

Audio Systems Solutions

---

Submitter's Information

**Name** Andrew Maz

**Title** Assistant Professor

**Email** [amaz@cerritos.edu \(mailto:amaz@cerritos.edu\)](mailto:amaz@cerritos.edu)

**Phone** 562 860 2451

**Extension** n/a

**Region** Los Angeles/Orange County

**College** Cerritos College

**CTE Dean** Nick Real

**CTE Dean Email** [yreal@cerritos.edu \(mailto:yreal@cerritos.edu\)](mailto:yreal@cerritos.edu)

---

Program Information

**Program Name** Audio Systems Solutions

<b>Projected Start Date</b>	2018-08-13
<b>Program Type(s)</b>	Certificate of Achievement 12-17 Semester (or 17-27 Quarter) Units
<b>Certificate Required Units</b>	15.5
<b>Units of Major Degree</b>	n/a
<b>Total Units for Degree</b>	n/a
<b>TOPs Code</b>	Commercial Music (100500)
<b>Program Goals</b>	<p>This 15.5-unit certificate will offer technical training for students seeking careers in professional audio studios, film studios, and game development workshops. Students will receive professional, certified training in music recording, audio networking and audio Digital Signal Processing systems, as they apply to the recording, film, television, and game industries. Students completing this certificate will be prepared for entry-level positions such as audio technicians, broadcast technicians, recording engineers, music editors, dialog editors, and audio network technicians.</p> <p>Designed for commercial music students seeking more technical expertise, the Audio Systems Solutions Certificate prepares individuals to work on the design and technical aspects of the music industry. This program covers the audio workflows, audio computer systems, and audio networking. The goal is to encompass new audio technologies and technical skills needed for the advancements in audio design and distribution.</p>
<b>Program Description</b>	The Audio Systems Solutions Certificate will prepare students to design and implement audio network and DSP solutions in professional environments. This 15.5-unit certificate will train students how to create audio solutions

for a variety of environments such as recording studios, theaters, outdoor venues, and performance halls. Students will engage in creating professional audio solutions for these environments while integrating their experience with analog and digital audio technologies.

Required Courses:

MUS 110 Music Technology Fundamentals - 3 units

MUS 135 This Business of Music - 3 units

MUS 145A Live Sound Techniques - 2.5 units

MUS 146A Recording Technique - 2 units

MUS 146B Mixing Techniques - 2.5 units

MUS 157 Audio Systems Design - 2.5 units

Total Units - 15.5

## **Program Requirements**

Semester One:

MUS 110 – Music Technology Fundamentals (3 units)

This course is a prerequisite course to Recording Techniques (MUS 146a) and Electronic Synthesizers I (MUS 144a). This course is required of commercial music majors. The course covers the fundamental vocabulary, techniques, concepts, and devices used in contemporary music production and related media fields. This course covers sound fundamentals, professional audio equipment, computers, music production software, recording studios, MIDI, electronic music, audio-visual productions, and film. Topics such as trade publications, relevant conventions, and employment opportunities are also discussed.

MUS 135 – This Business of Music (3 units)

This course focuses on the music business as it relates to the market place and job opportunities. It teaches the student about the important jobs in the industry and their duties and responsibilities. Topics include the process of promotion, publicity, management, touring, recording, contracts, accounting, artist relations and development, marketing, advertising, copyrights, and related music fields.

Semester Two:

MUS 146a – Recording Techniques (2 units)

This course covers the methods of audio recording in studio and live environments. It includes the technical, as well as

the artistic, aspects of recording. Emphasis will be placed on the practical use of audio equipment both in a studio situation and on location. Several recordings will be required of all students. Individual lab time is provided.

#### MUS 145A - Live Sound Techniques (2.5 units)

This course provides an overview of live concert sound reinforcement. Topics include sound system theory and its application. The course covers individual sound system component operation, including microphones, mixers, effects, power amplifiers, and speaker systems. This course offers opportunities for hands-on experiences in troubleshooting, sound checking, and mixing sound for live performance applications. Students are expected to mix live performances.

