

# ALCHEMEA

## Diploma Course in Studio Sound Engineering Units Overview

This qualification is independently validated by NCFE and has been found to be equivalent to Level 4 against the QCF.

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### **Unit 01**                      ***Sound, Hearing and Acoustics***

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This unit will provide learners with an overview of sound, from a scientific point of view: what it is and its characteristics, how we perceive it and how it is affected by its environment. This unit introduces some of the common terms, technical language and key concepts used in this area.

This unit will prepare the learner for all further units, in particular unit 4 which deals with microphones and digital audio.

This unit is **mandatory** and accounts for 10 hours of the total recommended guided learning hours.

#### **Learning Outcomes:**

##### **The learner will:**

Demonstrate a good understanding of what sound is and how it is perceived by human beings.

##### **The learner can:**

- 1.1 Explain the relationship between **frequency and musical pitch**.
- 1.2 Explain the relationship between **harmonic content and timbre**.
- 1.3 Explain the relationship between **amplitude and volume**.
- 1.4 Discuss the effects of phase differences when summing sine or **complex** waves.
- 1.5 State and discuss the findings of Fourier about **complex** waves.
- 1.6 State and discuss the findings of Fletcher & Munson on human hearing.
- 1.7 Discuss the human ability to localize sound sources in three dimensions, including **IAD, ITD** and **HRTF**.

##### **The learner will:**

Demonstrate a good understanding of how the propagation of sound is affected by its environment, from a free field to an enclosed space.

##### **The learner can:**

- 1.8 Discuss the propagation of sound in a **free field**.
- 1.9 Discuss the **effects** of an obstacle to the propagation of a sound wave.
- 1.10 Distinguish and discuss **key** soundproofing and acoustic design principles.

## Range (explanation)

**Frequency and musical pitch (1.1):** Musical notes are identified by their fundamental frequency, expressed in Hertz (Hz). These have been standardised for different musical systems, e.g. in the Western equal-tempered system, notes are relative to the tuning reference of Concert Pitch A = 440Hz (or 444Hz in the USA).

**Harmonic content and timbre (1.2):** The harmonic (and in-harmonic) frequency content of a sound, derived from the fundamental frequency, defines the type of sound by giving it a unique timbre, irrespective of pitch. For example, a piano and a guitar can be playing the same note (i.e. the same fundamental frequency is involved) but the other frequencies in the sound make one instrument sound like a piano, and the other like a guitar.

**Amplitude and volume (1.3):** The amplitude of the audio waveform (distance between positive and negative peaks), measured in Pascals or Volts for example, indicates how 'strong' the sound is, in absolute, although loudness (often a subjective concept) is dependent on the non-linearities of human hearing, as studied by Fletcher and Munson (see 1.6), measured in Phons. Also, it is important not to confuse signal-to-noise ratio (i.e. signal quality, expressed in dBs) and subsequent amplification, which leads to added volume but no increase in quality.

**Complex (1.4 & 1.5):** a waveform containing more than one frequency, as is typical of audio waveforms.

**IAD (1.7):** Interaural Amplitude Difference, also known as Interaural Level Difference (ILD) or Interaural Intensity Difference (IID).

**ITD (1.7):** Interaural Time Difference, also known as Interaural Phase Difference (IPD).

**HRTF (1.7):** Head-Related Transfer Function, also known as Anatomical Transfer Function (ATF).

**Free Field (1.8):** Theoretically infinite space with no obstacles to sound propagation in any direction.

**Effects (1.9):** Reflection, Absorption, Transmission, Re-Radiation, Diffraction, Refraction.

**Key (1.10):** Soundproofing: density of material, insulation, absorption, width, breaking vibration path, resonant frequency of material, layers of different materials, 'room within the room', double doors for air-tightness, double windows with different angles, ventilation considerations. Acoustic Design: symmetry for stereo image, non-parallel surfaces, standing waves, modes, frequency balance, bass traps, Helmholtz resonators, reverberation times, live-end / dead-end, quadratic diffusion, first-reflection

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## Unit 02

## Using a Computer for Audio Purposes

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This unit introduces learners to computer technology, both hardware and software, coming from the perspective of audio-related work, and identifies the technology used. The learner will gain an understanding of the importance of various hardware components (internal, such as RAM, processors etc., external, core or optional) as well as an overview of various requirements expected of software depending on the application.

This unit will prepare the learner for all further units involving computer and audio software, in particular units 3, 4, 5 and 12.

This unit is **mandatory** and accounts for 20 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of the computer hardware requirements involved in the production of audio.

#### The learner can:

- 2.1 Identify the **core hardware components** of a computer and discuss their **impact on audio processes**.
- 2.2 Identify **optional additional hardware** requirements and critically compare various **units of the same type**.
- 2.3 Critically compare **interfacing options**.

#### The learner will:

Demonstrate proficiency in basic computer operations related to audio production.

#### The learner can:

- 2.4 Navigate folders and sub-folders to quickly and reliably find a given file.
- 2.5 Import an audio file into a **session** while making sure there is a back-up copy.
- 2.6 Create a folder at a specific location, with a given name, as instructed.
- 2.7 Save a session with a given name, in a given location, as instructed.

#### Range (explanation)

**Core hardware components (2.1):** microprocessor, motherboard, RAM, ROM, hard drives, optical drives, PCI cards.

**Impact on audio processes (2.1):** processing power of microprocessor, benefits of added RAM, bandwidth of hard drive / optical drive connections, size of hard disk partition, buffer sizes, symptoms of insufficient resources (audio glitches, graphics slowing down, error messages, crashes).

**Optional additional hardware (2.2):** audio interface for recording / playing back audio, MIDI interface for recording / playing back MIDI, dedicated audio co-processors for mixing internally, additional RAM, external hard drives.

**Units of the same type (2.2):** audio interfaces (quality of pre-amps & converters, number of inputs and outputs), MIDI interfaces (number of inputs and outputs), PCI or Firewire based co-processors.

**Interfacing options (2.3):** USB 1.0, 2.0, 3.0, FireWire400, 800, PCI, PCI-e, PCI-x, ATA, SATA, IDE, SCSI, Ethernet, MIDI.

**Session (2.5):** DAW project and its associated folders and sub-folders.

**Back-up copy (2.5):** The audio file is copied from its original location into the correct project related location (i.e. a Pro Tools session's Audio Files folder).

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## Unit 03

## Editing Audio in a Digital Audio Workstation

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This unit will allow learners to develop and use their audio editing skills. Learners will be required to import, play back, edit and evaluate stereo recordings. While developing their technical ability and knowledge of audio editing, this unit will also enable learners to develop their ICT, project management and evaluation skills.

This unit, in conjunction with unit 2, will prepare the learner for all further units involving computers and audio software, in particular units 4, 5 and 12.

This unit is **mandatory** and accounts for 20 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good ability to edit audio as per instructions.

#### The learner can:

3.1 **Seamlessly** and **correctly** edit speech.

3.2 **Seamlessly** and **correctly** edit music.

3.3 Evaluate the edits made.

#### Range (explanation)

**Seamlessly (3.1):** No glitches, pops or double-breaths, no loss of desired audio (chopped words), consistent background noise during gaps, preserved flow and rhythm of original phrasing, no other noticeable artefacts.

**Correctly (3.1):** As instructed: the edits required are performed, no other additional edits are made.

**Seamlessly (3.2):** No glitches or pops, no loss of transients, preserved groove and timing of original performance, no other noticeable artefacts.

**Correctly (3.2):** As instructed: the edits required are performed, no other additional edits are made.

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## Unit 04 Workstation

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## Recording Acoustic Sounds into a Digital Audio

This unit will introduce learners to the skills required to produce sound recordings using equipment found in the modern recording studio. It aims to enable learners to use and identify microphones as well as basic digital recording equipment, by selecting and controlling microphone signals and sending them through to an appropriate recording device. Learners will be required to apply their understanding to produce and evaluate various audio recordings.

This unit will prepare the learner for all further units involving recording, in particular units 17, 19 and 21.

This unit is **mandatory** and accounts for 20 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of microphone types and techniques.

#### The learner can:

- 4.1 Explain how the two microphone **types** work and critically **compare** them.
- 4.2 Describe and discuss **polar patterns** with regards to room ambience pick-up, on- and off-axis frequency response, and spill.
- 4.3 Select an appropriate microphone **type** and **technique** to **adequately** record a **variety of sounds**.

#### The learner will:

Demonstrate a good understanding of basic digital recording concepts.

#### The learner can:

- 4.4 Explain what **sample rate** and **bit depth** mean and discuss their **impact** on the quality of a digital recording.
- 4.5 Deliver **good** digital recordings of a **variety of sounds**.

#### The learner will:

Evaluate the recordings submitted.

#### The learner can:

- 4.6 Evaluate the recordings both in terms of microphone choice and placement, and in terms of digital audio recording quality.

#### Range (explanation)

**Types (4.1):** The Dynamic type (moving coil, ribbon) is based on the electro-magnetic induction concept. The Condenser type (valve / tube, FET, electret / back-electret) is based on the

electro-static concept of capacitors, in particular a capacitor with varying distance between its plates.

**Compare (4.1):** Dynamic microphones tend to have a slightly heavier diaphragm, due to the materials used (and, potentially, the addition of a conductive coil attached to the diaphragm) which leads to less sensitivity to low SPLs and loss of high frequency response. They tend to be cheaper though, as they are passive, and more robust to mistreatment and high SPLs. Condenser microphones are more sensitive to low SPLs and high frequencies, but are more delicate and require powering (Phantom Power or other systems).

**Polar patterns (4.2):** Omni-directional, Bi-directional (figure-of-8) or uni-directional (sub-cardioid, cardioid, super-cardioid, hyper-cardioid).

