# Entertainment Design and Technology

## 8489 36 weeks

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Acknowledgments

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Course Description

Suggested Grade Level: 10 or 11 or 12
Students will learn and apply skills in various areas related to the creative process of live production. They will have the opportunity to explore scenic design and construction, lighting design and technology, and live sound reinforcement. Students will learn techniques used by industry professionals through hands-on experiences, and investigate job opportunities and careers in the dynamic and growing industry of live entertainment.

As noted in Superintendent's Memo #058-17 (2-28-2017), this Career and Technical Education (CTE) course must maintain a maximum pupil-to-teacher ratio of 20 students to one teacher, due to safety regulations. The 2016-2018 biennial budget waiver of the teacher-to-pupil ratio staffing requirement does not apply.

## Task Essentials List

- Tasks/competencies designated by plus icons (⊕) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (◯) are optional
- Tasks/competencies designated by minus icons (⊖) are omitted
- Tasks marked with an asterisk (*) are sensitive.

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**Curriculum Framework**
Understanding Varieties of Drafting Techniques

Task Number 39

Read scale drawings.

Definition

Reading should include

- use of scale ruler
- converting units of measurement
- interpreting symbols, according to the United States Institute for Theatre Technology (USITT) standards.

Process/Skill Questions

- How do you turn a drawing into a physical set?
- How do you determine the dimensions of a specified figure?
- What steps would you follow to create a model based on given dimensions?

Task Number 40

Compare manual drawing to computer drafting.

Definition

Comparison should include

- drafting tools
- available software
- production time
- benefits of each
- differences in creating 2-D forms and 3-D models with each.

Process/Skill Questions

- What is the value of manual drawing given today’s available technology?
- Does one method offer more creative liberty than the other? Explain.
- What are the strengths and weaknesses of various computer-aided drafting (CAD) software options?
Task Number 41

Identify different drawing types.

Definition

Identification should include

- plan view
- section view
- front and rear elevation
- projections
- paint elevations
- designer drawings
- construction drawings.

Process/Skill Questions

- What is the appropriate application of each type?
- How do designer drawings differ from construction drawings?
- How does the complete set of drawings work together?

Task Number 42

Apply basic drafting standards to support a scenic design.

Definition

Application should include

- using design drafting and CAD
- tools using design methodology (e.g., line weights, dimensions, symbols, surface texture)
- selection of materials and hardware.

Process/Skill Questions

- How do budgetary constraints affect design?
- What tools are used in creating CAD and/or manual drawings of scenic designs?

Exploring Scenic Production Aesthetics

Task Number 43
Collaborate with an artistic team to reinforce production concept.

Definition

Collaboration should include

- researching production context (e.g., time period, location, weather)
- analyzing performance source materials
- integrating the scenic design with production goals
- considering the audiences’ experience
- presenting design ideas.

Process/Skill Questions

- What are the benefits of collaboration? What are the challenges?
- What are the challenges in understanding the director’s intent?
- How do you identify your target audience?

Task Number 44

Apply understanding of copyright laws and intellectual property.

Definition

Application should include

- fair use/public domain
- understanding of copyright infringement
- protection of original creative work
- trademarks
- payment royalties/licensing.

Process/Skill Questions

- Why should intellectual property be protected? How should it be protected?
- What are some ramifications of theft of intellectual property?
- Where do you find royalty and copyright information?

Applying Safety Principles to Scenic Designs

Task Number 45

Select building materials, hardware, and method of assembly.

Definition
Selection should include

- consideration of load-bearing capacities
- preparation to ensure flame-retardant material
- adherence to fire code
- selection of surface coatings and finishes
- considering geometrical support of flats and platforms
- consideration of duration of use.

**Process/Skill Questions**

- How do the selections affect the budget?
- How would materials choice be affected by different venues (e.g., indoor, outdoor)?

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**Task Number 46**

**Design safe entrances and exits for performers, crew, and audience members.**

**Definition**

Design should include (per local codes and standards)

- stairs and ramps of safe rise and run
- width of walkways/passageways
- fire exits
- safety railings
- pathways free of obstruction.

**Process/Skill Questions**

- How do safety concerns affect designs for specific spaces?
- How are patrons and performers affected by safety concerns in the design?

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**Applying Basic Safety Standards (Core Safety)**

**Task Number 47**

**Comply with federal, state, and local safety legal requirements, including OSHA, VOSH, and the EPA.**

**Definition**
Compliance should include

- identifying the Hazard Communication Standard
- interpreting the information included on safety data sheets (SDS)
- describing the responsibilities of employers and employees under HazCom.

