EECE 503L: Digital Sound Design

Catalog Description
Students will learn to use digital audio workstations (DAW) such as ProTools, Reason, Audacity, and Sonic Visualizer softwares, MIDI and digital audio samplers, in addition to synthesizing digital sound using additive, subtractive, granular and physical modeling techniques. Applications use audio digital signal processing (DSP) plug-ins such as filters, graphic and parametric equalizers, compression, limiting and gate, in addition to stereo delays and impulse-response digital reverberation.

Perquisite by course
EECE 340

Perquisite by topic
Knowledge of signals and system

Required/Elective
Elective for 3rd and 4th year ECE

Textbook:
Notes provided by the instructor

References

Course objectives
This course provides students with:
1. An understanding of industry-standard tools and techniques used for electroacoustical transduction, storage, and signal processing
2. An understanding of the tools and techniques used to analyze sound, including acousmatic and acoustical sounds such as musical instruments and the human voice, and characterize timbral attributes for modeling purposes
3. A practical guide to DAW used for Multimedia
4. A practical guide to MIDI and audio samplers
5. A practical guide to audio DSP

Lab Topics
1. Digital Audio Workstations, Part I: Audio Production Console
2. Digital Audio Workstations, Part II: Audio Editing Suites
3. MIDI and Software Audio Samplers
4. Digital Recording and Characterization for Musical Acoustics
5. Digital Recording and Characterization for Voice and Speech Processing
6. Audio DSP, Part I: Spectral and Dynamic Range Processing
7. Audio DSP, Part II: Digital Delays and Artificial Reverberation
8. Sound Synthesis using Simple and Complex AM and FM
9. Course Project, Phase I: Soundscape Design Guidelines for Film and Game
10. Course Project, Phase II: Soundscape Design and Implementation

Lab experiments will be conducted using:
- DAW: ProTools, Audacity, Sonic Visualizer, and Reason
- AVID MBox, 96kHzHz, 24-bit dual-channel audio Data Acquisition (DAQ) Systems
- AKG C-414 condenser microphone
- Rode NT-5 Stereo condenser microphones
- Shure SM and Beta dynamic microphones
- AKG Studio head-sets

**Course Outcomes**

**At the end of this course, students:**
1. Are introduced to the practical aspect of sound engineering as an integrated engineering field
2. Have an understanding of the working environment
3. Are familiar with the people and skills associated in the production of sonic projects
4. Understand sound waveform and spectrum characteristics
5. Are familiar with acousmatic and acoustical sounds, including musical acoustics and human voice
6. Develop the skills to operate various DAW for digital audio recording, editing, processing, mixing and broadcast delivery
7. Develop the skills to manipulate and process digital sounds using various audio DSP tools
8. Understand the various audio analysis tools to characterize the attributes of acoustical events
9. Understand the various mediums used for the recording, storage, reproduction and transmission of audio signals in the digital and analog domain

**Resources of the course:**
Web references, learning objects, Audio/Video examples
Audio Engineering Society (AES) publications, articles and engineering reports
DAW Manuals

**Professional components:**
Engineering topics: 60%, Mathematics and physics: 30%, Musical education 10%

**Evaluation methods**
1- Audio Labs (40%)
2- Final (35%)
3- Project (25%)
Person(s) who prepared this description
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