**Type (4.3):** Operational type, polar pattern, small or large diaphragm.

**Technique (4.3):** Close-mic'ing versus distant / ambient mic'ing, multi-mic'ing, choice of polar pattern and position of microphone relative to source.

**Adequately (4.3):** The frequency content of the original acoustic sound must be captured in its entirety, the sound must not exhibit any form of distortion, microphone self-noise must be kept to a minimum (signal-to-noise ratio). Background noise and room ambiance must be kept to a minimum.

**A variety of sounds (4.3):** The learner will select 3 acoustic sounds to record. Each must be different and distinct from the other 2.

**Sample rate (4.4):** The sampling frequency, in Hz. Number of times per second the analogue signal is measured.

**Bit depth (4.4):** The number of binary digits used to encode the measurement of the analogue waveform.

**Impact (4.4):** The sample rate affects the bandwidth of audio frequencies captured by the digital system, following the Nyquist theorem. The bit depth directly affects the total dynamic range that can be captured by the recording system, adding 6dBs per bit used.

**Good (4.5):** The digital recordings must not exhibit any form of digital artefacts (including, but not limited to, clipping and word-length truncation) and must make good use of the available headroom (signal-to-noise ratio). The chosen sample rate must cover the original acoustic sound's frequency spectrum in full. The chosen bit depth must cover the original acoustic sound's dynamic range in full, with good resolution. The digital file format used must preserve all the information mentioned above.

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## Unit 05

## Processing Audio

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This unit will provide learners with the skills and knowledge needed to enhance and mix their own recorded sounds into a finished product. The focus here is on identifying and becoming fluent with the technology, as well as developing creativity.

This unit will prepare the learner for all further units involving mixing, in particular units 8 and 20.

This unit is **mandatory** and accounts for 20 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of audio manipulation techniques.

#### The learner can:

- 5.1 Identify different **types** of audio filters and explain their purpose.
- 5.2 Explain the concept of modulation and describe the **controls** on Envelopes and LFOs.
- 5.3 Discuss **creative audio editing techniques**.
- 5.4 Identify different **types of audio processing and effects** and implement them **effectively**.

#### The learner will:

Perform and justify some creative audio manipulations.

#### The learner can:

- 5.5 **Successfully** and **creatively** process audio files with a **reasonable degree of complexity**.
- 5.6 Evaluate and justify the processed files against stated objective.

#### Range (explanation)

**Types (5.1):** High Pass, Low Pass, Band Pass, Band Reject, Notch, Resonant and Non-Resonant, Order, Saturation character.

**Controls (5.2):** Attack, Decay, Sustain, Release, Wave Select, Speed, Amount, Offset, Retrigger.

**Creative audio editing techniques (5.3):** Unconventional editing (glitch, skipping), Reversing, Looping, Layering.

**Types of audio processing and effects (5.4):** including, but not limited to: Delay, Reverb, Tremolo, Chorus, Phasing, Flanging, Ring Modulating, Distortion, Bit Crushing, Tone Control (EQ), Dynamic Control (Compressor)...

**Effectively (5.4):** In such a way that the resulting audio is noticeably different to the original audio.

**Successfully (5.5):** In such a way that the resulting audio is noticeably different to the original audio.

**Creatively (5.5):** In such a way that the resulting audio meets the learner's own stated objective.

**A reasonable degree of complexity (5.5):** A process chain involving more than two processes.

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## Unit 06 Practices

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## The Recording Process: Equipment, Personnel and

The aim of this unit is to provide learners with an overview of sound equipment and the technical language used. In this unit, learners will explore the types of employment available within the industry, in particular the recording studio environment, and demonstrate an awareness of standard practices. In addition, learners will participate in work experience and use this to identify a range of desirable skills and personal qualities which they will outline in a report.

This unit will prepare the learner for all further units involving working in a studio environment, in particular units 7, 10, 11 and 14.

This unit is **mandatory** and accounts for 10 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of the key roles involved in the recording industry, and of the level at which a beginner applicant with no experience might be employed.

#### The learner can:

- 6.1 Discuss the roles, responsibilities and hierarchy of **key personnel** in the recording industry.
- 6.2 Identify the role **likely** to be assigned to a beginner in a recording studio.
- 6.3 Prepare an **appropriate** employment application (CV and covering letter).

#### The learner will:

Demonstrate a good understanding of the process of recording a band in a multi-track format.

#### The learner can:

- 6.4 Outline and discuss the **main steps** in the recording process.
- 6.5 Observe, report and discuss the relationship between the **different people** involved in a recording session.

#### The learner will:

Demonstrate a good understanding of the role and key skills required from a good runner / studio assistant.

#### The learner can:

- 6.6 Outline and discuss the **main tasks** assigned to a runner / studio assistant during a recording session.
- 6.7 Perform the role of studio assistant during a **recording session**.

### **Range (explanation)**

**Key personnel (6.1):** Runner, Tape Operator, Studio Assistant, Engineer, Producer, Studio Manager, Technical Support, A&R / Record Label Executive.

**Likely (6.2):** Receptionist, Copy Room staff, Runner, Studio Assistant.

**Appropriate (6.3):** Suitable to apply for a beginner's position as identified in 6.2.

**Main steps (6.4):** Initial take, overdubs, mixing.

**Different people (6.5):** The assistant and the engineer, the engineer and the artist(s), the assistant and the artist(s), potentially the producer and the engineer, the producer and the assistant, the producer and the artist(s).

**Main tasks (6.6):** Carrying in equipment, roughly setting up and connecting microphones, troubleshooting, making coffee / tea, running out to fetch various items that may be necessary, observing in silence, doing whatever is asked by the engineer, filling in logs, packing up, doing recalls.

**A recording session (6.7):** This should take place at the learning centre, conducted by a senior learner or a tutor, although real-world work experience is also encouraged and valid. This should be one 8-hour session (at least) where the engineer is recording a live performance to multi-track (overdubs session is also valid) or straight to stereo. There are twice as many senior learners actively performing recordings during the early stages of this learner's studies, providing plenty of opportunities for the learner to join such a session, although sourcing this opportunity ('networking') is part of the learner's responsibility. Help is available should the learner need an introduction or reference.

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## Unit 07

## Using a Mixing Desk

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This unit will provide learners with an overview of what constitutes a professional recording or mixing desk. Although a variety of examples will be discussed, the focus will take place on a basic analogue split console where learners will develop a good understanding and working knowledge of signal flow.

This unit will prepare the learner for all further units involving recording or mixing and, in particular, unit 13.

This unit is **mandatory** and accounts for 10 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of what a mixing desk is and does.

#### The learner can:

- 7.1 Explain the uses of a mixing desk in **various operational contexts**.
- 7.2 Identify and explain the function of each constituent **section** common to all mixing desks.
- 7.3 Distinguish and critically compare different **layouts**.

#### The learner will:

Demonstrate a good understanding of signal flow.

#### The learner can:

- 7.4 Explain how audio signals flow to, through and from the mixing desk in **various operational contexts**.
- 7.5 Perform with confidence a variety of audio **routing** tasks.

#### Range (explanation)

**Various operational contexts (7.1, 7.4):** Recording and mixing a live performance to stereo master, recording to multi-track, overdubbing, mixing from multi-track to stereo master.

**Section (7.2):** Input channel (input selection, pre-amplifiers, audio processing, insert points, routing matrix, auxiliaries, fader, pan pot, mute/on switch, solo switch), buses, master section (bus masters, monitoring options, solo options, talk-back), group section, monitors section (to/from multi-track selection).

**Layouts (7.3):** Split, in-line.

**Routing (7.5):** Sending an input signal from one section to another.

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## Unit 08

## Balancing a Multi-Track Recording

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In this unit, learners will have the opportunity to make use of a mixing studio and further develop, through practical project-driven work, their signal flow skills acquired in unit 7. The unit provides learners with basic skills and knowledge to produce a simple level / pan balance, with basic tone control, of a pre-recorded multi-track recording. This end product will be prepared and recorded to a digital 2-track stereo master.

This unit will prepare the learner for all further units involving mixing, in particular unit 20.

This unit is **mandatory** and accounts for 10 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of the process of balancing a multi-track recording, in particular the interaction between multi-track recorder, mixing desk and stereo master recorder.

#### The learner can:

8.1 Perform a **basic balance** of a **supplied multi-track recording** to a **stereo master**.

#### The learner will:

Demonstrate a good understanding of delivery requirements and associated processes.

#### The learner can:

8.2 **Prepare** the mixed stereo master for delivery in the **required format**.

8.3 Evaluate the balance.

#### Range (explanation)

**Basic balance (8.1):** Simple level / pan balance, broadly acceptable compared with commercial mixes of a similar genre. Tonal balance adjustments are not required but are a bonus if done correctly.

**Supplied multi-track recording (8.1):** Chosen by the learner, from a selection of staff-recorded, 16-track multi-track recordings, of varying styles.

**Stereo master (8.1):** A two-track recording device, such as a tape machine or a DAW.

**Prepare (8.2):** Export / Bounce the recorded mix to a CD quality digital file (Stereo Interleaved, 16 bit, 44.1kHz, PCM WAV or AIFF file), using Dither if necessary.

**Required format (8.2):** A playable Audio CD compliant with Red Book specifications.

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## Unit 09

## Programming Samplers

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In this unit learners will explore audio sampling technology and the technical terms and concepts used in this area. Learners will explore velocity layering, key groups, MIDI channel and output assignments, as well as a range of looping and editing functions.

This unit will prepare the learner for all further units involving electronic music, in particular unit 17 and 18, as well as unit 25.

This unit is **mandatory** and accounts for 10 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of sampler programming concepts.

#### The learner can:

- 9.1 Import **9 audio recordings** into the sampler.
- 9.2 Assign the recordings to a **key group** and **velocity zone**.
- 9.3 Assign the recordings to a **MIDI channel** and audio output.
- 9.4 Save and export their work **reliably** onto a data CD-r.
- 9.5 Evaluate the programming.