**Process/Skill Questions**

- Where should hazardous materials be stored?
- What information can be found on an SDS?

**Task Number 48**

**Identify personal protective equipment (PPE) requirements.**

**Definition**

Identification should include procedures for properly inspecting, wearing, and removing

- eye protection
- dust mask
- gloves
- hearing protection aids
- close-toed shoes.

**Task Number 49**

**Inspect and maintain a safe working environment.**

**Definition**

Inspection and maintenance should be ongoing and should result in identifying potential hazards on a job site or in the lab (i.e., unstable or improperly erected scaffolding, electrical hazards, job site debris, improperly stored materials, and air quality hazards).

When present, hazards must be remedied by appropriate measures in compliance with school and instructor guidelines.

**Process/Skill Questions**

- What are examples of job-site hazards?
- Why is it important to use good housekeeping standards on a job site?
- Why is it important to store materials and tools in their proper places?
Task Number 50

Explain safe working practices around electrical hazards.

Definition

Explanation should include

- identifying equipment used to test electrical circuits
- describing safe working conditions
- demonstrating safe work habits.

Process/Skill Questions

- What is the definition of *proximity work*?
- What are safe working clearances, according to the National Electrical Code (NEC)?
- What are considered safe working conditions and safe work habits?
- What is an unseen hazard with electrical work?

Task Number 51

Identify emergency first aid procedures.

Definition

Identification should include standard first aid procedures and school policies for incidents involving

- bodily fluids
- electrical injuries
- eye injuries
- falls
- burns.

Process/Skill Questions

- What steps should be followed in an accident?
- Why is knowing CPR an important skill within the construction trades?
- Why is it important to be certified to administer first aid?
- What are the different classifications (degrees) of electrical burns?

Task Number 52

Inspect course-specific hand and power tools.
Definition

Inspection of tools should include

- identifying components of machinery (e.g., guards, blades, moving parts, start/stop switches)
- identifying standard safety procedures (i.e., shop practices and manufacturer recommendations)
- observing a demonstration of the safe operation and use of each piece of machinery in the shop
- identifying tool defects.

Process/Skill Questions

- What are some of the basic power tools used in construction?
- What are the proper actions to take before using a power circular saw?
- Why should a power tool always be grounded?

Task Number 53

Demonstrate lifting and carrying techniques.

Definition

Demonstration involves lifting and carrying materials and equipment based on the principles of

- lifting with the legs
- keeping the back straight
- holding the load close to the body
- getting help, if necessary.

Process/Skill Questions

- What are some common injuries associated with improper lifting techniques?
- What can one do to prevent injury?
- How does proper positioning affect proper technique?

Task Number 54

Demonstrate safe laddering techniques.

Definition

Demonstration should involve using appropriate conduct and safety procedures while

- using aluminum ladders (e.g., three-point contact)
• carrying ladders (e.g., two people at all times)
• erecting and setting ladders
• identifying types of ladders and the components and safety features of each.

Process/Skill Questions

• Why are ladders rated for certain weights?
• Why is the apex (highest point) of a stepladder not considered a step?

Task Number 55

Earn the OSHA 10 card.

Definition

Earning an OSHA 10 card

• will recognize that one has acquired 10 hours of safety instruction
• will help teach national standards for personal safety within a construction environment
• will validate safety skills to the industry
• will help workers become more safety conscious and responsible.

Process/Skill Questions

• What is OSHA, and how are its standards validated?
• Why was OSHA established, and how has it evolved?
• What are the benefits of earning the OSHA 10 card?

Task Number 56

Pass a safety exam for shop/site safety and specific tool use.

Definition

Assessment must measure participation in safety training programs, including attending safety meetings and completing periodic demonstration of knowledge and skills gained from program topics (e.g., interpretation of SDS).

Process/Skill Questions

• How often should one participate in safety training programs? Why?
• What is the relationship between insurance and establishing or validating a continual retraining program for safety?
Applying Hand and Power Tool Safety and Maintenance

Task Number 57

Identify the basic hand tools and power tools commonly used in scenic construction.

Definition

Identification should include

- hammers
- screwdrivers
- ripping bars and nail pullers
- pliers
- spirit, electronic, and laser levels
- squares, including carpenter’s square and combination square
- rules and measuring tape
- vises
- clamps
- saws
- utility knives
- power drills, including electric, cordless, hammer electromagnetic, and pneumatic drills
- sanders
- nail guns.