Semester Three:

#### MUS 146b – Mixing Techniques (2.5 units)

This course covers the methods of audio mixing in the studio, covering a variety of music genres. It includes the technical, as well as the artistic, aspects of mixing. Emphasis will be placed on the practical mixing strategies and techniques. Students will supervise at least one recording session and provide a mix of that session. Several mix projects in varying genres will be required of all students. Individual lab time is provided.

Semester Four:

#### MUS 157 - Audio Systems Design (2.5 units)

This course trains students to design, implement, and support professional audio systems for studio, theatrical, and outdoor venues. Topics include sound system theory and integration. The course covers analog, digital, and network sound system component design, operation, and diagnostics. This course offers opportunities for hands-on experiences in designing and implementing sound systems for a variety of situations. Students will create several projects for different audio environments.

### **Program Projections**

Students entering the Certificate program will receive a two-year plan indicating which courses they will need to enroll in and when they will be offered. Beginning with the first

course, MUS 110 – Music Technology Fundamentals, students will learn the program expectations and requirements. The remaining courses are structured so that skills acquired in one course pass to the next level. Providing students with a clear understanding of the Certificate from the onset will improve persistence in the program. The Music Department expects eight completers per year.

Based upon discussions with students, Advisory Committee Members, and other industry experts the Music Department anticipates conservative enrollments in the Audio Systems Solutions Certificate Program, with five to six certificate completers each year once the program has matured. The Certificate is a two-year program with the first group of students completing in Spring 2020

**Labor Market Information**      [Download Commercial Music Cerritos Oct17.pdf](#)  
[\(/storage/lmi/137--Commercial Music Cerritos Oct17.pdf\)](#)

**Created At**      01/28/18 - 02:01 PM

**Status**      **Recommended**

---

Los Angeles/Orange County Region Specific Questions

**District**      Cerritos

**College**      Cerritos College

**CRLC Member**      Nick Real

**Email**      yreal@cerritos.edu

**Phone**      (562)860-2451 ext. 2903

<b>Reason for approval request</b>	New Program
<b>Place of program in college's curriculum/similar program</b>	The Audio Systems Solutions Certificate is a unique program to Cerritos College. It is expected that students from other disciplines will become interested in the course offerings. Students from the Film and Theater departments are enrolling in Commercial Music courses because they see the value of the content being taught and can apply it to their specific needs. This program will provide students from other disciplines the opportunity to explore new career options.
<b>Similar programs at other colleges in the Los Angeles and Orange County Region</b>	This program is unique to the Los Angeles and Orange County area with no other community college offering this type of certificate. This program enhances traditional recording and music production, by including emerging audio technologies to its curriculum as well as technical design elements involving computers and networking. Students earning this certificate will also have the opportunity to earn industry credentials.
<b>Annual Enrollment projects (non-duplicative)</b>	The Commercial Music program enrolls 20-25 students annually. It is expected that students will complete the certificate to enhance the training they receive from the other degrees offered.
<b>Advisory Minutes</b>	<u><a href="#">Download Cerritos Advisory Board Minutes FA 2017.pdf (/storage/Los Angeles/Orange County/137-154-379-Cerritos Advisory Board Minutes FA 2017.pdf)</a></u>



# Audio Technologies Support and Installations

October 2017

Prepared by the Los Angeles/Orange County Center of Excellence for Labor Market Research

---

## Program Recommendation

This report was compiled by the Los Angeles/Orange County Center of Excellence to provide regional labor market data for the program recommendation of audio technologies support and installations. This report is to help determine whether there is demand in the local labor market that is not being met by the supply from programs of study (CCC and non-CCC) that align with this occupation group.

Based on the data, the COE can determine that there may be an unmet need for workers in the field of the audio technologies support and installations in Los Angeles County. Reasons include:

- There are projected to be 2,055 annual job openings among jobs related to audio technologies support and installations over the next five years
- Between 2012-2015, there were an average of 298 annual award recipients, signaling a possible under-supply regionally
- Nearly half of all workers in this field have completed some community college coursework

Data included in this analysis represents the labor market demand for positions most closely related to **audio technologies support and installation**. Standard occupational classification (SOC) codes were chosen based on the national education level required for employment (associate degree and postsecondary certificate) as well as the proportion of current workers who hold a community college award or have had some community college training. This selection process narrows the labor market analysis to the most relevant employment opportunities for students with community college education and training.

