

Course Information: Linguistic Phonetics

Linguistics 520 (Moreton)*

2026 August 17 (M)

Time: MWF 12:20–1:10
Places: Dey 304 or: Zoom: Meeting ID 993 2562 1348, passcode 287847 ➡
Instructor: Elliott Moreton, moreton@unc.edu
Office hours: (Tentatively:) T 2–3, F 2:30–3:30, and by appointment
Office: Smith 101 or: Zoom: Meeting ID 973 4347 1746, passcode 531096 ➡
Textbooks: Johnson, *Acoustic and Auditory Phonetics* (on e-reserve)
Ladefoged & Disner, *Vowels and Consonants* (on physical reserve)

This is an in-person class. Zoom links are provided in case an emergency forces us to switch to remote instruction.

1 Target audience, course goals, and learning objectives

Linguistics 520 is intended to introduce phonetics to an audience of linguists, or others interested in the linguistic way of looking at spoken language. We will therefore be asking what physics, biology, and psychology can tell us about why spoken languages are the way they are.

The course is organized as a nature tour of the vocal tract. We will systematically examine each of the major speech-sound classes to see

- What the speech organs do to produce them
- What is happening acoustically when they are produced, and why
- Which of the acoustic cues listeners actually use to figure out what they heard.

We will listen to examples of these sounds in a wide variety of languages, and examine their acoustical properties using analysis software. We will pay special attention to phonetic explanations of phonological facts, such as:

- Articulatory and acoustic correlates of the distinctive features (why do languages use those particular features?)
- Markedness and inventory theory (why are certain sounds or contrasts common all over the world, while others are rare?)
- Phonological alternations (why are these two sounds in complementary distribution more often than those two?)
- Historical change (why is this sound change more common than that one?)

Doing this will require certain technical skills. It is a principal goal of this course to impart them. By the end of it, you will have learned (by doing)

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- How to collect acoustic speech data
- How to manipulate it with the Praat speech-analysis software
- How to interpret waveforms and spectrograms
- How to make accurate measurements of acoustic variables
- How to design, manufacture, run, and analyze a speech-production experiment
- How to use the International Phonetic Alphabet
- How to use acoustical theory to predict the acoustics of speech sounds from their articulations, and vice versa.
- How to critically read publications in experimental phonetics, and how to write your own.

By December you will have all of the basic skills needed to do your own experiments, and to understand (and critically evaluate) the published results of other peoples' experiments.

As part of the General Education curriculum satisfying the Natural Scientific Investigation Focus Capacity requirement, this course will enable students to:

1. Use scientific knowledge, logic, and imagination to construct and justify scientific claims about the articulation, acoustics, and perception of the sounds used in the world's spoken languages, including validation of theory through rigorous empirical testing.
2. Generate and test hypotheses or theories, use logic and creativity to design investigations to test these hypotheses, collect and interpret data, make inferences that respect measurement error, build and justify arguments and explanations, communicate and defend conclusions, revise arguments and conclusions based on new evidence and/or feedback from peers, and synthesize new knowledge into broader scientific understanding.
3. Evaluate science-related claims and information from peer-reviewed sources by examining the relationship between the evidence, arguments, and conclusions presented and by assessing consistency with existing knowledge from valid and reliable scientific sources.

As part of the General Education curriculum satisfying the Quantitative Reasoning Focus Capacity requirement, this course will enable students to:

1. Summarize, interpret, and present quantitative data in mathematical forms, such as graphs, diagrams, tables, or mathematical text.
2. Develop or compute representations of data using mathematical forms or equations as models and use statistical methods to assess their validity.
3. Make and evaluate important assumptions in the estimation, modelling, and analysis of data, and recognize the limitations of the results.
4. Apply mathematical concepts, data, procedures, and solutions to make judgements and draw conclusions.
5. Synthesize and present quantitative data to others to explain findings or to provide quantitative evidence in support of a position.

