**Lecture 10 – Speech production**

In 1960, the first model for speech production was created. The main idea of this model is a sum of filters: Glottal excitation and turbulent noise, vocal tract filter, and lip radiation. The product of these filters in the time-frequency domain equals human speech. Each of the filters model a physical system in the human body that make acoustic ingredients.

There are four basic acoustic ingredients that make up a speech signal: Quasi-stationary noises that make up unvoiced speech, impulsive bursts that make up plosive sounds, periodic vibrations that make up voiced speech, and periods of silence.

**Lecture 10 – Basics of linguistics**

Speech is made with phones, that are the simplest unit of sound. Phones are universal and do not depend on language. Phonemes are phones that carry a different meaning and depend on the language being spoken. Allophones are speech sounds that have the same meaning even though they are different phones in a language. An example of this would be [r] and [l] in the Japanese language.

The phonemes are basic units of sound, and they make up syllables. Syllables are rhythmic units that make up words. Words are speech units that generally have a distinct and unique meaning.