The data tables below show traditional labor market information, including current and projected employment as well as annual average awards granted by community colleges in Orange County between 2012 and 2015. Employer job postings information was used to capture number of advertised jobs and job titles for occupations relevant to the field of study. Job postings should not be used to establish current job openings, because the numbers may include duplicate job postings or postings intended to gather a pool of applicants.

## Occupation Codes and Descriptions

Currently, there are three occupations in the standard occupational classification (SOC) system related to the study of audio technologies. The occupation titles and descriptions, as well as reported job titles are included in Exhibit 1.

**Exhibit 1 – Occupations, descriptions and sample job titles**

<b>SOC Code</b>	<b>Title</b>	<b>Description</b>	<b>Sample of Reported Job Titles</b>
27-4011	Audio and Video Equipment Technicians	Set up, or set up and operate audio and video equipment including microphones, sound speakers, video screens, projectors, video monitors, recording equipment, connecting wires and cables, sound and mixing boards, and related electronic equipment for concerts, sports events, meetings and conventions, presentations, and news conferences. May also set up and operate associated spotlights and other custom lighting systems.	Audio Technician, Audio Visual Specialist, Audio Visual Technician, Audio/Visual Manager, Broadcast Engineer, Master Control Operator (MCO), Operations Technician, Production Assistant, Stagehand, Videographer
27-4012	Broadcast Technicians	Set up, operate, and maintain the electronic equipment used to transmit radio and television programs. Control audio equipment to regulate volume level and quality of sound during radio and television broadcasts. Operate transmitter to broadcast radio or television programs.	Audio Engineer, Board Operator, Broadcast Engineer, Broadcast Maintenance Engineer, Broadcast Operations Engineer, Broadcast Technician, Engineer, Master Control Operator (MCO), Master Control Supervisor, Production Assistant
27-4014	Sound Engineering Technicians	Operate machines and equipment to record, synchronize, mix, or reproduce music, voices, or sound effects in sporting arenas, theater productions, recording studios, or movie and video productions.	Audio Engineer, Audio Operator, Broadcast Engineer, Broadcast Technician, Master Control Operator, Mixer, Recording Engineer, Sound Editor, Sound Engineer, Sound Technician

Source: O\*NET Online



## Current and Future Employment

In Los Angeles County, the number audio technology jobs is expected to increase by 8% over the next five years. More than 2,000 job opportunities will be available annually for this group of occupations through 2021 due to new job growth and replacement need (e.g., retirements). Exhibit 2 contains detailed employment projections data for these occupations.

**Exhibit 2 – Five-year projections for audio technology jobs in Los Angeles County**

SOC	Occupation	2016 Jobs	2021 Jobs	2016 - 2021 Change	2016 – 2021 % Change	Annual Openings
27-4011	Audio and Video Equipment Technicians	10,997	12,091	1,094	10%	1,301
27-4012	Broadcast Technicians	2,583	2,757	174	7%	286
27-4014	Sound Engineering Technicians	4,446	4,651	205	5%	468
		<b>18,027</b>	<b>19,498</b>	<b>1,471</b>	<b>8%</b>	<b>2,055</b>

Source: Economic Modeling Specialists International (EMSI)

## Earnings

In Los Angeles County, the entry-level average wage for each of the three audio technology occupations (see Exhibit 3) is below the MIT Living Wage<sup>1</sup> estimate of \$14.48 per hour for a single adult. The average annual earnings for this occupation group (all levels of employment) in the region ranges from \$54,000 - \$76,000 per year, assuming full-time employment.

Exhibit 3 contains hourly wages and annual average earnings for these occupations. Entry-level hourly earnings is represented by the 10<sup>th</sup> percentile of wages, median hourly earnings is represented by the 50<sup>th</sup> percentile of wages, and experienced hourly earnings is represented by the 90<sup>th</sup> percentile of wages, demonstrating various levels of employment.

