

Linguist H286: Analyzing the Sounds of Languages Autumn 2007

Call number: 12367-1; **Credit Hours:** 05 **Course web page:** <http://ling.osu.edu/~mbeckman/Lx286>

Class meetings: Mondays, Wednesdays 9:30-11:18, Room 141 Biological Sciences Building

Instructor: Mary Beckman **Office hours:** Mondays at 1:00, Thursdays at 12:00, and by appointment

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Course description: Speech is a very complex behavior. Saying even a simple sentence such as *Luce hit another home run*. takes more motor coordination than actually hitting the home run. Yet we are not surprised when we talk with a child as young as three or four who can say a sentence like this very naturally and intelligibly. Understanding speech also is a very complex skill. We take it for granted that we can listen to this sentence and correctly identify the first word as *Luce* rather than as *Ruth* and the second word as *hit* rather than as *heat*. Yet speakers of some other languages besides English have a great deal of difficulty distinguishing these two pairs of words. How can we describe the similarities between the consonants in *Luce* versus *Ruth* or between the vowels in *hit* versus *heat* that make these two word pairs difficult for speakers of some other languages? Can we analyze speakers' behavior in saying words and sentences, and listeners' behavior in listening to them, well enough to be able to construct models that predict which sounds will be difficult for children acquiring their first language or for adults acquiring a second language? In this course, we will introduce pertinent ideas and results from research in the various disciplines that have contributed to our understanding of the sounds of languages. We will introduce some of the quantitative analytical tools that are used in the phonetic sciences, and do several experiments in class, to give a flavor of the diverse research methods that speech scientists have developed to try to determine how speech is produced and perceived by humans. We will also take a brief look at how speech engineers have applied this knowledge to develop computer speech synthesis and recognition systems.

Course objectives: Participation in this course should lead to:

1. an understanding of the general character of speech sounds, and of how they are produced and perceived,
2. a familiarity with some of the measurements and models that are used to study speech sounds,
3. an understanding of some basic concepts in probability theory and statistics, and
4. an appreciation of how probability theory and statistics can be applied to modeling speech.

Textbooks:

- Peter Ladefoged (2004). *Vowels and Consonants: An Introduction to the Sounds of Languages*. 2nd Edition. Blackwell. ISBN 1-4051-2459-8 [Note: the sound files on the CD that accompanies this book are also available at <http://hctv.humnet.ucla.edu/departments/linguistics/VowelsAndConsonants>.]
- Grant McGuire and Mary E. Beckman (2006). *Notes on Probability and Statistics for Analyzing the Sounds of Languages*. [Homework questions and data analysis problems from a forthcoming companion textbook that will be made available incrementally online as the course progresses.]

Coursework and grading: Letter grades will be assigned, based on class preparation and participation, as described in the Weekly Schedule. The grade will be based on three components, as follows:

- 30% reading and thinking about the reading (6 readings and associated homeworks & quizzes)
- 35% primary data analysis (5 data analysis problems)
- 35% term project (a three-part assignment, with each part including a measurement set, an oral report, and a written report)

A more detailed description of each of these components is given below.

Reading and associated homework and review: Every two or three weeks we will cover some topic, and learn a set of data analysis techniques that we can use to address some larger questions about this topic. In preparation, you will read a chapter or two from the *Vowels and Consonants* textbook and think about some more specific questions related to the larger questions. You will demonstrate that you have done the reading and thinking by completing the associated homework assignment, which will become available on the course web page at least a week before the class meeting where the assignment is due.

Since we will begin discussing the material in reading the day that the homework is due, I cannot accept late assignments. In a later class meeting, there will be a review quiz at the beginning of class, which we will go over before the end of class, in preparation for the associated data analysis report or term project report, which will be due in the immediately following class period. Each homework and paired review quiz together will make up 5% of your grade. (total: 30%)

Primary data analysis: In order to master the data analysis techniques that we cover for each topic, you will analyze some primary data. The data will be of 3 types: (1) data that have already been gathered in research by established speech scientists, (2) data that you will collect together in class, and (3) data that each of you will gather outside of class in a two-part experiment starting in Week 2 (see next component). Relating the data to the question will require numerical reasoning and visualization techniques that are useful in many other areas of science (and of life!) and I will introduce these techniques in class. For data types (1) and (2) you will need to turn in a short written report summarizing the data analysis and relating the results to the reading and discussion. Each **data analysis report** should be typed single-spaced with relevant figures embedded. Each report makes up 6% of the grade (total: 35%)

