MASTERS INSTITUTE
COURSE SYLLABUS

COURSE NO., TITLE: CC 2005/2205, Digital Audio Applications In Multimedia

INSTRUCTOR: Clovice A. Lewis, Jr.

TEXT:
1. David Miles Huber, *The MIDI Manual*
2. Ted Greenwald, *The Musician's Home Recording Handbook*

DESCRIPTION: This course is designed to teach the production and uses of digital audio in multimedia. Students will receive a thorough understanding of music notation, sound production techniques, MIDI technology, and the aesthetics of music and sound reinforcement,

COURSE OBJECTIVE: At the completion of this module the students will be able to:

1. Specify and operate software and hardware required to record, digitize, mix, edit, and output digital audio for CD-ROM, video, and animations.

2. Explain the role of sound effects and music in multimedia and aid other professionals in all phases of production, from the conceptualization of sound design to implementation of finished projects.

3. Diagnose and remedy problems that are likely to be encountered in a production environment. Students will be able to access outside resources such as service bureaus and music libraries of royalty free music/effects.

FORMAT: Theory lectures followed by application lectures which are concluded by open labs or individual instruction for the remainder of the class evening. Quizzes or tests may be given during open lab time.

SCHEDULE: See Class Calender.

COURSE EVALUATION: All projects are due on the assigned due dates. 5 points are deducted each day they are late after the due date. 5 points are deducted each day for informed or arranged late projects. (Communicate with your instructor!)

Attendance	35%	350	points	
Projects	32%	320	points	(2 projects, 160 points each)
Exercises	4%	40	points	(4 exercises, 10 points each)
Quizzes	4%	40	points	(4 quizzes, 10 points each)
Final Exam	25%	250	points	
	100%	1000	points	

Quizzes are given according to the class calendar.

ATTENDANCE POLICY: Attendance is crucial to student success at Masters Instimte. Ninety (90) percent attendance is expected during each module. For students who exceed 2 absences during a module, two (2) percentage points will be deducted from the final course point total for each days absence.

Masters Institute

DIGITAL AUDIO APPLICATIONS IN MULTIMEDIA

Class Calender

Class	1	**Fundamentals of Sound** overview of course; overview of emerging technologies and uses of sound; intro to Virtual Studio Technology(VST) workstation and InVision tools
	2	**Music Notation** reading scores; melody, texture and form
	3	**Reading Music** musical terminology, review of notation **Quiz #1-** Music Notation
	4	**Recording Components** sequencers, microphones, and peripherals
	5	**Audio Production Process** client research, identifying audience, environment of use, delivery media; production techniques; common troubleshooting **Quiz #2-** VST Basics
	6	**Sound Synthesis** using synthesizers, sound mixing, fundamentals of sampling
	7	**Musical Instrument Device Interface (MIDI)**- fundamentals of MIDI use, production, and application **Quiz #3-** Audio Production
	8	**Music Scores/Intro to Mid-term Project** using music scores; principals of orchestration and arrangement; intro to Mid-term project
	9	**Sound Design** analyzing soundtracks for mood and affect; enhancing action; sound design methodology for animation; resources (live performers, service bureaus, music libraries) **Quiz #4-** MIDI Basics
	10	**Guest Lecture** TBD
	11	**Synchronizing Sound** synchronizing multitrack soundfiles with images using Adobe Premiere
	12	**Lab Class #1** working on mid-term project **Mid-term Project Due-**end of class
	13	**Pro Tools III/Power Mix** intro to Pro Tools software
	14	**Intro to Final Project** outline and discussion of final project **Quiz #5-** Sound Design
	15	**Legal Issues** copyright laws pertaining to music and sound effects; independent contractor issues, licensing
	16	**Lab Class #2** working on final project
	17	**Web and On-line Audio** optimizing sound design for web and on-line applications; discussion of streaming technologies
	18	**Lab Class #3** working on final project

MASTERS INSTITUTE - Digital Audio Applications In Multimedia

Subject: Course Overview | Department: CC2005/2205

Day: 1 | Week: 1 | Lesson Topics: Course Outline, Overview of MIDI Overview of Emerging Technologies, Fundamentals of Sound, Demonstrations of Acoustical Instruments, Workstation Familiarization

Objective(s) of the day — At completion, the student will be able to:

The Instructor will describe the class structure, course outline, file management, attendance, and course expectations. Two lectures will be given by the instructor, one before break and the other after break. Lecture 1 will provide an overview of electronic music and sound in multimedia, as well as emerging technologies. Lecture 2 will describe the fundamentals of sound and demonstrate how acoustical instruments produce sound.