#### Range (explanation)

**9 audio recordings (9.1):** 3 original recordings from Unit 4 (LO 4.3) each further processed twice in Unit 5 (LO 5.5).

**Key group (9.2):** A range of musical pitches that will exclusively trigger the recording.

**Velocity zone (9.2):** A range of MIDI note on velocities that will exclusively trigger the recording.

**MIDI channel (9.3):** A channel of trigger data that will exclusively trigger the recording.

**Reliably (9.4):** In such a way that the work can be transferred and used on any other computer using the same sampling software.

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## **Unit 10** **Resources**

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## **Production and Project Management: Time &**

This unit introduces the learners to project management. While completing this unit learners will explore the resources and time required to complete various tasks. This will allow the learners to produce a plan allowing them to complete multiple concurrent projects and meet the deadlines. Learners will be required to evaluate the success of their plan and revise, if necessary, for future undertakings. This unit will also help learners develop their planning, research and teamwork skills.

This unit will prepare the learner for all further units involving project portfolios as assessment criteria, in particular units 16 through to 27 (except unit 23).

This unit is **mandatory** and accounts for 40 hours of the total recommended guided learning hours.

### **Learning Outcomes:**

#### **The learner will:**

Develop and follow a plan allowing for the simultaneous delivery of multiple products, at specified deadlines.

#### **The learner can:**

10.1 Assess the multiple projects, identify and **secure required time & resources**.

10.2 Prepare **contingency** options.

10.3 **Manage** human resources and deliver **completed** projects at the deadline.

10.4 Evaluate effectiveness of the plan. If all projects are not completed and delivered on time, review the plan, assess what went wrong and explain how this can be avoided in future.

#### **Range (explanation)**

**Required time & resources (10.1):** Time required in terms of number of studio or workstation sessions (8 hour blocks). Resources: human (studio assistants, performers, artistes, musicians, bands, actors...), equipment (microphones, instruments, recording studio, DAW) and other (scripts, music scores, sound libraries...).

**Secure (10.1):** Book required studio or workstation time, and make appointments with human resources in advance.

**Contingency (10.2):** Plan for additional studio or workstation time. Contact alternate human resources and make provisional appointments. Keep functional and up-to-date back-ups of the projects.

**Manage (10.3):** co-ordinate musicians, timekeeping, delegate tasks to studio assistant(s), create the right environment for performers to perform well, assess performance issues against timeline.

**Completed (10.3):** Check that all required aspects of the project are performed. Check that deliverables are as required and working. Final projects should also be backed-up and archived.

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## **Unit 11                      *Troubleshooting in a Recording Environment: Basic Studio Maintenance***

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This unit will introduce learners to basic studio maintenance / technical support. It will cover basic electronic and interfacing concepts and will provide learners with an opportunity to develop their problem-solving skills. Learners must also follow appropriate Health and Safety guidelines at all times.

This unit will prepare the learner for all further units involving recording, in particular units 19 and 24.

This unit is **mandatory** and accounts for 30 hours of the total recommended guided learning hours.

### **Learning Outcomes:**

#### **The learner will:**

Demonstrate a good understanding of basic electric, electronic and magnetism concepts applying to audio.

#### **The learner can:**

- 11.1 Give definitions for, and explain, **key electrical concepts and laws**.
- 11.2 Give definitions for, and explain, **key magnetism concepts**.
- 11.3 Give definitions for, and explain the role of **key electronic components**.
- 11.4 Identify **simple audio circuits** and explain their function.

#### **The learner will:**

Demonstrate a good understanding of studio interconnections and interfacing standards.

#### **The learner can:**

- 11.5 Explain the difference between balanced and unbalanced wiring, and critically compare their **impact on audio quality**.
- 11.6 Explain the importance of an **earth connection** and its potential **problems**.
- 11.7 Identify **audio connectors** and **audio cables** and specify whether they are balanced or unbalanced.
- 11.8 Explain the purpose of a studio patchbay and discuss its **internal wiring options**.
- 11.9 Discuss the **effects of impedance** on audio interconnections.
- 11.10 Discuss the **effects of signal copying** on transferred voltage.
- 11.11 Explain what a DI box is, and its role. Discuss the **pros and cons of the different types** of DI boxes.
- 11.12 Explain how Phantom Power works and its reliance on balanced connections.
- 11.13 Discuss the **impact** of a floating or unbalanced connection on a professional microphone with balanced output.

#### **The learner will:**

Demonstrate a good ability to identify and resolve simple technical problems, as a studio assistant, during recording sessions.

### The learner can:

- 11.14 Identify the **signal flow** in the studio environment and the chain of potential sequential problems.
- 11.15 Demonstrate a **logical and rigorous approach** to troubleshooting.
- 11.16 Implement **good practices** when connecting equipment.
- 11.17 Identify and fix a **range of problems** quickly and correctly.

### Range (explanation)

**Key electrical concepts and laws (11.1):** Electricity, charge, current, potential difference, voltage, resistance, impedance, power, DC and AC, Ohm's Law.

**Key magnetism concepts (11.2):** magnetism, electro-magnetism, electro-magnetic induction.

**Key electronic components (11.3):** Resistors, potentiometers, capacitors, inductors, op-amps.

**Simple audio circuits (11.4):** Series and parallel connections, passive circuits, voltage dividers, audio filters and DC removal, transformers, active circuits, buffer amps.

**Impact on audio quality (11.5):** Signal-to-noise ratio, interference cancellation.

**Earth connection (11.6):** Grounding for electrical safety, Faraday's cage and interference rejection (screen).

**Problems (11.6):** Earth loops, hum, floating connections.

**Audio connectors (11.7):** TS and TRS A jacks, minijacks, B jacks, Bantam jacks, Phono (RCA) jacks, male and female XLR connectors, BNC connectors.

**Audio cables (11.7):** Co-axial, twin twisted.

**Internal wiring options (11.8):** Fully normalised, half-normalised, not normalised.

**Effects of impedance (11.9):** Characteristic impedance, Power matching, Voltage matching, long audio cables as audio filters, loss of high frequencies, degradation of signal-to-noise ratio, distortion.

**Effects of signal copying (11.10):** Copying signals via buses, parallel ports on patchbays, effects on impedance when adding receivers in parallel and subsequent effects on audio quality.

**Pros and cons of the different types (11.11):** Passive design, simple, no need for power supply, can be used back-to-front coupled with another for long-distance guitar to amp interfacing, transformers, colouration of sound (frequencies), drop in voltage, active design, need for power supply (phantom power), op-amp, transparent sound, no loss of voltage, only works one way.

**Impact (11.13):** Condenser microphones: no sound as phantom power cannot be sent, dynamic microphones: noise, loss of volume, hum.

**Signal flow (11.14):** Source, microphone, connection to wall box, connection to patchbay, connection on patchbay, connection from patchbay to desk, desk settings including input selection, phantom power where appropriate, insert points, solo type being used, monitoring options.

**Logical and rigorous approach (11.15):** Changing only one unknown quantity at a time (i.e. one cable, or one microphone), using known items (i.e. cable already proven to be working) where possible as a reference, cross-referencing findings, logical deduction.

**Good practices (11.16):** Turning channel level and/or monitoring level down before switching phantom power on/off and/or before connecting / disconnecting microphones, turning phantom power off before connecting / disconnecting microphones, reporting faulty equipment to the technical supervisor.

**A range of problems (11.17):** Faulty microphone, faulty cable, faulty patching or patch cable, incorrect settings on desk, faulty input channel on desk.

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## Unit 12

## Industry Standard Digital Audio Workstations

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This unit builds on knowledge acquired in units 2 and 3 and will encourage learners to become proficient users in 2 different digital audio workstations, recognised to be amongst the industry standard. While completing this unit, learners will be encouraged to assess and compare how the 2 DAWs perform standard professional audio tasks, which in turn will allow them to formulate and justify their own preferences as well as develop an ability to adapt to any DAW they may use in future.

This unit will prepare the learner for all further units involving DAWs operation, in particular units 15 and 16.

This unit is **mandatory** and accounts for 170 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of key concepts and standard working practices for two industry standard digital audio workstations.

#### The learner can:

12.1 Demonstrate knowledge of basic principles, terminology and **user interface** for both digital audio workstations.

12.2 Identify **primary features** in both digital audio workstations and explain their purpose.

12.3 **Apply key skills** within both digital audio workstations.

12.4 Demonstrate an understanding of recommended workflow for **simple standard scenarios**.

#### The learner will:

Demonstrate a good understanding of what is required of an industry standard digital audio workstation in today and tomorrow's audio industry.

#### The learner can:

12.5 Discuss the **history** of digital audio workstations **in context** and explain how the 2 systems studied at the centre have achieved their current market leading position within the industry.

12.6 Evaluate strengths and weaknesses for both digital audio workstations studied at the centre and critically compare them.

12.7 Identify potential competitors and **challenges** to be addressed to meet the changing needs of the audio industry.

12.8 Extrapolate the position of both digital audio workstations studied at the centre within the industry over the next few years.

#### Range (explanation)

**User interface (12.1):** Layout, screens, menus, visual icons, basic key commands.

**Primary features (12.2):** For example, but not limited to: basic tools and functions, editing modes, types of tracks...

**Apply key skills (12.3):** Correctly implement workflows and features without any artistic or advanced expectations. This includes creating, configuring and customizing a new project, creating and naming tracks and buses, configuring inputs and outputs, selecting items and navigating the screen, configuring viewing options, importing, exporting, recording, editing and processing audio and MIDI, using plug-ins and software instruments, managing session data and media files, basic mixing (sends / returns, master & group faders) and automation (enabling, playing, viewing and editing).