Process/Skill Questions

- What are the different sizes of Phillips screwdrivers?
- What are the different types of saws? What is the function of each?

Task Number 58

Maintain hand and power tools.

Definition

Maintenance should include applying safety awareness and

- describing the rationale for keeping tools in good working order
• replacing tools in the same order and condition they were prior to their use (e.g., cleaning, lubricating, storing)
• making basic adjustments to or replacing worn components with instructor approval and by following manufacturer guidelines
• notifying the instructor about heavily worn, broken, or malfunctioning tools
• using the tool only for its intended purpose and adhering to all safety guidelines from the manufacturer, the instructor, and according to school policy.

Process/Skill Questions

• Before using a power circular saw, what are the main safety issues, and how should you prepare yourself and the material for the procedure?
• Why should you always make sure a power tool is grounded?

Reading Blueprints

Task Number 59

Identify basic blueprint terms, components, and symbols.

Definition

Identification should include

• components, including title block, border, drawing area, revision block, and legend
• scale
• lines of construction, including dimension lines, cut lines, section cuts, hidden line, center lines, and object lines
• common abbreviations, symbols, and keynotes.

Process/Skill Questions

• What are some common symbols used on blueprints?
• Why is it important to be able to distinguish the different types of lines on a blueprint?

Task Number 60

Interpret line weights.

Definition

Interpretation should include

• light-weight lines (e.g., extension lines, dimension lines)
• medium-weight lines (e.g., visible outline lines, hidden outline lines)
• heavy-weight lines (e.g., outlines of cuts, outlines of sectioned objects).

Process/Skill Questions

• What kind of information does each type of line weight convey?
• Where should dimension lines be located on drawings? Why?
• What line weight can be used to depict things that do not actually exist in physical form?

Task Number 61

Interpret scale.

Definition

Interpretation should be made for a variety of scales (1/4 inch, 3/4 inch, 1-1/2 inch, and 3 inch) and be performed measure-to-scale and scale-to-measurement.

Process/Skill Questions

• What factors determine the scale used on a drawing?
• How many scales are on the scale rule?

Task Number 62

Identify the different views of drawings from blueprints.

Definition

Identification should include the following views:

• Front
• Top
• Side
• Sectional.

Process/Skill Questions

• Why is it important to have each view represented in a theatrical design?
• What information is conveyed from a sectional view with a vertical cutting plane? Horizontal cutting plane?
Performing Basic Carpentry Skills

Task Number 63

Check stock and assemblies for squareness.

Definition

Checking should include testing stock and/or assemblies for a variety of applications to detect deviation from a right angle, a straight line, or a plane surface.

Process/Skill Questions

• What tools can you use to check for squareness?
• What method can you use to determine whether a cabinet frame is square?

Task Number 64

Measure materials, using a standard measuring device.

Definition

Measuring should include

• selecting the correct device for the situation
• recognizing and identifying correct lengths to within 1/8 inch
• reading the measurement
• marking the stock.

Process/Skill Questions

• What is the smallest measurement on most tapes used in construction?
• What lengths of tapes are commonly used in construction?

Task Number 65

Determine the levelness and plumbness of surfaces.

Definition

Determination should include
• using a level
• checking the horizontal surface for levelness
• checking the vertical surface for plumbness
• reading a level and noting whether the bubble is off-center.

Process/Skill Questions

• What is the difference between level and plumb?
• What are the different lengths of levels used?
• What are the possible consequences of failing to determine levelness and plumbness of surfaces?

Task Number 66

Handle and store materials.

Definition

Handling and storage include

• demonstrating safe and proper procedures in lifting, carrying, and stacking materials
• considering environmental factors such as humidity, light, and physical restrictions
• applying personal safety precautions
• securing materials to prevent theft.

Process/Skill Questions

• Where should flammable materials be stored?
• What negative effects can exposure to moisture have on materials?

Task Number 67

Identify carpentry materials.

Definition

Identification includes selecting materials relevant to the assigned job, including various

• plywood
• lumber
• fasteners
• adhesives
• millwork.

Process/Skill Questions
• What is the purpose of the grade stamp on materials?
• Why is two-by material actually 1-1/2 inches thick?

Cutting and Shaping Stock

Task Number 68

Crosscut and ripsaw stock to size, using hand and power tools.

Definition

Cuts should yield

• stock cut to specifications +/- 1/8 inch
• edges cut to a 90-degree angle with no chips or splinters.

Process/Skill Questions

• What is the difference between rip and crosscut?
• What type of blade would be best to rip and crosscut stock? Why?

