ECE 403 **Final Report Guidelines** **Spring 2016**

Univ. of Illinois **Version 1.04 April 21, 2017** **Prof. Allen**

1 General Guidelines

Each student should submit a copy of the report of their group, and a short personal report. A few pages should be sufficient. In your personal report you can make comments about how things went for you in the class, and in your group. If you felt one of the group members did not do his share of work, this would be a good time to mention that (nicely).

Document structure

A standard scientific report includes **Introduction, Methods, Results, Discussion, and Conclusions** sections. The goal of your lab work in this course is to analyze a loudspeaker. You may perform several experiments to do this - therefore, you can write up each experiment separately, or break your sections (e.g. Methods, Results) into subsections detailing each experiment. *It is very important to include the theory behind your measurements in the Introduction and Methods sections! You can get a good grade even if your measurements are not great, by showing that you understand the theory and experiments.*

You really should use LaTeXto make your report look nice. We will place a template on the website for you to see how this is done. Once you have the LaTeXfile, the commands to generate the pdf are **latex file.tex; dvipdf file.dvi**. This will result in a final output file called **file.pdf**.

Figures

All figures should be clearly labeled, with text that is **large enough** to read easily. Units should always been included, where applicable. There is a nice command that you can put at the top of your Matlab script which will increase the font size everywhere: **set(0,'defaulttextfontsize',24);**.

Use labels that make sense such as **xlabel('Frequency [kHz]')**. Use loglog scales.

2 Report Content

The core of your report should cover Labs 3-6, analyzing the loudspeaker. For instance, we estimated the Hunt parameters using multiple methods - explain these methods and compare the results. You can also use your Hunt parameters to predict your pressure measurements, then compare predicted and actual results. In the theory and methods sections of your lab report, you should demonstrate understanding of two-port network and Hunt parameter methods.

Your report should include, at minimum, the following topics covered by these labs:

1. Loudspeaker electrical impedance measurements:
   (a) Loudspeaker electrical impedance cone unloaded
   (b) Loudspeaker electrical impedance with speaker cone blocked (which Hunt parameter does this measure?)
   (c) Loudspeaker electrical impedance with different masses placed on the speaker cone (Lab 3 mass calibration to estimate the Hunt parameters, Z_e, Z_m, $T = B_0 l$)
   (d) Loudspeaker electrical impedance with speakers face to face (Lab 4 reciprocity calibration to calculate the Hunt Parameters)
2. Pressure measurements using the ER-7C microphone:

(a) Electrical-to-pressure transfer function (Lab 4 & 5)

(b) Two-cavity Thévenin calibration (Lab 5). In HWe we predicted the Thévenin parameters from the Hunt parameters - try this with your data

(c) Radiation impedance (Lab 6), calculated using a pressure measurement along with your Thévenin calibration

You may also wish to include measurements of the low-pass and Twin-T networks (Lab 2) or other measurements (Lab 7) in your report.

References

N. Kim and J. B. Allen. Two-port network analysis and modeling of a balanced armature receiver. *Hearing Research*, 301:156–167, 2013.