



COURSE OUTLINE

New Course Title ETT 208	Live Sound Reinforcement	3
Course Number	Course Title	Credits

Old Course Title ETT 208	Sound Technology	3
Course Number	Course Title	Credits

2	2	0	0	15 week
Class or Lecture Hours	Laboratory or Work Hours	Clinical or Studio Hours	Practicum, Co-op, Internship	Course Length (15 week, 10 week)

Performance on an Examination/Demonstration
(Placement Score (if applicable); minimum CLEP score)

Alternate Delivery Methods
(Online, Telecourse [give title of videos])

Catalog Description:

Basic principles of live sound reinforcement. Emphasis on signal flow, acoustic, sound reinforcement set-ups and installation, signal processing, microphone selections and placement. Includes setting up sound systems and mixing live music. Topics include microphones, recording equipment, control consoles, reproduction techniques, amplification, distribution, loudspeaker systems, frequency response, decibels, and dynamic range.

Prerequisites:

EET 130, ETT 101, ETT 103 or permission of the coordinator

Co requisites:

Last Revised: 1/11/2008

Course Coordinator: Robert Terrano, Assistant Professor
Office: ET110
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Required Materials:

Live Sound Reinforcement
ISBN: 0-918371-07-4
Author: Scott Hunter Stark
Publisher: Artist Pro Publishing
Date Published: 9th Printing, 2004

Important Health and Safety Information

As an entertainment technology student, you are involved in an industry that is dependent upon good hearing. Please protect yours! Tests have indicated that if you are rehearsing, recording, performing, listening to recorded music (especially through portable equipment) and/or attending gigs, concerts and nightclubs, it is very likely that you are experiencing daily sound levels well above those recommended for good aural health.

Damage to your hearing is not reversible. Avoid noisy environments as much as possible. Wear earplugs for your protection. Disposable earplugs are readily available or you can see an audiologist to have specialized hearing protection devices designed specifically for you.

Students with Disabilities

Any student in this class who has special needs because of a disability is entitled to receive accommodations. Eligible students at Mercer County Community College are assured services under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973.

If you believe you are eligible for services, please contact Arlene Stinson, the Director of Academic Support Services. Ms. Stinson's office is LB221, and she can be reached at (609) 570-3525.

Academic Integrity

As per the student handbook, "A student will be guilty of violating academic integrity if he/she (a) knowingly represents the work of others as his/her own, (b) uses or obtains unauthorized assistance in the execution of academic work, or (c) gives fraudulent assistance to another student." Students should read the Academic Integrity policy in the MCCC Rights and Responsibilities Student Handbook. ***Academic Dishonesty will result in failure of this course.***

Available Resources:

Books

Collons, Martin. *High Performance Loudspeakers*, Pertech Press First published 1985. Moderate.

Deny, Roger. *PC Audio Editing*, Focal Press, March 2000.

Johnston, Ian. *Measured Tones*, Adam Hilger/IOP Publishing 1989

McLeish, Robert. *Radio Production*, 2nd Edition, Focal Press 1994

Moore, Brian C. J. *An Introduction to the Psychology of Hearing*, Academic Press, 1989.

Nisbett, Alee. *The Use of Microphones*, 3rd Edition, Focal Press, 1989.

Rumsey, Francis. *Digital Audio Operations*, Focal Press, 1991.

Rumsey, Francis. *MIDI Systems and Control*, Focal Press, 1990.

Talbot-Smith, Michael (ed.). *Sound Engineer's Pocket Book*, Focal Press, 2001.

Websites

Handout for students.

Course Goals.