Task Number 69

Bore holes, using hand and power tools.

Definition

Boring holes includes measuring the specific hole diameter, according to specifications and correct location within +/- 1/16 inch.

Process/Skill Questions

• What type of bit could be used to make a flat-bottom hole?
• What feature determines the size of a portable drill?

Task Number 70

Square stock to 90 degrees.

Definition
Squaring stock requires material cut to a 90-degree angle, accurate to within +/- 1/16 inch.

**Process/Skill Questions**

- What is the purpose of cutting stock to 90 degrees?
- What tools could be used to determine squareness?

---

**Task Number 71**

**Cut a miter joint, using hand and power tools.**

**Definition**

Cutting a miter joint requires that the joint fits snugly and that the angle is correct according to specifications.

**Process/Skill Questions**

- What degree cut is made to make most miter joints?
- What tools would you use to cut miter joints?

---

**Working with Fasteners**

**Task Number 72**

**Apply clamping devices.**

**Definition**

Application involves closing surfaces with specified clamps, without scarring.

**Process/Skill Questions**

- What are the different types of clamps used?
- What types of clamps would be used when gluing boards edge to edge?

---

**Task Number 73**

**Fasten stock with metal fasteners (e.g., bolts, nails, screws, staples).**

**Definition**
Fastening should include

- selecting the appropriate fastener
- applying with hand and pneumatic tools.

**Process/Skill Questions**

- What determines the size of nails?
- What does the gauge of screws mean?

**Task Number 74**

**Compare the different types of adhesives used in scenic construction.**

**Definition**

Comparison should include the purposes of various types of adhesives (e.g., wood glue, liquid nails, foam adhesives).

**Process/Skill Questions**

- Why is it important to know the purpose of each adhesive before using them to bond materials?
- What type(s) of adhesives could be damaging to foam boards?
- What types of materials could silicone adhesives cause damage to?

**Construction for Scenic Elements**

**Task Number 75**

**Differentiate between materials used for permanent vs. scenic construction.**

**Definition**

Differentiation should include

- choices of building materials
- choices of hardware
- anchoring and bracing techniques
- portability considerations.

**Process/Skill Questions**
- Why would you use a different type of lumber in scenic construction as opposed to residential construction?
- Why would you use canvas instead of sheet rock for walls?

Task Number 76

Contrast the construction techniques for permanent vs. scenic construction.

Definition

Contrast should include

- permanence
- portability
- engineering
- material selection
- joinery techniques
- flame-proofing
- special considerations for usage (e.g., trapdoors, special effects, smoke and mirrors)
- storage considerations.

Process/Skill Questions

- What are some examples of scenic construction that are not temporary?
- How do portability and storage needs affect construction?

Task Number 77

Identify scenic components.

Definition

Identification should include

- vertical structures (e.g., flats, columns, masking)
- horizontal structures (e.g., platforms, trapdoors, stairs, ramps)
- moveable structures (e.g., wagons, flying scenery, periaktoi, turntables/revolves)
- scenic properties and dressing
- support structures (e.g., stage jacks, static fly lines, truss)
- portable staging.

Process/Skill Questions
Task Number 78

Demonstrate knowledge of basic scenic painting.

Definition

Demonstration should include

- selection of appropriate tools for application (e.g., brushes, sprayers, rollers)
- surface preparation
- paints, textured coatings, and finishes
- techniques (e.g., woodgrain, marble, spattering, dry brushing, ombré)
- cleanup/disposal and storage.

Process/Skill Questions

- How would different applications require different painting techniques?
- How can you use commercial products to reach a desired scenic goal?
- What are the steps to create a marble technique? Woodgrain?
- How can certain painting techniques create depth in scenery?
- How can scenic painting techniques be applied in other environments?
- What are steps to preparing a flat for painting?

Apply Basic Rigging Techniques

Task Number 79

Compare types of rigging systems.

Definition

Comparison should include

- counter-weight
- hemp/sandbag
- motorized
- winch
- dead-hung
- truss (free-standing)
- roll-drop
• trip-drop.

Process/Skill Questions

• What are the advantages of each system?
• How are different rigging systems used in various sectors of the entertainment industry?
• What are the safety requirements for overhead rigging?
• How do you select appropriate hardware for given applications?
• How do you identify the weaknesses in your system?

Task Number 80

Maintain rigging systems.

Definition

Maintenance should include

• regular safety inspections (e.g., line wear, hardware condition, damage and replacement needs, environmental hazards)
• accessibility to rigging specs and documentation
• repair and replacement, as needed.

