Syllabus – *EGR227: Data Structures and Analysis*

Gordon and Jill Bourns College of Engineering Mission Statement and Verse

"Preparing engineering students of excellence and character, with a Christian worldview, who are called to serve, equipped to lead and sent to engage the world with their lives and the appropriate use of technology."

"… For we are God's workmanship, created in Christ Jesus to do good works, which God has prepared in advance for us to do." *Ephesians 2:10*

Purpose of the Course

The purpose of this course is to learn various data structures and analyze their complexity. This course introduces the notion of complexity and performance trade-offs in examining classic algorithms such as sorting, searching, recursion and classic data structures such as linked lists, stacks, queues, trees, etc.

Course Description (from CBU catalog)

Fundamental data structures for implementation and analysis. Techniques for solving problems by programming. Analysis for complexity and performance trade-offs. Topics include object oriented design, debugging, abstract data types (ADTs), recursion, big-O notation, interfaces, inheritance, and encapsulation, linked lists, stacks, queues, hash tables, heap, trees, searching, sorting.

Prerequisites

EGR 222

General Course Objectives

Upon successful completion of this course, students should be able to:

1. Understand Fundamental Data Structures: Demonstrate a deep understanding of fundamental data structures such as arrays, linked lists, stacks, queues, and trees, including their properties, operations, and use cases.
2. Apply Sorting and Searching Algorithms: Apply various sorting algorithms (e.g., quicksort, mergesort) and searching algorithms (e.g., binary search) to solve real-world problems, analyze their time and space complexity, and choose appropriate algorithms based on problem requirements.

[1]

3. Implement Data Structures: Proficiently implement common data structures and abstract data types (ADTs) in C++ or a similar programming language, including both array-based and linked data structures.
4. Analyze Algorithm Efficiency: Analyze the efficiency of algorithms using Big O notation and understand the trade-offs between time and space complexity in algorithm design.
5. Design and Implement Recursion: Design and implement recursive algorithms for various problems, including those involving mathematical induction and recursive data structures.
6. Explore Advanced Data Structures: Gain knowledge of advanced data structures such as hash tables, balanced trees (e.g., AVL and red-black trees), and graphs, and select and implement them appropriately.
7. Solve Complex Problems: Solve complex computational problems using a combination of data structures and algorithms, demonstrating the ability to break down problems into manageable components and develop efficient solutions.
8. Apply Data Structures and Algorithms in Practical Scenarios: Apply knowledge of data structures and algorithms to practical scenarios, including real-world applications such as cryptography, password hashing, and network routing.

Instructor

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Office Hours: Tu/Th: 3:30 - 5:30pm or by Special Appointment

Course Meeting Times

Section A
Lecture: Tu/Th 12:15pm-1:45pm
Location: TEGR 107
Section B
Lecture: Tu/Th 2:00pm-3:30pm
Location: TEGR 107

Tutoring available Tues/Wed/Thur 6-8pm (location TBD)

Required Materials

Textbook: There is no traditional textbook for this class. We will be using an online resources known as zyBooks and zyLabs. Please purchase your zyBook subscription from the CBU bookstore.

Your section is listed as the last letter of the course code. For example, EGR227B is section B. If you are unsure, please ask your instructor.

There is a fee to subscribe to the zyBook; any applicable returning student discounts will be applied automatically. You may purchase a voucher for the zyBook through the CBU bookstore You must use your CalBaptist e-mail address when registering. The student subscriptions will be valid until slightly past the end of the semester unless the student chooses to purchase a longer subscription for a higher fee.

Here is a video that shows the zyBooks registration process: https://www.youtube.com/watch?v=wVPI41jAZTw

Technological Support

This course will be supported by Blackboard. Go to http://www.calbaptist.edu and click on the Blackboard link. Grades will be posted on the Blackboard's Grade Center. Check in frequently for announcements, assignments, and discussions. Course materials such as PowerPoint slides, assignments, etc. will be posted on Blackboard. You are responsible for all material covered during lectures and assigned reading, not just what appears on the PowerPoint slides!

Plagiarism/Cheating vs. Collaboration

Collaboration is a very good thing. On the other hand, plagiarism or cheating is considered a very serious offense. Please don't do it! Concern about cheating creates an unpleasant environment for everyone. If you cheat, you risk losing your position as a student in the department and the college. The department's policy on cheating is to report any cases to the college cheating committee. What follows afterwards is not fun for anyone.

Grading:

Graded Item	Percentage
Class attendance	5%
Quizzes	5%
Zybooks Assignments	15%
Zylabs	15%
Mid Term Exams	30%
Final Exam	30%

Grades will be assigned on the following basis:
A   93-100%   A- 90-92%   B+ 87-89%   B 83-86% B- 80-82%
C+ 77-79%   C   73-76%   C- 70-72% D+ 67-69% D 63-66%   D- 60-62%   F below 60%

CSDS Rules of conduct:

As college students and soon-to-be professionals, your conduct around your peers and your professor are expected to be polite, respectful and non-distracting. In particular, this means the following:

- No use of cell phones in class (for calls, texting, browsing, gaming, playing music or any other function) unless required for a classroom activity. Check with your instructor if you have any questions.
- No use of any computer for a non-class related purpose (taking notes is OK, working on homework, gaming or browsing is not)
- Earphones are not allowed during any class sessions.
- Do not record the lecture without permission.
- No talking or other behavior that might distract another student
- No treating another class member or the instructor with disrespect
- No submitting late work via email (or any other method) pleading for consideration

For each violation of any of the above guidelines, five points will be deducted from your overall grade for the course

Late assignments

- Late assignments **WILL NOT BE ACCEPTED**.
- Students are encouraged to submit assignments early; do not wait until the last possible moment to submit assignments.
- There are no acceptable excuses for the assignments being late.