Upon Successful completion of this course, the student will be able to:

1. Demonstrate conceptual and working knowledge of the basic principles of the behavior of sound in various environments through classroom discussion, written assignments, and audio laboratory exercises, and use appropriate technical and musical terminology in articulating these concepts; (GE Goals 1, 3 and 4, MCCC CS Goals A, B and D)
2. Demonstrate conceptual and working knowledge of the basic principles of sound reinforcement systems through classroom discussion, written assignments, and audio laboratory exercises; (GE Goals 1, 3 and 4, MCCC CS Goals A, B and D)
3. Proficiently set up and operate a variety of live sound reinforcement equipment, including but not limited to: microphones and other transducers, amplifiers and preamplifiers, effects processors, stage monitoring systems, main speaker systems, digital and analogue mixing boards in a variety of scenarios ranging from lectures in small rooms to large outdoor music festivals; (GE Goal 4, MCCC CS Goals B and D)
4. Create typical sound system configurations for live sound reinforcement;
5. Maintain and keep in good working order a variety of live sound reinforcement equipment; (GE Goal 4, MCCC CS Goals B and D)
6. Manage all aspects of a live sound reinforcement event, including booking, staffing, load-in/out, set-up, rigging, sound check, running, and troubleshooting. (GE Goal 4, MCCC CS Goal B.)
7. Read and create stage plots, input lists, and contract riders. (GE Goal 4, MCCC CS Goal B.)
8. Work on teams, teach others, serve customers, negotiate and work well with people from culturally diverse backgrounds. (GE Goal 8, MCCC CS Goal F and G.)

General Education Knowledge Goals

- **Goal 1. Communication.** Students will communicate effectively in both speech and writing.
- **Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
- **Goal 3. Science.** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
- **Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
- **Goal 8. Diversity.** Students will understand the importance of a global perspective and culturally diverse peoples.

MCCC Core Skills

- **Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.
- **Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.
- **Goal D. Information Literacy.** Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
- **Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems, and communicate with others.
- **Goal F. Collaboration and Cooperation.** Students will develop the interpersonal skills required for effective performance in group situations.
- **Goal G. Intra-Cultural and Inter-Cultural Responsibility.** Students will demonstrate an awareness of the responsibilities of intelligent citizenship in a diverse and pluralistic society, and will demonstrate cultural, global, and environmental awareness.

Unit Objectives

Unit I: An Introduction to Sound Reinforcement Systems

The student will be able to:

- Write an essay that describes the fundamental building blocks of a sound reinforcement system. Included in the essay will be descriptions and uses for the following components: transducers, amplifiers, signal processors, microphones, mixers and accessory units, equalizers, amplifiers, pre-amplifiers, power amplifiers, speakers and crossovers. (GA; CG2)
- Draw a basic system layout of a simple sound reinforcement system. (GB; CG2, CG4)

Unit II: The Physics of Sound and Hearing

The student will be able to:

- Explain in his/her own words the following terms; sound waves, cycle, reverberation, amplitude, frequency, wavelength, the sine wave, resonance, sound spectra, phase and interference, and other related terms. (CG1)
- Explain and analyze the relationship between the fundamental frequency, harmonics, wave form, and phase and how it relates to the musical note and what we hear. (GB, CG1)
- Describe the physical structure of the ear including attributes of the ear such as frequency response, loudness compensation, the time line of hearing, perception of intensity and direction.
- Explain the concepts of the missing fundamental, frequency loudness warp, the precedence effect. Analyze the impact on what one hears given these characteristics. (GB, CG1)

Unit III: Audio Measurement Terms and Concepts

The student will be able to:

- Analyze a frequency response curve and interpret how it will affect tonal quality. (GB; CG1; CG2)
- Compare and contrast the terms, db, db spl, dBu, dBm, dbv. (CG1 and 2)
- Describe in writing Basic Gain Structure and analyze a working system's gain structure. (GB; CG 1& 2)
- Define and analyze the various forms of distortion that may be introduced in a sound system and evaluate the impact of distortion on the fidelity of a sound system.. (GB; CG 1& 2)
- Use Ohm's law to calculate power, current, voltage and resistance. (GB; CG 1& 2)
- Describe the concept of impedance. Identify impedance values for the various audio components. (GB; CG 1& 2)
- Compare and contract instantaneous peak vs. RMS, vs. average. Calculate the power output of an amplifier using each method. (GB; CG 1& 2)

Unit IV: Microphones

The student will be able to:

