UNIVERSITY OF CALIFORNIA A-G CMP Course Management Portal

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RCOE Audio Technology

Riverside County Office of Ed. ROP

Basic Course Information

Title:	RCOE Audio Technology
Transcript abbreviations:	
Length of course:	Full Year
Subject area:	Visual & Performing Arts ("f") / Music
Integrated (Academics / CTE)?	Yes
Grade levels:	10th, 11th, 12th
UC honors designation?	No
Course learning environment:	Classroom Based

Course Description

Course overview:

The Audio Production course focuses on the aesthetic qualities of sound production in the studio and live environment. It will analyze the impact of digital and analog audio technology as a vital part of communication in the world today. Students will creatively express and develop written ideas within groups and individuals including, proposals, budgets and musical compositions. Students will also write and produce podcasts, webcasts and songs in a variety of formats. Instruction in the creative process that precedes any final project including writing, rewriting, collaboration and more rewrites will be a main focus. Students will also study the impact audio and sound production on our society from a social, economic, and political viewpoint. Students will learn the history of sound production and the technological advances in the art form. Knowledge and utilization of microphones, digital, analog and computer-based audio editing and recording equipment, and software programs such as Reason and Pro Tools will be a secondary focal point to that of meeting the elements of art and principles of design as well as the components in the state standards. Study and training in the Audio Production course will prepare students for careers in music engineering and production, post-production for film and television, and live sound-mixing for theater and concerts.

- Students will learn the terminology and vocabulary of audio production and design necessary to analyze and respond to the sensory, formal, and expressive properties of sound.
- Students will acquire the technical skills (an understanding of analog and digital recording, mixing and mastering, overdubbing, effects, microphone technique, radio broadcasting, podcasting and MIDI to communicate their ideas in this medium.
- Students will learn to make aesthetic judgments and evaluations of their own audio art, and other's work, as distinct from personal preference or

"taste."
- Students will recognize and distinguish the historical and/or cultural underpinnings of sound, audio and music in developing basic historical/cultural literacy in the discipline.
- Students will produce high quality, meaningful work that establishes links to acknowledged cultural and artistic traditions in music and sound.
- Students will establish connections and meanings between the critical thinking skills that are learned in this class to other subject areas, including art forms and potential future careers.
- Students will demonstrate their ability to critique, compare and contrast, and evaluate audio productions in content.
- Students will acquire the knowledge and capability to express creative ideas and concepts with audio in other academic forums.
- Students will research the historical relationships between audio production and society.
- Students will investigate recording techniques and research the productions and the shared secrets of renowned music producers over the last century.
- Students will write and record their own music, relying on the combination of intuition and modern creation techniques using software and other technologies.
- Students will differentiate genre and the role of the musician, music producer, and audio engineer in the mixed media industry.
- Students will acquire the knowledge of industry specific safety practices including the handling of power and equipment rigging.

Prerequisites:

TV / Video 1 (Recommended)
Careers / ICT (Recommended)

Co-requisites:

None

Course content:

Audio Industry Orientation
Unit 1:

Business of Media, History of Music Production, Basic Electronic/ Digital Audio Recording, Media Management, Studio Etiquette and Psychology, Genre.

- Identify, Compare and Use Personal Protective Equipment
- Recognize basic equipment rigging
- Identification and understand of Electrical Safety
- Recall and recite equipment operational safety

Key Assignment:

1. As a result of their safety training and investigation, students will be given and achieve a 100% score on an administrator-approved safety test. They will also collaboratively create a safety checklist for the class production activities that meets expected criteria outlined by the instructor's rubric.

2. Each student will present a two-minute oral/visual presentation of their research on an industry accident, and include a one-page handout of their research for their classmates. At the end of the presentations, each student will complete a one-page expository essay, analyzing the economic effects and the personal effects of how the incident made an impact on the industry.

