ELECTROACOUSTICS I (EEE.7-2.4)

1. COURSE CONTENTS

The course is organized in four sections:
Section 1: Sound applications, electronic-electroacoustic (audio) systems, the effect of space. Parts of an audio system depending on the application, categories of audio systems. The audio system as a linear and time-invariant system, linear distortions. Non-linear distortions and system noise.
Section 2: Sound waves, wave equations, speed of sound, traveling and standing waves. Sound sources, source directivity, sound intensity as a function of source power and distance from it. Sound measurement, level and frequency, noise measurement. Outdoor sound propagation, reflection-refraction-propagation / absorption.
Module 3: Equivalent circuits of mechanical and acoustical systems. Electro-mechano-acoustical systems, electroacoustic converters (sensors & actuators). Basic types of microphones, operating principles, basic relationships, features. Use of microphones. Basic types of speaker drivers, operating principles. Electrodynamic speaker driver analysis, equivalent circuits, Thiele-Small parameters. Loudspeakers, crossover circuits. Measurement of the loudspeaker enclosure-speaker driver system, determination of design parameters.
Module 4: Audio system subsystems, types and characteristics: connectors, wiring, preamplifiers (topologies, specifications), mixers, power amplifiers (power supply and output stages, classes, circuits), digital power amplifiers, power amplifier operating characteristics (power, harmonic distortion, input / output characteristics), dynamic range processors, signal processors, sound recording systems, electrical audio signal sources, loudspeakers and linear loudspeaker arrays, distributed systems.

Within the course, practical exercises and demonstration of the process of applied acoustic / electroacoustic measurements such as sound level measurement, microphone calibration, impulse response acquisition of electroacoustic system will be performed.