2 Approximate schedule

Week	Date	Topics	Events
1	8/17 8/19 8/21	M Organization. Overview. Sound. Praat W F	Setting up your computer.
2	8/24 8/26 8/28	M Vowels. Source/filter theory. Larynx and the W glottal wave. Resonances of schwa. F	
3	8/31 9/2 9/4	M Theory of resonance. Harmonics vs. formants. W Recording with Praat. Perturbation theory. F	
4	9/9 9/11	W Supralaryngeal anatomy. Height, backness, and F rounding. English vowels. IPA.	
5	9/14 9/16 9/18	M Non-English vowels. Vowel space. Protection W of research subjects. Two-tube vowel models. F Vowel typology.	On-line human-subjects training due.
6	9/23 9/25	W Adaptive dispersion. Laryngeal and nasal vowel F features.	MIDTERM.
7	9/28 9/30 10/2	M Consonants. Fricatives. Acoustics of fricative W noise. Voicing contrasts in fricatives. F	
8	10/5 10/7 10/9	M Stops. Production, acoustics. Acoustic theory of W formant transitions before schwa. F	Article selections due. Trip to Odum Institute.
9	10/12 10/14	M Filter functions for stops before non-schwa vow- W els. Spectrogram reading.	
10	10/19 10/21 10/23	M Phonation types. Places of articulation. Experi- W mental design. F	Article reports due.
11	10/26 10/28 10/30	M Nasals, laterals, and semivowels. Clicks, trills, W taps, and flaps. F	Final-project proposals due.
12	11/2 11/4 11/6	M Perception. Hearing. Ears. Physical vs. psy- W chological units. Perceptual maps. F	
13	11/9 11/11 11/13	M McGurk effect. Native-language effects on per- W ception. F	
14	11/16 11/18 11/20	M Acquisition of phonetics: Perception. W F	
15	11/23	M Acquisition of phonetics: Production	
16	11/30 12/2	M Project presentations. W	
17	12/11	M	Final exam, 12-3

3 Prerequisites

The only prerequisite for this course is Linguistics 101, Introduction to Language, or the equivalent. A knowledge of high-school algebra is assumed.

4 Where to find course components

The main tools we will be using to communicate in this course are the following:

1. The class log➡¹, on the World Wide Web, updated after each class. Here you will find
 - (a) A brief outline of what was covered each day
 - (b) A list of any assignments made that day
2. The Canvas site➡². Everyone who is enrolled in the class should already have access to it. Our class's ID, if you need it, is 119018. The main things we will need there are
 - (a) Course materials like slides, handouts, and readings (under **Modules**). You should download all of them and keep a copy on your local machine in case (a) Canvas goes down, or (b) you want to consult them after the semester is over.
 - (b) The place to pick up assignments (under **Assignments**). They will be handed in on paper.
 - (c) A discussion forum for asynchronous collaboration (under **Discussions**)
 - (d) The gradebook (under **Gradebook**)
3. The Zoom meeting links (see p. 1 of the syllabus). If Zoom is not already installed on your computer, please go to zoom.unc.edu➡³ to get it. *This is an in-person class. The Zoom links are provided in case an emergency forces us to meet on-line.*

5 The International Phonetic Alphabet

We'll need to use the IPA. Here are some links that may help:

1. A freeware Unicode IPA font, Charis SIL➡⁴ that works on Windows, Mac, and Linux systems.
2. An IPA keyboard➡⁵ webpage. You type by clicking on IPA symbols, then cut and paste the result into your word processor.
3. Guidance on typing IPA on a Windows machine➡⁶
4. Guidance on typing IPA on a Mac➡⁷

6 Specific requirements

Final grades for this course will be calculated as follows:

Attendance and participation	10%
Homework (problem sets and labs)	25%
Exams (two)	20%
Article report	15%
Final project	30%

Numeric grades will be converted to UNC's letter-grade system by mapping the numeric range from 60 to 100 onto the 10 passing letter grades from D to A, with four numeric points per step (except that A has 5 points, 96 to 100).

¹<http://users.castle.unc.edu/~moreton/Ling520/520log.html>

²<http://canvas.unc.edu>

³<http://zoom.unc.edu>

⁴<https://software.sil.org/charis/>

⁵<https://westonruter.github.io/ipa-chart/keyboard/>

⁶<https://www.gouskova.com/2016/09/04/international-phonetic-alphabet-fonts-and-keyboards/>

⁷http://wstyler.ucsd.edu/posts/ipa_with_osx.html

Attendance and participation You are expected to come to class in person, having done the reading and thought about it until either (a) it makes sense, or (b) you can express precisely what about it doesn't make sense; either way, you'll have something to talk about in class. In the case of the Ladefoged and Disner book, doing the reading includes listening to the sound files for that chapter. In the case of the Johnson book, it includes the stuff in the gray boxes.

If I start getting the impression that people aren't doing the readings, I'm going to institute pop quizzes. These are annoying because they waste class time, but coming to class without having done the reading wastes even more class time.

Missing classes will make it hard to keep up. It will also lower your participation grade. If you miss a class, it is your responsibility to get missed materials from me or other students. Always check the website if you have been absent.

Homework Homework includes problem sets and labs, of which there will be about 6. You'll get detailed information about each one when it's assigned, but there are some general points that apply to all of them. Homework can be handwritten, word-processed, or even typed, but it has to be (1) neat, (2) legible, (3) on paper, and (4) well-organized. Homeworks will be graded on a 3-point scale, in a way that will be explained along with each assignment using a grading rubric. Homeworks that are not handed in will receive a zero.

