

Electronics and Electroacoustics for Sound Engineering (offerta solo in inglese)

The course aims at providing a solid background on transducers, sensors, devices and systems used in electronic systems for acquisition, processing, recording and rendering of audio signals. The course discusses the electronics of microphone transducers and semiconductor devices (BJT, JFET and MOSFET) used in audio systems. It also illustrates the main amplification stages and analog processing systems (preamplifiers, equalizers, mixer), as well as issues related to noise/distortion minimization. Finally, the course covers the main configurations of the power amplification stages, with a in-depth analysis of their features and performance. The topics covered by the course are:

- Electroacoustic devices: microphones, professional condenser microphones, vibrational and piezoelectric sensors, loudspeakers; electro-mechanical models, sensitivity, directionality, frequency response, dynamic range, noise, impedance; MEMS technology and microphones.
- Solid state electron devices for audio systems: BJT, JFET and MOSFET transistors: static and dynamic characteristics and parameters.
- Thermionic valves for audio systems: diode, triode, tetrode and pentode: physics, static and dynamic characteristics and parameters.
- Electronics for audio signal analog processing: single and multi stage transistor and valve amplifiers, signal transformers, preamplifiers, differential and instrumentation amplifiers, balanced input and output, phantom power supplies, automatic gain control, compressors, summing amplifiers, active filters, Baxandall tone control, resonant filters, graphic and parametric equalizers.
- Audio mixing consoles: Analog and digital console architectures, preamplification and equalization sections, aux and group sections, pan pot, VCA, mixing matrix, buses, output modules.
- Noise in electron devices and circuits: electronic noise sources: white, $1/f$ and Lorentzian. Noise characteristics of BJT, JFET, MOSFET and Thermionic Valves. Audio preamplifier noise analysis. Noise analog filtering.
- Signal distortion in electronic circuits: amplifier distortion analysis and measurement, distortion reduction techniques.
- Power amplifiers: Class A, AB, D output stages; efficiency, distortion, output impedance, transient response.

Minimum requirements for attending this course is a basic knowledge of the theory of electrical networks and fundamentals of electronics.