LING 307/707: Phonetics II
Justification for Laboratory Experience

Phonetics II is an advanced course in the acoustics and perception of speech. It includes a number of laboratory assignments as well as three major laboratory projects. Emphasis is placed on the methods and standards by which scientists measure and evaluate the physical characteristics of speech. Laboratory assignments focus on aspects of digital speech processing and spectral analysis and typically require students to sample, store, and measure their own speech productions. Predictions of acoustic theory are directly evaluated by comparing theoretical and measured speech spectra. For example, students will test their understanding of the Acoustic Theory of Speech Production by calculating the first three formant frequencies of a vowel and then compare their predicted values to those measured in a spoken vowel. Differences between predicted and observed values are discussed in terms of theoretical modeling assumptions as well as physical differences among speakers. Students will also deepen their understanding of aspects of digital speech processing, for example by exploring the relationship between sampling rate and window size and that between resolution in the temporal and frequency domains. The in-depth exploration of quantitative modeling methods also emphasizes scientific discovery procedures and the integration of natural science principles. In addition, the pitfalls of choosing an inappropriate analysis method are highlighted.

In sum, at the end of this course, students are expected to implement the scientific method and formulate an interesting research question, set up an actual experiment, collect and analyze data using lab equipment, and write up their findings in journal format. The first two major laboratory projects are designed to explore various aspects of phonetics (e.g., production, perception) involving practice in the use of laboratory equipment. A number of classic acoustic findings are replicated. Throughout the course, students are given increasingly more independence. For example, in Project 1 all students are given the same set of speech materials. They are provided with very explicit instructions about what to measure and how to measure and write up the results. While obtaining accurate measurements is very important, it is only a first step in the process of scientific discovery. Students then have to interpret their data with respect to phonetic theory. In Project 2, students are given an explicit research idea, but they are to come up with their own research design and hypotheses, based on published literature in that area that is provided in class. After review of each project in class during which expected and surprising findings are discussed, the students are asked to turn in another (improved) version of their write-up. Finally, students are allowed to design and conduct the third and last project to investigate any phonetic topic of their choice. These projects are often motivated by an interest in a language area, in phonology, or in the acquisition or use of language. It is very important to give students an intuitive feel for the equipment, as well as how to choose an appropriate algorithm and conduct a reliable analysis. The opportunity to learn about and experiment with the physics of an activity in which humans engage on a daily basis provides a direct and compelling link between theory and practice and may provide students with a deeper appreciation for the physical sciences and the scientific method.