Music Technology
PLC

Area of Study 1 Recording and Production techniques for both corrective and creative purposes

Topic	Content	Skills, Knowledge and Understanding	RAG	Evidence
1.1 Software and Hardware	1.1.1 The core and Advanced functions of a digital audio workstation (DAW)	ALL FUNCTIONS BELOW		
	1.1.2 Names, purposes and functions of hardware	Microphones (D112, NT2A, NT5, SM57, SM58)		
		Audio Interfaces		
		Microphone pre-amps		
		DI Boxes		
		Mixing desks		
		Outboard effects		
		Guitar pedals		
		Controller keyboard		
	1.1.3 Other programming environments and new and emerging software	Awareness of new, alternative software environments used in music production. Ableton, Logic 9, Logic X, Cubase, Protools		
		MIDI		
		OSC		
	1.1.4 The impact of new and emerging software of music production	The contribution of new music technology to music production practices		
1.2 Capture of Sound	1.2.1 Gain structure and how it affects noise and distortion	Setting gain to maximise signal-to-noise ratio		
		Avoiding clipping, interference and hiss		
		Checking input and output levels when several effects/pieces of hardware are chained together		
		Pre-amp controls such as phantom power, gain, pad, high pass filter, polarity, clip/activity LED		
	1.2.2 The Characteristics and suitability of microphone types	Dynamic microphones		
		Condenser microphones		
		Ribbon microphones		
	1.2.3 The suitability of microphone placement techniques	Suitable distances/ angles (mic placement)		
		Recording instruments using 1 microphone (vocals, wind/brass/strings, guitar amps)		
		Recording instruments using multiple microphones, e.g. drum kit		
	1.2.4 The advantages and disadvantages of microphone	On-axis and off-axis frequency responses		
		Directional: cardioid, hypercardioid, figure of 8		
		Omnidirectional		

	disadvantages of microphone types in terms of polar pattern and frequency response	Advantages and disadvantages of different polar patterns		
		Proximity effect		
		Frequency response and transient response of microphones		
	1.2.5 Advanced microphone techniques	Understand phase relationships between multiple microphones		
		Coincident pairs		
		Spaced stereo pairs		
	1.2.6 How microphones work	Sensitivty		
		Electromagnetic induction		
		Capacitance		
		Diaphragms		
		Moving coil		
		Plates		
		Phantom power		
		Microphone switches (pad, high pass, polar pattern switch)		
		Microphone accessories (pop shield, elastic/suspension cradle)		
1.3 Synthesis	1.3.1 How synthesis is used to create sounds	Selecting and mixing sine, triangle, pulse, square and saw waveforms		
		white noise		
		Low frequency oscillator (LFO)		
		Low pass/ high pass filters		
		Envelopes		
	1.3.2 How timbre is affected by a wider range of parameters	Cut-off frequency		
		Resonance		
		ADSR/ AHDSFR amplitude envelope		
		Mapping envelope and LFO to filter cut-off and pitch		
		Oscillator tuning (Octave, course , fine)		
		Pitch bend range		
		Monophonic synthesiser		
		Polyphonic synthesiser		
		Portamento		
		Arpeggiator		
1.4 Sampling	1.4.1 Pitch mapping	Transposing		
	1.4.2 Editing samples	Cutting and trimming		
	1.4.3 Looping	Loop points		
		Zero crossings		
		Cross-fade looping		
	1.4.4 Advanced parameters	Sample rate		
		Bit depth		
		Using synthesis parameters on samples (e.g. filter and envelope)		
		Setting pitch key zones		
		Velocity layering		
		Time-stretch		
		Reversing samples		