Attendance

- Attendance at all lectures and labs is required. Attendance will be taken at the beginning of classes. **If late, it is the student's responsibility to inform the professor after class**. Two late arrivals, or one lateness of 15 minutes or more, will count as one unexcused absence. For an absence to be excused, you must give the instructor a written/email notice in advance, or within 24 hours after class in case of an emergency. A note from your doctor, coach of campus sports team, court, etc. may be required if applicable. The instructor will determine if the absence is excused. You will lose 1% of your final grade (up to 5%) per two unexcused absences. The student is responsible for studying materials covered during missed classes. A personal makeup class during office hours is not acceptable. **Unless other arrangements are explicitly agreed upon by the instructor, all assignments are due at their original time as listed in the syllabus or in Blackboard in case of any excused or unexcused absence**.
- If a student decides to drop the course, it is their responsibility to do so by submitting a Drop Form to the registrar's office.
  - The instructor cannot drop a student from a class.
  - If the course is not properly dropped, the student will receive an "F" as the final grade.

Class Preparation

- Students are expected to prepare for each assignment prior to the class which presents the topic.
- There will be in class discussions and demonstrations.
  - Demonstrations are not the sole responsibility of the instructor, but from time to time individuals and teams will be required to demonstrate a technique.
- Plan to spend approximately six hours each week working on reading, reviewing, homework, and laboratory assignments to obtain a grade of "C" in this course.

Academic Dishonesty

- Academic dishonesty, as explained in the student handbook HONOR CODE policy, **WILL NOT BE TOLERATED**.
- Each student should become familiar with those offenses identified in the student handbook.
- A failing grade in the course will result from offenses identified as "cheating," especially the misrepresentation of assignments.
- ***All course work is the sole responsibility of the student***. Work performed by a student other than the name appearing on the assignment turned in, will be considered misrepresentation for **both** students for the assignment. At a minimum, a failing grade for the

assignment and potentially the course will result from any incident of academic dishonesty.

- Students are expected to uphold the school's standard of conduct relating to academic honesty.
- Students assume full responsibility for the content and integrity of the academic work they submit. The guiding principle of academic integrity shall be that a student's submitted work, examinations, reports, and projects must be that of the student's own work.
- Students shall be guilty of violating the honor code if they:
  1. Represent the work of others as their own.
  2. Use or obtain unauthorized assistance in any academic work.
  3. Give unauthorized assistance to other students.
  4. Modify, without instructor approval, an examination, paper, record, or report for the purpose of obtaining additional credit.
  5. Misrepresent the content of submitted work.

- The penalty for violating the honor code is severe. Any student violating the honor code is subject to receive a failing grade for the course and will be reported to the Office of Student Affairs and Provost. If a student is unclear about whether a particular situation may constitute an honor code violation, the student should meet with the instructor to discuss the situation.

It is permissible to assist classmates in general discussions of computing techniques. General advice and interaction is encouraged. Each person, however, must develop his or her own solutions to the assigned projects, assignments, and tasks. In other words, students may not "share solutions" on graded assignments. Such collaboration constitutes cheating. A student may not use or copy (by any means) another's work (or portions of it) and represent it as his / her own. If help on an assignment is needed, contact the instructor; do not seek solutions from other classmates.

Classroom Behavior

Any acts of classroom disruption that go beyond the normal rights of students to:

- question and discuss the instructor's educational process or outside relative subject content,
- ingress and egress the classroom on time, or
- conduct normal communication

will not be tolerated. (see Student Life Policy described in the Student Handbook).

Appeals Policy

To appeal a grade on an individual assignment, send e-mail to your instructor's e-mail address within two weeks of the grade having been received. Overdue appeals

will not be considered. To appeal a final course grade, use the normal CBU appeals process.

Incomplete Policy

Students will not be given an incomplete grade in the course without sound reason and documented evidence as described in the Student Handbook. In any case, for a student to receive an incomplete, he or she must be passing and must have completed a significant portion of the course.

Disability Policy

In compliance with the Americans with Disabilities Act (ADA), all qualified students enrolled in this course are entitled to "reasonable accommodations." Please notify the instructor during the first week of class of any accommodations needed for the course.

Sexual Harassment & Title IX Policy

Review the Sex Discrimination, Sexual Violence & Sexual Harassment section of the Student Handbook. All offences will be reported.

Student Handbook: http://www.calbaptist.edu/explore-cbu/offices/office-registrar/academic-catalogs/undergraduate/
Academic Catalog: http://www.calbaptist.edu/explore-cbu/offices/office-registrar/academic-catalogs/undergraduate/
Calendar: https://insidecbu.calbaptist.edu/ICS/Academics/Academic_Calendars.jnz

Tentative Course Calendar (subject to change)

Week	Zybooks Chapter	Topics	Quiz	Zylabs/Zybook Assignment
1	1	C++ Review of Classes and Pointers		
2	2	Intro to Data Structures and Algorithms	1	
3	3	Induction and Recursion	2	
4	4	Sorting Algorithms	3	
5	5	Stacks and Queues	4	
6	6	Lists	5	
7	7	Hash Tables, Mid Term Exam (FRI)	6	Check Zybooks E-book for Due dates
8	8	Trees	7	
9		Spring Break – No classes		
10	9/10	Balanced Trees/Heaps	8	
11	11	Graphs		
12	11	Graphs (cont'd)	9	
13	12	B-trees	10	
14		**Final Exam (TBD)**		