Ears - Understanding and Responsibility
Unit 2:

In this section we will be exploring the parts and responsibility of the human ear. We will look into hearing loss, loss prevention and well as natural hearing loss. We will discover medical breakthroughs on hearing loss correction. The final section to this unit will allow students to discover their own ability to listen discrimanantly by realizing that we truly do have selective hearing and taking corrective measures to change the way we listen to all sounds around us.

- Recall and recite the parts or components that make a healthy ear.
- Students will identify and analyse the various symptoms and outcomes of hearing loss as well as hearing correction.
- Identify and differentiate between having educated ears and just listening.

Key Assignment:

Students will participate in an online interactive ear test. This test will check the relative sensitivity of a range of frequencies and their ears. The project will provide students a real understanding and verification that no two people hear the same. This was discovered by two doctors which is where the Fletcher and Munson curve comes from. A bi product of this assignment will also provide useful information to students that may be suffering from hearing loss and have no awareness of it.

Physics of Sound
Unit 3:

The below items will be covered in the unit. Students will discover both physics and psycho acoustics of sound. Students will conduct research on the components to sound waves, sound quality, loudness levels and the effect on the human body.

- Understand the principles and components of a sound wave.
- Identify various components of physical sound and their corresponding psychological correlation.
- Know the frequency ranges of the 10 octaves audible to human hearing and their sonic characteristics.
- Understand the difference in measurements between sound in acoustical form and sound in electrical form.
- Know the equal loudness principle.
- Understand how the acoustic phase relationships of sound waves affect amplitude.
- Understand timbre.
- Understand the relationship of frequency and pitch.
- Know the four stages of the sound envelope.

Key assignment:

Create a physical environment with 2 microphones and attempt to create phase cancellation. Students will realize when a single sound source is spoken into or captured by 2 microphones with identical tonal and fundamental characteristics there by eliminating all things equal between both microphones.

Acoustics of Sound
Unit 4:

This unit analyzes acoustics and psycho acoustics. The evaluation of these elements will allow students the ability to recognize various acoustic environments while relating them to how they can affect a live concert or studio recording. Students discover different acoustic treatment options as well as some DIY solutions to convert an ordinary space to one that could be utilized as a recording/performance environment.

- Students will understand, memorize and identify direct, early and reverberant sounds.
- Understand and recognize the differences between various acoustic treatment solutions.
- Understand and apply the use of ergonomically designed equipment.
- Apply concepts of recording studio designs through comparison.

Key Assignment:

Scavenger Hunt. In an area such as a high school, there are several different locations that can be thought of as spaces with different acoustic environments. With the knowledge gained from the unit, students will search the campus to locate various environments including spaces with early reflections, reverberation and echo. In determining this they will discover spaces with flutter echoes and early reflections, reverberation, delay and dry/dead environments. They will report their findings and compare to the rest of the class. This assignment will determine students awareness of the acoustic environment as well discover that everyone hears things differently.

Microphones
Unit 5:

This unit will explore the operating principles, directional characteristics and application of microphones used today. Students study the design of magnetic induction and variable capacitance microphones. They look at speciality application type microphones including wireless RF systems, parabolic microphones, shotgun microphones, lavaliere microphones and boundary microphones.

- Understand and apply the concepts of operating principles of microphones including magnetic induction and variable capacitance.
- Understand and apply the concepts of microphones based on the directional characteristics or microphones in various applications.
- Identify and apply the principles of microphone/system components.
- Identify and interpret the technical specifications of various microphones.
- Connect and apply principles of microphone accessories.

Key Assignment:

The key assignment will test the understanding of microphone selection and application. Students will be given two budgets and will be tasked with spending the money but be required to fulfill specific requirements.

Task #1 - $500 maximum Budget. Students will be tasked to purchase a complete set of microphones to accommodate a 5 piece drum set with a bass drum, snare drum, hi hat, 2 rack toms, floor tom and cymbals. The cymbal microphones need to be condenser microphones and kick drum microphone mast be tailored specific for low frequency instruments.

