CS 2401

Elementary Data Structures and Algorithms

CRN: 11378

Course Info

Prereq: CS 1301 and CS 1101, with a grade of C or better in both.

Day: Mondays & Wednesdays

Time: 9 AM - 10:20 AM

Location: UGLC 128

Course Platform: Blackboard

Instructor Info

Dr. Monika Akbar

Office Hours: **Monday** (in-person): 1 to 2 PM

Friday (Virtual - MS teams) 1 to 2:00 PM

Location: CCSB 3.0422

makbar@utep.edu

Fall 2024

Course Objectives

This is the second course for students majoring in Computer Science. Students will learn about fundamental computing algorithms including searching and sorting; recursion; elementary abstract data types including linked lists, stacks, queues and trees; and elementary algorithm analysis.

Knowledge and Abilities Required for the Course

Students are assumed to be comfortable programming in Java. Students should be able to code basic arithmetic expressions, define simple classes, use strings, code loops and conditional statements, write methods, create objects from classes, invoke methods on an object, perform basic text file input and output, and use arrays.

Topics

1. Review and deeper study of **arrays**, **objects**, **linked lists**, and **recursion**.
2. Introduction to b and rigorous study of **searching and sorting algorithms**.
3. New data structures: **binary trees** (including binary search trees), **stacks**, and **queues**, along with their implementations.

Textbook

A free e-book called OpenDSA

NOTE

The next computer science class, CS 2302 (Data Structures), has two prerequisites: **CS2401** and **Discrete Math** (or Discrete Structures I and Discrete Structures II).
To avoid delaying your progress through the program, if you are **NOT** currently taking Discrete Math (or, Discrete Structures I and Discrete Structures II) and have not already passed it, you should seriously consider registering for Discrete Math (Discrete Structures).

Logistics

While each week of the course will be slightly different, and students should stay up to date, an "average" week in the course will include:

- 2 class sessions where the instructor will lead a discussion of examples and answer questions about the materials being learned
- 2 lab sessions where the TA/IAs will lead a discussion primarily related to the lab assignments and topics covered in the class
- 0 to 2 homework assignments
- 1-2 in-class activities or quiz
- 1-2 laboratory implementation assignment

Note: The instructor may make changes to this items during the semester to better serve the students.

Grading

Grades are communicated to students in a timely manner. It is the student's responsibility to keep track of their grades by compiling the grades they receive. Your semester grade will be based on a combination of homework assignments, weekly quizzes, class participation, mid-term exams, student engagement, and a final exam.

The approximate percentages are as follows:

- 10% Attendance and class participation
- 10% Homework/Quizzes/In-class assignments grade
- 30% Midterm exams (three to four exams, around an hour each)
- 15% Final exam (Equal or less than 2 hours 45 minutes)
- 35% Lab grade

The nominal percentage-score-to-letter-grade conversion is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- below 60% is an F

These minimums may be lowered without notice but will not be raised.

Regardless of your standing in the class at that time, you need to earn a C or better on the final exam to pass the course – as well as a C or better as your average grade on the lab assignments.

Labs

CRN	Day, time, location	TA	IA
12063	MW (4:30PM – 5:50PM) CCSB 1.0704	Sariyah Russell srrussel@miners.utep.edu	Adalberto Vazquez Villalobos avazquezvi@miners.utep.edu Lauren Alvarado laalvarado6@miners.utep.edu
13560	TR (9:00AM – 10:20AM) CCSB 1.0704	Manuel Gutierrez mgutierrez44@miners.utep.edu	Carlos Cisneros cmcisneros2@miners.utep.edu Gabriela Sigala Acosta gasigala1@miners.utep.edu
13672	TR (3:00PM-4:20PM) CCSB 1.0704	Angel Coronel acoronel@miners.utep.edu	Kevin Porras kporras2@miners.utep.edu Jazmin Salmon jesalmon@miners.utep.edu
15009	TR (TR 9:00AM-10:20AM) CCSB 1.0410	Adrian Torres agtorres3@miners.utep.edu	Daniela Castro Enriquez dcastroenr@miners.utep.edu

TA and IA office hours: TBA on Blackboard

When emailing the instructor or TA/IA, please use [CS 2401] in the subject.

Expectations

Keeping up with content and participating in all class and lab sessions are critical factors for your success in this course.

Communication: Students are expected to consult their emails and blackboard messages every day during the week.