1.5 Sequencing	1.5.1 Real-time input	Using a MIDI controller keyboard		
	1.5.2 Non-real time input	Step grid (drum editor/ piano roll)		
		Using the pencil tool to draw in notes		
	1.5.3 Quantise	Hard quantise values, e.g. 1/8, 1/12, 1/16, 1/32 (and note length equivalents)		
		Swing/ percentage quantise		
		Snap/ Grid		
	1.5.4 Editing skills	Velocity and note length		
		Piano and list editor		
		Cutting, looping and duplicating		
	1.5.5 How MIDI works by studying data bytes	Note on/off		
		Pitch		
		Controllers (controller keys)		
		Pitch bend		
		Most Significant Bit and Least Significant Bit (MSB and LSB) - The prioritising of values when transmitting MIDI in binary code.		
		Tempo data in bpm		
1.6 Audio editing	1.6.1 Truncating	Scissor tool/ split		
		Lead-in and lead-out times		
	1.6.2 How to remove clicks and noise	Removing hiss, hum and plosives		
		Fades and cross-fades		
	1.6.3 How and why clicks and other noises occur	Examples include discontinuous waveforms and plosives		
	1.6.4 Audio editing functions	Normalising		
		Inverting waveforms		
1.7 Pitch and Rhythm correction and manipulation	1.7.1 How to correct inaccuracies in pitch	Retuning a vocal part with automatic tuning		
		Manually tuning individual notes by drawing in pitch		
		Manually tuning by playing via MIDI		
		Replacing small errors with material from elsewhere in the song		
		Manually tuning by using offline processes such as a pitch shifter		
	1.7.2 How to correct inaccuracies in rhythm	Tightening drum parts using audio quantise		
		Replacing small errors with material from elsewhere in the song		
		Manually cutting and moving notes that are out of time		
		Pitch: Use of autotune as a creative effect		
		Pitch: autotune response time		

	1.7.3 Parameters that allow greater control and creativity	Pitch: selectong different algorithms		
		Pitch: formant shifts		
		Pitch: fine tuning in cents		
		Pitch: polyphonic retuning		
		Rhythm: Transient detection threshold		
		Rhythm: Groove templates		
		Rhythm: Selecting different algorithms		
		Rhythm: time-stretch		
1.8 Automation	1.8.1 How to use volume and pan automation	Fades		
		Movement in the stereo field		
	1.8.2 Automating parameters of plug-ins	For example: cut off frequency and delay feedback		
1.9 Dynamic processing	1.9.1 Uses of compression and gating	Situations when you would use a compressor and/or gate		
		Limiting		
		Expansion		
		De-essing		
		Pumping		
	1.9.2 Core and advanced parameters of a compressor and gate	Compressor threshold		
		Compressor ratio		
		Compressor make-up gain		
		Compressor attack		
		Compressor release		
		Compressor knee		
		Compressor side-chain		
		Gate threshold		
		Gate reduction/ range		
		Gate attack		
		Gate release		
		Gate hold		
		Gate side-chain		
		Drawing graphs of compression and gating		
1.10 Stereo	1.10.1 Pan	Setting pan positions for individual parts (tracks, instruments and/or vocals) in a		
	1.10.2 Panning law, mono-summing and mid-side processing	stereo widening		
		Mono compatibility		
1.11 EQ	1.11.1 Different types of EQ used in a recording	High-shelf		
		Band		
		Low pass filter		
		High pass filter		
		Band pass filter		
		Parametric EQ		
		Graphic EQ		
		Correcting problems including sibilance, noise and resonances		

	1.11.2 How different parameters affect the sound	Gain		
		Frequency/ cut-off		
		Q		
		Slope		
		Resonance		
		Drawing graphs of EQ		
1.12 Effects	1.12.1 Core and Advanced parameters	Wet/ Dry and bypass settings		
		Using sends and inserts		
		Core and advanced parameters as listed for each effect		
	1.12.2 Reverb	Room		
		Hall		
		Plate		
		Spring		
		Gated		
		Reversed		
		Reverb Time		
		Pre-delay time		
		High frequency damping		
	1.12.3 Delay	Single and multi-tap delay		
		Slapback		
		Timed delay		
		Ping-pong delay		
		Delay time		
		Feedback		
		Number of repeats		
		Delay pan and EQ		
		Automatic double tracking (ADT)		
	1.12.4 Modulated delay	Flange		
		Chorus		
		Phaser		
		LFO Rate		
		LFO Depth		
		LFO Feedback		
		Comb filtering		
	1.12.5 Wah wah pedal	Band pass filter		
	1.12.6 Distortion	Overdrive		
		Fuzz		
		Gain/drive		
		Tone		
		Amp modelling parameters		
		Amps and speaker types		
		Virtual mic type/placement		
	1.12.7 Tremolo	LFO rate; LFO depth		
	1.12.8 Vocal Effects	Vocoder/ Talk box		
1.13 Balance and Blend	1.13.1 Balance	The relative balance of parts (tracks, instrument and/or vocals)		
	1.13.2 Blend	How blend is affected by compression, EQ and effects		
	1.14.1 Percieved volume	Limiting		

