**UNIVERSITY OF GHANA**

**DEPARTMENT OF COMPUTER SCIENCE**

**DCIT308: DATA STRUCTURES AND ALGORITHMS 2**

**SECOND SEMESTER 2024/2025**

**SEMESTER PROJECT (GROUP)**

**Expenditure Management System for Nkwa Real Estate Ltd**

*Nkwa Real Estate* is a growing construction firm focused on delivering low-cost housing solutions across peri-urban communities in Ghana. As the company expands, financial monitoring during construction and post-sales activities has become increasingly challenging. Accountants must now track multiple bank accounts, fluctuating supplier costs, and a maze of construction-phase spending.

The company lacks a digital solution. You’ve been invited to build a locally stored, offline-first Expenditure Tracking Application—built from the ground up using fundamental data structures. Your system should simulate accountant workflows, not just automate them.

**Project Tasks**

Develop a menu-driven command-line system that leverages data structures including: arrays, stacks, queues, linked lists, sets, maps, trees, hash maps, and graphs. Avoid external libraries, databases, or prebuilt sorting/searching modules.

**Functional Requirements**

1. Expenditure Records
   * Record each expenditure with details:
     + Code, amount, date, phase (e.g., construction, marketing, sales), category, account used.
   * Store in hash maps or linked lists, allowing retrieval by expenditure code.
2. Category Management
   * Create a dynamic list of expenditure categories (e.g., “Cement”, “Printing”, “TV Adverts”).
   * Implement sets or hash tables to ensure category uniqueness and support category searches.
3. Bank Account Ledger
   * Store and update information about different company bank accounts, each with:
     + Account ID, bank name, balance, list of related expenditures.
   * Use maps or dictionaries and create a relationship graph if accounts are internally related.
4. Search & Sort
   * Sort expenditures by:
     + Alphabetical order of category
     + Chronological order of transaction
   * Search by:
     + Time range (e.g., “all expenses in April 2025”)
     + Category
     + Cost range
     + Bank account used
5. Invoice/Receipt Handling
   * Link each expenditure to a receipt/invoice record stored in a file or internal pointer-like structure.
   * Use a queue or stack to simulate upload and review queues for accounting validation.
6. Bank Tracker
   * Every expenditure draws funds from a selected bank account.
   * The application must update balances, log expenditures, and notify if an account is low on funds using a min-heap.
7. Cash Flow & Financial Analysis
   * Implement logic to:
     + Track monthly burn rate.
     + Forecast profitability based on spending patterns.
     + Analyze how building material prices affect house affordability.

**Output and Documentation**

* Command-line interface with menus: Add/View/Search Expenditure, Manage Categories, Bank Overview, Generate Reports.
* Store persistent data in text files (expenditures.txt, accounts.txt, categories.txt, receipts.txt).
* Create reports that:
  + Justify choice of each data structure.
  + Explain sorting/searching techniques.
  + Include complexity analysis using Big O and Omega notation.

**Rate the group members**

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| **Name** | **Activities** | **%Contribution** | **Attendance** |
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