Term project: Starting in Week 3 of the quarter you will work in groups of 4-5 members, gathering primary data for a study of English vowels and consonants using yourselves as the talkers & listeners. The study has 3 stages, and for each stage your group will need to produce electronic data files with the results of measurements for that stage. Each group will also give a short oral presentation summarizing the group's results at each stage, alternating presenters so that each of you talks at least once during the quarter. Each of you also turns in an individually annotated set of the group's slides, interpreting the findings. The last report also should include a short narrative (two pages at most) summarizing the findings over the whole quarter. Each set of measurements, oral report, and written interpretation constitutes 10% of the grade and the final summary constitutes 5% of the grade (total 35%)

Instructor's Philosophy: By my offering this course and your enrolling in it, we have instigated the following agreement. I am responsible for designing and implementing a course that engages your intellect and for executing assessment procedures that fairly test your knowledge of the course material. You are responsible for coming to class, doing the readings on time, participating in class activities and discussions, independently completing the assigned homework exercises, reports, and term project. That is, your part of the agreement is not just to memorize or to do the analyses by rote, but to actively think about the questions that we tackle through the weeks. I pledge to do my part to make this class interesting, challenging, and thought-provoking. By your presence, you are promising to do your part, too.

A note on collaboration: I encourage collaborative learning habits such as making study groups to discuss assignments out of class, and you will work in a group on the term project measurements and oral reports. However, you must acknowledge the others explicitly in your written reports, and the homework, data-analysis reports, and term project notes that you turn in must be your own individual effort.

Students with disabilities: If you need some accommodation to the impact of a disability, please make an appointment to meet with me as soon as possible to discuss the course format in terms of anticipated needs and to explore potential adaptations of the format to those needs. I rely on the Office of Disability Services to verify the need for accommodation and to help develop accommodation strategies. Students with disabilities who have not previously contacted the Office of Disability Services are encouraged to do so, by looking at their web site (<http://www.ods.ohio-state.edu>) and calling them for an appointment (614 292-3307).

Academic misconduct: I am required by my contract with the university to report suspected cases of academic misconduct to the Committee on Academic Misconduct. The most common form of misconduct is plagiarism. Remember that any time you use the ideas or the statements of someone else, you must

acknowledge the source in a citation. This includes material that you found on the Web. The University provides guidelines for research on the Web at <http://gateway.lib.ohio-state.edu/tutor>.

Weekly schedule, summary of deadlines

[Week#] Class meeting	Topic# Description of numerical and linguistic concepts	assignment to do before class meets; related homework due in class	review quiz or data analysis report due	in-class components and due dates for term project reports
[1] Wed Sep 19	1 Introduction to counting, types versus tokens / Counting syllables, words, speakers, languages, ...			
[2] Mon Sep 24		read Ladefoged Ch 1; Homework #1 due		
Wed Sep 26		download R; practice reading in a data file	Quiz #1	
[3] Mon Oct 1	2 Counting things over time / Duration, frequency, pitch, and intonation patterns		Data analysis report #1 due	form project groups & make recordings
Wed Oct 3		read Ladefoged Ch 2; Homework #2 due	Data analysis report #1 due	
[4] Mon Oct 8		download Praat; practice opening an audio file	Quiz #2	
Wed Oct 10	3 Review of set theory / Commutation sets and lexical contrast for tones & vowels		Data analysis report #2	do perception exp
[5] Mon Oct 15		read Ladefoged Chs 3 & 4; Homework #3 due		count vowel types
Wed Oct 17	4 Measures of central tendency / Vowel timbre and vowel features			Term project interim report #1
[6] Mon Oct 22		read Ladefoged Ch 5; Homework #4 due	Quiz #3	work on measuring vowel formants
Wed Oct 24	5 Evaluating differences between population means / Vowel spaces and vowel inventories		Quiz #4	vowel measures due by end of class
[7] Mon Oct 29			Data analysis report #3 due	work on term project interim report #2
Wed Oct 31			Data analysis report #3 due	Term project interim report #2
[8] Mon Nov 5	6 Measuring mean differences versus discriminating categories / Consonant features and consonant gestures	read Ladefoged Ch 6; Homework #5 due		work on consonant measures Term project interim report #2
Wed Nov 7		read Ladefoged Ch 6; Homework #5 due	Quiz #5	
[9] Wed Nov 14			Data analysis report #4 due	work on consonant measures
[10] Mon Nov 19	7 Conditional probability and the Chi-squared test of independence / Modeling how sounds are combined	read Ladefoged Ch 9; Homework #6 due		consonant measures due by end of class
[11] Mon Nov 26			Quiz #6	
Wed Nov 28			Data analysis report #5 due	
[12] Tue Dec 4	[Finals week] Term project wrap-up	Last class meeting is the final exam time 7:30-9:30		Term project final report due