Attendance: Attendance will be taken at every class and lab, and will count towards your class participation grade. Students should be **on time** for all scheduled sessions and attend the **entire** session.

Students should be on task: When in a class or lab session, students are expected to direct their attention to the task/activity as directed by the lecture/lab instructor. For instance, class sessions are certainly not places for social-networking and working on homework.

Professionalism: Students should notify the instructor prior to missing a session if at all possible, and certainly right after if earlier was not possible. The instructor will allow two unexcused absences per semester before having the option to deduct points from the final grade. Students should submit their work on time and meet all deadlines. Failing to do so will affect the participation grade. Any request for a possible rescheduling of an exam (e.g., midterm) should be made at least a week in advance. No quiz or in-class activity can be made up.

It is the student's responsibility to review the content covered during missed class(es) or labs. Participation points also include completing post-lecture and post-labs activities (when requested) that are administered as surveys to monitor students' overall progress and potential struggles.

Homework / Quizzes / In-class activities

Quizzes: The purpose of each quiz is to ensure that students are staying current with the weekly reading assignments and to verify that they have acquired the skills developed in class.

Most quizzes are **unannounced**. Most quizzes will be on the blackboard, and there will be no make-up for missed quizzes. Students must bring a laptop to the classroom so that they can take quizzes from the classroom.

In-class activities: There can be unannounced in-class activities, to be turned in either by the end of the class or within a short period of time after the class (details will be given for each assignment). There will be no make-up for missed in-class assignments/activities.

Online Homework: You should expect to spend at least four hours per week outside of lectures on reading and homework. Completing the assigned activities on time will be crucial to your success in the class (since these activities prepare you for classwork and exams).

If you struggle in any way while working on these, it is crucial that you reach out to the instructor, TA, or IA and seek help as soon as possible.

If you miss a class session, it is your responsibility to find out what you missed, including assignments that might have been given in class.

Lab assignments and related homework

Lab assignments are designed for you to further your practice on the concepts presented in class and demonstrate your level of mastery of these. In the lab, you will typically work on either small activities related to currently covered concepts or concepts in which your instructional team thinks you should acquire more fluency, or more substantial lab assignments.

Specifically, there will be approximately one lab assignment per week and a few smaller lab activities.

Attendance and active participation: You are expected to attend and actively participate in labs (active participation includes group activities). Attendance will be taken and will count towards your overall standing in the class.

Grade: Your lab grade will be 90% lab assignments + 10% lab attendance and participation in lab activities. The total lab grade will be converted to 35%, which will count towards the final CS 2401 course grade.

You need to score 70% or higher in labs to pass CS2401, regardless of your average otherwise.

Exams

There will be three to four exams throughout the semester and one final exam. Because the exams contribute heavily to your total grade, it is vital that you do well on them. The purpose of the midterm exams is to allow you to demonstrate mastery of course concepts covered thus far during the semester.

The final exam will be comprehensive. You must earn 70% or more on the final exam to pass this course.

Final exam date and time will be communicated during the semester.

Standing in the course

Students will have access to their grades for all assignments so that they can self-monitor their standing and progress.

Incomplete grade policy

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Under no circumstances an incomplete status can be used to improve grades. Since this course has many skill development aspects in labs and in class, it is not always feasible to allow completion of the rest of the activities when the instructional team has already completed their duties for the semester. Talk to the instructor immediately if you believe an incomplete is warranted.

Drop Policy

You will NOT be dropped by the instructor in this course. However, if you feel that you are unable to complete the course successfully, please let me know and then contact the Registrar's Office to initiate the drop process. If you do not, you are at risk of receiving an "F" for the course.

Accommodations policy

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, or email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

Help Desk: Please contact UTEP Help Desk if you are experiencing technological challenges (email, Blackboard, software, etc.), and submit a digital ticket for assistance. Contact the Helpdesk via phone, email, chat, website, or in-person if on campus.

Individual Resources

- Military Student Success Center: Assists personnel in any branch of service.
- Counseling and Psychological Services: Provides a variety of counseling services, including individual, couples, and group sessions as well as career and disability assessments.
- Resources for Students.

Standards of Conduct

You are expected to conduct yourself in a professional and courteous manner, as prescribed by the UTEP Standards of Conduct.