Familiarize students with the operation of the Steinburg VST system and have them compare its functions with the theoretical knowledge they have gained. Correlate musical terms and functions with controls and displays offered by the VST. Introduce the InVision Sound Generator as a sound source only (not as a manipulative element) and have them differentiate a sound source from a synthesizer.

Introduction:

See Lecture Notes

Method: ☐ Lecture ☐ Demo ☐ Lab ☐ Video ☒ Text/Handout

Learning Activities - Students will learn and demonstrate knowledge of:

An overview of MIDI technology and the significance of digital audio in the emerging technologies of digital animation, video production, virtual reality, and CD-ROM development. Students will be able to explain the fundamentals of sound, how it is produced, and compare acoustical means of production with electronic means.

Major features of the Steinburg VST and how they relate to theoretical base established. Opening a MIDI song file from and performing simple changes to the file (such as tempo and instrument assignment). Using the InVision Sound Generator to change sound banks.

Resources: ☒ Text ☒ VidTape ☒ Computer ☐ Overhead ☒ Handout

Evaluation: (Determination that student has accomplished objectives)

☐ Quiz ☐ Oral Exam ☐ Project ☒ Exercise ☒ Observation ☒ Survey

Summary/Comments:

- List the emerging technologies discussed and describe some of the ways digital audio applications are used with them.
- What is the historical significance of MIDI and how is it used today?
- What are the basic components of sound?
- What are the major features of the Steinburg VST?
- What are the major features of the InVision Sound Generator?

Time: 4.5 hrs. | Date: Tuesday, August 27, 1996

Day 1 - Course Overview

Presentation Materials:

Principles and Practice of Electronic Music Book
- Pictures of Early Electronic Music Instruments

Studio Picture from UCSB
Musical Score Examples
- Scores
- Popular Music Songs

How To Read Music Book
MIDI Manual
HRHandbook
An Instrument - Cello
Various Handouts

Course Outline

How Quizzes and Exams are done

All Quizzes and exams are done on the workstation. Students must take the material off the server and send it to the "Drop Tests Here" folder on the day of the exam.

About The Exercises

Exercises are to be done at the workstation unless otherwise noted, and are due on the day they are given.

File Management

File naming conventions, music file names/conversions, and internet information is given as a handout. Discuss finer points.

History of Electronic Music

Music Concrete

Pierre Schaeffer (b. 1910) has spent most of his life in radio broadcasting in Paris. He was trained as a technician. Early in 1948, he began to plan ahd to write about musique concre'te, a music which does not exist in abstraction like a traditional musical score, but exists as a finished product, a reality, on recordings. Musique concréte was to take concrete, real sounds and transform them by electro-mechanical processes into music.

Schaeffer's first piece of musique concrete, Etude aux chemin de fer, composed from the recorded sounds of trains, was made in 1948. On October 5, 1948, the RTF (Radiodiffusion -Television Francaise) presented a concert of Schaeffer's first five compositions. These early works were realized on variable speed turntables, radio station mixers, and disc recorders.

In 1949, Pierre Henry (b. 1927) began to work with Schaeffer. Henry is a trained composer, a pupil of Olivier Messiaen, and the collaboration was fruitful to both men. The new works became longer and more complex.

Avant-Garde

Tapes in performance

Early Electronic Musical Instruments

Theramin

Leon Theremin (b. 1896) introduced the instrument that bears his name in his native Russia in 1919. Later Theremin came to the United States where his instrument gained popularity. An early Theremin concert in the United States was given in New York on January 31, 1928.

The Theremin is the only well-known instrument which the performer does not touch in order to play. Two oscillators tuned above audio frequency generate the same ultrasonic frequency. One of the oscillators generates a fixed frequency, while the other oscillator generates a variable frequency which is changed by the position of

the player's hand near a receiving antenna. As the player's hand approaches the antenna, the oscillator is detuned to an ever greater degree, resulting in an increasing difference in frequency between the two oscillators and so producing a difference tone. The difference tone lies in the audio frequency band and is amplified and played over a loudspeaker.

One problem with the Theremin is articulation. Because of the method of tone production, the instrument glides from one tone to another. While ethereal in quality, the effect soon becomes monotonous.

Other electronic instruments followed the Theremin. Jörg Mager (b. 1880) built an electronic instrument, the Spharophon, which was presented at the Donaueschingen Festival in Germany in 1926. In France, Maurice Martenot (b. 1898) built the Ondes Martenot, presented in 1928 at the Paris Opera. Frederick Trautwein (b. 1888) built the Trautonium, presented in 1928 in Berlin. The Hammond organ was invented in 1929 and was first heard in public in 1935.

