

**CS 2136**

## Data Structures and Algorithms

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**Faculty of Computational Sciences & Informatics**

**COURSE HANDBOOK**

**COURSE OUTLINE**

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| **SECTION 1: COURSE TITLE AND DETAILS** |

**CS 2136: Data Structures and Algorithms**

**Contact details and hours of Faculty:**

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| ***Instructor:*** | **Navel K Sharma** |
| ***Email:*** | navel.sharma@acity.edu.gh |
| ***Lecture Timings:*** | **Tuesday: [10:35AM] to [12:25PM]**  **Wednesday: [11:35AM] to [02:25PM]** |
| ***Faculty Advisory Hours\*:*** | **Wednesday post lunch.** |
| ***Faculty Office Location:*** | **HoD IT Office** |

***\*Faculty will be available during these times at his/her office. Make an appointment via email to meet with faculty during these hours for any questions or assistance pertaining to the course.***

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| **SECTION 2: COURSE INTRODUCTION** |

This course introduces fundamental concepts in data structures, various types of data structures and their use in programming in ‘C’ language.

Topics include introduction to data structure, types of data structure, recursion, array, stack, queue, link lists, tree, graph, searching and sorting - linear search, binary search, bubble sort, insertion sort, selection sort, merge sort, quick sort, heap sort, hashing and hash table.

Practical Component will include array, stack, queue, link lists, tree, graph, searching and sorting

**SECTION 3: LEARNING OUTCOMES**

By the end of this course, a student will be able to:

1. Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
2. Choose the appropriate data structure and algorithm design method for a specified application.
3. Apply algorithm analysis techniques to evaluate the performance of an algorithm and to compare data structures.
4. Implement and know when to apply standard algorithms for searching and sorting.
5. Select appropriate methods for organizing data files and implement file-based data structures.

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| **SECTION 6: MODE OF COURSE DELIVERY** |

* PowerPoint Presentation
* Tutorials
* Video
* Simulation

**SECTION 7: LEARNING RESOURCES**

**Recommended Textbook:**

Venkatesh N.B. (2021) Introduction to data structures using c, 2nd edition. Delhi: Laxmi publications;

**Additional Textbooks:**

1. Lipschutz S., (2020). Data Structures with C, Tata McGraw-Hill Education
2. Dr. Prabhakar G., Vineet A. and Manish V. (2021) Data structure using c, 2nd edition. Delhi: Laxmi Publications;
3. Kanetkar Y., (2019), Data Structures through C, BPB Publications

**Online Resources**

1. https://www.youtube.com
2. <https://www.youtube.com/watch?v=bum_19loj9A&list=PLBZBJbE_rGRV8D7XZ08LK6z-4zPoWzu5H>

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| **SECTION 8: ASSESSMENT BREAKDOWN** |

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| **Assessment Type** | **Score** | **Weight** |
| Attendance, Participation, Discipline   * Attendance * Participation * Discipline | 1 point for each class per sem.  100 points per sem.  100 points per sem. | 5% |
| Continuous Assessments   * Assignments * Practical * Quizzes * Presentation | -10 %  - 5 %  - 5 %  - 5 % | 25% |
| Mid-Semester Evaluations   * Written Test | 1 Mini-Project for 10 % | 10% |
| Final Evaluations  -Practical  -Exam | * 20 % * 40 % | 60% |

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| **SECTION 9: ASSESSMENT DETAILS** |

Attendance: **Attendance will be taken exactly at class start time**

Students will receive,

* **+1** **attendance grade for each class** where they enter **on time or** **within 15 minutes** **after class start time**

**[15 minutes after start time, doors will be CLOSED and no more students will be allowed into class]**

* **+0** **attendance grade for each class** that a student misses

Class Participation:

* Points will be allotted to students based on
  + Active participation and engagement in the classroom (noticeable to lecturer and classmates)
  + Presenting during the semester (any form of presentation; student must be one of the key speakers during the presentation)

Continuous Assessments

Continuous assessments would be a combination of the following:

* + Individual Assignments and Projects
    - Would be assigned to students to complete and submit independently (on their own, strictly without assistance or aid from others)
  + Team Assignments
    - Would be assigned to students in groups to complete by working together through effective collaboration and inclusion
  + Quizzes (will be individual)
    - Both pre-announced or surprise quizzes may be conducted that can be closed or open book
* Assignments or quizzes will be given before, during or after class, and can be administered in-person or online
* Students who miss the in-class assignments or quizzes due to absence or late entry, will not be provided an alternative opportunity to complete the assignment or take the quiz
* On occasion, ad hoc extra credit opportunities will be available

