

ELECTROACOUSTICS II (EEE.8-2.8)

1. COURSE CONTENTS

Theory part (Lectures)

The theoretical part of the course is organized in four sections:

Section 1: The physiology and function of the human sense of hearing, hearing in animals, the response of the ear, the perception of sound by humans, subjective characteristics and subjective measurement units of sound. Binaural hearing, determination of source direction, production of sound by man. Sound masking, difficulty in communication, speech intelligibility.

Section 2: Indoor acoustics (propagation of sound in small and large enclosed spaces, wave, geometric and statistical study of the development of the sound field). Signal theory and indoor acoustics. Characteristic quantities that assess the quality of music and speech reproduction in a closed space in direct relation to the way a person perceives sound (physiological acoustics / psychoacoustics). Principles of indoor acoustic design, acoustic errors and corrective interventions. Acoustic modeling and auralization. Case studies using indoors sound field development simulation software.

Section 3: Acoustical parameters of sound reinforcement systems' (audio installations') operation. Source-receiver distance relationships. Needed and potential acoustic gain. Sound coverage. Time delay relationships, Loudspeaker systems (general requirements, speaker driver and loudspeaker directivity, speaker placements and combinations). Audio installation equalization. General input / output relationships. Wiring issues in audio installations (matching of subsystems, ways of connecting loudspeakers). Typical examples of audio installations.

Section 4: Effects of noise on humans, equivalent noise level, effects of noise on hearing, permissible noise level limits, daily personal noise exposure, weekly average personal noise exposure, partial & total noise annoyance, noise dose, noise pollution, noise indices, traffic noise, noise barriers, noise and safety at work, legislation, noise assessment & sound protection software, structural sound insulation measurements, measurement standards, sound insulation improvement.

Lab

The laboratory part of the course aims to familiarize students with the use of specialized instruments / measuring systems and the conduction of electroacoustics and applied acoustics measurements, covering topics such as:

- Use of microphones and digital sound / noise measurement systems.
- Evaluation of electroacoustic / acoustic systems through the acquisition of their impulse response.
- Determination of indoor acoustical parameters.
- Electrical equivalents & analogues of speaker drivers and loudspeakers.
- Design of electroacoustic systems and audio installations (sound reinforcement systems).