

SCUOLA DI MUSICA DI FIESOLE

FONDAZIONE – ONLUS

iscritta al n° 6 del Registro Regionale delle Persone Giuridiche Private

Agg.: 21/10/2019

Course Programme for TRIENNIO ORDINAMENTALE

ARTISTIC-DISCIPLINARY SECTOR CODE **COME/04** ELECTROACOUSTICS

Field of study : ELECTROACOUSTICS

YEAR 1

Hours	Credits	Mode of Verification	
30	4		EXAM

PROGRAMME OF STUDY:

- Discussions about the fundamentals of acoustics:
 - o Characteristics of sound;
 - Frequency, intensity and timbre;
 - o Unit of measurement of sound pressure:
 - db_{spl} and db_{fs} ;
 - perception of sound pressure
 - o Representation of sound (amplitude);
 - o Discussion on the Fourier theorem, on the breakdown of a sound in sinusoidal waves;
 - o Partial and harmonics in a sound;
 - o Phase;
 - o Propagation of sound:
 - Compression/rarefaction of the propagating medium;
 - Speed of propagation;
 - Reflection;
 - Defraction;
 - Refraction;
 - Absorption;
 - Diffusion;
 - Inverse square law;

- Introduction to the electroacoustic chain:
 - o Microphones;
 - o Systems of acquisition;
 - o Diffusers;
 - o Analogue connections:

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- Balanced/Unbalanced;
 - Types of connectors
- Microphones:
- Technological and constructive solutions:
 - Moving coil microphones;
 - Tape microphones;
 - Condensing microphones;
 - Discussions:
 - Crystal microphones;
 - Ceramic microphones;
 - Carbon microphones;
 - Technical characteristics:
 - Directional characteristics;
 - Frequency response;
 - Phasing;
 - Sensibility;
 - Impedance;
 - Distortion;
 - Background noise and signal/noise rapport;
 - Maximum sound pressure level;
 - Dynamic range;
- Analogue – Digital conversion:
- Discussions on binary arithmetic;
 - Analogue and Digital properties;
 - Sampling;
 - Sampling theorem (Theorem by Nyquist);
 - Supersampling and subsampling;
 - Aliasing;
 - Quantization;
 - Quantization errors;
 - Discussions on audio signal coding (PCM);
 - Non-linear quantization;
 - Working principles of A/D and D/A convertors;
 - A/D converters with double ramp integration;
 - A/D converter with successive approximation;

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- A/D converter with delta-sigma modulation;
 - A/D high density linear converter;
 - Current weighing D/A converter;
 - 1 bit D/A converter;
 - Supersampling;
- Analogue Mixers
- Characteristics and functions;
 - The inputs;
 - The outputs (Aux, Bus, Master);
 - Insert;
 - Equalizers;
 - Routing;
 - Master;
 - Monitoring;
- Digital Mixers:
- Layers of input, output and remote;
 - patching :
 - physical input-output;
 - logical input-output;
 - Programming and management software for the digital mixer;
 - Studio Manager;
 - Scene saver;
 - Window to see the channels:
 - routing (bus and aux);
 - insert;
 - Pairing functions and the creation of channel groups;
 - routing internal effects and their use;
- Types of digital connections:
- AES/EBU;
 - SPDIF;
 - ADAT;
 - TASCAM;
 - MADI;
 - ADI;
 - Systems based on network connections (CAT5);
 - Cobranet;

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- AES50;
- Dante;

- Digital Systems:
 - Digital sync;
 - Use of devices for digital sync;
 - Examples of digital chains;

- Systems for reproduction of digital audio and their characteristics:
 - Compact disc;
 - DAT;
 - Multi-channel systems ADAT and TASCAM;
 - Discussion on the compression system for Mini Disc;
 - Super Audio CD;
 - DVD-Audio;
 - Blu-ray;
 - Discussion on the systems of HardDisk;

- Acoustic Diffusors:
 - Types of speakers:
 - Direct diffusion or dynamic speakers;
 - Trumpet speakers;
 - Low frequency speakers;
 - Speakers in open field, with infinite screen and in a closed speaker;
 - Purpose and characteristics of the acoustic speaker:
 - Labyrinth;
 - Bass reflex;
 - Function and characteristics of Crossover;
 - Diffusor characteristics:
 - Sensibility;
 - Strength;
 - Impedance;
 - Response curve;
 - Polar diagram;
 - Amplifiers:
 - Function of an amplifier;
 - Characteristics:
 - Power output:

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- Nominal power;
- Maximum power;
 - Distortion (linear, harmonic, phasing, intermodulation);
 - Noise levels;
 - Channel crosstalk;
- Output characteristics;
- Connection of the diffusors to an amplifier:
 - In constant impedance;
 - In constant tension;
- Discussions on the use of diffusors for studio monitoring:
 - Stereophonic configuration;
 - Multi-channel configuration;
- Discussion on the use of diffusors for amplifying:
 - Problems of cover and efficiency;
 - Problems of the use of diffusors for monitoring;
- Discussions on the measurement of diffusor systems;

EXAM PROGRAMME

Oral exam on the subjects covered.

BIBLIOGRAPHY

F. Alton Everest – Manuale di Acustica

Genelec - Multichannel Control Room Acoustics and Calibration

A.P. Goldberg - Reproducing Commercial Multichannel Formats Through a Single Monitoring System

J. Maes e M. Vercammen - Manuale di Tecnologie audio digitali;

M. Sacco – Corso audio multimediale

Curtis Roads - The Computer Music Tutorial

U. Nicolao – Microfoni

V. Lombardo, A. Valle – Audio e Multimedia

Other materials provided by the professor