**Simple standard scenarios (12.4):** From setting up the project to delivering the final product, for music (recording live performances, mixing or composing and sequencing) and post-production (importing video media, spotting effects and recording audio to picture, exporting).

**History (12.5):** Origins and key evolution stages.

**In context (12.5):** The learner can identify the needs and practices of the audio industry at the time, as well as the technical limitations of the time. The learner can also identify a few contemporary competitors and their shortcomings at the time.

**Challenges (12.7):** Missing features to be added compared with the competition, identified weaknesses to be resolved, new workflows for new types of projects.

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## Unit 13 Mixing Desk

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### Using an Industry Standard Analogue Automated

This unit builds on knowledge acquired in unit 7 and will develop learners' skills further by exploring the features of more advanced mixing desks, including the concept of mix automation. This unit will encourage learners to become proficient users of 2 different mixing desks, recognised to be amongst the industry standard. While completing this unit, learners will be encouraged to assess and compare how the 2 desks perform standard professional audio tasks, which in turn will allow them to formulate and justify their own preferences as well as develop an ability to adapt to any desk they may use in future. This unit will prepare the learner for all further units involving recording and mixing, in particular units 19 through to 27.

This unit is **mandatory** and accounts for 70 hours of the total recommended guided learning hours.

#### Learning Outcomes:

##### The learner will:

Demonstrate a good working knowledge of 2 different industry standard analogue automated mixing desk.

##### The learner can:

13.1 Break down into individual steps the **path** that an audio input signal takes when flowing through the desk to an output, **during standard operation**.

13.2 Implement and justify standard **desk configurations** and **related practices**.

13.3 Implement different mono and stereo headphone mixes for the performers and justify **standard practices**.

13.4 Implement a variety of **advanced processing chains and creative routing**, and justify their **relative merit**.

13.5 Generate and repair broken LTC Timecode coming from a connected multi-track recorder. Read Timecode and **troubleshoot potential problems**.

13.6 Operate the on-board computer system in order to log session information and **remote control** the multi-track recorder.

13.7 Perform a variety of automation **events**.

13.8 Explain automation **editing modes** and options and demonstrate some edits.

##### Range (explanation)

**Path during standard operation (13.1):** Recording: microphone input, channel fader, pan pot, routing matrix, group master fader, group output, multi-track recorder, back into monitor fader, pan pot, mix bus and monitoring system. Mixing: multi-track recorder to channel fader and/or monitor fader, pan pot, mix bus, to 2-track master recorder and monitoring system. Overdubbing: most channels follow the mix configuration except a few channels following record configuration.

**Desk configurations (13.2):** Settings for recording (input to mic, channels to routing matrix, monitors to mix bus, non-destructive solo), settings for mixing (input to line, channels to mix bus, destructive solo with safe effect returns), settings for overdubbing (in particular headphone mix considerations), metering options.

**Related practices (13.2):** Recording channel faders further away from operator to avoid being changed by accident, monitor faders close by for monitoring adjustments, potential problems when switching between record, overdub, mix and playback situations, pros and cons of direct output routing from recording channel.

**Standard practices (13.3):** Headphone mix taken from monitor path, considerations when overdubbing.

**Advanced processing chains and creative routing (13.4):** Filter, EQ & Dynamics permutations, dynamic side-chain path and processing, sub-grouping, bouncing a sub-group back to multi-track recorder, faders as additional effects sends and returns. This can be done with the processing tools supplied on the desk itself or via patching of outboard equipment.

**Relative merit (13.4):** Corrective EQ followed by dynamic control, or EQ to correct dynamic control artefacts on frequency, filters at the top of recording chain or as creative tools, sub-grouping to process ensembles as a whole, bouncing to save tracks in the multi-track recorder, additional sends and returns if the desk's ones are all used up, automated effects sends and returns...

**Troubleshoot potential problems (13.5):** No Timecode, wrong frame rate, drop-outs.

**Remote control (13.6):** Play, stop, locate, cue points, cycle.

**Events (13.7):** VCA automation of faders, cuts, creation of VCA automation groups.

**Editing modes (13.8):** Trim versus absolute, on-line versus off-line, editing cuts without affecting faders and vice-versa, auto-takeover and glide back.

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## Unit 14 DAW

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## Operating a Studio with a Tape Machine and/or

The purpose of this unit is to provide learners with the practical skills required to interface and operate a range of equipment used during recording / mixing. In particular, this unit will introduce multi-track magnetic tape recorders and their synchronisation to DAWs. This unit will prepare the learner for all further units involving recording and mixing, in particular units 19, 20 and 21.

This unit is **mandatory** and accounts for 30 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a proficiency in using two different recording studios, equipped with an analogue tape machine or DAW multi-track recorder, or both.

#### The learner can:

- 14.1 **Successfully** connect microphones from the recording area to the mixing desk.
- 14.2 **Process** audio using the mixing desk and **outboard processors and effects**.
- 14.3 **Successfully** route signals to and from the multi-track recorder.
- 14.4 **Successfully** create a headphone mix from the mixing desk back to the recording area.
- 14.5 **Successfully** connect audio output from a DAW in the control room, to the mixing desk.

#### The learner will:

Demonstrate a good understanding of how to prepare an analogue multi-track tape recorder for recording and mixing.

#### The learner can:

- 14.6 Explain the **procedure for analogue tape line-up** and justify its sequence.
- 14.7 **Successfully** perform the procedure.

#### The learner will:

Demonstrate a good understanding of synchronisation concepts and practices.

#### The learner can:

- 14.8 Critically compare the different types of **Timecode** and their uses.
- 14.9 Identify the different **frame rates** and explain their relevance.
- 14.10 Generate LTC Timecode from **a variety of sources** and **correctly** record onto tape.
- 14.11 Synchronise **any two** given multi-track recorders, **correctly** choosing which should be the Master and which the Slave.
- 14.12 Identify the different types of **machine control protocols** and explain their uses.
- 14.13 Implement machine control where possible and appropriate.

### **Range (explanation)**

**Successfully (14.1):** Audio can be heard in the control room's monitors, with no noticeable degradation in terms of frequency or noise.

**Process (14.2):** EQ, Compress, Noise Gate, adding artificial Reverberation...

**Outboard processors and effects (14.2):** Compressors / Limiters, Expanders / Gates, EQs, Filters, Artificial Reverberation units, Delay units, etc.

**Successfully (14.3):** Audio is recorded onto the multi-track recorder, at optimum level, and is monitored back through the mixing desk with no noticeable degradation.

**Successfully (14.4):** The monitor mix and talk-back can be heard in the headphones located in the recording area, with no noticeable degradation in terms of frequency or noise.

**Successfully (14.5):** Audio can be heard in the control room's monitors, with no noticeable degradation in terms of frequency or noise.

**Procedure for analogue tape line-up (14.6):** De-Gaussing, Cleaning the heads, playback calibration with reference tape, appropriate bias adjustment, record calibration, creation of test tone pad on session tape.

**Successfully (14.7):** in such a way that the session tape will be ready to record audio with no undue degradation in frequency content, noise or extreme saturation.

**Timecode (14.8):** LTC, MTC, VITC, BITC, Serial TC.

**Frame rates (14.9):** Frames per second, i.e. 24, 25, 30 drop and non-drop, 29.97 drop and non-drop.

**A variety of sources (14.10):** different DAWs, different mixing desks.

**Correctly (14.10):** on the last track and at -10VU, in such a way that it can be read back and perform its function.

**Any two (14.11):** an analogue tape recorder and a DAW, or two analogue tape recorders, or two DAWs.

**Correctly (14.11):** the Master being the least flexible of the two multi-track recorders, if applicable.

**Machine control protocols (14.12):** Sony 9-pin, MTC, SSL.

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## Unit 15

## Developing Composition and Arrangement Skills

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This unit aims to provide learners with a basic overview of music theory, notation and terminology in order for them to communicate more effectively with musicians in subsequent units. The unit also provides practical tips and tricks in order to help beginners develop basic musical ability in terms of performance and composition.

This unit will prepare the learner for all further units involving sequencing, arranging and production, in particular units 16, 17, 18 and 21.

This unit is **mandatory** and accounts for 20 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of basic music theory concepts.

#### The learner can:

- 15.1 Identify musical intervals by ear.
- 15.2 Sing musical intervals.
- 15.3 Distinguish and perform **basic** major and minor scales.
- 15.4 Distinguish major phrases from minor phrases played on a piano.
- 15.5 Distinguish and perform **important** chord forms including inversions.

#### The learner will:

Compose a musical piece to a specific brief, under time restriction.

#### The learner can:

- 15.6 Capture and memorize **a musical phrase** and reproduce it **accurately**.
- 15.7 Identify the "base" mode of the phrase and utilise its notes in order to develop melodic and harmonic ideas around the phrase.
- 15.8 Compose a 1 minute-long **musical piece** based on the phrase, within 1 hour.

#### Range (explanation)

- Basic (15.3):** Major scale and natural (or harmonic) minor scale based on C, D, F and G.
- Important (15.5):** Triads, augmented, dominant 7<sup>th</sup>, minor 7<sup>th</sup> and diminished 7<sup>th</sup> chords for C, D, F and G.
- A musical phrase (15.6):** The learner is played a phrase on a piano, which corresponds to one of three given modes discussed in class: Dorian, Aeolian and Mixolydian.
- Accurately (15.6):** The phrase should be reproduced and recorded exactly, using a piano sound, without any deviation in pitch or timing.
- Musical piece (15.8):** Open to creativity but with strict guidelines and expectations in terms of arrangement and organisation of sound i.e. must contain drums / percussion, a bass line, chords and an additional melody.

