

## Fall 2018 – Physics of Speech (SPLH/LING 120)

<b>Professor.</b>	Dr. Cynthia Hunter
<b>Office.</b>	Dole 3029
<b>Email.</b>	c.hunter@ku.edu
<b>Office hours.</b>	Tue: 1:00 pm to 2:00 pm & Thu: 3:00 pm to 4:00 pm
<b>Class meeting times.</b>	Tue & Thu: 11:00 am – 12:15 pm
<b>Place.</b>	Dole 2092
<b>Graduate TA.</b>	Mallory Miller
<b>GTA office.</b>	3025 Dole
<b>GTA email.</b>	mmiller30@kumc.edu
<b>GTA Office Hours.</b>	Fri: 12:00 pm to 1:00 pm

**Notes: (1)** Please also read the document on **Course Policies**.

**(2)** Please refer to your **lab syllabus** for Grad TA information and meeting times.

### **Course pre-requisites, co-requisites and other restrictions**

MATH 101 or 104 or equivalent. PHSX 111 is recommended for students with no background of basic physics.

### **Course Description**

This course offers an introduction to the acoustic structure of speech intended for nonscience majors. Course material begins with the basic physics of sound structure and sound propagation and progresses to the application of these basic principles to speech perception and the production of speech sounds by the human vocal tract. This course is intended to provide students with foundational knowledge of speech perception and production as physical processes. Emphasis will be placed on the methods and standards by which scientists measure and evaluate the physical characteristics of speech. Topics will include: simple harmonic motion, the propagation of sound waves, aerodynamic aspects of vocal fold vibration, resonance, digital speech processing, frequency analysis, and speech synthesis. Three class hours and one laboratory per week.

### **Learning Objectives and Outcomes**

- To be able to describe the generation and propagation of simple and complex sound waves
- To be able to perform basic analysis of simple and complex sound waves
- To describe and demonstrate acoustic and articulatory characteristics of consonant and vowels
- To apply basic principles of psychophysics to describe speech production and speech perception

### **Required Textbooks and Materials**

Mullin, W.J., Gerace, W.J., Mestre, J.P., and Velleman, S.L. (2016). Fundamentals of sound with applications to speech and hearing. Amherst, MA: Off the Common Books.

Scientific calculator

Any other required material will be shared on Blackboard.

## **Assignments (See attached schedule and lab syllabus for all due dates)**

Lab assignments & attendance	30%	300 points (30 points per lab)
2 in-class quizzes	15%	150 points (75 points per quiz)
Weekly in-class group assignments	15%	150 points (approx. 14 points each)
1 midterm exam	20%	200 points
1 comprehensive final exam	20%	200 points
<b>Total</b>	<b>100%</b>	<b>1,000 points</b>

### **Lab assignments and attendance (300 points; 30% of final grade)**

Lab assignments provide an opportunity for students to apply concepts learned from lectures, readings, and class discussions to manipulation and measurement of sounds. Students will learn ways of describing and measuring sounds using software. Attendance is required. See lab syllabus for full description of labs.

### **In-class Quizzes (150 points; 15% of final grade)**

A total of 2 quizzes will be administered in class. Quizzes provide students with sample questions that may be asked on exams and help students identify key concepts covered in the readings and lectures. Students are expected to work independently on quizzes. You will be allowed to bring your calculator as well as one sheet of formulas for each quiz. In calculating final grades, each of the 2 quizzes is worth 7.5% of your grade.

### **In-class Group Assignments (150 points; 15% of final grade)**

Each week during the Thursday class a substantial portion of class time will be devoted to collaborative group work on problem-based assignments. Groups will be assigned by the instructor and group membership will rotate after the midterm. Group assignments are designed to promote active learning of the course material and to facilitate hands-on practice needed to master the problem-based reasoning that is required in this course. **GROUP ASSIGNMENTS ARE ALSO AN EXCELLENT STUDY GUIDE FOR THE EXAMS.** Group assignments will be handed out and graded in-class. Each group member who is present will receive the group grade. If you miss class, you will receive a zero for that day's group assignment. Each student will be allowed drop up to 3 assignments from the calculation of their group assignment grade.

### **Midterm and Final Exams (400 points; 40% of final grade)**

Midterm and final exams: The exams will include (1) multiple-choice (2) short-answer numerical and (3) true-or-false questions to assess your knowledge of the course content and ability to apply concepts and formulas learned in class. Questions will include material covered in the readings and in class lectures, in class group assignments, and discussions. For each of these exams, you will be allowed to bring your calculator as well as one sheet of formulas. Each exam is worth 20% of your grade.

### **Extra Credit**

Extra credit may be earned by participating in class discussions. In order for an extra credit point to be earned, you must be called on by the instructor, and your answer must be correct. It is your responsibility to report to the instructor immediately after class so that extra credit for that day can be noted next to your name in the instructor's grade sheet. Maximum possible extra credit for each student will consist of 1 extra credit point earned per class.