Process/Skill Questions

• What are the dangers of an ill-maintained system?
• How might maintenance differ depending on the type of system?

Task Number 81

Demonstrate the safe and proper use of a rigging system.

Definition

Demonstration should include

• proper materials selection (e.g., hardware, lift lines)
• proper orientation
• adhering to usage standards (e.g., knots, swaging, sleeves)
• adhering to load capacities
• operation of system (e.g., manual systems, motorized systems, weight transfer, acceleration and deceleration of system, locking of system).
Process/Skill Questions

- What are the advantages and disadvantages of different types of systems?
- How does the type of system influence its use?
- How might a designer incorporate a rigging system into a design?

Task Number 82

Identify components of various rigging systems.

Definition

Identification should include components of

- hanging positions
- lift lines
- connecting hardware
- blocks and pulleys
- counter-weight system
- anchoring positions
- network connections (for automated systems).

Process/Skill Questions

- How do you select appropriate components for a given application?
- How does a hemp system differ from a single purchase system?
- How does your space dictate your rigging choice(s)?

Exploring Project Management

Task Number 83

Identify the components of project management.

Definition

Identification should include

- scheduling
- budgeting
- personnel (roles and tasks)
- communication
- contracts (e.g., rental agreements)
- licensing (e.g., copyright, royalties)
• resource management (e.g., partnerships, equipment, budget, materials)
• oversight.

Process/Skill Questions

• How is production management in entertainment unique?
• What types of constraints does a project manager have to deal with?

Task Number 84

Apply project management techniques.

Definition

Application should include

• creation of a production budget, schedule
• organization of personnel
• securing projects/licensing
• documentation to support project management.

Process/Skill Questions

• What personal characteristics make an effective project manager?
• How do you transition from planning to implementation?
• What are the impacts of effective planning on resource management?
• What types of constraints does a project manager have to deal with?

Understanding Basic Electricity

Task Number 85

Identify basic electrical concepts.

Definition

Identification should include

• AC/DC
• circuitry (e.g., power, communication)
• power
• phase
• basic electrical formulas
• efficiency and conservation
• heat management.

Process/Skill Questions

• What are the differences between power circuits and communication circuits?
• What is the relationship between power and load?
• What are the uses of various electrical circuit types?
• What are the differences between AC and DC? When would you use one over the other?

Task Number 86

Demonstrate proper use of electrical equipment and practices.

Definition

Demonstration should include

• testing equipment (e.g., digital multimeter)
• safety equipment
• soldering equipment
• connectors
• switches
• receptacles
• wiring (e.g., A/C power, communication)
• grounding.

Process/Skill Questions

• How would you use a multimeter to test voltage, current, resistance and continuity?
• What personal protective equipment (PPE) is needed when working with electrical equipment?

Understanding Lighting Technology

Task Number 87

Identify lighting equipment.

Definition

Identification should include

• lighting instrument components (e.g., shutters, lenses, reflectors, lamps, yokes)
• types of lighting instruments (e.g., spot vs. wash, intelligent vs. conventional, Fresnel vs. PAR Can, LED vs. incandescent)
• accessories and media (e.g., gels, patterns, special effects)
• lighting board
• dimming system
• connectors and cables (data and power)
• tools (e.g., C-wrench, cable tester, multimeter, screw driver)
• custom hanging positions (e.g., trees, booms, floor mount, side arm).

Process/Skill Questions

• What are the advantages of using an LED instead of an incandescent lamp?
• How do the different types of instruments affect usage?
• How does information pass from the light board to the instrument?

Task Number 88

Demonstrate safe and proper use of lighting equipment.

Definition

Demonstration should include

• hanging techniques
• focusing
• accessory use
• maintenance and repair
• cable management
• troubleshooting
• dimming system operation
• control system operation (e.g., patching, cueing, editing).

Process/Skill Questions

• What is the difference between soft patch and hard patch?
• What is the procedure to replace a lamp?
• How do you find a hotspot on an instrument?

Task Number 89

Explain the properties of light.

Definition

Explanation should include
• color theory
• intensity (e.g., inverse square law, lumens, wattage, beam and field)
• shape
• texture
• movement
• angle.

Process/Skill Questions

• What is the use for a warm light? A cool light?
• How can the use of the properties of light affect the production?

Task Number 90

Explain the functions of production lighting.

Definition

Explanation should include

• setting (location and time)
• mood
• illumination (e.g., visibility, angles)
• special effects
• thematic support
• safety (e.g., running lights, transition lights, production-specific).