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## **Unit 16                      Sequencing and Arranging MIDI and Audio in a Digital Audio Workstation**

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This unit builds on knowledge acquired in units 12 and 15, and will develop learners' skills further by applying the knowledge to a practical project-based context. In this unit learners will explore audio and MIDI sequencing to create a piece of music. Upon successful completion of this unit learners will be able to demonstrate a series of audio and MIDI sequencing operations. Learners will prepare the sequencer for operation, create an audio sequence, and then edit and arrange these sequences into a more complete and musical result. Learners will be required to apply their understanding to produce and evaluate an audio sequence. This unit will provide learners with an opportunity to develop their ICT skills when deciding which sound sources to use when putting together their final piece. This unit will prepare the learner for all further units involving creative music production, in particular units 17 and 18.

This unit is **mandatory** and accounts for 170 hours of the total recommended guided learning hours.

### **Learning Outcomes:**

#### **The learner will:**

Demonstrate a good working knowledge of two industry standard digital audio workstations.

#### **The learner can:**

In both digital audio workstations:

- 16.1 Record, edit and manipulate MIDI information to a **competent level**.
- 16.2 Record or import, edit and manipulate audio files to a **competent level**.
- 16.3 Arrange MIDI and audio parts into a **coherent song-like structure**.
- 16.4 Bounce software instrument parts triggered by MIDI into audio.
- 16.5 Create a **working** tempo change and a **working** time signature change in the song.
- 16.6 **Mix** the tracks to a stereo master using basic software plug-ins and automation.
- 16.7 **Archive** the finished project on a data CD-R.
- 16.8 Export the finished mix to a Red Book standard audio CD-R.
- 16.9 Evaluate their submitted work against the brief.

#### **Range (explanation)**

**Competent level (16.1):**The minimum requirement of 6 MIDI tracks must be in time (quantised) and in tune with each other, in order to demonstrate purposeful control on the part of the learner.

**Competent level (16.2):**The minimum requirement of 10 audio tracks must be in time and in tune with each other, edited and cleaned-up, in order to demonstrate purposeful control on the part of the learner.

**Coherent song-like structure (16.3):** The overall project must be between 3 and 5 minutes long and must contain a rhythm section (at least 5 rhythm elements through most of the project) and a bass part. The project should evolve and develop with elements being introduced or dropped-out every so often (every 8 to 16 bars or so). However, no song-writing (original material, chords and melody) or performance skills are required from the learner. The project could be a cover performed by musicians.

**Working (16.5):** Both MIDI and audio elements must be shown to follow the tempo and time signature changes, when they occur.

**Mix (16.6):** A level and pan balance supplemented by the use of some judicious EQ and dynamic control, as well as some creative real-time processing. An effects bus send / return must be created and used. Extensive mixer and plug-in automation must also be used.

**Archive (16.7):** Once the project is complete, delete unused parts and compact / optimize / minimize files. Back-up on personal hard drive. Export a copy with files conformed and dithered to 16 bits, 44.1kHz and burn onto a data CD-R.

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## Unit 17

## Producing Electronic Music

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This unit builds on knowledge acquired in units 15 and 16. Learners will explore the background, technology and production techniques used in modern popular electronic music. They will investigate an electronic music style of their choice and identify the stand-out features defining its production. Learners will also explore features of synthesisers, samplers, sequencers and DAWs, and related techniques pertinent to the chosen style. Using their skills and the knowledge gained about the style's sounds and structures, learners will ultimately produce a complete electronic music track in their chosen style.

This unit is **mandatory** and accounts for 40 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of various synthesis, sampling and advanced MIDI programming concepts.

#### The learner can:

- 17.1 Describe and critically compare synthesis and sampling.
- 17.2 Describe and critically compare subtractive, additive and FM synthesis.
- 17.3 Describe and critically compare the approach to creating different **types of sounds**.
- 17.4 Describe the **structure** of a MIDI message.
- 17.5 Critically compare hardware synthesisers and virtual instruments.

#### The learner will:

Produce and present an original piece of electronic music.

#### The learner can:

- 17.6 Produce a piece of electronic music that conforms to the **standards** of the chosen style / genre.
- 17.7 Overdub 3 **acoustic performances**, recorded with a microphone, including some lead vocals.
- 17.8 **Mix** the tracks to a stereo master.
- 17.9 **Archive** the finished project on a data CD-R.
- 17.10 Export the finished mix to a Red Book standard audio CD-R.
- 17.11 Evaluate the product against the stated standards.

#### Range (explanation)

**Types of sounds (17.3):** Percussive sounds (fast attack, low sustain) including drum sounds (no sustain, noise as main waveform at source), pads (long attack and release, high sustain, lots of modulation).

**Structure (17.4):** Status byte (1, 3 bits encoding 8 types of message, 4 bits encoding 16 channels), data byte (0, 7 bits encoding 128 values) and possibly a second data byte (0, 7 bits encoding 128 values) depending on type of message. E.g. Note On: data byte 1 = note pitch, data byte 2 = velocity; or Controller: data byte 1 = controller number, data byte 2 = controller value.

**Standards (17.6):** The learner will indicate the chosen style / musical genre for the song and will list key aspects that define it, such as tempo, instrumentation (e.g. female vocal led) / types of sounds or samples (e.g. dark subtractive synth bass, or sampled funk drum loop), structure and arrangement...

**Acoustic performances (17.7):** Live percussion, guitar, vocals etc. These will be recorded with a microphone. They can, however, be further edited and processed.

**Mix (17.8):** A level and pan balance supplemented by the use of judicious EQ and dynamic control, as well as creative processing and effects, in keeping with the chosen genre.

**Archive (17.9):** Once the project is complete, delete unused parts and compact / optimize / minimize files. Back-up on personal hard drive. Export a copy and burn onto a data CD-R.

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## Unit 18

## Remixing

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This unit is related to unit 17 and builds on knowledge acquired in units 9, 15 and 16. Learners will explore the background, technology and production techniques used when producing modern remixes of popular songs. They will investigate an electronic music style of their choice and identify the stand-out features defining its production. Learners will also explore features of synthesisers, samplers, sequencers and DAWs, and related techniques pertinent to the chosen style. Using their skills and the knowledge gained about the style's sounds and structures, learners will ultimately produce a remix of a given song, in their chosen style. The original song should be clearly identifiable but the tempo of the song will have been changed in order to match the tempo of the chosen remix style.

This unit is **mandatory** and accounts for 90 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of the purpose of remixing in today's industry.

#### The learner can:

18.1 Explain what the **commercial purpose** of a remix is.

#### The learner will:

Demonstrate a good understanding of the process of remixing.

#### The learner can:

18.2 Break down the process of remixing into a **sequence of tasks**. Research and select (a combination of) software that will be **appropriate** for each task in the process.

18.3 Import the supplied parts of the original song into a DAW, identify the original tempo of the song and timestretch parts to the new **chosen tempo** for the remix.

18.4 Produce a remix that conforms to the **standards** of the chosen style / genre, while **retaining key recognisable elements** of the original song.

18.5 **Mix** the tracks to a stereo master.

18.6 **Archive** the finished project on a data CD-R.

18.7 Export the finished mix to a Red Book standard audio CD-R.

18.8 Evaluate the remix.

#### Range (explanation)

**Commercial purpose (18.1):** Creating different versions of a song for different target audiences, to be played on different radio stations and in different clubs. A song or artist may also gain more respectability through a 'star' produced remix, while also creating desirability in owning exclusive remixes (collector's items). The aim is to reach a broader target audience, to achieve maximum exposure and marketing avenues, in order to generate more sales.

**Sequence of tasks (18.2):** Importing and processing (timestretching) original parts, producing a new backing track in a given style around the original parts, mixing.

**Appropriate (18.2):** In particular, and taking into account the learner's preference or familiarity, which software or third-party algorithm offers the best timestretching results (with the least audible artefacts) for each given audio part and chosen percentage change of tempo? Which algorithm parameter combination works best (if there is a choice)? Processing requirements? General loop and sample manipulation options? Linear vs non-linear mixing and arrangement options?

**Chosen tempo (18.3):** A new tempo, noticeably different to that of the original song and consistent with the musical style chosen for the remix, e.g. House music is between 125bpm and 135bpm.

**Standards (18.4):** The learner will indicate the chosen style / musical genre for the remix and will list key aspects that define it, such as tempo, instrumentation / types of sounds or samples (e.g. 909 kick drum), structure and arrangement (e.g. 8 minutes long, with a beat only intro, a breakdown half way through, a beat only outro)...

**Retaining key recognisable elements (18.4):** The aim is to produce a remix that can clearly be identified as a remix of the given original song. To that end, the learner must identify key elements of the original song (e.g. vocals, instrumental hook...) and ensure they appear prominently in the finished remix.

**Mix (18.5):** A level and pan balance supplemented by the use of judicious EQ and dynamic control, as well as some creative processing and effects, in keeping with the chosen genre.

**Archive (18.6):** Once the project is complete, delete unused parts and compact / optimize / minimize files. Back-up on personal hard drive. Export a copy and burn onto a data CD-R.

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## Unit 19

## Recording Live Music in Multi-Track Format

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This unit builds on knowledge acquired in units 4, 6 and 14. It will give learners the skills to produce sound recordings using the full range of facilities found in a professional recording studio. This unit will be delivered by making use of a typical studio facility with a large-format mixing desk, multi-track tape recorder, external hardware effects as well as a DAW loaded with plug-ins. This unit requires the final work to be mastered to a digital audio format.

This unit will prepare the learner for unit 21.

This unit is **mandatory** and accounts for 60 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of recording techniques.

#### The learner can:

19.1 Describe, critically compare and justify the use of a variety of **stereo microphone recording techniques**.

19.2 Critically compare close microphone placement with distant microphone placement. 19.3

Discuss the effects of **spill** when recording in multi-track format, and how to best minimise it.

19.4 Explain how phase issues can arise during recording, how to best detect them and how to best resolve them.

#### The learner will:

Record and present 2 original multi-track recordings of a live band, including a full drum kit. The second recording will be undertaken after assessment of the first recording.