Exams There will be two, a midterm and a final, weighted equally and both cumulative from the beginning of the course.

Article report As mentioned above, one of the goals of this course is to learn to read and understand phonetics articles. One assignment, therefore, is to pick an interesting-looking article from an actual journal or conference, read it, and summarize and discuss it in a short paper. This will also give you an idea of how phonetics is written up, which will be useful for your...

Final project Students choose a research question, then design, execute, and analyze an experiment to answer it, and finally present the question and the results to the class. This will take place in several steps, and I'll be giving details as each one comes up.

Human-subjects certification Students are required to complete the Collaborative Institutional Training Initiative's on-line training course in research ethics and the protection of human research subjects. ➡⁸This will get you a certificate that will allow you to do human-subjects research at UNC. (If you've already done this for another class or project, you don't need to repeat it.) There is no grade for this, but you have to do it to get a grade for the class at all.

7 Partnerships

Except when otherwise specified, the assigned work in this class will be done with a partner, for a shared grade. There are several reasons for this.

One is purely practical. The final project is going to take more work than one person can reasonably be asked to do, so you will have to work with someone in order to finish the project on time and do a good job. But, the final project shouldn't be the first time you and your partner work together. Collaboration on homeworks during the first part of the semester gives you the opportunity to get the bugs out of the partnership.

Another reason is pedagogical. If you want to understand something yourself, it is very helpful to try explaining it to someone else. Again and again throughout the semester, each of you is going to find yourself having to explain something to your partner. Both of you will understand it better as a result.

Finally, this is how real research is done. You work with other people, share the ideas, share the labor, spot opportunities or mistakes that the other person overlooked, present the results together, and share the

⁸<https://research.unc.edu/human-research-ethics/ohre-citi-program/>

credit (or ignominy). This is an upper-division course, and it's none too early to start getting used to this aspect of research culture.

I will be assigning partners, on the basis of questionnaires, to insure that there is a fair distribution of skills and backgrounds among the partnerships. It is your job to insure that there is a fair distribution of work within each partnership. For the final project, this is mandatory: your project proposal must include an account of how you have agreed to divide up the work. Explicit agreements are not required for the homework, but informal ones are a very good idea.

Partners will work together on the homeworks and the final project, but not on the two in-class exams. You may work with your partner on the article report, but you can choose to work alone if you want.

Partners are jointly responsible for handing in the assignment; that is, if it doesn't show up on time, it counts against both people.

8 Policies

Attendance. If you must miss class because of a medical or family emergency, you should let me know *beforehand* by emailing or buttonholing me in person. If you miss a class, it is your responsibility to get missed materials from me or other students. Always check the class log and the Canvas website if you have been absent.

Late assignments. Homework solutions will normally be discussed in class the day the assignment is due. Therefore, as a general rule, NO LATE ASSIGNMENTS WILL BE ACCEPTED FOR CREDIT. Exceptions *may* be made if

- You got *advance* permission (by asking me *before* the due date) to hand in an assignment late, or
- You couldn't come to campus on the day the assignment is due because of a serious illness or other unexpected emergency. You need to get the assignment in at the earliest possible opportunity with a *written explanation* of the situation. Email is best.

Use of natural intelligence: Natural intelligence is a suite of cognitive innovations in our species which is capable of identifying and solving complex problems across a wide range of domains. When used together with natural language, it allows networks of intelligent agents to collaborate synergistically. Example use cases include

- *Brainstorming.* Natural intelligence can generate new ideas and evaluate their promise, allowing users to make creative improvements to their own knowledge base and that of society.
- *Generating outlines.* Natural intelligence can organize ideas, facts, and other mental objects in a logical way that brings out connections between them and enables them to be transmitted efficiently to other natural intelligences via written or spoken language.
- *Genre and style modelling.* Natural intelligence can analyze texts belonging to a particular genre (such as scientific writing) to construct a model of its characteristic information structure and linguistic choices. It can then use the model to express its own ideas as well-formed instances of the genre, facilitating uptake of those ideas by natural intelligences trained on that genre.
- *Summarizing longer texts.* Natural intelligence can accept longer texts as input and identify their main points and the structure of their arguments. This process may reveal logical fallacies that were concealed behind a screen of verbiage.
- *Editing and refining.* Natural intelligence can detect grammatical mistakes, factual errors, and logical inconsistencies in document drafts, and suggest ways to remedy them.

These are only examples; more applications can be suggested by natural intelligence. The functionalities of NI improve with use as the system trains itself, sometimes dramatically. Novel insights may be spontaneously generated as a by-product of the training process.

