

MUS 470L Syllabus

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| Semester: | Fall 2024 |
| Course title: | Audio Design Project III Lab |
| Instructor: | Professor Matt Klassen |
| Email: | mklassen@digipen.edu |
| Phone: | (425) 895-4423 |
| Office hours: | M,Th 11:00-12:00, or by appointment |
| Course Web Page: | http://azrael.digipen.edu/MUS470 |
| Time/Place: | labs: T 9:00-10:20 in Gibran, Th 4:00 - 5:20 in Jimbo |

COURSE DESCRIPTION:

This course presents a guided lab environment to pursue project work in audio design and implementation. Particular topics and project work include: parametrized audio components with user interfaces, audio-plugin development, and audio algorithm implementation.

PREREQUISITES and COREQUISITES:

Prerequisites: CS 245, MAT 320, MUS 371, MUS 371L

Corequisites: MUS 470

COURSE OUTCOMES:

After successful culmination of the course, students should be able to fulfill the following outcomes:

- a) Understand some of the low-level algorithms in audio.
- b) Reinforce knowledge of mid-level components and audio plugins.
- c) Implement user interfaces for audio applications.
- d) Implement a software application related to audio engine design, spatial audio, algorithmic music, synthesis, or digital signal processing.

DISABILITY SUPPORT SERVICES:

If students have disabilities and will need formal accommodations in order to fully participate or effectively demonstrate learning in this class, they should contact the Disability Support Services Office at (425) 629-5015 or dss@digipen.edu. The DSS office welcomes the opportunity to meet with students to discuss how the accommodations will be implemented. Also, if students need assistance in the event of an evacuation, they should let the instructor know.

GRADING:

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| Assignments | 50% |
| Milestones and Reports | 50% |

Grades will be determined based on total course percentage. Percentage scores will determine letter grades according to the scale: (in the worst case)

A : 93 – 100, A- : 90 – 92.9, B+ : 87 – 89.9, B : 83 – 86.9, B- : 80 – 82.9, C+ : 77 – 79.9, C : 73 – 76.9, C- : 70 – 72.9, D : 60 – 69.9, F : < 60

ASSESSMENT and RUBRICS:

Programming assignments will be given during the semester and posted on the website. One project milestone, as well as project specification report, must be met on time and be complete in order to receive full credit. Partial credit may be given for aspects which are complete and can run, or stand alone, correctly and independently of missing or not yet functional portions. In some cases partial credit may be given for partially complete work on a given aspect of the milestone requirements, but only if significant and clear progress is displayed.

ACADEMIC INTEGRITY:

Academic dishonesty in any form will not be tolerated in this course. Cheating, copying, plagiarizing, or any other form of academic dishonesty (including doing someone else's individual assignments) will result in, at the extreme minimum, a zero on the assignment in question, and could result in a failing grade in the course or even expulsion from DigiPen.

All students are asked to help in promoting a culture of academic integrity by discouraging cheating in all forms.

RELIGIOUS ACCOMMODATION: DigiPen Institute of Technology provides reasonable accommodations to students who may be absent from activities or incur significant hardship due to religious holidays or observances. These holidays or observances must be part of a religious denomination, church, or religious organization, and the course instructor must be notified in writing during the first two weeks of the course. The institute's policy for grievances is published in the course catalog.

TEAMS, DISCORD and STREAMING:

I am prepared to use Teams or Discord for individual check-in with students, project discussion, code review and demo, and also in order to accommodate students who might suddenly need to stay away from campus due to symptoms, exposure or illness. The default is for these activities to happen in person in the lab, but it is also straight forward to do these over Teams or Discord. We will default to using Discord for project demos since Discord accommodates stereo audio streaming, which may be necessary.

TENTATIVE WEEKLY TOPICS:

| Week | Dates | Topics |
|------|----------------|--|
| 1 | Sep 3 - Sep 6 | Introduction to Audio Projects, requirements and topics |
| 2 | Sep 9 - 13 | Introduction to Machine Learning for Audio DSP Review |
| 3 | Sep 16 - 20 | Short-Time Fourier Transform (STFT), various implementations of STFT |
| 4 | Sep 23 - 27 | Audio Segmentation and Tensors in Python and PyTorch |
| 5 | Sep 30 - Oct 4 | Microphone arrays and First Order Ambisonics (FOA), Auditory events of multi-loudspeaker playback |
| 6 | Oct 7 - 11 | 2D/3D Ambisonic Panning and Decoding, Vector-Based Amplitude Panning (VBAP) |
| 7 | Oct 14 - 18 | SH encoding/decoding, Binaural Ambisonic decoding |
| 8 | Oct 21 - 25 | Dynamic processing and reverb effects for Ambisonics |
| 9 | Oct 28 - Nov 1 | Higher Order Ambisonics (HOA), Microphones |
| 10 | Nov 4 - Nov 8 | Intro to Statistical DSP, Discrete-time random processes |
| 11 | Nov 11 - 15 | Random variables, mean and variance, Gaussian and Stationary processes |
| 12 | Nov 18 - 22 | Introduction to mathematical music theory, chord sequences on a torus, the Tonnetz |
| 13 | Nov 25 - 29 | Seventh chord sequences, geometry and Hamilton cycles |
| 14 | Dec 2 - Dec 6 | Spline modeling of digital signals, cycle interpolation |
| 15 | Dec 9 - 13 | Final Exams |