

Course Summary and Comps Guide

Speech Science

Be able to describe the principle features of the following

Basic Acoustics

- Simple and complex vibration of air particles
- Acoustic features of sound and how they are measured
 - Frequency
 - Amplitude
 - Duration
 - Period
 - Wave length
- The difference between a simple and complex periodic waves
- Fundamental Frequency (F_0) and Harmonics and how are they related
- Aperiodic complex waves (obstruant consonants)
- “Resonance” and “Filtering” and how do they relate to perception of vowels, semivowels, nasals
- Transitions: what they are, why are they important in speech, and how they are measured
- The three primary methods of for measuring speech sounds
 - Power wave (time x amplitude)
 - Spectrum (frequency x amplitude)
 - Spectrogram (frequency x time x amplitude)
 - Wide band: peak energy and formants
 - Narrow band: sound source and harmonics

Glottal Sound Source: Phonation

- The sound source for voice production? Complex periodic wave from speed and amplitude of vocal fold vibration.
- Spectrum of speech = Fundamental Frequency + harmonics
- Vocal Pitch = Fundamental Frequency (F_0) based on speed of V.F. vibration
- Vocal Tone = number of harmonics
- Vocal Loudness = amount of air volume and air pressure through vocal folds. Based primarily on Psg
- Vocal Quality = symmetry and periodicity of vocal fold tissue and vibration
- Acoustic measurement of vocal quality: vocal jitter and shimmer
- Clinical Application
 - Voice disorders
 - Fluency disorders
 - Dysarthrias (neurologically based speech disorders)

Vowels and Diphthongs

- Sound Source: periodic complex waves generated by vocal folds
- Resonance = selective amplification of certain vocal harmonics and

attenuation of others create energy “peaks” in spectrum based on length and shape of vocal tract

- Formants = Resonances (areas of increased energy) of the vocal tract created by the vocal tract “resonating” certain harmonics from the glottal sound source
- Vowel Identification: based on location and spacing of formant 1 and formant 2 peaks based on tongue position, degree of mouth opening and lip rounding
- Formant bandwidth = influences vowel quality based on degree of sound absorption in the vocal tract.
- Vowel duration and pitch influenced by surrounding consonants, speech rate and other factors.
- Serve as the “nucleus of syllables
- Diphthongs: two vowels combined by a transition of a specified duration.

Consonants

- How are consonants produced and how do they differ acoustically from vowels?
- What are the primary classifications of consonants?
- What acoustic features differentiate between and among each consonant?
- What acoustic feature determines the perception of manner of articulation?
- What acoustic feature determines the perception of place of articulation?
- What determines voiced versus unvoiced consonants?
- How are formant transitions involved in perception of stop consonants?
- What are semivowels, their sound source and how they differ from obstruents consonants and vowels
- What are nasals and their primary acoustic features?
- Terms to know and love
 - Stop gap
 - Voice Onset Time (VOT)
 - Aspiration
 - Formant transitions
 - Voice Bar
 - Turbulence
 - Sibilants and Nonsibilants

Suprasegmentals of Speech

- What are suprasegmentals and what are the primary acoustic features?
- At what levels of connected speech can suprasegmentals occur? Can you give examples?
- What roles do suprasegmentals play in American English?
- What is Intonation, what role does it play in American English?
- What is Stress, what are the acoustic features
- What is the general sequence of suprasegmental development?
- What are the primary features of speaking rate and how do we vary rate?
- What are the primary features that differentiate “conversational” from “precise”/“clear” speech?