- Identify the different design types of microphone and describe the major characteristics of each type including their structure. (CG1 &2)
- Identify and describe the basic directional patterns of microphones and choose which type is best for different types of music, room acoustics and applications. (GB; CG 1,2, 3 and 4)
- Interpret pickup pattern variations by frequency using various charts and graphs published by the manufacturer. (GB; CG 1,2, 3 and 4)
- Write clear instructions on the effective use of microphones for talent. (GA, GB; CG 1,2, 3 & 4)
- Describe the differences between balanced and unbalances microphone circuits and choose the proper type for various applications. (GB; CG 1,2, 3 and 4)
- Identify and describe all issues of microphone impedance, sensitivity and distortion. Choose the appropriate microphone for a given application and level match it to the correct input. (GB; CG 1,2, 3 and 4)
- Write a one page paper of wireless microphones, their types, uses and applications. (GA, GB; CG 1,2, 3 and 4)

Unit V: The Audio Production Console/Mixer

The student will be able to:

- Write a two page paper(with block diagrams) describing basic mixer functions including input attenuation, fader, gain, potentiometer, auxiliary sends, sub masters, masters, etc. (GA&B, CG 1&2)
- Identify and describe the inputs and outputs of a mixer with associated characteristics and the type of equipment or components to which they are connected.
- Achieve a workable gain structure.
- Describe and explain the difference between TRS and XLR connectors and draw a pin-out for each that identifies polarity and ground.
- Connect microphones, musical instruments, recorded music sources such as CD players, DAT Players, I-Pod, monitor amps, house amplifiers and external processors to a basic mixer. . (GB; CG 1,2, 3 and 4)
- Operate digital and analogue mixers for live productions. (GB; CG 1,2, 3 and 4)

Unit VI: Loudspeakers and Associated Components

The student will be able to:

- Identify and explain the various basic design concepts of loudspeakers. (CG1&2)
- Identify and explain the different types of speaker enclosures and discuss the characteristics of each. (CG1&2)
- Identify, explain and discuss the characteristics of basic horns including low, mid and hi frequency horns. (CG1&2)
- Choose the proper type of horn for a given application. (GB, CG1,2,3&4)
- Identify and explain the various types of low and mid frequency cone drivers. (CG1&2)
- Identify and describe the various characteristics of cone drivers such as stiffness, excursion and rigidity. (CG1&2)
- Draw a basic diagram of a cone driver and a horn driver. (CG1&2)
- Interpret driver frequency response curves and on and off-axis response curves, and evaluate the impact on the fidelity of the sound reproduced. (GB, CG1,2,)
- Explain and calculate the impact of speaker impedance, speaker cable wire size, length and resistance variables on the transfer of power to the speaker and the damping factor for the low frequency driver. (GB, CG1,2,)
- Describe the concept of a passive and active speaker crossover including crossover frequency and crossover slope. (CG1&2)
- Interpret the frequency response curves of crossover networks. (GB, CG1,2,)
- Describe the physical construction of an inductor and a capacitor and explain the electrical characteristic of each. (CG1,2,)
- Calculate the reactance of an inductor and capacitor at any given frequency. (GB, CG1,2,)
- Design a simple 6db/octave three way passive crossover network. (GB, CG1,2,)
- Choose a speaker system for any given sound reinforcement application. (GB, CG1,2,)
- Connect a loudspeaker system with proper placement in an assigned venue. (GB, CG1,2,3&4)
- Calculate impedance loads when connecting multiple speakers in series or parallel. (GB, CG1,2)

Unit VII: Amplifiers

The student will be able to:

- Describe the differences between line level amplifiers, pre-amplifiers, power amplifiers, RF amplifiers and differential amplifiers by outlining the characteristics of each and identifying the typical applications for each. (CG1&2)
- Understand and interpret manufacturer's specification sheets for power amplifier and use that information to choose the appropriate power amplifier based on the venue, the maximum sound levels required and speaker efficiency. (CG1&2)
- Connect multiple speakers to the power amplifier consistent with the minimum impedance load tolerated by the power amplifier. (GB, CG1,2,3&4)

Unit VIII: Equalizers and Signal Processing

The student will be able to:

