Summary
The goal of this course is to provide the students with the main formalisms, models and algorithms required for the implementation of advanced speech processing applications (involving, among others, speech coding, speech analysis/synthesis, and speech recognition).

Content
1. **Introduction**: Speech processing tasks, language engineering applications.

2. **Basic Tools**: Analysis and spectral properties of the speech signal, linear prediction algorithms, statistical pattern recognition, dynamic programming.

3. **Speech Coding**: Human hearing properties, quantization theory, speech coding in the temporal and frequency domains.

4. **Speech Synthesis**: Morpho-syntactic analysis, phonetic transcription, prosody, speech synthesis models.

5. **Automatic Speech Recognition**: Temporal pattern matching and Dynamic Time Warping (DTW) algorithms, speech recognition systems based on Hidden Markov Models (HMMs).

6. **Speaker recognition and speaker verification**: Formalism, hypothesis testing, HMM based speaker verification.

7. **Linguistic Engineering**: state-of-the-art and typical applications

Keywords
speech processing, speech coding, speech analysis/synthesis, automatic speech recognition, speaker identification, text-to-speech

Learning Prerequisites

**Required courses**
Basis in linear algebra, signal processing (FFT), and statistics

**Important concepts to start the course**
Basic knowledge in signal processing, linear algebra, statistics and stochastic processes.

Learning Outcomes
By the end of the course, the student must be able to:

• speech signal properties
• Exploit those properties to speech codign, speech synthesis, and speech recognition

Transversal skills

• Use a work methodology appropriate to the task.
• Access and evaluate appropriate sources of information.
• Use both general and domain specific IT resources and tools

Teaching methods

Lecture + lab exercises

Expected student activities

Attending courses and lab exercises. Read additional papers and continue lab exercises at home if necessary. Regularly answer list of questions for feedback.

Assessment methods

Written exam without notes

Supervision

Office hours  No
Assistants  Yes
Forum  No

Resources

Bibliography
Fundamentals of Speech Recognition / Rabiner and Juang

Ressources en bibliothèque
• Fundamentals of Speech Recognition / Rabiner and Juang

Websites
• http://lectures.idiap.ch/

Moodle Link
• https://go.epfl.ch/EE-554