**Assignment # 3**

**Institution Instructions for Assignment Submission**

**Assignment Title: File Handling in C++ – Encryption & Decryption**

**Submission Guidelines:**

1. **Upload Code File:**
   * **Submit the .cpp file of your code on the university portal.**
   * **Folder name format: YourName\_FileHandling**
2. **Screenshots:**
   * **Run the program on your computer.**
   * **Take a screenshot showing:  
     ✅ User input  
     ✅ Encrypted text saved in secure.txt  
     ✅ Decrypted text output**
   * **Print and attach screenshots with the handwritten assignment.**
3. **In-Class Submission:**
   * **Bring your ouput of assignment along with printed screenshots to class.**

**C++ Case Study-Based Assignment**

**Topic: 2D Arrays (int, float, char) & Functions**

**Level: Intermediate to Advanced**

**Total Case Studies: 10**

**Instructions: Solve each case using functions and appropriate 2D arrays. Write modular code and include proper input/output formatting.**

## Case Study 1: School Result Processing System

A school wants to automate result processing for 10 students and 5 subjects using a 2D integer array.  
Create functions to input marks, calculate each student’s total and average, and identify the top scorer.  
Also, write a function to display grades (A/B/C/F) based on average.

## Case Study 2: Restaurant Sales Tracker

A restaurant records daily sales of 4 items over 7 days using a 2D float array.  
Write functions to input data, calculate total sales per item and per day.  
Find out which day had the highest total sales and which item was sold the most overall.

## Case Study 3: Hospital Patient Record System

A hospital maintains a 2D char array to record ‘S’ (Stable), ‘C’ (Critical), and ‘R’ (Recovered) status of 5 patients over 7 days.  
Use functions to input data, count patients in each status category.  
Find the number of days each patient remained in a 'Critical' state.

## Case Study 4: Temperature Monitoring Grid

A weather station records temperature at different locations using a 5x5 float array.  
Write functions to input temperature, find the average temperature of each row (zone), and detect extreme hot or cold spots.

## Case Study 5: Quiz Competition Scoreboard

Six teams participate in four rounds of a quiz competition. Their scores are stored in a 2D int array.  
Functions must input data, find total score per team, and determine the winner and runner-up.  
Also, display any team that failed to score above 10 points in any round.

## Case Study 6: Flight Seat Reservation System

A small airplane has a 6x4 char array representing seat layout ('E' for Empty, 'B' for Booked).  
Write functions to:  
 Display the seating chart.  
 Book a seat (change 'E' to 'B').  
 Count available seats.  
 Find the row with maximum empty seats.

## Case Study 7: Product Rating Dashboard

A company collects user ratings (1 to 5) for 5 products over 10 users using a 2D int array.  
Create functions to input ratings, find average rating of each product, and count how many users gave a product a perfect rating.  
Display product(s) with the worst average score.

## Case Study 8: Library Book Availability Tracker

A library maintains a 5x5 char array: ‘A’ = Available, ‘I’ = Issued, ‘M’ = Missing.  
Write functions to:  
 Display book status.  
 Count total available, issued, and missing books.  
 Identify rows (shelves) with the highest missing count.

## Case Study 9: Factory Quality Control Analysis

A factory checks product quality hourly over 3 shifts and 7 days (3x7 float array of defect percentage).  
Write functions to input data, calculate average defects per shift and day, and identify critical shifts (where avg defects > 10%).

## Case Study 10: Election Result Matrix

In a local election, 4 candidates receive votes from 6 polling stations. Votes are stored in a 2D int array.  
Use functions to:  
 \* Input votes.  
 \* Calculate total votes per candidate and per polling station.  
 \* Identify winner(s).  
 \* Detect if any station had voter turnout less than 100.