Mid-semester Exam

* Individual Mini-Projects
  + - The mini project for this class will be creating a website.
    - The subject of it will be of your own choice.
    - Your website is due during your mid-semester exam time listed in the exam schedule on the ACC Academic Calendar.
    - During this time, you need to present your website to the class.
    - Students will defend their mini-project via presentation and demonstration
  + Quiz (will be individual)
    - A pre-announced and closed book quiz will be conducted
    - Students who miss the quiz due to absence or late entry, will not be provided an alternative opportunity to complete or take the quiz

Final Exam

* A structured examination will be conducted at the end of the Semester
* Students who miss the Final Exams due to absence or late entry, will not be provided an alternative opportunity to complete or take the exams

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| **SECTION 10: RULES, GUIDELINES AND EXPECTATIONS** |

Decorum & Respect:

* Class decorum must be maintained **at all** times during class
  + - Respect the classroom, your peers and your faculty
    - No food allowed in the classroom (only beverages)
    - Students must be polite, respectful and professional in how they conduct themselves in class, treat their peers, and provide responses to faculty and peers
    - Students must maintain respect for the views and ideas of others (both faculty and students). Counter arguments are always welcome however using respectful choice of words/tone and without discrediting an opposing view
    - “Respect the speaker” rule – when anyone is speaking (be it faculty or student) others must respect the speaker by maintaining silence/decorum and listening to the speaker. Any responses should be after the speaker finishes without interrupting the speaker

Students with Disability & Special Needs:

* + - Any student requesting academic support and accommodations based on a disability or Special Need is required to register with the Dean of Student Affairs and/or Registrar each semester.
    - Students with Special Need or Disability (especially seeing and Hearing challenges) must inform the instructor before the Session starts.

Assignment Submissions and Grading:

* All assignments must be submitted within the time allotted by the faculty
* If assignments are submitted after submission deadlines an automatic 5% grade point deduction will be applied, unless the delay was previously approved by faculty due to legitimate reasons
* When an assignment is submitted, faculty will provide a specific timeframe by when the graded assignment will be returned to students, and all such return timeframes will be honored by faculty
* The use of unauthorized material, communication with fellow students during an examination, attempting to benefit from the work of another student, and similar behavior that defeats the intent of an examination or other class work is unacceptable to the University.
* It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tension accompanying examinations. When the Instructor determines that a violation has occurred, appropriate action, as determined by the instructor, will be taken.
* Although working together is encouraged, all work claimed as yours must in fact be your own effort. Students who plagiarize the work of other students will receive zero points and possibly be referred to the University Judicial Affairs and Community Standards.

Use of Electronics:

* All electronics, except laptops, must be switched off during class. Usage of such devices during class will absolutely not be tolerated!
* ACC Labs will be available for students during Lab sessions.
* Before logging off a computer at the Lab, students must ensure that they have emailed or saved projects created during the class or lab session. Any work saved to the computer may be erased after restarting the computer. ACC is not responsible for any work lost.

**SECTION 11: OUTLINE OF TOPICS TO BE COVERED:**

This is a tentative schedule and thus it may change several times throughout the semester. We will upload current versions on the course website but it is your responsibility to make sure that you are following the correct version

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|  |  | **Lesson** | **Reading** | **Activities** | |
| Basic Data structures |  | Definition, Types | M: Ch1 | Individual Assignment | |
|  | Algorithm design | M: Ch1 |  | |
|  | *Flow charts* |  | *Observation, Analysis report* | |
| Basic Data structures |  | Array Definition | M: Ch1 |  | |
|  | Array Analysis | M: Ch1 | Individual Assignment | |
|  | *Arrays* |  | *Observation, Analysis report* | |
| Basic Data structures |  | Linear Arrays | M: Ch1 |  | |
|  | Array Insertion and Deletion | M:Ch1 | Individual Assignment | |
|  | *Array Activities* |  | *Present Arrays in C programming* | |
| Dimensional Arrays |  | Single Dimensional Arrays | M: Ch1 |  | |
|  | Two Dimensional Arrays | M: Ch1 |  | |
|  | *Dimensional Arrays* |  | | Group work |
| Link List |  | Linked lists | M: Ch3 |  | |
|  | Singly linked lists | M: Ch3 | Quiz | |
|  | *Implementation* |  | *Overview of Stack and Queue in C programming* | |
| Link List |  | Doubly linked list | M: Ch3 |  | |
|  |  | Circular linked list | M: Ch3 |  | |
|  |  | Implementation |  |  | |
| Stacks |  | Stacks | M: Ch2 |  | |
|  | Queue | M: CH2 |  | |
|  | ***QUIZ*** |  | *QUIZ* | |
|  | ***Mid-semester exam*** |  | ***Mid-semester exam*** | |
| Post Mid Semester Overview |  | Post Mid-Semester Overview |  |  | |
| Tree and Graphs Representations |  | Trees representations | M: Ch4 | Group work | |
|  | Graphs representations | M: Ch4 |  | |
| Search Algorithms |  | Searching | M: Ch4 |  | |
|  | Hashing | M: Ch4 | Group work | |
|  | *Search Methods* |  | *Present Search in C programming* | |
| Search Algorithms |  | Adjacency list and matrices | M: Ch5 |  | |
|  | Spanning tree, Linear Search, Binary Search | M: Ch5 | * Quiz | |
|  | *Metrics* |  | *2X2, 3x3 Matrix in C programming* | |
| Sort Algorithms |  | Sorting: Insertion Sort, Bubble sort, Selection sort | M: Ch5 |  | |
|  | Sorting: Quick sort, Heap sort | M: Ch5 |  | |
|  | *Sort Methods* |  | *Sorting Algorithms in C programming* | |
|  |  | **Revision Week** | M: Ch1-3 |  | |
|  | **Revision Week** | M: Ch4-5 |  | |
|  | **Revision Week** |  |  | |
| **Final exams** | | | | |