The use NI in this class is strongly encouraged, especially by leveraging the possibilities afforded by using natural language to network two or more NI agents. However, *the use of natural intelligence must be open*

and documented. The finished product must credit the NI agents that participated in its making — through citation of written sources, and through acknowledgement or co-authorship for real-time interactions.

Use of artificial intelligence. When not otherwise specified in an assignment, the use of generative AI in this class is governed by the “No AI Use” standard⁹, which says: “AI tools are not permitted; all work must be completed independently by the student. For example, a student writes a paper or solves a math problem entirely on their own without any AI assistance. Should students have questions, they should seek clarification from the instructor.” Exception: You may use AI for simple repetitive tasks, e.g., “Change all the spellings in this draft from UK to US”, or “Reformat our bibliography in MLA style”. Individual assignments may have more or less stringent requirements, which will be stated in the assignment itself.

Recording. Students are not permitted to record audio or video of lectures and discussion sessions. Permission will be granted only if the use of recording devices has been approved by the University Compliance Office¹⁰ as an accommodation.

Dates are still tentative at this point. I’ll give at least two weeks’ notice of the midterm, and will hand out an exam syllabus (a study guide) one week before each exam.

The Carolina Honor Code (Code of Student Conduct) is in effect in this class, and I will treat violations seriously. You should review it at <http://instrument.unc.edu>. If you have questions about interpretation, you should bring them to me. **Every assignment you hand in must be accompanied by a signed statement that you have complied with the Code requirements in everything related to that work**, e.g., “I completed this assignment in full compliance with the Honor Code.”.

9 Equipment and software

You will need

Headphones Most assignments (including the “reading” assignments) will involve listening to audio files. This is best done using headphones or earphones.

Microphone To record, you’ll need a microphone. Most laptops come with a little microphone embedded in them somewhere. Better ones are available in the Phonetics Lab, Dey 103 (of which more later).

Speech-analysis software Thanks to the generosity of the Government of the Netherlands, a very nice speech-analysis package is available free for download from the Institute of Phonetic Sciences in Amsterdam. There are versions for PC, Mac, and Linux. I’ll be providing or linking to details on how to download and install it.

A mirror Some days, I’ll ask you to bring a small mirror to class, for observing your articulators. The best kind is the folding pocket mirror, the kind which has a regular mirror and a magnifying mirror hinged together (so you can see around corners). However, a plain old hand mirror is perfectly serviceable.

A stapler and staples This ancient and reliable technology is for handing in assignments on paper when they occupy more than one sheet of paper.

10 General UNC-CH course policies and resources

Accessibility Resources UNC-Chapel Hill facilitates the implementation of reasonable accommodations for students with learning disabilities, physical disabilities, mental health struggles, chronic medical conditions, temporary disability, or pregnancy complications, all of which can impair student success. See the ARS website for contact and registration information: <https://ars.unc.edu/about-ars/contact-us>

⁹<https://ai.unc.edu/ai-guidance-for-faculty>

¹⁰<https://compliance.unc.edu/access-and-accommodations/student-accommodations/>

Attendance Policy No right or privilege exists that permits a student to be absent from any class meetings, except for these University Approved Absences:

1. Authorized University activities
2. Disability/religious observance/pregnancy, as required by law and approved by Accessibility Resources and Service and/or the Equal Opportunity and Compliance Office(EOC)

Significant health condition and/or personal/family emergency as approved by the Office of the Dean of Students, Gender Violence Service Coordinators, and/or the Equal Opportunity and Compliance Office(EOC). Absences for reasons other than those listed above must be approved in advance by the instructor. If a student misses class for any reason, the student is responsible for finding out what material has been missed and is encouraged to speak to the instructor.

University Testing Center The College of Arts and Sciences provides a secure, proctored environment in which exams can be taken. The center works with instructors to proctor exams for their undergraduate students who are not registered with ARS and who do not need testing accommodations as provided by ARS. In other words, the Center provides a proctored testing environment for students who are unable to take an exam at the normally scheduled time (with pre-arrangement by your instructor). For more information, visit <http://testingcenter.web.unc.edu/>.

Counseling and Psychological Services CAPS is strongly committed to addressing the mental health needs of a diverse student body through timely access to consultation and connection to clinically appropriate services, whether for short or long-term needs. Go to their website: <https://caps.unc.edu/> or visit their facilities on the third floor of the Campus Health Services building for a walk-in evaluation to learn more.

Honor Code Statement Students are bound by the Honor Code in taking exams and in written work. The Honor Code of the University is in effect at all times, and the submission of work signifies understanding and acceptance of those requirements. Plagiarism will not be tolerated. Please consult with the instructor if you have any questions about the Honor Code.