Process/Skill Questions

• How can color and texture affect mood?
• How does light vary at different times of the day?
• How can practical lighting enhance a production?

Creating Lighting Design

Task Number 91

Interpret lighting needs and constraints of a given production.

Definition

Interpretation should include

• reinforcing artistic elements
• supporting utilitarian requirements
• researching production context (e.g., time period, location, weather)
• analysis of performance source materials
• integrating the lighting design with production goals
• consideration of audience’s experience
• consideration of budget and space limitations
• consideration of resource availability.

Process/Skill Questions

• How are the lighting needs of a dance production different from a dramatic stage production?
• What are some ways to obtain lighting information from a dramatic script?

Task Number 92

Generate lighting design.

Definition

Generation should include

• use of available technology/software (e.g., Vectorworks, Lightwright)
• documentation (e.g., light plot, magic sheet, channel hookup, research)
• hanging and focus
• cueing/programming
• presentation of design ideas.

Process/Skill Questions

• What information is required to be on a light plot?
• How can lighting design documentation support the installation?
• How can improper documentation impact the production?

Understanding Principles of Sound and Acoustics

Task Number 93

Identify the basic physics of sound.

Definition

Identification should include

• periodic motion
• sound waves
• amplitude/loudness
- frequency/pitch
- speed of sound
- wavelength
- harmonic structure
- frequency spectrum
- Sound Pressure Level (DB-SPL).

**Process/Skill Questions**

- How does frequency correlate to pitch?
- How does the physics of sound correlate to human hearing within the context of frequency and amplitude?
- How does sound travel as a wave through a medium?
- What are the applications of sound pressure level measurements?

---

**Task Number 94**

**Identify the components of acoustics within sound.**

**Definition**

Identification should include

- physical properties of space that affect sound (e.g., arch acoustics)
- resonance
- reverberation
- time delay
- reflection
- absorption
- diffusion
- diffraction
- transmission
- noise (e.g., internal, external, structure-borne).

**Process/Skill Questions**

- How do the physical properties of a space affect the clarity of sound?
- How does the resonance in a space affect tonal characteristics?
- What happens when sound waves encounter different objects?
- What are some examples of noise within an acoustic environment? How would you control them?

**Understanding the Basic Elements of Music**

**Task Number 95**
Identify the basic elements of music in sound reinforcement.

Definition

Identification should include

- rhythm
- dynamics
- intonation
- balance
- blend
- styles
- instrumentation
- tone
- tempo
- pitch
- melody
- harmony.

Process/Skill Questions

- How does the interpretation of the elements of music apply to sound reinforcement?
- How does sound reinforcement affect an artistic performance?
- What are the challenges of supporting the basic elements of music in sound reinforcement?

Understanding Audio Equipment

Task Number 96

Identify types of microphones and hardware.

Definition

Identification should include

- directionality (e.g., omni, uni, bi)
- transducer type (e.g., dynamic moving coil, condenser, electret, ribbon)
- boundary
- lavalier
- headset/body microphones
- wireless microphone systems
- microphone stands, clips, booms, and counterweight.

Process/Skill Questions

- What are the applications of various microphones?
- What challenges are unique to wireless microphones?
Task Number 97

Demonstrate the use of microphones in sound reinforcement.

Definition

Demonstration should include

- microphone selection
- microphone placement
- feedback reduction/elimination
- microphone storage
- wireless systems
- body microphones
- pop filters and wind screens.

Process/Skill Questions

- What are some ways to prevent or control feedback?
- How does application affect microphone selection?
- What are some problems caused by body microphones?
- How are plosives reduced?

Task Number 98

Identify types of audio signals, cables, and connectors.

Definition

Identification should include

- analog/digital
- 3 pin XLR
- ¼ inch (1/8 inch) TS or TRS
- balanced/unbalanced
- high/low impedance
- RCA
- snake
- Ethernet
- USB
- wireless communications (e.g., radio, Bluetooth, WiFi).
Process/Skill Questions

- What is the difference between analog and digital signals?
- What are the differences between balanced and unbalanced signals? Explain how it impacts signal flow?
- What are the advantages and disadvantages of wireless communications?

---

**Task Number 99**

**Demonstrate the use of audio cables and connectors for standard connection audio equipment.**

**Definition**

Demonstration should include connecting multiple audio components together, such as

- microphones
- electric instruments
- audio mixers
- audio signal processors
- amplifiers
- speakers.