**Exhibit 3 – Earnings for audio technologies in Los Angeles County, 2016-2021**

SOC	Occupation	Entry-Level Hourly Earnings	Median Hourly Earnings	Experienced Hourly Earnings	Average Annual Earnings
27-4014	Sound Engineering Technicians	\$14.28	\$29.24	\$65.40	\$76,000

<sup>1</sup> MIT Living Wage Calculator. <http://livingwage.mit.edu/>

27-4012	Broadcast Technicians	\$13.24	\$24.32	\$46.11	\$54,000
27-4011	Audio and Video Equipment Technicians	\$13.10	\$24.18	\$46.78	\$56,000
<b>AVERAGE</b>		<b>\$13.54</b>	<b>\$25.91</b>	<b>\$52.76</b>	<b>\$61,000</b>

Source: Economic Modeling Specialists International (EMSI)

## Employer Job Postings

In this research brief, real-time labor market information is used to provide a more nuanced view of the current job market, as it captures job advertisements for occupations relevant to the field of study. Employer job postings are consulted to understand who is employing audio technology occupations, and what they are looking for in potential candidates. To identify job postings related to audio technology jobs, the three SOC codes used throughout this report were used as search terms.

### Top Occupations

In 2016, there were 654 employer postings for audio technology jobs. Nearly half of the postings (44%) were for audio and video equipment technicians (288 job postings). There were 744 job postings for the same cluster of occupations in 2015, and 533 job postings in 2014.

#### Exhibit 4 – Top occupations in job postings (n=654)

SOC Code	Occupation	Job Postings, Full Year 2016
27-4011	Audio and Video Equipment Technicians	288
27-4012	Broadcast Technicians	201
27-4014	Sound Engineering Technicians	165

Source: Labor Insight/Jobs (Burning Glass)

### Top Titles

The top job titles for employers posting ads for audio technology jobs are listed in exhibit 5. AV Technician/Installation Technician was mentioned as the job title in 21% of all relevant job postings (139 postings).

#### Exhibit 5 –Job titles (n=654)

Title	Job Postings, Full Year 2016
AV Technician/Installation Technician	139
Production Assistant	54

Board Operator	40
Theater/Stage Technician	25
AV Engineer	13
Broadcast Engineer	13
Audio/Sound Engineer	21
Master Control Operator	10
Sound Mixer/Boom Operator	9
Broadcast Technician	8

Source: Labor Insight/Jobs (Burning Glass)

### *Top Employers*

Exhibit 6 lists the major employers hiring professionals in the field of audio technologies. Top employers postings job ads included PSAV Presentation Services, CBS Broadcasting, California State University, Fox and NBC. The top worksite cities in the region for these occupations were Los Angeles, Burbank, El Segundo, Culver City and Glendale.

### **Exhibit 6 – Top employers (n=389)**

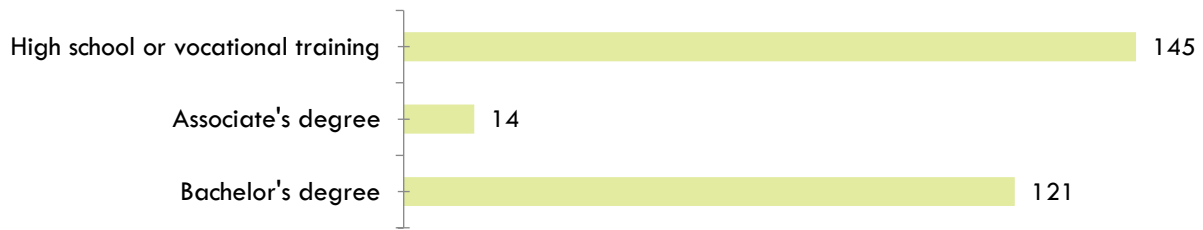
<b>Employer</b>	<b>Job Postings, Full Year 2016</b>
PSAV Presentation Services	58
CBS Broadcasting	24
California State University	14
Fox	14
NBC	14
Disney	11
DreamWorks	11
iHeartMedia, Inc.	10
Time Warner	9
AT&T	8

Source: Labor Insight/Jobs (Burning Glass)

### *Advertised Education Levels*

Exhibit 7 displays the education level requested by employers in online job ads. The majority of employers were looking for a candidate with a high school diploma or vocational training. Approximately 57% of job postings did not specify a level of education.

