% Define variables

lambda = 0.01; % Decay constant

N = 1000; % Number of time steps

t\_max = 10; % Maximum time in seconds

tau = t\_max/N; % Time step size

% Initialize arrays

t = linspace(0, t\_max, N+1);

N\_approx = zeros(1, N+1);

N\_approx(1) = 1000; % Initial number of particles

% Compute numerical solution using forward difference scheme

for i = 1:N

N\_approx(i+1) = N\_approx(i) - lambda\*tau\*N\_approx(i);

end

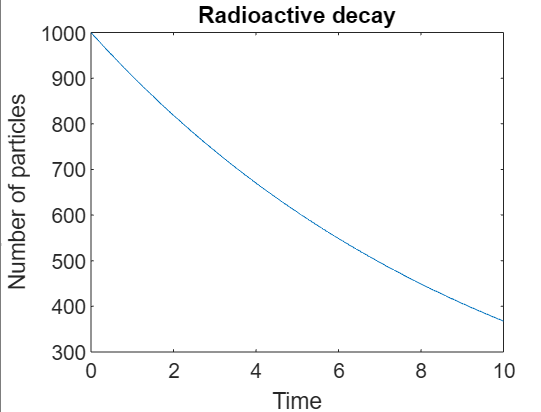
% Plot numerical solution

plot(t, N\_approx);

xlabel('Time (s)');

ylabel('Number of particles');

title('Radioactive Decay (Forward Difference Scheme)');



% Take user inputs

lambda = input('Enter the decay constant: ');

N = input('Enter the number of time steps: ');

t\_max = input('Enter the maximum time in seconds: ');

tau = t\_max / N;

% Initialize arrays

t = linspace(0, t\_max, N+1);

N\_exact = zeros(1, N+1);

N\_exact(1) = 1000; % Initial number of particles

% Compute exact solution using finite difference scheme

for i = 2:N+1

N\_exact(i) = N\_exact(i-1) \* (1 - lambda \* tau);

end

% Plot exact solution

plot(t, N\_exact);

xlabel('Time (s)');

ylabel('Number of particles');

title('Radioactive Decay (Exact Finite Difference Scheme)');

% Plot exponential decay curve

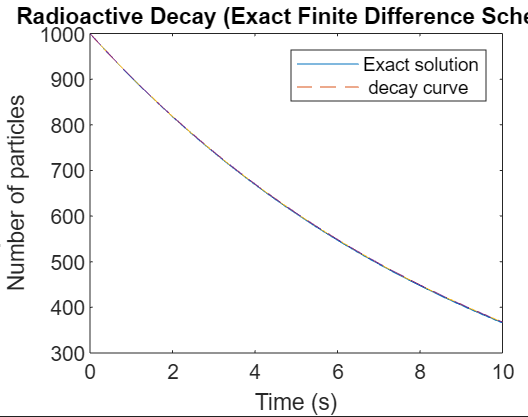
N\_0 = N\_exact(1);

N\_exp = N\_0 \* exp(-lambda \* t);

hold on;

plot(t, N\_exp, '--');

legend('Exact solution', ' decay curve');



CEL22

Enter the decay constant:

0.1

Enter the number of time steps:

1000

Enter the maximum time in seconds:

10

% Define variables

lambda = 0.2

; % Decay constant

N = 100; % Number of time steps

t\_max = 10; % Maximum time in seconds

tau = t\_max/N; % Time step size

% Initialize arrays

t = linspace(0, t\_max, N+1);

N\_approx = zeros(1, N+1);

N\_approx(1) = 100; % Initial number of particles

% Compute numerical solution using fourth-order Runge-Kutta method

for i = 1:N

k1 = -lambda\*N\_approx(i);

k2 = -lambda\*(N\_approx(i) + tau\*k1/2);

k3 = -lambda\*(N\_approx(i) + tau\*k2/2);

k4 = -lambda\*(N\_approx(i) + tau\*k3);

N\_approx(i+1) = N\_approx(i) + tau\*(k1 + 2\*k2 + 2\*k3 + k4)/6;

end

% Plot numerical solution

plot(t, N\_approx);

xlabel('Time (s)');

ylabel('Number of particles');

title('Radioactive Decay (Runge-Kutta Method)');

