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IN5230 - Mandatory Task 1

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Simulation Tool

- LTspice
  - http://www.linear.com/designtools/softwareRegistration.jsp
  - Download for either MAC or Windows.

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Report

- Submitting Individually
- Complete schematics including forces and simulation mode as well as simulation results
- White background on schematics and simulation results
- Using legends
- Avoiding yellow color on curves
- Making a conclusion
  - summary table
- In English
- PDF format
- Attaching Schematics/symbols at LTspice format

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Deadline for delivery

- September 26th @ 08:00

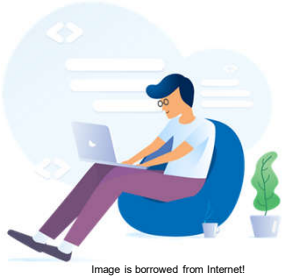

Image is borrowed from Internet!

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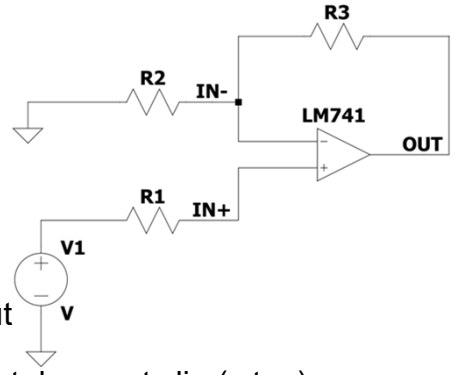
Task 1: Get familiar with the simulator



- Op-amp LM741
  - LTC\LTspiceIV\examples\Educational
- a) Transient Analysis (.tran)
  - Calculating the gain in theory
  - Applying a DC offset for the negative input and calculating the gain
  - Finding DC offset interval where the output does not clip (.step)
- b) AC Analysis (.ac)
  - Finding DC gain and GBW
  - Phase margin

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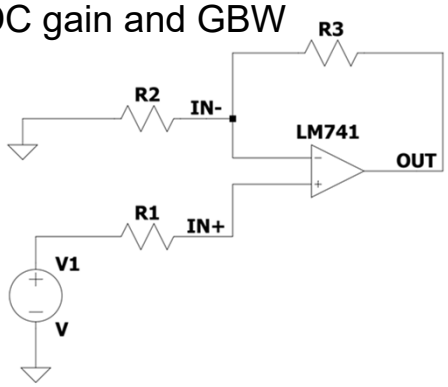
Task 1: Get familiar with the simulator

- c) Common mode DC offset
- d) Effect of the load capacitor on the DC gain and GBW



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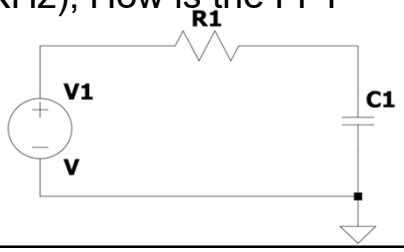
Task 2: Frequency characteristics of some curves

- Define the R1 and C1 value to have a very high cut-off frequency
- a) Effect of the time step in .tran simulation on the FFT values
- b) FFT for different square pulse inputs with different rise time (freq. = 1KHz)
- c) Redesign the filter so that the cut-off frequency is the 5 times over the fundamental frequency (1KHz), How is the FFT output?



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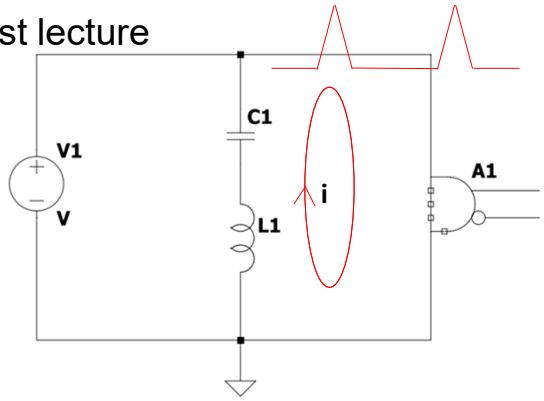
Task 3: Decoupling capacitors

- Find the size and number of capacitors required to reduce the supply voltage noise to an acceptable level
- Study the slide 48 to 57 of the first lecture



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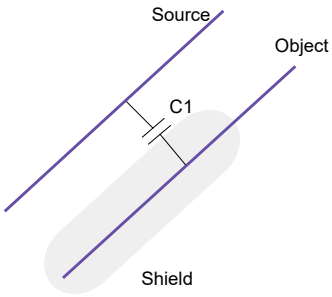
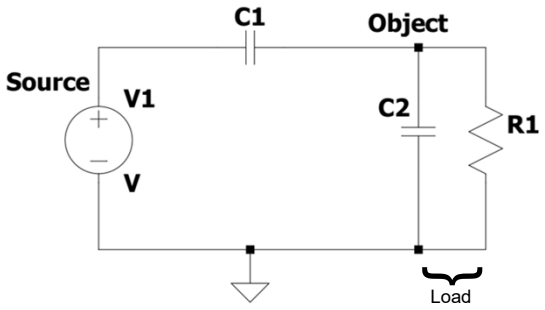
Imp.: Task 4 : Parasitic capacitive coupling

- a) Coupling the signal from a noise source to an object due to the parasitic cap.
- b) How does shielding reduce the coupling?





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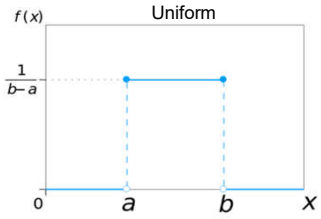
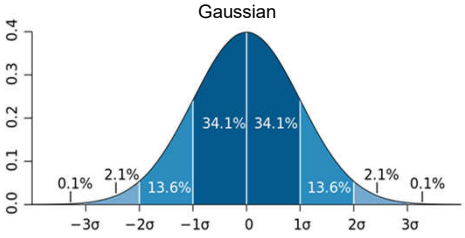
Task 5: Artificial sources of transient analysis

- Generating different noise source “bv”:
  - RAND, RANDOM: Uniform within [0, 1)
  - WHITE: Semi gaussian distribution within (-0.5, 0.5)
  - PWL signal





*Datafile and example schematic are available on the web-site

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Random Noise Source