# NM Lab Sheet
# II Year / II Part
# Faculty: Computer/Electrical

## Labsheet#5

**Objectives:**

1. To Implement Basic Gauss Elimination method to find solution of following linear simultaneous equations:

$3x + 2y + 1z = 10$                $4x + 2y + 3z = 4$                $3x + 2y - 4z + 3u = 2$

$2x + 3y + 2z = 14$                $2x + 2y + z = 6$                $2x + 3y - 3z - u = 1$

$\underline{1x + 2y + 3z = 14}$                $\underline{x + y + z = 0}$                $x + 2y + 3z - u = 10$

*x= 1, y=2, z=3*                      *x= 6, y=1, z=-6*                  $\underline{2x - y + 2z + 3u = 7}$

                                                                *x= 1, y=2, z=2, u=1*

## Basic Gauss Elimination - Steps:

1. Declare matrix & required variables
2. Enter Augmented Matrix
3. Forward Elimination
    a. Upper Triangular Matrix
4. Backward Substitution
5. Print Solution/Roots

## Gauss Elimination Algorithm:

1. Start

2. Declare the variables and read the order of the matrix n.

3. Take the coefficients of the linear equation as:

    Do for k=1 to n

    Do for j=1 to n+1

         *Read a[k][j]*

    End for j

    End for k

4. Do for k=1 to n-1

    Do for i=k+1 to n

    Do for j=k+1 to n+1

         *a[i][j] = a[i][j] – a[i][k] /a[k][k] * a[k][j]*

    End for j

    End for i

    End for k

5. Compute x[n] = a[n][n+1]/a[n][n]

6. Do for k=n-1 to 1

> sum = 0
>
> Do for j=k+1 to n
>
> > *sum = sum + a[k][j] * x[j]*
>
> End for j
>
> x[k] = 1/a[k][k] * (a[k][n+1] – sum)

End for k

7. Display the result x[k]
8. Stop

**Lab Assignment#5**

1. Solve the following system using Gauss Elimination Method: (x = 1, y = 2, z = 3)
   $$2x + 4y - 6z = -18$$
   $$x + 3y + z = 10$$
   $$2x - 4y - 2z = -12$$
2. Solve the following system using Gauss Elimination Method with *Partial Pivoting*: (3, -2, 1, 5)
   $$x + 2y - 12z + 8v = 27$$
   $$5x + 4y + 7z - 2v = 4$$
   $$7y - 3x + 9z + 5v = 11$$
   $$6x - 12y - 8z + 3v = 49$$
3. Solve the following system using Gauss Elimination with *Partial Pivoting*: (5, 6, -10, 8)
   $$2x1 + x2 + x3 - 2x4 = -10$$
   $$4x1 + 2x3 + x4 = 8$$
   $$3x1 + 2x2 + 2x3 = 7$$
   $$x1 + 3x2 + 2x3 - x4 = -5$$
4. Solve the following system using Basic Gauss Elimination Method: (Inconsistent)
   $$p + q + r = 150$$
   $$p + 2q + 3r = 100$$
   $$2p + 3q + 4r = 200$$
5. Solve the following system using Gauss Elimination with *Complete Pivoting*: (1, 1, 1)
   $$r - s + 2t = 2$$
   $$r - s + t = 1$$
   $$2r + 3s - t = 4$$