

Lab Sheet

IA 3203 – DIGITAL SIGNAL PROCESSING

*Department of Instrumentation and Automation Technology
University of Colombo*

DSP 302 – Analog Filters using Octave

Instructions:

Ensure you have the 'signal' and 'control' packages installed and loaded. If not, you can install them using the following commands:

```
pkg install -forge control
```

```
pkg install -forge signal
```

```
pkg load control
```

```
pkg load signal
```

Exercise:

01. Design a simple low-pass Butterworth filter with the following specifications:

Order: 4

Cutoff frequency: 100 Hz

Sampling frequency: 1000 Hz

***Hint: Follow the steps given below.*

- i. *Define Filter Specifications*
- ii. *Calculate Filter Coefficients*
- iii. *Generate a Sample Signal (50 Hz sine wave with noise)*

```
% Time vector from 0 to 1 s  
t = 0:1/sampling_frequency:1  
signal = sin(2*pi*50*t)+0.5*randn(size(t));
```
- iv. *Apply the Filter*
- v. *Plot the Original and Filtered Signal*

02. What are the main characteristics of a Butterworth filter?

03. Where are Butterworth filters commonly used?