MUS 470L Syllabus

Semester:	Fall 2018
Course title:	Audio Design Project III Lab
Instructor:	Professor Matt Klassen
Email:	mklassen@digipen.edu
Phone:	(425) 895-4423
Office hours:	M-W 1:00-2:30 or by appointment
Course Web Page:	http://azrael.digipen.edu/MUS470
Time/Place:	labs: M 9:00-10:20, T 5:00-6:20, in Mathews

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 246, MAT 321, MUS 371, MUS 371L

Corequisites: MUS 470

COURSE GOALS AND OBJECTIVES:

1) Students learn the basic definitions and low-level algorithms in spatial audio

2) Students will become familiar with mid-level components and plugins

3) Students gain experience with user interface design for audio applications

4) Students will implement an application related to audio engine design, spatial audio, 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:

Assignments	20%
Milestones and Reports	20%
Final Project	60%

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 weekly and due two weeks later. Students are required to complete at least five such assignments, and if more than five are completed they will receive their best five grades. Two project milestones, as well as two pre-milestone reports, 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 elses 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.

TENTATIVE WEEKLY TOPICS:

Week	Dates	Topics
1	Sep 3 - 7	Audio components and audio engine design and implementation (guest lecture). Assignment 1: Graphing magnitude response
2	Sep 10 - 14	Spatial sound and human auditory system. Localization cues: interaural time difference (ITD), interaural level difference (ILD), spectral cues. Assignment 2: Modeling ITD with Woodward's formula
3	Sep 17 - 21	Definition of HRTF, time and frequency domain versions. Localization one or more sound sources, stereophonic law of sine, precedence effects. Assignment 3: Panning and stereophonic law with frequency-dependent parameter testing
4	Sep 24 - 28	User Interface Elements for audio design (guest lecture) Spherical harmonics and first-order ambisonics: definitions. Assignment 4: First order Ambisonic encoder
5	Oct 1 - 5	Binaural recording, synthesis, and virtual auditory display, introduction to HRTF measurements. Assignment 5: Deconvolution for impulse response in frequency domain
6	Oct 8 - 12	HRTF equalization, signal generation and processing, quality and errors, far-field HRTF databases. Assignment 6: HRTF data processing and format translation
7	Oct 15 - 19	Near-field HRTF measurements, time and frequency domain features of HRTF, minimum phase. Assignment 7: FIR minimum phase model of HRTF
8	Oct 22 - 26	Higher order ambisonics, sound field rotations (guest lecture). Assignment 8: Ambisonic decoder with rotations
9	Oct 29 - Nov 2	Spatial interpolation for HRTF, principle component analysis (PCA). Assignment 9: Spatial Interpolation of HRTF for elevation zero
10	Nov 5 - 9	Spherical head model for HRTF: far-field calculations, interaural localization cues (guest lecture). Assignment 10: Binaural rendering with convolution
11	Nov 12 - 16	Filter models and approximation, FIR vs IIR, frequency warping
12	Nov 19 - 23	Sound synthesis and physical modeling for 3D sound, numerical techniques
13	Nov 26 - 29	Spatial basis functions, sound-field signal mixing
14	Dec 3 - 7	Binaural reproduction through headphones and loudspeakers, crosstalk cancellation
15	Dec 10 - 14	Final Exams