**Process/Skill Questions**

- How do you test an audio cable?
- How would you interface between high and low impedance devices?
- How would the creation of a signal flow diagram help troubleshoot the interconnection of audio components within a system?

---

**Task Number 100**

**Identify the components and functions of an audio mixer.**

**Definition**

Identification should include

- the sections of an audio mixer (e.g., outputs, inputs, faders, gain-staging, meter, auxiliary busses)
- signal flow
- audio processing (e.g., equalizers, filters, compressors)
- pads
- phantom power.
Process/Skill Questions

- How can the signal meters on an audio mixer be used to establish proper gain structure?
- How do different input devices dictate the need for pads or phantom power?

Task Number 101

Demonstrate the functions of an audio mixer.

Definition

Demonstration should include

- connecting audio equipment with audio mixers
- mixing
- bussing
- gain-staging
- applying audio processing.

Process/Skill Questions

- How would you determine whether to use a balanced or unbalanced connector?
- How do you find the correct gain level on an input channel?

Task Number 102

Identify common accessories of audio systems.

Definition

Identification should include

- direct injection boxes
- real-time analyzers
- SPL meters
- stage amplifiers
- computer audio interfaces
- midi interfaces
- software applications
- recording devices
- playback devices.

Process/Skill Questions
• In what situation would you need a direct injection box?
• What are some commonly used audio processing software programs in the entertainment industry?
• How can real-time analyzers be used to create an ideal audio installation?

---

Task Number 103

Identify audio processing equipment.

Definition

Identification should include

• time domain processors (e.g., echo, delay, reverberation)
• spectral processors (e.g., equalizers, filters).

Process/Skill Questions

• What are some ideal features on a modern effects processor?
• How does an external equalization device differ in functionality from one built into a mixer?

---

Task Number 104

Identify power amplifiers and speaker systems.

Definition

Identification should include

• power amplifier specifications
• speaker connector and power requirements
• speaker coverage
• powered/passive speakers.

Process/Skill Questions

• What are the most common speaker connector types?
• What types of speakers are typically used in different entertainment venue positions?

---

Task Number 105
Demonstrate the use of power amplifiers and speaker systems.

Definition

Demonstration should include the set-up of an operational sound reinforcement system for coverage within a venue.

Process/Skill Questions

- In what situations would you want to use a powered speaker?
- How do you properly match an amplifier with a speaker or speakers?
- How can speaker pattern overlap affect coverage?

Task Number 106

Use sound reinforcement systems.

Definition

Use should include

- setting up
- operating
- testing
- troubleshooting (e.g., feedback, component failure, cable failure, poor connections)
- maintaining and repairing
- storing.

Process/Skill Questions

- What are the benefits of constant maintenance of sound reinforcement systems? Consequences of lack of maintenance?
- How do the components of sound reinforcement systems work together?
- What storage consideration should be factored?
- What causes feedback? Why?
- What procedures should be followed during a power failure?

Understanding Audio Mixing

Task Number 107

Identify the role and function of audio mixing within a production.
Definition

Identification should include

- purpose/environment
- sources
- balance
- timing.

Process/Skill Questions

- What are the differences between mixing a rock concert and a play/musical?
- How do you prioritize and balance output levels?
- What are some key skills needed to effectively mix a live show?

Task Number 108

Demonstrate audio mixing techniques.

Definition

Demonstration should include

- demonstrating an “ear” for proper balance
- creating the appropriate sound environment for a particular production/situation
- operating the mixer efficiently during live performance and with appropriate timing.

Process/Skill Questions

- What should a board operator be listening for during a live performance?
- Why is there great value in experience when it comes to mixing live sound?
- What are some techniques that a board operator could employ to increase efficiency in a complex production?

Task Number 109

Identify signal processing within live audio mixing.

Definition

Identification should include

- equalization
• filtering
• time/pitch shift
• echo, flange, reverb, chorus, phasers, etc.
• compression
• limiters
• noise control
• synthesizers.

**Process/Skill Questions**

• How are different processing effects (e.g., echo, flange, chorus) created?
• What is the difference between digital and analog audio processing?
• When is compression used?

---

**Task Number 110**

**Apply signal processing.**

**Definition**

Application should include

• use and understanding of both analog and digital processing
• selecting appropriate processing effects for different applications
• use of signal processing in both live and pre-recorded sound
• harnessing the capabilities of various pieces of available processing and effects equipment and software.

**Process/Skill Questions**

• How are analog and digital processing different?
• What are some ways in which pre-recorded processing is used in live entertainment?
• How can signal processing be used to enhance the “sound” of a venue?

