Department of Electrical and Computer Engineering

ENCS4370- Computer Architecture

First Semester 2025/2026

Project#1

Maximum Clique Detection in a Graph Using MIPS Assembly

Deadline: November 20, 2025

1. Project Description

A clique is a subset of vertices of an undirected graph such that every two distinct vertices in the clique are adjacent. In other words, it is a subgraph where every pair of vertices is directly connected by an edge. Detecting maximum clique in a graph is crucial in many scientific and engineering applications. A maximum clique is the clique with the largest possible number of graph vertices

In this project, you are required to implement a maximum clique detection algorithm in MIPS assembly language that detects the maximum clique (if it exists) in an input graph following the flow below:

- Read a graph represented as an adjacency matrix from an input text file.
- Detect the maximum clique (if any).
- Write the results into an output text file. The output will be either the detected maximum clique or a message indicating that no cliques has been detected.

Notes:

- You may use the brute-force approach clique detection, which implies finding and checking all possible subgraphs to determine whether they form a clique
- You can limit the graph size to 5 vertices because maximum clique detection is a computationally expensive problem (actually it is an NP-Complete problem)

Sample Input Text File

0 1 2 3 4

0 0 1 1 0 0

1 1 0 1 1 0

2 1 1 0 1 0

3 0 1 1 0 1

4 0 0 0 1 0

Sample Output Text File

Maximum clique size: 3

Vertices in maximum clique: 1 2 3

Teamwork:

You can work on this project in teams of up to two students only. The team members can be from different sections. Teams of more than two students are NOT accepted at all.

Submission

You need to submit the complete MIPS assembly files

Grading Criteria

Note: if the program does not run, the code will be graded out of 70%

Criteria	**Points**
Code structure, organization, and documentation	5
User interface to prompt the user to enter the input text file name/path. Print an appropriate error message if the file does not exist or cannot be opened.	5
Discussion and answering questions	10
Reading the graph from the input text file and storing it in suitable data structures. Print an appropriate error message if the input file does not contain a valid adjacency matrix	20
Maximum clique detection	30
Printing the results on the output text file	10
Total	**80**

GOOD LUCK