These days potential employers will expect you to know how to use tools like ChatGPT to generate code, so it is a skill we need to teach you. If it helps you learn some things faster, GREAT because we can spend class time on more interesting topics. Just remember: If you REALLY want to be good, work for it.

Using Remote Testing Software
☐ This course does not use remote testing software.

☒ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities
Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity

At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.
To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed

by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.