****

|  |  |
| --- | --- |
| Course Number | ESE 1444 |
|  |  |
| Course Title | MATHEMATICS FOR EMBEDDED SYSTEMS |
| Semester/Year | Summer/2019 |
|  |  |

**LAB:2 (Part 1)**

**SUBMITTED BY:**

**Student Name                              Student Number           Signature**

Jasmine C0748300 JK

Gurvinder Singh C0748418 GS

Diksha Shah C0748229 DS

1. **Write a C++ program to Solution of Linear Equations using Gauss Elimination method**.

* **Program: -**

#include <iostream>

#include <cmath>

#include <vector>

using namespace std;

void print(vector< vector<double> > X) {

int n = X.size();

for (int i=0; i<n; i++) {

for (int j=0; j<n+1; j++) {

cout << X[i][j] << "\t";

if (j == n-1) {

cout << "| ";

}

}

cout << "\n";

}

cout << endl;

}

vector<double> gauss(vector< vector<double> > X) {

int n = X.size();

for (int i=0; i<n; i++) {

**// Search for maximum in this column**

double maxEl = abs(X[i][i]);

int maxRow = i;

for (int k=i+1; k<n; k++) {

if (abs(X[k][i]) > maxEl) {

maxEl = abs(X[k][i]);

maxRow = k;

}

}

**// Swap maximum row with current row (column by column)**

for (int k=i; k<n+1;k++) {

double tmp = X[maxRow][k];

X[maxRow][k] = X[i][k];

X[i][k] = tmp;

}

**// Make all rows below this one 0 in current column**

for (int k=i+1; k<n; k++) {

double c = -X[k][i]/X[i][i];

for (int j=i; j<n+1; j++) {

if (i==j) {

X[k][j] = 0;

} else {

X[k][j] += c \* X[i][j];

}

}

}

}

**// Solve equation Ax=b for an upper triangular matrix X**

vector<double> x(n);

for (int i=n-1; i>=0; i--) {

x[i] = X[i][n]/X[i][i];

for (int k=i-1;k>=0; k--) {

X[k][n] -= X[k][i] \* x[i];

}

}

return x;

}

int main() {

int n;

cout<<"Enter the size of matrix: - ";

cin >> n;

vector<double> line(n+1,0);

vector< vector<double> > X(n,line);

cout<<"Enter the elements of matrix:-"<<endl;

**// Read input data**

for (int i=0; i<n; i++) {

for (int j=0; j<n; j++) {

cin >> X[i][j];

}

}

for (int i=0; i<n; i++) {

cin >> X[i][n];

}

**// Print the input**

print(X);

**// Perform Calculations to have solution**

vector<double> x(n);

x = gauss(X);

**// Print the result**

cout << "Result:\t";

for (int i=0; i<n; i++) {

cout << x[i] << " ";

}

cout << endl;

}

* **Output:-**