- Identify and describe the basic equalizer design types. (Fixed, cut-only, fixed frequency, sweepable, parametric, etc.) (CG1&2)
- Interpret frequency response curves to assist in setting up house and channel equalization. (GB, CG1,2,3&4)
- Connect and set-up automated and manual equalizers and perform a house equalization. (GB, CG1,2,3&4)
- Identify and describe the basic kinds of additional outboard and/or optional equipment which can facilitate the goals of sound reinforcement. (CG1&2)
- Describe each of the characteristics of compressors and limiters and identify scenarios that require their use. (CG1&2)
- Connect and properly adjust built-in and external compressors and limiters. (GB, CG1,2,3&4)
- Describe the characteristics of delay/echo and reverb units and identify each of the parameters required for adjustment.
- Connect, set-up and use delay/echo and reverb units. (GB, CG1,2,3&4)
- Compare and contrast analog and digital reverb and echo units. (CG1&2)
- Use equalizers and signal processing units during live performances. (GB, CG1,2,3&4)

Unit IX: System Wiring

The student will be able to:

- Cable multiple speakers using the correct wire size based on the parameters of speakers impedance, cable length and power required for the desired house sound levels. (GB, CG1,2,3&4)
- Effectively ground the sound reinforcement system using standard safety requirements to reduce or eliminate shock hazards. (GB, CG1,2,3&4)
- Cable low level and line level devices. (GB, CG1,2,3&4)
- Wire 3 pin XLR connectors, balance 1/4" TRS connectors and unbalanced TRS connectors. (GB, CG1,2,3&4)
- Identify and describe the typical audio connectors and adapters used in a sound reinforcement system. (GB, CG1,2,3&4)

Unit X: The Practicum

The student will be able to:

- Maintain and keep in good working order a variety of live sound reinforcement equipment. (CG 2,3,&5)
- Manage various aspects of a live sound reinforcement event, including booking, staffing, load-in/out, set-up, rigging, sound check, running, and troubleshooting. (GB,D&E; CG1,2,3,6&7)
- Read and create stage plots, input lists, and contract riders. GB,D&E; CG1,2,3,6&7)
- Work on teams, teach others, serve customers, negotiate and work well with people from culturally diverse backgrounds. (GF&G; CG8)

Evaluation of Student Learning.

Students' achievement of the course objectives will be evaluated through the use of the following

- Active participation in class
- A series of Unit tests assessing students' comprehension of basic sound terminology and practices. (CG1&2)
- A series of essays and short papers assessing students' comprehension of basic concepts and practices. (GA&B, CG1&2)
- A practicum where students will set-up and run sound in an approved local venue. (CG 1-8, Goals B,F,G)
- The final project will be the design of a sound system for a small venue. Students are to research and prepare a 1,000 word (minimum) MS Word document outlining the proposed purchase of a sound system for the Studio Theatre (CM122) or an approved venue proposed by the student. As well as outlining the general performance requirements and listing all of the individual components, students must gather prices (either new or second-hand) and include a cost breakdown and total price to assemble and operate this 'ideal' system. This planned sound system should not include backline equipment (for example: guitar amps, drums, keyboards etc.) (GA,B,D & E, CG1,2&4)

Evaluation Tools	Percentage Of Grade
Unit Tests	20%
Unit essays and papers	20%
Practicum	25%
Final design project	30%
Class Participation	5%
Total	100%

PRACTICUM EVALUATION OF ETT 208 STUDENTS
Entertainment Technology Program

Directions: Please complete this form and return to the Entertainment Technology Coordinator: Robert Terrano, ET110, 609-570- 3828.

Student's Name:		Your Name:			
Company/Org:					
Title:					
Date:					
	Excellent	Very Good	Average	Marginal	Unsatisfactory
Quality of Work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attitude	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dependability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attendance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ability to take direction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interpersonal Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work with people of culturally diverse background	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Collaboration with the Design team	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Creation of Stage Plots and Input Lists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintain Equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sound Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Running Board	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Load-in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Load out	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would rate the student's overall performance as:					
Excellent Very Good Average Marginal Unsatisfactory					
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>					
Indicate behaviors which may help and/or hinder this student's advancement:					
How well does this student interact with peers and the design team or producer?					