Description
The Acoustics of Speech and Hearing is an H-Level graduate course (4-1-7) that reviews the physical processes involved in the production, propagation and reception of human speech. Particular attention is paid to how the acoustics and mechanics of the speech and auditory system define what sounds we are capable of producing and what sounds we can sense. Areas of discussion include (1) the acoustic cues used in determining the direction of a sound source, (2) the acoustic and mechanical mechanisms involved in speech production and (3) the acoustic and mechanical mechanism used to transduce and analyze sounds in the ear.

General Information
The class meets for two 1.5 hour lectures and one 1-hour recitation session each week with two take home laboratory sessions scheduled during the semester. There are 15 written assignments during the year consisting of problem sets (11 throughout the term), lab reports (2 throughout the term) and two take-home exams (a mid-term and a final). There are also 5 paper discussion sessions in which everyone is expected to participate.

Grading: 15% of the final grade is based on homework, 15% is based on participation in class and in discussions of relevant literature, 10% is based on the two lab reports, 60% is based on the mid-term and final exam. Students are encouraged to seek the help of the teaching assistants in performing the homeworks.

Who Should Take This Course
The Acoustics of Speech and Hearing course is open to beginning graduate students and upper level undergraduates who have had two semesters of college-level physics (or equivalent) and differential and integral calculus. Past students have included Physics, EE and ME juniors, seniors and graduate students as well as graduate students from the Media Lab.

Where & When
Lectures are held Tuesdays (T) and Thursdays (R) from 1PM - 2:30PM in 26-302.
Recitations are on Wednesdays (W) from 12:00 to 1:00 PM in 36-156

Text Books & Library Resources
The recommended (but not required) textbook for the course is: The Speech Chain: The physics and biology of spoken speech by P.B. Denes & E.N. Pinson, WH Freeman 2nd ed. 1993, ISBN 0716722569. This text is written for non-engineers but it contains a clear basic description of the physiologic and physical processes involved in speech production, transmission, reception and recognition. This book may be purchased for $27 from Amazon.com or Barnes & Noble.com.

A text/workbook that covers some of the course material in more detail is; "The Fundamentals of Sounds with Applications to Speech and Hearing" by WJ Mullin, WJ Gerace.JP Mestre and SL Velleman, Published by Allyn and Bacon, Boston, 2003, ISBN 0-205-37087-X. This book is available from Barnes and Noble (www.bn.com) for $67 new or $20 to $35 used.

Other more engineering oriented texts will be useful from time to time and that can be found in the Engineering Library, include:

Acoustics by Leo Beranek, American Institute of Physics 1986.


A book that gives a more balanced view point of acoustics and speech and hearing is Acoustic Systems in Biology by Neville Fletcher, Oxford University Press 1992.


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Lectures include:

3 Lectures on sound propagation in space
1 Lecture on Sound Diffraction Sound Localization
2 Lectures on Sound Localization
1 paper discussion on sound localization
4 Lectures on electro-acoustic circuits
3 Lectures on acoustic transducers including the middle ear
1 Lecture on middle-ear disease and reconstruction
1 Paper discussion on middle ear models
3 lectures on sound in tubes
2 Lectures on the inner ear
2 Lectures on the perception of sound and hearing loss
2 Lectures on speech sound production
2 Paper discussions on frequency selectivity in the auditory system
1 Lecture on the processing of speech by the auditory system

Laboratory sessions include:

1 Lab on the acoustic analysis of speech
1 Lab on quantifying the perception of sound

see http://web.mit.edu/6.551j/www/ for an up-to-date class schedule

Lecture handouts, homeworks and other material is (or will be) available for registered class participants at https://stellar.mit.edu/S/course/6/fa12/6.551J/

5-Sept-2012