#### The learner can:

19.5 Record a **band** performing live, including a **full drum kit**, to a multi-track recorder.

19.6 Perform drop-ins and overdubs in order to correct / enhance performances.

19.7 Perform some **creative** overdubs.

19.8 **Archive** the finished project on a data CD-R.

19.9 Evaluate own recording. Review and revise approach and plan for second recording.

#### Range (explanation)

**Stereo microphone recording techniques (19.1):** A-B, X-Y, M-S, Binaural (dummy head) and quasi-binaural (Schoeps sphere), Jecklin disk, ORTF, Decca Tree.

**Spill (19.3):** When a microphone picks up the sound of other instruments in the room, other than the one it is intended to record.

**A band (19.5):** For the purpose of this assignment, a band is considered to be at least 3 musicians, including a drummer. All musical styles are welcome.

**Full drum kit (19.5):** For the purpose of this assignment, a full drum kit is considered to be at least a kick drum, a snare drum, a hi-hat and a crash or ride cymbal.

**Creative (19.7):** Such as double-tracking guitars or vocals, recording vocal harmonies, additional guitar parts such as feedback or solos, recording additional percussion...

**Archive (19.8):** Once the project is complete, delete unused parts and compact / optimize / minimize files. Back-up on personal hard drive. Export a copy and burn onto a data CD-R.

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## Unit 20

## Mixing a Multi-Track Recording to a Stereo Master

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This unit builds on knowledge acquired in units 5, 8 and 13. In this unit, learners will have the opportunity to make use of the full capabilities of a multi-track mixer and recording device to control, route, record and monitor a range of sound sources. The unit provides learners with the skills and knowledge to enhance and mix their own recorded multi-tracks into a finished product using various types of EQ and effects processing, consistent with current standards in the style of the recording. This end product will be prepared and recorded to a digital 2-track stereo master.

This unit will prepare the learner for units 21 and 22.

This unit is **mandatory** and accounts for 160 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of the concept and process of mixing.

#### The learner can:

20.1 Explain the **purpose** of mixing and **why** it is required.

20.2 Describe the **main stages** in the process of mixing and justify their **order**.

20.3 Discuss the influence of **human hearing, monitoring** and **room acoustics** on the process of mixing.

#### The learner will:

Demonstrate a good understanding of the tools used during mixing and their controls and parameters.

#### The learner can:

20.4 Explain the **function** of equalisers and filters and describe their **controls**.

20.5 Explain the **function** of dynamics units and describe their **controls**.

20.6 **Classify** various audio processes and effects.

20.7 Differentiate effects and processes, and explain **how** to respectively connect them to the mixer.

20.8 Discuss **why** artificial reverberation is sometimes needed.

#### The learner will:

Present 6 original stereo mixes of multi-track recordings: 2 of pre-recorded material (live music), 2 of own recorded material (live music), 2 of own produced material (electronic music). The second mixes will be undertaken after assessment of the first mixes.

#### The learner can:

20.9 Identify the musical genre of the recording to be mixed.

20.10 **Mix** the multi-track to a stereo master that conforms to the **standards** of the identified genre.

20.11 Export the finished mix to a Red Book standard audio CD-R.

20.12 Evaluate own mix. Review and revise approach and plan for second mix.

### **Range (explanation)**

**Purpose (20.1):** Create clarity and separation so that all elements can be heard and contribute to the whole song. Slight biases can be made to favour some elements over others depending on style and taste.

**Why (20.1):** Frequency masking, phase cancellation, inconsistencies in performance, unnatural effect of close microphone techniques.

**Main stages (20.2):** Cleaning up (editing, tuning, quantizing, good gain structure, filtering), corrective EQ of recording, gating / expanding, compressing / limiting, corrective EQ of processing, mixing EQ to resolve clashes, panning, effects and additional processing, automation, stereo mix bus processing.

**Order (20.2):** Filtering and corrective EQ of the recording must be done before compression as low frequencies can affect the response of the compressor, gating / expanding must be done before compression as it is more difficult to remove unwanted low level material once the signal is compressed, compression / limiting can create frequency imbalances that can be resolved by a second EQ stage, panning should only be done once all frequency and phase clashes have been resolved in mono, further effects and processing can then be added to the clear, dry stereo mix. Automation should only be made once the overall balance is almost ready to be recorded, mix bus processing should be applied once the mix is ready otherwise everything is heard through a compressor which will skew judgement.

**Human hearing (20.3):** Fletcher-Munson curves: our frequency biases and how loudness affects perception of frequency balance. Adaptive nature of human hearing: the importance of taking breaks and having external references. How substances like alcohol and drugs can affect perception.

**Monitoring (20.3):** Speaker compression, frequency response. The importance of different monitoring options for comparison.

**Room acoustics (20.3):** Frequency response, symmetry around the monitoring position, control of early reflections, diffused reverberation, background noise and sound proofing.

**Function (20.4):** Affect the frequency balance of a sound.

**Controls (20.4):** Filter: type (HPF, LPF), slope, cut-off frequency. EQ: type (bell, shelf), gain / cut, centre frequency, Q.

**Function (20.5):** Affect the dynamic range of a sound, either reducing it or increasing it.

**Controls (20.5):** Threshold, ratio, attack, release, gain make-up, knee, metering options (gain reduction).

**Classify (20.6):** Into the following categories: pitch-based, amplitude-based, phase-based, time-based.

**How (20.7):** Effects usually add to the dry sound and are typically accessed via effects sends / returns (auxiliary buses). Processes usually modify the sound and are typically accessed via insert send / return points.

**Why (20.8):** If real reverberation is not captured at the time of recording. Depending on recording technique, sounds may lack reverberation, or it may be unbelievable or unsuitable for the track, or instruments sound like they are in different spaces...

**Mix (20.10):** A level and pan balance supplemented by the use of judicious EQ and dynamic control, as well as creative processing and effects, in keeping with the chosen genre (in 20.9).

**Standards (20.10):** The learner will list key aspects that define the identified genre, such as: most prominent instruments (guitars in rock, vocals in pop / r'n'b, rhythm in hip-hop and dance...), use of effects (lots of reverb in new age, delays in dance, minimal reverb in hip-hop...), overall frequency bias (heavy kick in dance / urban, gentle kick in jazz...).

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## Unit 21

## Producing Live Music

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This unit builds on the knowledge and experience acquired through units 19 and 20. It allows the learners to reflect upon recording and mixing practices in order to develop and hone their skills. This unit will also delve deeper into advanced production tools, tricks and techniques that are essential in today's output, and explore how this technology has influenced aspects of modern music production. Learners will finally produce a recording that will incorporate all these tools and techniques, which will be prepared and recorded to a digital 2-track stereo master.

This unit will prepare the learner for unit 22.

This unit is **mandatory** and accounts for 50 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of modern audio standards in recorded live performance music and the tools used to achieve them.

#### The learner can:

21.1 List and define **tools** that achieve improved, tightened performances.

21.2 Discuss the **pros and cons** of such tools.

21.3 Discuss the use of layered, multi-tracked, harmonised vocals in modern pop music and the importance of precise tuning and timing.

#### The learner will:

Produce and present an original piece of recorded live music.

#### The learner can:

21.4 Identify the musical genre of a self-recorded multi-track.

21.5 Perform **additional production** that enhances the recording and conforms to the **standards** of the identified genre.

21.6 **Archive** the finished project on a data CD-R.

21.7 Evaluate the production with regards to stated standards and identified aims.

#### Range (explanation)

**Tools (21.1):** Compression (parallel, multiband), tuning and harmonizing, audio quantizing (warping, elastic audio, beat slicing), sound replacement and audio triggers for synthesised / sampled sounds.

**Pros and cons (21.2):** They can improve poor performances, or save time with good performers, as well as create a distinctive sound of their own. However, overuse will cause noticeable artefacts that may not be desirable.

**Additional production (21.5):** Such as: tuning vocals, quantizing drums / bass, double-tracking guitars or vocals, recording and tuning vocal harmonies, recording additional guitar parts such as

feedback or solos, recording additional percussion, strings or choir, programming additional synthesisers / beats...

**Standards (21.5):** The learner will list key aspects that define the production of the identified musical genre (21.4), such as: use of compression, audible vocal tuning, layered vocals...

**Archive (21.6):** Once the project is complete, delete unused parts and compact / optimize / minimize files. Back-up on personal hard drive. Export a copy and burn onto a data CD-R.

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## Unit 22

## Mastering a Stereo Mix

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This unit builds on the knowledge and experience acquired through units 20 and 21. It provides an introduction to mastering equipment, techniques and terminology. In this unit, learners will have the opportunity to make use of the full capabilities of a digital studio, complete with DAW, high-quality plug-ins and good monitoring. The unit provides learners with the skills and knowledge to enhance their own mixes into a finished product using various types of EQ and effects processing, consistent with current standards in the style of the recording. This end product will be prepared and recorded to a digital 2-track stereo master.

This unit is **mandatory** and accounts for 20 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of the concept and process of mastering.

#### The learner can:

22.1 Explain the **purpose** of mastering and **why** it is required.

22.2 Describe the **main stages** in the process of mastering and justify their **order**.

22.3 Discuss the influence of **human hearing, monitoring** and **room acoustics** on the process of mastering.

#### The learner will:

Demonstrate a good understanding of the tools used during mastering and their controls and parameters.

#### The learner can:

22.4 Explain the **function and purpose** of multiband compressors and describe their **controls**.

22.5 Explain the **function** of peak limiters and their **relationship** to crest-factor and loudness.

22.6 **Discuss** loudness versus dynamic range, crest-factor, transient clarity, impact and stereo imaging.

22.7 Explain how M-S encoding of stereo signals can achieve **greater control** over the mastering process.

#### The learner will:

Present 2 mastered versions of stereo mixes: one of live music and one of electronic music.

