# File Management and Organization - CS202 / CS304

## Assignment

### Objective

The objective of this assignment is to explore file organization, indexing, and searching techniques. You will implement a file management system that supports various operations, such as record insertion, deletion, searching, and sorting, using both fixed-length and variable-length records. You will also analyze the performance of these operations.
The file should contain fields such as ID, Name, Score, and Date of Birth. And can be used to simulate file operations.

### Requirements

#### Task 1: File Organization

1. Fixed-Length Records:
    - Create a file to store records as fixed-length records.
    - Implement functionality to add, delete, and update records.
    - Allow direct access to records using their ID.
2. Variable-Length Records:
    - Create a file to store records as variable-length records.
    - Implement functionality to add, delete, and update records.
    - Use an avail list to reclaim space for deleted records.
3. Compare the performance of insertion, deletion, and update operations between fixed-length and variable-length records. Use metrics such as execution time and disk accesses.

#### Task 2: Searching

1. Sequential Search:
    - Implement sequential search for variable-length records.
    - Measure the time taken to search for specific records.
2. Binary Search:
    - Implement binary search for fixed-length records (requires the file to be sorted).
    - Compare its performance to sequential search.
    - Comment on the differences in performance.

### Task 3: Indexing

1. Create a Primary Index for fixed-length record:
    - Use the ID as the key.
    - Enable efficient searching using the index.
2. Create a Secondary Index for variable-length records:
    - Use the Name as the key.
    - Discuss how indexing impacts search performance.
3. Test and report the performance of searches using primary and secondary indexes. Compare these results with those from Task 2.

## Submission

This is an individual project. Please submit your work through the following email address: file.project.team2024@gmail.com. Due on 13 December 2024 11:59 PM.

Your submission should include:

1. Source Code: Submit your implementation in .c format with the created file.
2. Report: Include a short report (PDF) summarizing:
    - Your findings and observations.
    - Performance metrics.
    - Challenges faced and solutions implemented.

## A file structure example (should contain at least 50 records)

| ID | Name | Score | Date of Birth |
|---|---|---|---|
| 1001 | Alice | 90 | 1998-05-23 |
| 1002 | Bob | 85 | 2000-11-17 |
| 1003 | Carol | 78 | 1995-03-11 |
| 1004 | David | 92 | 1999-12-01 |
| .<br>.<br>. | .<br>.<br>. | .<br>.<br>. | .<br>.<br>.<br>. |
| 1050 | Eve | 88 | 2001-07-19 |