EE2015: Assignment 2 - Synthesis of Filters

Deadline: Fri, 4th Oct, 10:00 PM

1. **Synthesis of Analog Filters**

   In this experiment you will characterize an analog filter provided to you. Perform the following tasks and submit your results/report on Acadly.

   (a) Plot the frequency response of the circuit on a graph sheet, and calculate the pass and stop band frequencies (pass band gain ≥ -3 dB and stop band gain $= \leq -10$dB. What are the factors that impact the limits of measurable gain in your experiment, if any?

   (b) Obtain the transfer function of the filter based on its frequency response using (a) Butterworth filter design and (b) Chebyshev type I filter design.

   (c) Synthesize the obtained transfer functions using RC circuits.

   (d) Choose a square wave input signal of appropriate frequency and observe the variation of output as a function of frequency. Explain the observed behavior.

   (e) Choose a square wave of appropriate frequency and determine the frequency spectrum of (a) input and (b) output (when the frequency of square wave is in pass and stop bands).

   (f) *Thought experiment*: A filter will have both amplitude and phase response. How would you characterize the phase response in the lab?