## Grading Policy

The University has prescribed definitions for grades. The University Senate Rules and Regulations define grades in the following way <http://policy.ku.edu/governance/USRR#art2sect2para3>: Grading Scale and Interpretation of Performance Level per University Senate Rules and Regulations

2.2.1.1 The grade of A will be reported for achievement of outstanding quality

2.2.1.2 The grade of B will be reported for achievement of high quality

2.2.1.3 The grade of C will be reported for achievement of acceptable quality

2.2.1.4 The grade of D will be reported for achievement that is minimally passing but at less than acceptable quality

2.2.2 The letters F, U (unsatisfactory), and NC (no credit) shall indicate that the quality of work was such that, to obtain credit, the student must repeat the regular work of the course.

The relationship between total points accumulated and quality of achievement is as follows:

Total Course Points	Percent	Quality of Achievement	Final Letter Grade (GPA)
528-570	94+	Outstanding	A (4.0)
511-527	90 - 93		A- (3.7)
494-510	87 - 89		B+ (3.3)
471-493	84 - 86	High	B (3.0)
454-470	80 - 83		B- (2.7)
437-453	77 - 79	Acceptable	C+ (2.3)
414-436	74 - 76		C (2.0)
397-413	70 - 73		C- (1.7)
380-396	67 - 69	Minimal	D+ (1.3)
357-379	64 - 66		D (1.0)
340-356	60 - 63		D- (0.7)
0-339	< 60	Inadequate	F (0.0)

If your level of achievement during this course is falling short of your goal, you are **strongly encouraged** to consult with the instructor during office hours or by appointment to improve the quality of your learning of course material.

## Course Schedule

Note.

- (1) The dates of quizzes and exams are fixed.
- (2) Schedule of topics may change depending on the pace of learning.
- (3) Please check Blackboard for the most current schedule

Week	Tue	Topic	Thu	Topic	Fri	Lab that week	Reading
1	Aug 21	Syllabus- Introduction	Aug 23	Background Math, SI Units, Basic Physics etc	Aug 24	<i>INTRO LAB</i>	Appendix A Ch 10 pg. 178-181
2	Aug 28	Intro to Waves	Aug 30	Intro to Waves - II	Aug 31	Lab 1: Generating & Measuring Sine Waves	Ch 1
3	Sept 4	Intro to Waves - III	Sept 6	Intro to Waves - IV	Sept 7	Lab 2: Pitch and Frequency	Ch 1
4	Sept 11	Review	Sept 13	<b>Quiz 1</b>	Sept 14	<b>NO LAB</b>	
5	Sept 18	Standing Waves in Strings	Sept 20	Standing Waves in Air	Sept 21	Lab 3: Loudness and Intensity	Ch 2, Ch 3
6	Sept 25	Resonance / Complex Waves	Sept 27	Complex Waves II	Sept 28	Lab 4: Complex Waves	Ch 4, Ch 6
7	Oct 2	Wave Analysis	Oct 4	Wave Analysis II	Oct 5	Lab 5: Filters	Ch 7
8	Oct 9	Review	Oct 11	<b>Midterm Exam</b>	Oct 12	<b>NO LAB</b>	
9	Oct 16	<b>FALL BREAK</b>	Oct 18	Speech Production I	Oct 19	Lab 6: Vowel Space	Ch 8
10	Oct 23	Speech Production II	Oct 25	Acoustics of Speech Sounds - Vowels	Oct 26	<b>NO LAB</b>	Ch 8
11	Oct 30	Acoustics of Speech Sounds – Consonants I	Nov 1	Acoustics of Speech Sounds – Consonants II	Nov 2	Lab 7: Co-articulation and Word Segments	Ch 9
12	Nov 6	Intensity, Loudness, Sound Pressure - I	Nov 8	Intensity, Loudness, Sound Pressure - II	Nov 9	Lab 8: Noise and Hearing Loss	Ch 11
13	Nov 13	Review	Nov 15	<b>Quiz 2</b>	Nov 16	Lab 9: Speech Perception	
14	Nov 20	Speech Perception - I	Nov 22	<b>THANKSGIVING BREAK</b>	Nov 23	<b>THANKSGIVING BREAK</b>	Ch 12
15	Nov 27	Speech Perception -II	Nov 29	Speech Intelligibility / Hearing Loss	Nov 30	Lab 10: Final Lab	Ch 12
16	Dec 4	Flex Class	Dec 6	Tutorial -	Dec 7	<b>NO LAB (Stop day)</b>	

The final examination follows KU's policy for final exams  
<http://policy.ku.edu/governance/USRR#art1sect3>

**All information provided in this syllabus is meant to serve as guidance and is subject to change. If any of this information changes, I promise to announce this change in class. It is your responsibility, however, to keep track of these changes (especially if you miss a class).**

**Have a great semester ahead!**