The depression of the 1930's and the world war that followed slowed the development of electronic music. It was only in the late 1940's that activity resumed.

- Buchla
- Moog
- Others

- Control
  - Control Voltage and Triggers
  - Early Sequencers
  - Patching
  - Signal Routing
- Early Computer music before MIDI
  - John Chowning and Max Matthews
  - Computer Music before Desktops
- Overview of MIDI

MIDI stands for MUSICAL INSTRUMENT DIGITAL INTERFACE and is a standard used by numerous hardware and software manufacturers in the music industry to allow their products to "talk" to one another.

Many things support MIDI, such as:

- Software sequencers like Opcode's Vision, Passport's MasterTracks Pro, Mark of the Unicorn's Performer, and OSC's Metro.
- Synthesizers and samples like Korg's M1, the Korg Wavestation, Yamaha DX7, Roland JD-800, and more!
- Software editor librarians like Opcode's Galaxy.
- Hardware devices like Opcode's Studio 3 interface.

Because all of these things support and understand MIDI, they can be used together to form a very powerful music system which can allow you to play music, record music, experiment with sound design, and more!

MOST BASIC SYSTEM

The most basic MIDI system requires at least one synthesizer with MIDI capabilities, a MIDI interface to connect the synthesizer to the computer, and some MIDI compatible software. Opcode makes something called the EZMusic Starter Kit which is excellent for beginners to

learn about MIDI. Use keyword OPCODE for more information.

SEQUENCERS

Sequencers allow you to play and record "tracks" of performance with your synthesizers, samples, and drum machines. You can record a single track such as a bass line of a song and then play it back while recording the piano track, etc. You can layer and edit as many tracks as you like until the song is complete. This is the "new" way to compose and requires no pencil and paper!

SYNTHESIZERS and SAMPLERS

Synthesizers allow you to play (and create) numerous sounds ranging from acoustic sounding pianos and wind instruments to strange space type sounds. Each synthesizer uses a unique (or relatively unique) synthesis technique. Some of these techniques are FM Synthesis, Additive Synthesis, Subtractive Synthesis, Vector Synthesis, AI Synthesis, and Wavetable Synthesis! There are as many synthesis techniques as there are companies to create them. Each has its own unique sound and characteristics that you become familiar with as you use them.

A quick example to show you what these are like:

Using Additive Synthesis, you start with no sound and ADD frequencies and modulation to produce the desired sound you are looking for.

Using Subtractive Synthesis, you start with "white noise", which sounds like TV static late at night, and SUBTRACT frequencies and modulation to produce the desired sound you are looking for.

Samples, on the other hand, are nothing more than digital recorders that allow you to record sound and manipulate it in numerous ways such as filtering it, changing its pitch, rearranging it, playing it backwards, and more.

EDITOR/LIBRARIANS

Editors and Librarians are software that you use with your synthesizers and samplers to help you store and maintain all of the sounds you create over the years. Editors usually give you a full screen graphic editing environment for the sound. Librarians allow you to store these sounds in a way that allows you to find what type of sound you are looking for ... quickly.

Once you have the sounds stored, you can easily and quickly load them into your synthesizer or sampler to hear them.

HARDWARE DEVICES

MIDI is not just synthesizers and samplers and software...you need things to connect them all together, such as MIDI Interfaces. A MIDI Interface can be as small as an audio cassette (Apple MIDI Interface) or as large as a multiple space rack mounted unit (Opcode's Studio 5). Each one has features that you may find are required for your sort of work.

- Need for MIDI
- Differences between MIDI and Audio
- What MIDI is not

Performance Tape of "A Little Sadness"

- Demonstrates MIDI with Live Performance - Future Concerts
- Faking as a fine art - Chicago

Overview Of Emerging Technologies

- Definition of Multimedia
- Sound on the Internet
  - Mods
  - Sampled Sounds
  - Games
  - Education
- CDI
- Virtual Reality
- Video Tape of D'Cockoo and MIDI Inventor

Fundamentals of Sound - Basic Acoustics

- Sound vs. Noise - Some Definitions
- Partials
  - The Overtone Series
- Vibrations and Sound
- Waves in Vibrating Wind Column
- Amplitude
- Envelopes
- Waveforms

Demonstration of Acoustical Instruments

- Instrument types
  - String
  - Wind
  - Brass
  - Percussion

Introduction to InVision CyberSound
Introduction to Steinburg VST
Handout #1 - Behind the Scenes at the Internet Underground Music Archive
Handout #2 - Basic Acoustics
Handout #3 - Music Terms
Reading Assignment - Music Terms

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