ASSIGNMENT 3A

NUMERICAL METHODS (CS-406)

GAUSS ELIMINATION IMPLEMENTATION IN PYTHON

SUBMITTED BY: UMANG KANCHAN
SUBMITTED TO: DR. AYESHA CHOUDHARY

```python
import numpy as np

# Read matrix A and vector b from user input
n = int(input("Enter the size of the matrix: "))
A = np.zeros((n,n))
b = np.zeros(n)
for i in range(n):
    row = input(f"Enter the coefficients of row {i+1} of matrix A, separated by spaces: ")
    A[i,:] = np.array([float(x) for x in row.split()])
    b[i] = float(input(f"Enter the constant term for row {i+1} of vector b: "))

def gauss_elimination(A, b):
    n = len(b)

    # Forward elimination
    for k in range(n-1):
        for i in range(k+1, n):
            factor = A[i,k] / A[k,k]
            for j in range(k+1, n):
                A[i,j] -= factor * A[k,j]
            b[i] -= factor * b[k]

            # Print intermediate results
            print("Step ", k*n+i-k*(k+1)//2+1, ":")
            print(A)
            print(b)

    # Back substitution
    x = np.zeros(n)
    x[n-1] = b[n-1] / A[n-1,n-1]
    for i in range(n-2, -1, -1):
        sum = b[i]
        for j in range(i+1, n):
            sum -= A[i,j] * x[j]
        x[i] = sum / A[i,i]

    return x

# Call the Gauss Elimination function and print the result
x = gauss_elimination(A, b)
print("Solution: ", x)
```

SAMPLE OUTPUT

Enter the size of the matrix : 3

Enter the coefficients of row 1 of matrix A, separated by spaces: 2 1 -1

Enter the constant term for row 1 of vector b: 8

Enter the coefficients of row 2 of matrix A, separated by spaces: -3 -1 2

Enter the constant term for row 2 of vector b: -11

Enter the coefficients of row 3 of matrix A, separated by spaces: -2 1 2

Enter the constant term for row 3 of vector b: -3

Step 2 :

[[2.   1. -1.]

 [-3.   0.5 0.5]

 [-2.   1.   2.]]

[8. 1. -3.]

Step 3 :

[[2.   1. -1.]

 [-3.   0.5 0.5]

 [-2.   2.   1.]]

[8. 1. 5.]

Step 5 :

[[2.   1. -1.]

 [-3.   0.5 0.5]

 [-2.   2. -1.]]

[8. 1. 1.]

Solution: [2. 3. -1.]