A fundamental principle for any educational institution, academic integrity is highly valued and seriously regarded at The University of Texas at El Paso. More specifically, students are expected to maintain absolute integrity and a high standard of individual honor in scholastic work undertaken at the University. At a minimum, you should complete any assignments, exams, and other scholastic endeavors with the utmost honesty, which requires you to:

- Acknowledge the contributions of other sources to your scholastic efforts.
- Complete your assignments independently unless expressly authorized to seek or obtain assistance in preparing them.
- Follow instructions for assignments and exams, and observe the standards of your academic discipline; and
- Avoid engaging in any form of academic dishonesty on behalf of yourself or another student.

Graded work, e.g., homework and tests, is to be completed independently and should be unmistakably your own work (or, in the case of group work, your team's work), although you may discuss your project with other students in a general way. You may not represent as your own work material that is transcribed or copied from another person, book, or any other source, e.g., a web page.

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable to another person.

Scholastic Dishonesty

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, and submission for credit of any work or materials that are attributable to another person.

Cheating is:

- Copying from the test paper of another student
- Communicating with another student during a test to be taken individually
- Giving or seeking aid from another student during a test to be taken individually
- Possession and/or use of unauthorized materials during tests (i.e., crib notes, class notes, books, etc.)
- Substituting for another person to take a test
- Falsifying research data, reports, academic work offered for credit

Plagiarism is:

- Using someone's work in your assignments without the proper citations
- Submitting the same paper or assignment from a different course, without direct permission of instructors

To avoid plagiarism, see: Avoiding-Plagiarism.pdf

Collusion is: Unauthorized collaboration with another person in preparing academic assignments.

Communications with websites like Chegg and public or private forums to find solutions in full or in part will be considered as an act of scholastic dishonesty. Such activities will be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) at UTEP.

Using generative AI: Exercise caution when utilizing AI tools like ChatGPT. It is acceptable to use these tools to complement learning, but their use is restricted during exams and quizzes. Students should work on developing their proficiency in applying introduced concepts. Proper citation of sources is required to adhere to citation guidelines and copyright regulations, and to prevent plagiarism when utilizing AI tools. Violations of these guidelines will lead to referrals to the Office of Student Conduct and Conflict Resolution.

All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. Students are expected to comply with the standards of conduct. To learn more about student conduct, visit HOOP: Student Conduct and Discipline.

Professors are required to – and will – report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students and OSCCR.

NOTE

When in doubt about any of the above, please contact your instructor to check if you are following the authorized procedure.

Copyright Statement for Course Materials

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. It is not permitted to share, reproduce, or alter any assignment for any purpose. Students are not permitted from sharing code, uploading assignments online in any form, or viewing/receiving/modifying code written from anyone else. Assignments are part of an academic course at The University of Texas at El Paso and a grade will be assigned for the work produced individually by the student.

COVID-19 precautions

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let the instructor know as soon as possible, so that appropriate accommodations can be made. If you

have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.

Learning Objectives

Level 1: Knowledge and Comprehension:

Level 1 outcomes are those in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. On successful completion of this course, students will be able to:

1. Demonstrate an understanding of the features of object-oriented languages (related to the implementation of data structures discussed in other objectives)
2. Articulate the notion of average-case time complexity.

Level 2: Application and Analysis:

Level 2 outcomes are those in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details. Upon successful completion of this course, students will be able to:

1. Describe, implement, and use the following algorithms for:
    a. Searching: linear and binary search.
    b. Sorting: merge sort, quicksort, and at least one quadratic sorting algorithm.
2. Use basic notions of algorithm complexity:
    a. Use Big-O notation to describe the running time and memory requirements for an algorithm.
    b. Determine the best- and worst-case behaviors of a simple algorithm.
3. Use standard problem-solving techniques such as: problem decomposition, iteration, and recursion.

Level 3: Synthesis and Evaluation:

Level 3 outcomes are those in which the student can apply the material in new situations. This is the highest level of mastery. On successful completion of this course, students will be able to identify, implement and use the following data structures as appropriate for a given problem:

1. Implement and use the following data structures to solve computational problems:
    a. Linked lists
    b. Binary trees as linked structures
    c. Binary search trees as linked structures
    d. Stackes
    e. Queues
2. Trace code that uses:
    a. Strings
    b. Single-value data types
    c. 1D and 2D arrays
    d. Reference-based data structures
    e. Iterative methods
    f. Recursive Methods
    g. Primitive vs. non-primitive data types