
Higher Institute of Engineering & Technology, El-Beheira

Computer Engineering Department

# Second assignment in numerical analysis

## (Guass Elimination)

Under supervision of Dr.Mahmoud Gamal



| **Team** | **ID** |
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## Source code in C++:-

```
#include<iostream>
#include<iomanip>
using namespace std;

void intro();
void input_matrix(double Matrix[100][100],int* n);
void print_matrix(double Matrix[100][100],int n);
void Gauss_Elimination(double Matrix[100][100],int n);
void BACKWARD_SUBSTITUTION(double Matrix[100][100],double
res[100],int n);
void print_solution(double res[100],int n);

int main()
{
intro();
double Matrix[100][100], res[100];
int n;
while(1)
{
input_matrix( Matrix , &n );
cout << "\n ---------------------------------\n";
cout << "\n AUG Matrix is:\n";
print_matrix( Matrix , n );// Printing AUG original
Matrix
Gauss_Elimination( Matrix , n ); // Gauss Elimination
cout << "\n Matrix after Gauss Elimination is:\n";
print_matrix( Matrix , n ); //Printing the Matrix after
Gauss Elimination
BACKWARD_SUBSTITUTION( Matrix , res , n ); // BACKWARD
SUBSTITUTION
print_solution( res , n ); // OUTPUT
cout<<"\nTry anther one\n";
}
return 0;
}

void intro()
{
cout<<"Project for 'Numerical Analysis' under the
supervision of Dr.
Mahmoud Gamal.\n";
cout<<"by:\n\t\tMohamed Yosry ElZarka 19100.\n\t\tYoussef
Mohamed
ElSheheimy 19124.\n\t\tOmar Abd Al-Halim Khalil 19138.\n";
cout<<"\nThis is a program to calculate the solution of a
system of
linear equations using Gauss Elimination.\n";
```

```
38 cout<<"The user can determine the number of equations to
be solved.\n";
39 }
40
41 void input_matrix(double Matrix[100][100],int* n)
42 {
43 cout << "\nEnter the number of equations: ";
44 cin >> *n;
45 cout << "Enter Elements of each row of the AUG matrix with
the dimensions
of (" << *n << " Rows X " << *n+1 <<" Columns)\n";
46 for (int i = 0; i < *n; i++)
47 {
48 cout << "\tEnter Row #" << i + 1 << ": ";
49 for (int j = 0; j < *n + 1; j++)
50 cin >> Matrix[i][j];
51 }
52 }
53
54 void print_matrix(double Matrix[100][100],int n)
55 {
56 for (int i = 0; i < n; i++)
57 {
58 for (int j = 0; j < n + 1; j++)
59 {
60 if(j==n) cout <<"| ";
61 cout<< setw(6) << setprecision(2) << Matrix[i][j];
62 }
63 cout << endl;
64 }
65 cout << "\n --------------------------------\n";
66 }
67
68 void Gauss_Elimination(double Matrix[100][100],int n)
69 {
70 for (int j = 0; j < n - 1; j++)
71 for (int i = j + 1; i < n; i++)
72 {
73 double op = Matrix[i][j] / Matrix[j][j];
74 for (int k = 0; k < n + 1; k++)
75 Matrix[i][k] -= Matrix[j][k] * op;
76 }
77 }
78
79 void BACKWARD_SUBSTITUTION(double Matrix[100][100],double
res[100],int n)
80 {
81 for (int i = n - 1; i >= 0; i--)
82 {
```

```
83 double op = 0.0;
84 for (int j = i + 1; j < n; j++)
85 op += Matrix[i][j] * res[j];
86 res[i] = (Matrix[i][n] - op) / Matrix[i][i];
87 }
88 }
89
90 void print_solution(double res[100],int n)
91 {
92 cout << "\n The Solution is:\n";
93 for (int i = 0; i < n; i++)
94 cout << "x[" << i + 1 << "]=" << setw(5) << setprecision(11) <<
res[i
] << endl;
95 cout << "\n ---------------------------------\n";
96 }
```

## The program in C++:-

```
C:\Users\admin\Desktop\STUDY\Gauss_Elimination.exe
Project for 'Numerical Analysis' under the supervision of Dr. Mahmoud Gamal.
by:
               Mohamed Yosry ElZarka      19100.
               Youssef Mohamed ElSheheimy 19124.
               Omar Abd Al-Halim Khalil   19138.

This is a program to calculate the solution of a system of linear equations using Gauss Elimination.
The user can determine the number of equations to be solved.

Enter the number of equations: 3
Enter Elements of each row of the AUG matrix with the dimensions of (3 Rows X 4 Columns)
        Enter Row #1:  1 1 1 6
        Enter Row #2:  2 1 -1 1
        Enter Row #3:  1 2 -1 2

 --------------------------------

 AUG Matrix is:
    1     1     1|      6
    2     1    -1|      1
    1     2    -1|      2

 --------------------------------

 Matrix after Gauss Elimination is:
    1     1     1|      6
    0    -1    -3|    -11
    0     0    -5|    -15

 --------------------------------

 The Solution is:
x[1]=    1
x[2]=    2
x[3]=    3

 --------------------------------

Try anther one

Enter the number of equations:
```