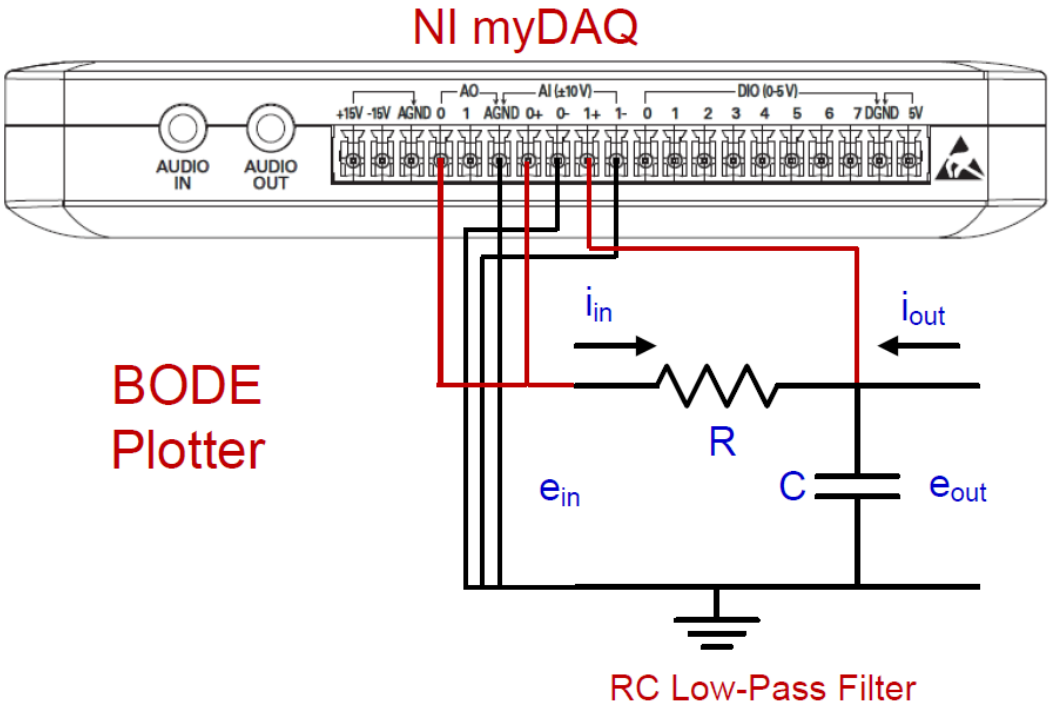
MEEN 2210 Electromechanical Engineering Systems Spring 2011

Studio Exercises Week #4

- **Time Response and Frequency Response of a RC Circuit**



- For an RC circuit with a 15 KΩ resistor and a 0.01 μF capacitor, predict the output voltage first to a square wave and then to a sine wave. For the square wave input, determine the required frequency of the input square wave so the RC circuit response achieves steady state. For the sine wave input, determine the bandwidth of the RC circuit and set the input sine wave to that frequency.
- Build the RC circuit on the breadboard with a function generator square-wave input. Measure the output voltage with the oscilloscope. Use the oscilloscope cursors to identify the RC circuit time constant and steady-state gain.
- Now input a sine wave from the function generator at the bandwidth frequency. Measure the output frequency, amplitude, and phase shift and compare these to your predictions. Increase the sine wave frequency. What do you observe in amplitude and phase shift? Decrease the frequency. What do you observe in amplitude and phase shift?
- Use the NI myDAQ virtual Bode Plotter (see circuit connections above) and create the frequency response plots (Bode plots) – amplitude and phase – for the RC circuit. Use the real function generator and oscilloscope to verify the Bode plot. Check the amplitude ratio and phase angle at the bandwidth frequency, and then at three frequencies above the bandwidth and at three frequencies below the bandwidth.