#### The learner can:

22.8 Identify **issues** with the mixes, both internal and compared with an external **reference**.

22.9 Master the stereo mixes, showing a high level of skill in manipulating the source audio, so that it is **improved** and the result **conforms** to the stated reference.

22.10 **Archive** the finished project on a data CD-R.

22.11 Export the mastered mix to a Red Book standard audio CD-R.

22.12 Critically evaluate own work with reference to issues outlined and reference CD.

### **Range (explanation)**

**Purpose (22.1):** Create a consistent sound that will translate across all playback systems. Create a coherent sound across a body of work (an album). Satisfy aesthetics of the time in the industry, within a given genre of music (e.g. over-compression for maximum loudness).

**Why (22.1):** Mixing is dependent on often less-than-ideal monitoring systems and environments, which can cause misjudgements or simply not reveal issues, combined with a potential lack of familiarity with the monitoring environment and equipment on the part of the mix engineer. Mixes on an album can also come from different engineers in different studios. All this can cause good mixes to have slight frequency imbalances, either internally or when compared to other mixes.

**Main stages (22.2):** Corrective overall EQ, compression (multi or single band), peak limiting, top and tail, PQ encoding, sample rate conversion (if needed), dithering.

**Order (22.2):** If the mix comes on an analogue format (tape), then perform all analogue processing (if any required) before encoding to digital to minimise sound degradation through multiple AD/DA processes. Once in the digital domain, remain digital. If the mix comes in a digital form (a file), only do analogue processing if the pros (flavour) outweigh the cons of double AD/DA conversion. Generally EQ performed first, compression second, peak limiting third. Fade-ins and outs should be done after rendering compression as otherwise compression effect would vary during fade-in and out (change of input level). Dithering should always be the very process as any other process increases the word length.

**Human hearing (22.3):** Fletcher-Munson curves: our frequency biases and how loudness affects perception of frequency balance. Adaptive nature of human hearing: the importance of taking breaks and having external references. How substances like alcohol and drugs can affect perception.

**Monitoring (22.3):** Speaker compression, frequency response. It is very important that monitors used for mastering are as uncompromising as possible.

**Room acoustics (22.3):** Frequency response, symmetry around the monitoring position, control of early reflections, diffused reverberation, background noise and sound proofing. It is very important that the room used for mastering is carefully acoustically designed to be as perfect as possible.

**Function and purpose (22.4):** A multi-band compressor first separates the input audio into multiple (usually 3 or 4) frequency bands through cross-over filter networks. It then reduces the dynamic range of the audio in each frequency band individually, following individual settings. This allows for more precise / transparent control than a single-band compressor, where a loud kick drum would create audible artefacts in high frequency instruments (pumping), thus allowing for more compression without the pumping.

**Controls (22.4):** Cross-over frequencies, then for each band: threshold, ratio, attack, release, gain make-up, knee, metering options (gain reduction).

**Function (22.5):** Peak limiters reduce fast bursts of sound (transients) that are mostly inaudible but take up a lot of headroom.

**Relationship (22.5):** Once the transients are reduced and headroom retrieved, the main body of the sound (containing the RMS power) can be amplified. The main body of the sound is now closer to the peaks: this is a reduced crest-factor. This achieves more overall loudness.

**Discuss (22.6):** Loudness is increased to the detriment of transient clarity (very high frequencies are lost), punch (impact of dynamic range) and stereo image (loss of very high frequencies).

**Greater control (22.7):** Converting left/right information to middle/side gives the ability to process sounds in the centre of the mix, such as vocals, lead instruments, bass, kick drum and snare drum,

independently from more peripheral instruments. This is more sympathetic to the way stereo mixes are done.

**Issues (22.8):** Focusing on the following categories: tonal balance, dynamic range, loudness.

**Reference (22.8):** Current commercial release (CD quality) of a similar genre.

**Improve (22.9):** Some or all of the issues have been partially or totally addressed without creating other problems / artefacts, through the use of judicious EQ and dynamic control.

**Conforms (22.9):** The result is similar to the chosen reference in terms of loudness, punch, frequency balance and stereo imaging.

**Archive (22.10):** Once the project is complete, delete unused parts and compact / optimize / minimize files. Back-up on personal hard drive. Export a copy and burn onto a data CD-R.

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## Unit 23

## Advanced Digital Audio Concepts

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This unit builds on knowledge acquired in unit 4 and can be used in a variety of ways. Its aim is to be flexible, to enable different projects or approaches to be used to suit its delivery. In this unit, learners will be introduced to the complexities of digital interfacing and clocking. Advanced DSP processes will be explored and evaluated. The unit aims to help learners develop more informed digital workflows and adopt better working practices. This unit will prepare the learner for all further units involving multiple digital hardware, in particular unit 26.

This unit is **mandatory** and accounts for 10 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Develop a rigorous approach to good digital interfacing.

#### The learner can:

23.1 List and compare **digital interfaces**.

23.2 For a given scenario, identify required **digital audio devices**, assess interfacing **options** and connect devices.

23.3 Explain the concept of the master clock and justify own choice given **a range** of devices and situations. Implement, test and review the set-up.

23.4 Discuss digital audio degradation relating to clock jitter and **interfacing jitter**.

#### The learner will:

Develop a rigorous approach to good digital audio processing.

#### The learner can:

23.5 Discuss digital audio quality in terms of **gain structure** and word length.

23.6 Explain dithering and noise-shaping. Compare a few **noise-shaping algorithms**.

23.7 Explain **how** sample rate conversion is achieved. Compare a few **algorithms**.

23.8 Develop and **justify** a general workflow that optimizes quality.

23.9 Justify **when** the use of data reduction is necessary. Compare a few popular **algorithms**.

23.10 Explain what convolution and impulse responses are. Discuss the pros and cons of convolution-based audio processing versus traditional digital signal processing.

23.11 Critically compare DSD and L-PCM digital audio concepts.

#### Range (explanation)

**Digital interfaces (23.1):** S/PDIF, AES/EBU, AES31, ADAT, MIDI, MADI, TDIF...

**Digital audio devices (23.2):** Digital mixer, playback device, recorder, effects units, synthesisers with digital outputs, computers.

**Options (23.2):** From the list of digital interfaces listed in 23.1.

**A range (23.3):** Practical concerns: with and without video devices involved, with and without devices that do not offer a choice of clock, with and without word-clock options, with and without Timecode connection. Once this is addressed, assessing the best clock available.

**Interfacing jitter (23.4):** Long cables and clock distribution (impedance), phase-locked loops, clock feedback.

**Gain structure (23.5):** Recording level into analogue-to-digital converter, multiple analogue-to-digital and digital-to-analogue conversion, input and output levels of plug-ins, plug-in processing resolution, clipping, mixer levels and master faders, mix bus resolution...

**Noise-shaping algorithms (23.6):** POW-r types 1, 2 and 3, UV22, UV22HR, Weiss.

**How (23.7):** Decimation, interpolation, re-sampling.

**Algorithms (23.7):** Various audio software native algorithms, operating system native algorithms, third party specialist algorithms.

**Justify (23.8):** Taking into consideration when to convert analogue to digital, the effect of digital signal processing on word length, the necessary reduction of word length at various stages of the signal path, comparing truncation, dithering and the effects of multiple serial dithering, and taking into consideration the findings of 23.5, 23.6 and 23.7.

**When (23.9):** Bandwidth considerations, storage considerations.

**Algorithms (23.9):** MPEG2 layer 3, AAC, WMA, Apt X, AC3...

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## Unit 24

## Direct to Stereo Recording

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This unit builds on the knowledge and experience acquired through units 14 and 19. It provides an introduction to live sound equipment, techniques and terminology. In this unit, learners will identify the technology used in the live concerts industry and will become familiar with how to set up specified pieces of equipment. This unit develops learners' awareness of the differences involved between recording a performance on a multi-track format with overdubs, and the presentation of a live performance in a concert environment. Learners will set up and operate simple sound reinforcement systems in a safe and aesthetically sympathetic manner. They will then record the performance live to a stereo master digital file, in one take with no overdubs.

This unit is **mandatory** and accounts for 10 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of the specific requirements of recording a live performance.

#### The learner can:

24.1 Critically compare recording a live performance straight to stereo versus recording in a multi-track format.

#### The learner will:

Record and present an original live stereo recording of a live performance.

#### The learner can:

24.2 Record and **mix** a live **performance** straight to stereo.

24.3 Export the finished mix to a Red Book standard audio CD-R.

24.4 Evaluate the recording.

#### Range (explanation)

**Mix (24.2):** A level and pan balance supplemented by the use of judicious EQ and dynamic control, as well as processing and effects if required, in keeping with the chosen genre.

**Performance (24.2):** For the purpose of this assignment, a performance is considered to be at least 4 musicians and must include a minimum of 3 microphones. All musical styles are welcome.

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## Unit 25

## Recording a Live Radio Programme for Broadcast

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This unit builds on knowledge acquired in units 4 and 9. It provides an introduction to broadcast techniques and terminology. In this unit, learners will work on a self-produced project following the requirements of live broadcasting. This unit develops learners' awareness of the live broadcasting industry. Learners will plan a programme and script, record material and prepare additional resources in order to broadcast the programme live at the given time slot. This broadcast will be recorded live to a stereo master digital file. This unit aims to allow learners to use music technology to develop creativity and communication skills while also providing an opportunity for the additional development of problem solving and ICT skills.

This unit is **mandatory** and accounts for 30 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Analyse the brief and prepare materials for the live broadcast.

#### The learner can:

25.1 Investigate a range of ideas in response to the brief.

25.2 Secure **resources** to produce content.

25.3 Assess **techniques** and **produce** content material showing a high level of skill.

25.4 Assess the **live trigger** requirement of the brief and experiment with **tools** to provide a working solution.

#### The learner will:

Produce and broadcast a live radio programme that meets the brief.

