

## Case Study-1

- Determination of friction factor from implicit equation
- Solve a nonlinear algebraic equation relating friction factor and flow parameters.

The image shows handwritten notes on lined paper. At the top, it says "→ Used Darcy-Weisbach eqn" followed by the equation  $h_f = f \frac{L}{D} \frac{V^2}{2g}$ . Below this, it says "→ Colebrook Equation" followed by the equation  $\frac{1}{\sqrt{f}} = -2 \log_{10} \left( \frac{\epsilon}{3.7D} + \frac{2.51}{Re\sqrt{f}} \right)$ , where  $\epsilon$  is labeled as "Diameter".

### Code:

```
clc; clear; close all;

% Given values
Re = 1e5;
D = 0.05;
eps = 0.00015;    % Roughness(m)

% Colebrook equation
func = @(f) (1/sqrt(f)) + ...
          2*log10((eps/(3.7*D)) + (2.51/(Re*sqrt(f))));

% Initial guess
f_initial = 0.03;

f = fzero(func, f_initial);

disp('Friction factor = ')
disp(f)
```

### Output:

```
Friction factor =
0.0275
```