Task #2 - $3000 minimum Budget. Students will be tasked to purchase a complete set of microphones to accommodate a 5 piece drum set with a bass drum, snare drum, hi hat, 2 rack toms, floor tom and cymbals. The cymbal microphones need to be condenser microphones and kick drum microphone mast be tailored specific for low frequency instruments. Rack tom microphones need to be concealed/low profile type. Snare drum must have a microphone for top and bottom snare heads.

With both tasks, students will be responsible for determining the results of frequency response, polar pattern, operating principles, max SPL, size, mounting hardware, application (live, studio, broadcast).

Consoles and Control Surfaces
Unit 6:

This unit will cover operation, aesthetic and functionality difference and similarities of mixing surfaces. We will look at digital and analog as well as study differences between mixers and consoles. Learning proper signal path and troubleshooting will be key components to this unit. This unit will be filled with practical hands-on experiences with pre-recorded multi-track recordings and with live musicians.

- Recognize and operate the various functions of the input section to an analog or digital mixing or control surface.
- Understand and apply cable patching physically and virtually for digital and analog work environments.
- Compare and distinguish the differences between the metering functions of a mixing console.
- Identify and demonstrate the automation features of a mixing console.

Key Assignment:

Five Points of Audio. Through the course on this unit, students learn the functions of both digital and analog mixers, consoles and control surfaces. The key to proper work flow and system navigation is understanding signal path. With the understanding of signal path, students will be assigned a task of routing a sound source (microphone, CD player, media device) through a specific location within a set time. The following 5 points or steps must be performed in exact order to complete the assignment. #1 Adjust Input Gain, #2 Assign or direct channel where to route, #3 adjust fader/knob output, #4 Monitor signal levels and sound quality, #5 Adjust master output level.

System Connection and Connectors
Unit 7:

This unit will be a continuation of the previous expanding on the already learned signal path but with the integration of additional external peripherals. It will cover the proper application of direct injunction boxes, high impedance to low impedance converters, connector gender orientation and proper cable termination.

- Recognize, compare and connect various connectors and cables.
- Compare the functions and applications of DI Boxes.
- Identify and understand the gender orientation of various connectors.
- Create cables with connectors with proper connection termination.

Key Assignment:

In this Unit students will understand and demonstrate the signal flow process of a live sound and studio environment from the sound source to the mixing console. The process of capturing audio goes through a sequence of Acoustic Sound, transducers, XLR cable, Panel/Snake, Patch-bay and Mic Pre-amp. This will be completed in a virtual live environment. Students will be given a complete set of equipment to complete the task of connecting the components to the mixing console and by following the proper steps, they will verify the proper completion upon the audio being heard by all people in the room/space.

Loudspeakers and Monitors
Unit 8:

The final major component to the audio system will be introduced in this section. The various types of speaker enclosures will be reviewed, discussed, analyzed and used with practical hands on applications. Students will learn the proper times to employ various types of speaker boxes to optimize their working conditions. Technical speaker data will be studied to assist in determining the proper amplification systems to be employed.

- Identify various types of speaker enclosures.
- Identify and apply the use of various powering systems.
- Deploy and apply principles of loudspeaker placement.
- Compare and demonstrate the use of speaker enclosures.
- Investigate the needs and apply use of headphones and I.E.M. systems.

Key Assignment:

In this unit, students look at speaker selection and placement. Students work together in a team to determine the proper setup and placement of speakers for a mock rock band setup. In this process they will determine which speakers are used for FOH (Audience Speakers), monitor wedges, drum fill and side fills. Additionally, they will configure the amplifiers to be connected and route cable in a managed professional looking environment. The end result will prove speakers have been routed properly and laid out in a professional manner.

Signal Processing
Unit 9:

This unit will expand on the previous unit with the addition of signal processing. Typically outboard electronics, signal processing can do anything from dynamic control, time based processors and system management systems.

- Apply principles of pre/post signal routing and understand specific applications.
- Recall the employ the use of time based and dynamic based signal processing.
- Apply concepts of Loud Speaker Management Systems.
- Understand and employ the use of outboard equipment for in live and studio environments.