#### The learner can:

25.5 Secure **resources**, set-up and test materials in readiness for the live broadcast. 25.6 **Mix** the materials and record the **live** broadcast, straight to stereo.

25.7 Export the recorded broadcast, encode to the **correct** file format and deliver immediately.

25.8 Evaluate the programme.

#### Range (explanation)

**Resources (25.2):** Studio, microphones, person to interview, prepared questions.

**Techniques (25.3):** Where and how to record, time of interview, how much to edit out.

**Produce (25.3):** Good recording (no pops or blasts, no background noise, consistent levels) and judicious editing (no clicks or glitches, good flow, removing unwanted parts) of the interview as appropriate to the brief.

**Live trigger (25.4):** Edited parts of the interview must be triggered during the live broadcast. Problems (parts to be triggered in full, at consistent volume, triggers must be clearly labelled and confusion must be avoided...) must be anticipated and addressed.

**Tools (25.4):** Keyboard and sampler.

**Resources (25.5):** Studio, background music, CD player, person to present the show, microphone, headphones, script, edited triggers from interview, sampler, keyboard.

**Mix (25.6):** A level and pan balance of background music and voices, supplemented by the use of judicious EQ and dynamic control (voice of presenter), as well as processing and effects if required, in keeping with the style of talk radio.

**Live (25.6):** A member of staff will give a start time and observe the recording of the show. At the end of the time slot, the member of staff will collect the recording.

**Correct (25.7):** First to a 16 bit, 44.1kHz, stereo interleaved WAV file, then to a 128kbps mp3 file labelled as follows: 'Radio Show – Course Code - Learner Name.mp3'.

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## Unit 26 Film

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## Producing Audio Post Synchronised Soundtrack for

This unit provides an introduction to audio post-production for video and an overview of equipment, techniques and terminology used in this area. In this unit, learners will have the opportunity to make use of the full capabilities of a digital dubbing suite, complete with DAW, control surface and surround sound monitoring. The unit provides learners with the skills and knowledge to produce their own re-recorded soundtrack, synchronised to picture. The finished product will be prepared and exported to an authored DVD. This unit will produce the material required for unit 27.

This unit is **mandatory** and accounts for 110 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of the requirement for, and the techniques of, audio post production for film.

#### The learner can:

- 26.1 Explain why sound recorded at the time of the original filming cannot always be used.
- 26.2 Identify the **key areas** of audio post production and explain what their purpose is.
- 26.3 Explain a range of technical terms and techniques.

#### The learner will:

Produce a post-synchronised audio soundtrack for a given section of film.

#### The learner can:

- 26.4 **Configure** the work environment, import and edit the **section of film**.
- 26.5 Analyse film segment and break-down visual elements into **categories**. Experiment with a range of **materials, tools and resources**, select and justify the most suitable approach to creating appropriate sound for the visual elements.
- 26.6 Secure **resources** and apply appropriate **techniques**, showing a high level of skill, in order to create appropriate sounds for all visual elements and atmospheres, accurately time-**spotted** where necessary.
- 26.7 Identify the mood of the section of film, source and justify an appropriate piece of **pre-recorded music** to be used where necessary. Edit and spot in place as necessary.
- 26.8 **Archive** the finished project.
- 26.9 Evaluate the post-produced soundtrack.

#### Range (explanation)

**Key areas (26.2):** Location recording, ADR re-recording, Foley performing and recording, sound design, composing and recording music, dubbing mix.

**Configure (26.4):** Synchronise clocks for digital video and audio devices, set-up Timecode link between video and audio streams at the correct frame rate, configure displays so that Timecode and other useful information are shown, set-up inputs and outputs for the hardware and mix buses in the software, set-up delay compensation for video projectors and displays.

**Section of film (26.4):** Pre-allocated section of film, given to the learner in a digitised form as an AAF sequence.

**Categories (26.5):** On- or off- screen dialogue and narration, body movements and live-action related sounds (Foley), real and un-real / hyper-real sounds, environment-related sounds and atmospheres.

**Materials, tools and resources (26.5):** Library of pre-recorded stock sound effects, synthesis and sampling techniques, sourcing own props and special materials for Foley, sourcing actors for dialogue re-recording.

**Resources (26.6):** Studio, microphones, actors and any material selected in 26.5.

**Techniques (26.6):** Efficiently browsing SFX library, importing, editing and spotting effects, layering sound effects, recording ADR with sync plops, using a range of lip-syncing techniques such as editing, time-stretching, 'warping', 'VocAlign', recording and layering Foley effects based on experiments with materials, creating un-real or hyper-real sounds using synthesis and sampling techniques, preparing real-time effects (reverb, delay) and laying down pre-recorded atmospheres and room tone tracks.

**Spotted (26.6):** Placed in the exact time location to match the visuals on screen, i.e. slamming doors, sword clashes, lip-syncing of dialogue.

**Pre-recorded music (26.7):** library music, own composition or music commissioned specifically from another musician, commercial CDs.

**Archive (26.8):** Once the project is complete, delete unused parts and compact / optimize / minimize files. Back-up on personal hard drive. Export a copy and burn onto a DVD-R.

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## Unit 27

## Mixing in Surround Sound

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This unit builds on the knowledge and experience acquired in unit 20, and uses material produced in unit 26. In this unit, learners will have the opportunity to make use of the full capabilities of a digital multi-track surround sound mixing environment. The unit provides learners with the skills and knowledge to enhance their audio post-produced soundtrack into a finished product, using automation, snapshots and various types of effects / processing, consistent with current standards in film sound. The emphasis here will be on 5.1 surround sound placement. Learners will investigate surround sound mixes for film and identify standard sound placement conventions which they will then apply to their own work. The finished product will be prepared and exported to an authored DVD.

This unit is **mandatory** and accounts for 10 hours of the total recommended guided learning hours.

### Learning Outcomes:

#### The learner will:

Demonstrate a good understanding of the history and evolution of surround sound formats in film and music releases, with a view to predicting, and adapting to, future developments.

#### The learner can:

- 27.1 Describe the quadraphonic concept and give **reasons** why it failed.
- 27.2 **Justify** the existence of the centre speaker in all surround formats since quadraphonic.
- 27.3 Chart the evolution of **surround formats** in film and explain the **terminology**. Explain the purpose of the rear and LFE channels.
- 27.4 Chart the evolution of **surround formats** in music releases. Discuss the pros and cons of the **physical formats** and **speaker layouts** used.
- 27.5 Discuss and compare different mixing **approaches** for film and music, in particular with relation to the use of the centre speaker and the LFE channel.
- 27.6 Compare surround **re-mixing approaches** used with music re-releases. Evaluate flaws based on **limitations** of source material and propose system to better archive projects.
- 27.7 Discuss **limitations** when mixing music in surround, when recorded using traditional techniques. Review **emerging** surround sound recording techniques and propose new ways to better record music projects.
- 27.8 Compare surround sound to binaural audio. Review how music and films are being **consumed** today and extrapolate future developments in the film and music industries, in terms of audio production standards.

#### The learner will:

Produce and present a surround sound mix of a film.

#### The learner can:

- 27.9 **Mix** the multi-track of post-produced audio to a 5.1 surround sound master, demonstrating a high level of skill and conforming to accepted industry standards.
- 27.10 Export and encode the finished **mix**.
- 27.11 **Author** a playable DVD-R containing the synchronised video and audio mix.

## 27.12 Evaluate the mix.

### **Range (explanation)**

**Reasons (27.1):** Flawed concept, rival incompatible speaker layouts, limitations of the physical format used for release, limitations of speaker design and amplifier technology.

**Justify (27.2):** Formats are film based. Film requires a physical centre speaker to provide real centre images to audiences seated far from the sweet spot.

**Surround formats (27.3):** Analogue, optical, matrixed LCRS formats (Dolby Stereo, Dolby Surround, Dolby Matrix, Dolby Pro Logic and Pro Logic II), digital, discrete 5.1 formats (Dolby Digital, DTS, Dolby Digital EX, DTS ES Matrix), 6.1 formats (DTS ES Discrete), 7.1 and HD formats (SDDS, Dolby TrueHD, DTS HD).

**Terminology (27.3):** Matrixed versus discrete, speaker layout terminology such as 5.1, LFE.

**Surround formats (27.4):** Quadraphonic, Dolby Pro Logic, Dolby Digital, DTS.

**Physical formats (27.4):** SACD, DVD-A, DVD-V.

**Speaker layouts (27.4):** Usually based on film specified 5.1 rather than music specified 5.1.

**Approaches (27.5):** LFE is optional and should be accessed as an effect send only, centre channel for all important elements on screen (film), centre channel debate (music) for vocals.

**Re-mixing approaches (27.6):** Re-mix from multi-track, stem mix, up-mix from stereo master.

**Limitations (27.6):** Multi-track might not have effects and processes rendered so the sound might be very different to the original mix. Stems capture the sound but are a restriction and are not always available. Up-mixing is always the worse option but might be the only option available.

**Limitations (27.7):** Traditional stereo recording techniques will not capture the full sound field and will restrict panning options.

**Emerging (27.7):** Multi-mic set-up, M-S-D, Ambisonics, Holophone etc.

**Consumed (27.8):** Music: portable players and data reduced downloaded files, headphones over speakers, poor speaker set-ups for stereo. Film: 3D technology, internet downloads and streaming. The end of physical formats?

**Mix (27.9):** A level and surround pan balance supplemented by the use of judicious automation, EQ and dynamic control, as well as creative processing and effects.

**Mix (27.10):** First exported as discrete high resolution files, then encoded and interleaved to Dolby Digital AC3 for DVD authoring.

**Author (27.11):** Create a standard, playable DVD-V with basic menu interaction.