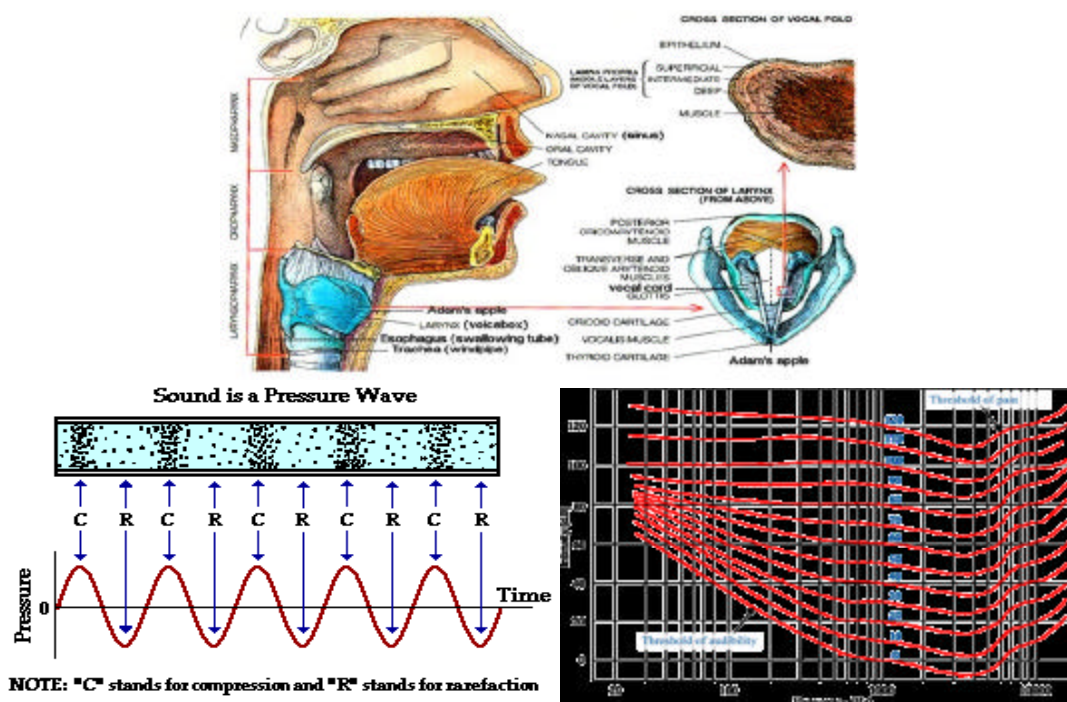


SPEECH and HEARING SCIENCE

CDSc 259



“One easy way to understand speech sounds is to track a glob of air through the vocal tract into the world, starting in the lungs.”

Steven Pinker (1995), The Language Instinct

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Office Hours: MW 11:30-12:30
T 12:00-1:00 or by appointment

Exams: Exam #1 – 2/20/08; Exam #2 – 3/19/08;
Exam #3 – 4/16/08; Final Exam – 5/12/08 - 8:00-11:00

Prerequisites: To register in CDCs 259 you must have completed CDSC 142, CDSC 150, CDSC 221 and CDSC 228

Course Description:

Speech and hearing sciences are disciplines concerned with basic physiological, biomechanical, neurological, and acoustical aspects of normal speech production, hearing and sound perception. The topics covered in this course include (a) basic acoustics with emphasis on the decibel scale of sound intensities and the relationship between sound intensity and perceived loudness, and the relationship between sound frequency and perceived pitch, (b) speech acoustics with emphasis on vocal tract geometry and the generation of acoustic speech patterns, (c) the kinematics and aerodynamics of speech breathing, (c) digital signal processing in speech and hearing, and (d) laryngeal physiology and voice generation. Acoustic and physiologic measurement techniques will be discussed, and when feasible, demonstrated. This course is designed to be consistent with the principle that academic and clinical education should provide students with learning experiences that will orient them to provide service in an effective, ethical, legal, and safe manner. Additionally, this course has been designated to ensure that students demonstrate required knowledge and ability as outlined in the ASHA Standards for the Certification of Clinical Competence in Speech-Language Pathology.

Course Outline :

- I. **Basic Acoustics**
 - A. Simple harmonic motion & sine waves
 - B. Parameters of sound & the decibel (dB)
 - C. Complex waves
 - D. Waveforms and spectra
 - E. The Decibel
 - F. Perception of loudness and frequency

- II. **Speech Acoustics**
 - A. The laryngeal sound source
 - B. Tube resonances
 - C. Vocal tract resonances
 - D. Spectrography and vowel formants
 - E. Acoustic signatures of consonants

- III. **Speech Breathing**
 - A. Breathing to sustain life
 - B. Kinematics of speech breathing
 - C. Gender and age differences in speech breathing
 - D. Aerodynamic aspects of speech breathing

- IV. **Digital Signal Processing**

- A. Computer basics
- B. Analog vs digital signals
- C. Analog to digital conversion of speech
- D. Digital to analog conversion of speech

V. Laryngeal Functions

- A. Glottal volume velocity and complex sound
- B. Myoelasticaerodynamic theory
- C. Pitch and intensity change mechanisms
- D. Laryngeal articulatory activities
- E. Acoustic measurements of voice

Text: The required text for this course Ferrand, C. T. (2001). *Speech Science: An integrated approach to Theory and Clinical Practice*. Allyn & Bacon: Boston, MA. Other readings will be assigned when appropriate.

Numeric to Letter Grade Conversions :

A	95-100	C+	77-79
A-	90-94	C	73-76
B+	87-89	C-	70-72
B	83-86	D	60-69
B-	80-82	E	< 60

Learning Outcomes: At the completion of this course, students will be able to;

- A. Explain simple harmonic motion and sine waves
- B. Explain complex waves and Fourier analysis
- C. Identify waveforms and spectra
- D. Summarize the parameters of sound
- E. Explain how to use (and why we use) the decibel scale to measure sound intensity
- F. Discuss in detail the nonlinearity between sound intensity and perceived loudness
- G. Discuss in detail the nonlinearity between sound frequency and perceived pitch
- H. Explain tube resonances
- I. Explain vocal tract resonances
- J. Interpret spectrograms
- K. Identify vowel formants and other salient spectrographic features
- L. Summarize the acoustic signatures of consonants
- M. Contrast quiet and speech breathing
- N. Explain speech breathing kinematics and aerodynamics
- O. Summarize the main components of analog to digital conversion
- P. Summarize the myoelasticaerodynamic theory of voice production
- Q. Explain the physiologic frequency and intensity change mechanisms (respiratory & laryngeal)

The above objectives comply with ASHA Standard III.B.

Formative and Summative Experiences:

To enhance learning based on student input, this course contains both formative and summative experiences. Formative experiences shall include 1) designated question periods at the beginning of each class, and 2) the invitation to students to submit written questions prior to each exam for possible inclusion in that exam. Summative experiences shall include all exams.

Students With Special Needs:

SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional or learning disabilities. Students should consult with the Director in the Office of Disability Services (Tabitha Buggie-Hunt, 105D Erwin, tbuggieh@geneseo.edu) and their individual faculty regarding any needed accommodations as early as possible in the semester.

The Science of Speech and Hearing Can be Fun