Key Assignment:

This unit will continue through the signal path past the basic functions of the audio console. Students will explore the varieties and differences between time based and dynamic based effects processors. The students will be assigned the task of mixing down a pre-recorded recording session and adding dynamic and time based effects to a variety of source channels as well as dynamic effects processing on master outputs.

MIDI Microphone Technique, Podcasting
Unit 10:

This section will be the introduction to the Digital Audio Workstations. We will be utilizing Reason and Pro Tools. Through this introduction we will be exploring the basic functions of application navigation. We will discuss the universal controls such as transport, record enable, edit window, mix window and sequence windows.

- MIDI Sequencing in Reason
- Creating Patterns
- Building an Arrangement from Patterns
- Playing with a click track
- Navigating DAW (digital audio workstation)
- Bars, Beats, and Subdivisions

- Real-Time Recording
- Replace and Overdub
- Loop Recording
- Step Recording
- Punching in and out
- Importing and Exporting media
- Voice and vocal recording

Key Assignment:

Create a cultural song or sound-scape. Focus on microphone set-up and technique. Compression, limiting. Lyric writing or sampling in native or learned language, other than English, celebrating a wide variety of cultural heritages. Revisit genres: jazz, world, techno, house, hip-hop, trance, electronica, classical, tribal--and BPM. Have at least one live recorded track. Recording live instruments: a guitar, percussion, vocals, or all of the above. Mix in Reason and/or Protocols. An introduction to mastering.

Editing and Live Recording
Unit 11:

This unit will expand on the previous adding an in depth knowledge to the musical creativity component including the below list functions.

- Exploring Tempo, Key, Song Length, Velocity, Dynamics, Gate Time, Delay, Editing
- Fixing Mistakes
- Correcting Timing
- Correcting Durations
- Correcting Dynamics
- Editing Pitch
- Cut/Copy/Paste Operations
- Editing in the Arrange Window
- MIDI Mixing and Automation
- Live recording seminar, techniques, etiquette
- The relationship between the engineer, producer and artist

Key Assignment:

Engineer a multi-channel live recording: the school orchestra, jazz band, choir, guitar class, or a local band. Focus on mic techniques, studio etiquette, the role of the engineer in relationship to the producer and artist. Tracks will be mixed in the Protocols or Logic. Post production aspects: compression, EQing, adding effects, editing techniques, fading in and out, gate/limiting. Emphasis on mixing, remixing, and mastering. Media management, sharing with server and the social media.

Mixing and Mastering
Unit 12:

The final step before students export their finished product is to master the master output. This can be achieved by verifying master output meters are consistently outputting on the VU meters as close to 0db as possible. This will be achieved with the proper use of compression, gate as needed, eq, time based effects and dither.

- Dynamics Processing
- Compressing the Bass Track
- Gating
- Time-Based Effects
- Delay
- Doubling/Flanging/Chorus
- Reverb
- EQing, Compression, DB

Key Assignment:

Students create, produce and mix an ambient song in Reason. Pieces will be mixed and exported as .AIFF, then placed on the share-drive and organized into the database. Media management (organization of media in Reason, naming organization is an essential aspect.)

Hard-Disk Recording and Editing
Unit 13:

Students will explore the variety of software production tools. They will discover that concepts of sampling loops, changing session tempos an well as destructive and non-destructive recording mode. They will learn the pros and cons to both. Basic automation functions such as fade in and fade out as well as gain adjustments and channel normalization.