**Exhibit 7 – 2016 Online job ads with minimum advertised education requirements for audio technology jobs (n=280)**



Source: Labor Insight/Jobs (Burning Glass)

**Industry Concentration**

Audio technology jobs in Los Angeles County are most often found in the motion picture and video production industry (7% of total jobs in the industry). Exhibit 8 shows the industries that are the largest employers of audio technology jobs in the region.

**Exhibit 8 – Industries with the largest number of audio technology jobs, 2016**

NAICS (6-Digit)	Industry	Occupation Group Jobs in Industry	% of Occupation Group in Industry
512110	Motion Picture and Video Production	9,482	53%
515120	Television Broadcasting	1,793	10%
711510	Independent Artists, Writers, and Performers	837	5%
512191	Teleproduction and Other Postproduction Services	575	3%
512240	Sound Recording Studios	541	3%
512230	Music Publishers	354	2%

**Education and Training**

Exhibit 9 shows the typical entry-level education requirement for the occupations of interest, along with the typical on-the-job training, and percentage of workers in the field who hold a community college award or have completed some postsecondary courses. Nearly half of the workforce in all three occupations have completed some community college education as their highest level of education.

**Exhibit 9 – Education and training requirements 2015-2020**

SOC	Occupation	Typical entry-level education	Typical on-the-job training	% of Community College Award Holders or Some Postsecondary Coursework
27-4011	Audio and Video Equipment Technicians	Postsecondary nondegree award	Short-term on-the-job training	45%
27-4012	Broadcast Technicians	Associate degree	Short-term on-the-job training	45%
27-4014	Sound Engineering Technicians	Postsecondary nondegree award	Short-term on-the-job training	45%

Source: Economic Modeling Specialists International, Bureau of Labor Statistics Employment Projections (Educational Attainment)

Currently, there are six community colleges in Los Angeles County that train students in programs related to audio technology. Exhibit 10 displays the headcount and annual average community college awards for each of the colleges training in this field. Headcount is the actual number of students enrolled, regardless of credit hours. It is also important to note that an award is not equivalent to a single person in search of a job opening, since a student may earn more than one award (e.g. an associate degree and a certificate).

Between 2012-2015, the total annual average community college awards conferred was 298 (30 associate degrees and 268 certificates) across one program: Commercial Music (1005.00).

**Exhibit 10 –CCC Student Awards (by TOP and College), 2012-2015 (Average)**

1005.00 – Commercial Music							
College	Headcount	CCC Associate Degrees	CCC Certificates	Total CC Awards	Program Title	AA or AS	C
Cerritos	94	1	-	1	Commercial Music	X	
					Commercial Music Production		X
Citrus	550	19	41	60	Recording Technology	X	
					Audio Recording Technology		X
LA City	487	N/A	139	139	Instrumental Performer		X
					Music Copyist		X
					Orchestrator/Arranger		X
LA Harbor	187	N/A	1	1	Music Media		X
					Music Performance		X
					Music Songwriting		X
					Music Theory		X
					Music Arranging		X
					Music Recording Arts		X
LA Valley	348	2	11	13	Instrumental/Vocal Performer		X
					Music Notation		X

					Commercial Music	X	
					Jazz Studies		X
Long Beach	521	9	76	85	Composer/Arranger	X	X
					Music Performance – Instrumentalist Concentration		X
					Music Performance – Vocalist Concentration		X
					Music Production – Music Technology Concentration		X
					Music Production – Songwriter/Producer Concentration		X
					Audio Production – Record Producer Concentration	X	X
					Audio Production – Recording Engineer Concentration		X
					Compton	86	-
East LA	163	-	-	-	-	-	
Glendale	90	-	-	-	-	-	
LA Mission	1	-	-	-	-	-	
LA Pierce	215	-	-	-	-	-	
LA Southwest	13	-	-	-	-	-	
Pasadena	12	-	-	-	-	-	
West LA	6	-	-	-	-	-	
<b>TOTAL</b>	<b>2,773</b>	<b>30</b>	<b>268</b>	<b>298</b>			

Source: California Community Colleges Chancellor's Office MIS Data Mart

Regional supply data shows that there is a supply of students who have completed program(s) in non-California community college institutions. The following institutions have awarded the following:

Argosy University-The Art Institute of California-Hollywood: 0 Average Annual Associate degrees

Argosy University-The Art Institute of California-Los Angeles: 4 Average Annual Associate degrees

### Student Outcomes

The CTE LaunchBoard provides student outcome data on the effectiveness of CTE programs. The following student outcome information was collected from exiters of the Commercial Music Taxonomy of Program (TOP) code (1005.00) in Los Angeles County for the 2014-15 academic year.