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| **SECTION 12: ACADEMIC DISHONESTY AND PLAGERISM** |

Academic City expects and requires all students to engage in all academic affairs with complete honesty and integrity, which would create an atmosphere of trust and openness within our campus community that would further allow our students to thrive and succeed through a collaborative spirit.

Academic dishonesty is a serious violation that would mandate disciplinary action, which would be determined by the Head of Department or Academic City Judiciary Committee depending on it being a first, second or third offense for the student, and could lead to failure in the course/semester or even suspension/dismissal from program.

A student shall be considered guilty of academic dishonesty if he or she:

* Uses, gives or possesses unauthorized aid during assessments in any and all forms including course materials, textbooks, technology support, through other students, and so on.
* Obtains assistance from another in carrying out any academic work or vice versa when collaboration is not permitted
* Presents false data or information, or fabricates any material in support of a research work or other academic work
* Engages in plagiarism (i.e. taking someone else’s work or ideas to pass them off as their own). In cases where external references are made, sources of such references should be specifically cited to clearly indicate the external reference

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| **SECTION 13: APPLICATION OF CORE GOALS** |

1. **ENTREPRENEURIAL THINKING**

**An Academic City student** doesn’t wait for change, but desires and seeks change by continuously introspecting the status quo.

*Key characteristics:* Initiating ideas **|** Thinking outside the box **|** Identifying problems **|** Differentiating symptoms vs. root-cause **|** Studying stakeholders

FACULTY IMPLEMENTATION PLAN:

* Students will identify a company or Enterprise having Book keeping challenges
* Students will create a software to assist the company with records keeping electronically base on the skills obtained in C programming
* This will be considered as a Mini-Project at the end of the semester

1. **INCLUSIVE COLLABORATION**

**An Academic City student** gives equal regard to another’s ideas as to their own, thus readily learning from others and developing others while developing self.

*Key characteristics:* Bringing ideas together **|** Active listening **|** Co-working **|** Motivating others **|** Mobilizing teams **|** Driving consensus **|**Leading teams

FACULTY IMPLEMENTATION PLAN: …

* Students will be put into a team not exceeding 3 students (base on class size)
* The team will be assigned a common challenge to provide solutions. Someone will be in charge of System Design and Analysis, Coding and Implementation, and Software Testing.
* The team will present their project to the entire class for further discussions

1. **CRITICAL REASONING**

**An Academic City student** logically gathers information and analyses arguments, as a guide to effective reasoning and action

*Key characteristics:* Questioning ideas **|** Diagnosing situations **|** Assessing evidence **|** Conceptualizing baseline **|** Reasoning leading to conclusion

FACULTY IMPLEMENTATION PLAN: …

* Students will be asked to write an essay on **“Multi-Dimensional Arrays”**

1. **CONSTRUCTIVE COMMUNICATION**

**An Academic City student** presents ideas effectively and seeks clarification constructively

*Key characteristics:* Considering the context **|** Reading between the lines **|** Delivering effectively **|** Communicating with impact **|** Creating transparency

FACULTY IMPLEMENTATION PLAN: …

* Students will be required to discuss and debate the ***“Error handling procedures in C.”***

1. **ETHICAL REASONING** **AND CONDUCT**

**An Academic City** **student** can reason through a moral dilemma to create an ethically viable action

*Key characteristics:* Reflecting on an action’s morality **|** Being accountable **|** Taking responsibility of others **|** Leading to a morally correct action

FACULTY IMPLEMENTATION PLAN: …

* Students will be taught the need for the programming with C Language.
* Students will be required to write a paper on **“*Error Handling in C”***
* Students will be taught the need for team work and respect for each member of the team