- Sampling Concepts
- Overview of Hard-Disk Recording
- Hard-Disk Issues
- Non-Destructive Editing
- Defining Regions
- Editing a Song Form
- Defining Rhythm Loops
- Loops and Song Tempo
- Destructive Editing
- DSP (Digital Signal Processing)
- Using the Change Gain and Normalize Commands
- Using the Fade In/Out Commands

Key Assignment:

Create 3-minute Dance Song in Reason. Song will fall under the genre “dance” but can equally fall under the techno, house, hip hop, trance, electronica. Explore and experiment with BPM (beats per minute: between 117 and 135. Discuss and learn additional mixing techniques, including effects, compression and EQing. Create final mix and export your song into server database to be shared in teacher's shared drive. Also, there will be a heavy emphasis on Studio Etiquette and Psychology

Preparing Files for Distribution
Unit 14:

This unit will take students through the final step of music production for the listening market. They will learn the skills needed to convert a multi-track sequence or recording session to the various desirable file formats. They will learn the difference in codecs as they relate to the medium they will be published to including CD/DVD, flash-drive, Streaming Internet etc. They will learn about how sampling rates and bit depth affect the final product as well as the needs of the consumer and how they access recorded audio material today.

- Preparing Sequence Files for Distribution
- Importing and Exporting Standard MIDI Files with Protocols
- Importing and Exporting Standard MIDI Files with Reason
- Posting Sequence Files on the Web
- Audio Distribution Formats
- Final Master
- Mastering for CD, MP3, Vinyl
- Audio File Compression Overview
- Making MP3 Files
- Organizing and embedding in iTunes
- Distributing Audio Files via the Web

Key Assignment:

Upon completion of the previous unit, students will be tasked to export the media with specific codecs including AIFF, WAV, AAC and MP3. This final product will captured and placed on a CD with accompanying album artwork. In addition, student files will be loaded to the Internet in our shared soundcloud.com media account.

Exploring a Career in Audio Production
Unit 15:

Students research careers such as sound engineer, music producer, sound mixer, recording artist, song-writer, live sound, music score, Foley artist. This will include local and national data related to market trends, pay rates, hours, job availability.

Key Assignment:

A three part process to this assignment. Students will work with a partner and learn to search and identify various online job search resources. Once complete ALL students will share their findings in a bit of classroom collaboration. With the added results students will search the databases for their "Top 3" picks and determine if their is an online application or if they will need to fill out a generic application. The conclusion of the job search will be a mock interview with the teacher as well as a panel of 1-2 additional school administrators or other staff as well as community members.

or

Make oral and written reports (including bibliography) on two music producers, one from the western tradition and one from another cultural perspective. Include biographical information and perceptual critical analyses of at least four works by that producer/artist. Discuss the role of the producer within the history of the audio medium. Compare and contrast like subject matter across cultures. Careers in the arts will be discussed in terms of particular artists and their work, especially looking at crossover artists who were able to work both as artists and as commercial producers.

Final Project and Course Wrap-Up
Unit 16:

This unit will be a review of all things covered through the course of the program. It will consist of a self-evaluation as well as looking into pursuing a career in the Arts, Media and Entertainment Industry in the future. Students will have an opportunity to meet and interview with local business advisors allowing them to mock interview with the added chance of gaining employment directly out of the program.

- Course Wrap-Up
- How to Grow Your Basic Setup
- Suggested Additional Reading and Further Study

Key Assignment:

Produce, self-produce, or engineer a collection of songs as artist or for artist. Create an album, record or collection of songs (between 4 and 7, depending on length) in a particular genre of the artist's choosing. The task will require studio management, collaboration, media management, recording technique and style. Final albums will be loaded to the classroom server and shared with school and general communities as desired.

Course Materials

Textbooks

Title	Author	Publisher	Edition	Website	Primary
Audio in Media	Stanley R. Alten	Wadsworth	10th	http://www.cengagebrain.com/shop/isbn/9781133307235	Yes
Modern Recording Techniques	David Huber & Robert E. Runstein	Taylor and Francis	8th	http://www.routledge.com/cw/huber-9780240821573/	No

Websites

Title	Author(s)/Editor(s)/Compiler(s)	Affiliated Institution or Organization	URL
Hearing Test	Joe Wolfe - School of Physics	The University New South Wales	http://newt.phys.unsw.edu.au/jw/hearing.html
Shure Listening Lab	Shure Incorporated	Shure Incorporated	http://www.shure.com/americas/support/tools/mic-listening-lab