import numpy as np

import matplotlib.pyplot as plt

# RC Circuit parameters

R = 1000 # Resistance in ohms

C = 1e-6 # Capacitance in farads

V\_source = 10 # DC voltage in volts

# Time setup

t0 = 0

t\_final = 0.01 # 10 ms

h = 0.0001 # Step size

n\_steps = int((t\_final - t0) / h)

# Initial condition

Vc = 0 # Initial capacitor voltage

time = [t0]

vc\_values = [Vc]

# Define the differential equation: dVc/dt = (V - Vc) / (RC)

def dVcdt(t, Vc):

return (V\_source - Vc) / (R \* C)

# Modified Euler's Method

t = t0

for \_ in range(n\_steps):

predictor = Vc + h \* dVcdt(t, Vc)

corrector = Vc + (h / 2) \* (dVcdt(t, Vc) + dVcdt(t + h, predictor))

Vc = corrector

t += h

time.append(t)

vc\_values.append(Vc) # Ensure every step's value is appended

# Plotting the capacitor voltage over time

plt.plot(time, vc\_values, label="Modified Euler Method")

plt.xlabel("Time (s)")

plt.ylabel("Capacitor Voltage Vc (V)")

plt.title("RC Circuit Response to DC Input (Modified Euler)")

plt.grid(True)

plt.legend()

plt.show()