- The median annual wage after program completion is \$12,175
- 14% of students are earning a living wage
- 56% of students are employed within six months after completing a program

Source: CTE LaunchBoard

**Sources**

O\*Net Online, Labor Insight/Jobs (Burning Glass), Economic Modeling Specialists International (EMSI), MIT Living Wage Calculator, Bureau of Labor Statistics (BLS) Education Attainment, California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart, CTE LaunchBoard, Statewide CTE Outcomes Survey, Employment Development Department Unemployment Insurance Dataset

## Commercial Music Advisory Board Fall 2017 Meeting

Advisory Board Minutes  
October 11, 2017  
07:00pm – 08:00pm  
Cerritos College Campus

### Members Present:

Barry Rudolph  
Instructor at Musician's Institute, Hollywood, CA

Amilcar "PRO" Welton  
CEO CREATE.Management Firm

Benjamin Maas  
President Fifth Circle Audio

Patrick Killianey  
Network Applications Engineer  
Yamaha Professional Audio Division

Marcel Mauceri  
Technical Sales Specialist | NUAGE  
Steinberg | Yamaha

Javad Butah  
Brand Manager/SouthWest Ableton Inc.

### Agenda:

1. Emerging technologies and student training
2. Additional courses needed
3. Importance of industry certification



Discussion:

### 1. Emerging technologies and student training

Ben stressed the importance that program teach students current and new technologies in their courses. Understanding digital consoles is essential in live sound production as well as digital audio routing. Javad added that several of Ableton user have informed him that the work they do with artists goes beyond producing sounds. These users must assist artists with their computer systems and be able to handle computer issues in stressful situations. Ben added that the primary quality he looks in new hires is their ability to problem solve. Patrick and Marcel stated that Yamaha has made a full commitment to the Dante audio networking platform and that many other companies are doing so as well. They both feel that Dante Certification will be essential for students seeing employment. Barry mentioned that students need to have a deep understanding of computer systems. These days studios want engineers that can fix and maintain computers as well as use them. Amilcar added that several of the artists he represents are looking for assistants that can not only use the software but can also service the computers and recording technology.

### 2. Additional courses needed

At the very least, the committee suggested a course that focuses on audio technologies such as computer maintenance and troubleshooting. They also suggested adding audio networking to the curriculum. Students do not need to be networking engineers, but they need to understand the basics of wiring a network and how switches work. While Dante is the fastest growing audio networking platform, Patrick suggested that students be made aware of other protocols such as AVB. They all are the same fundamentally, but it is important to understand the differences. Patrick offered a series of YouTube videos that cover the essentials of audio networking that he produced to the program. Ben stressed again that troubleshooting is critical. He said that students should be put in scenarios where nothing works and they have a time limit to fix the problem. Barry suggested that the students take computer courses that focus on hardware and operating systems if they exist on campus. Patrick added that many computer courses offered by IT programs focus on enterprise systems and networks and might be too advanced for what students need for entry-level audio technician positions.

### 3. Importance of industry certification

Marcel stated that industry certification is important but it depends on the certification. While many programs focus on offering Avid Pro Tools certification, it is not enough for employment, according to Ben. Barry added that the Avid Certified Systems Engineer might be more useful since that it is a technical certification and shows that students can service Pro Tools systems and hardware. Marcel said that the Certified Technology Specialist (CTS) certification offered by Avixa (formerly InfoComm) is recognized by companies such as Crestron, Extron, AMX, and other A/V companies. Patrick added that the Dante Certification is free and can be completed online. He recommended that the school encourage students to earn at least the Level 1

certification. Barry suggested that any new courses created include Dante so that students can successfully earn the certificate. Marcel pointed out that Yamaha recognizes the CTS and Dante certifications when considering candidates.

In closing the committee supports adding computer system and audio networking to the existing programs at the College. The committee cautioned against using traditional courses since they are not focused on the specific needs of audio production.