

CHANGES TO LAB 2

6 May

The COVID-19 situation in South Africa called for drastic changes to the teaching methodology of the University of Pretoria. Due to the National Lockdown and the requirement of social distancing, students are not allowed to use the University laboratories at all. Since not all students have access at home to equipment necessary to make practical measurements, changes the previously published Practical 2 and 3 requirements are necessary.

The practical will now have a much heavier focus on design and simulations aspects which needs to be submitted as a written report for evaluation. There will not be any physical circuit construction required, although students with the means to do this at home should still attempt to do so for their own benefit and include photos of the circuit (easy for most students) and measured results (not possible for most). There will not be a demonstration of the constructed circuit. The following changes to the practical will be made.

1. Practicals will now be done individually. The course schedule allows sufficient time for students to do the practical.
2. Over and above the original requirement of simulating the filter setups with ideal components, you now also need to simulate your designed circuit and verify the response using non-ideal components. This means you have to also consider practical op-amps models in addition to the ideal models. You will need to use the models provided by the manufacturer and consider the non-ideal (static and dynamic) effects of practical opamps (for example offset voltage, GBP, etc.).
3. You should now also investigate output variation and variation from the desired design specifications resulting from component value variations. How do component tolerances affect your circuits' behavior and important parameters such as cut-off frequency, ripple, Q, to name a few. Students should also implement a version of their circuit that makes use of the E6 resistor standards and E12 capacitor standards.
4. The theory questions that would have been asked in the demo must now be answered in the form of an appendix at the end of the report. The questions are given below.
 - 1) Explain the difference between the natural frequency and the cut-off frequency. How does the relationship between the two vary for Chebyshev and Butterworth responses?
 - 2) Designers need to choose between topologies when implementing their filters. What are some reasons that a designer may choose a KRC filter over a Multiple Feedback filter?
 - 3) Designers need to choose between topologies when implementing their filters. What are some reasons that a designer may choose a Multiple Feedback filter over a KRC filter?
 - 4) In cascade design, how would one order the different sections?

Please consult the assistant lecturers (ALs) directly with any questions.