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<tr>
<td>103</td>
<td>Identify audio processing equipment.</td>
</tr>
<tr>
<td>104</td>
<td>Identify power amplifiers and speaker systems.</td>
</tr>
<tr>
<td>105</td>
<td>Demonstrate the use of power amplifiers and speaker systems.</td>
</tr>
<tr>
<td>106</td>
<td>Use sound reinforcement systems.</td>
</tr>
<tr>
<td>107</td>
<td>Identify the role and function of audio mixing within a production.</td>
</tr>
<tr>
<td></td>
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<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>108</td>
<td>Demonstrate audio mixing techniques.</td>
</tr>
<tr>
<td>109</td>
<td>Identify signal processing within live audio mixing.</td>
</tr>
<tr>
<td>110</td>
<td>Apply signal processing.</td>
</tr>
</tbody>
</table>
# Appendix: Course Sequences and Career Cluster Information

**Concentration sequences:** A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.

- Carpentry I (8601/36 weeks, 140 hours)
- Construction Technology (8431/36 weeks)
- Technical Drawing and Design (8435/36 weeks)
- Technical Drawing and Design (8434/18 weeks)
- Technology Foundations (8403/36 weeks)
- Technology Foundations (8402/18 weeks)

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### Career Cluster: Architecture and Construction

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Carpenter</td>
</tr>
<tr>
<td></td>
<td>Electrician</td>
</tr>
<tr>
<td></td>
<td>Project Manager</td>
</tr>
<tr>
<td>Design/Pre-Construction</td>
<td>Architectural Drafter</td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering Technician</td>
</tr>
<tr>
<td></td>
<td>Interior Designer</td>
</tr>
</tbody>
</table>

### Career Cluster: Arts, Audio/Video Technology and Communications

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio and Video Technology and Film</td>
<td>Audio and Video Equipment Technician</td>
</tr>
<tr>
<td></td>
<td>Audio-Video Designer, Engineer</td>
</tr>
<tr>
<td></td>
<td>Editor</td>
</tr>
<tr>
<td></td>
<td>Graphic Designer</td>
</tr>
<tr>
<td></td>
<td>Multimedia Artist, Animator</td>
</tr>
<tr>
<td></td>
<td>Producer</td>
</tr>
<tr>
<td></td>
<td>Sound Engineering Technician</td>
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<tr>
<td></td>
<td>Videographer</td>
</tr>
<tr>
<td>Journalism and Broadcasting</td>
<td>Art Director</td>
</tr>
<tr>
<td></td>
<td>Broadcast Technician</td>
</tr>
<tr>
<td></td>
<td>Editor</td>
</tr>
<tr>
<td></td>
<td>Program Director</td>
</tr>
<tr>
<td></td>
<td>Radio, TV Announcer</td>
</tr>
<tr>
<td></td>
<td>Radio, TV Reporter</td>
</tr>
<tr>
<td>Performing Arts</td>
<td>Cinematographer</td>
</tr>
<tr>
<td></td>
<td>Costume Designer</td>
</tr>
<tr>
<td></td>
<td>Lighting Designer</td>
</tr>
<tr>
<td></td>
<td>Technical Director</td>
</tr>
<tr>
<td></td>
<td>Video, Film Editor</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>Computer Programmer</td>
</tr>
<tr>
<td></td>
<td>Network Systems and Data Communication Analyst</td>
</tr>
<tr>
<td></td>
<td>Telecommunications Equipment Installer, Repairer</td>
</tr>
<tr>
<td>Pathway</td>
<td>Occupations</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Visual Arts</td>
<td>Commercial Photographer</td>
</tr>
<tr>
<td></td>
<td>Costume Designer</td>
</tr>
<tr>
<td></td>
<td>Fashion Designer</td>
</tr>
<tr>
<td></td>
<td>Fashion Illustrator</td>
</tr>
<tr>
<td></td>
<td>Graphic Designer</td>
</tr>
<tr>
<td></td>
<td>Illustrator</td>
</tr>
<tr>
<td></td>
<td>Interior Designer</td>
</tr>
<tr>
<td></td>
<td>Media Planner, Buyer</td>
</tr>
<tr>
<td></td>
<td>Multimedia Artist, Animator</td>
</tr>
<tr>
<td></td>
<td>Photographic Process Technician</td>
</tr>
<tr>
<td></td>
<td>Textile Designer</td>
</tr>
</tbody>
</table>