1.14 Mastering	1.14.2 Mastering parameters	Limiter gain		
		Fade in/ fade out		
	1.14.3 Understanding how EQ is used in the mastering process	Master EQ (e.g. high shelf boost and rumble (high pass) filter)		

Area of Study 2: Principles of audio and sound technology

Topic	Content	Skills, Knowledge and Understanding	RAG	Evidence
2.1 Acoustics	2.1.1 How the live room acoustics affect the recording	Room size		
		Absorption		
		Reflection		
		Diffusion		
		Isolation booths for vocals, drums and amps		
	2.1.2 Acoustics parameters	Describing a reverb tail: Pre-delay time, early and late reflections, reverberation time, resonant frequencies		
2.2 Monitor Speakers	2.2.1 The characteristics of different monitor speakers	The frequency range of tweeters		
		The frequency range of woofers		
		The frequency range of subwoofers		
	2.2.2 How monitor speakers work	Electromagnetic induction		
	2.2.3 How different types of monitor speakers affect mix translation	Checking mixes on different monitoring (i.e. headphones, speakers with pronounced mid range, and systems with subwoofers)		
2.3 Leads and Signals	2.3.1 How leads work	Balanced connections		
		Unbalanced connections		
	2.3.2 Connectivity including signal path and signal types	Aux sends		
		Insert points		
		Sub-groups		
		Mixer channel strips		
	2.3.3 The different types of leads	Jack		
		XLR		
		MIDI Cable (5 pin)		
		Digital ins/outs		
		Computer cables (USB, firewire)		
		Using balanced connections to avoid noise issues such as hum, hiss and rumble		
		Using DI boxes		
	2.3.4 Impedance	Signal levels: Mic, Line, Instrument		
	2.3.5 The advantages and disadvantages of different leads and connectivity	Comparing balanced and unbalanced		
		Comparing analogue and digital connections		

		Comparing computer data connections (USB vs Firewire)		
2.4 Digital and Analogue	2.4.1 The differences between digital and analogue technologies	Frequency response		
		Signal to noise ratio		
		Headroom		
		Digital clipping		
		Analogue Clipping		
		How components such as valves and transistors affect the sound		
2.5 Numeracy	2.5.1 How to display and interpret information graphically	Waveforms		
		EQ Curves		
		Compressor responses		
		Amplitude envelopes		
		Interpreting frequency response diagrams how sound quality is affected		
		Interpreting polar response graphs to understand how sound quality is affected		
	2.5.2 Technical Numeracy	Parameter settings and associated units of measurement		
		Levels in Db		
		Frequency in hertz/kilohertz		
		Delay time in milliseconds/ note values		
		Tempo in bpm		
		Synthesiser octave settings in feet		
		Course tuning in semitones		
		Fine tuning in cents		
		Feedback and effects mix percentages		
		Understand binary, formulae and logarithms and how they are used in music technology		
	2.5.3 How to make calculations to describe sound waves	Waveform frequency		
		Waveform phase		
		Waveform amplitude		
2.6 Levels	2.6.1 Principles of levels and metering	Management of levels to prevent distortion and maximise signal-to-noise ratio		
	2.6.2 Levels and metering scales	Decibel scales: when to use peak metering		
		Decibel scales: when to use RMS metering		
		Psycho-acoutics related to percieved volume		
	2.6.3 The scpecifications of digital recordings and how they affect sound quality	A/D and D/A conversion		
		Sample rate		
		Bit depth		
		Streaming bit rate		
		Uncompressed PCM Audio formats (e.g. WAV)		

		Data compressed formats (e.g MP3)		

Area of Study 3: The development of recording and production technology

Topic	Content	Skills, Knowledge and Understanding	RAG	Evidence
3.1 Software and Hardware: Digital	3.1.1 Digital hardware/ software attributes	The differences between digital and analogue recordings		
		The advantages and disadvantages of digital hardware/software		
		Graphical user interfaces (GUI)		
		Sampling theory and converters		
	3.1.2 Digital sequencing and digital audio workstations	Core and advanced functions of a DAW		
		Real-time (native) processing		
		Software instruments		
		Non-destructive editing		
		Non-linear editing		
		Convolution reverb		
		Amp modelling		
	3.1.3 Digital consumer formats	CD		
		MP3/ M4a		
		High definition masters		
		Emerging technologies		
		Data bit rate		
	3.1.4 Digital recording and sampling hardware	Digital multitrack formats		
		Sampling with limited available memory		
3.2 Hardware: Analogue	3.2.1 Analogue hardware attributes	The difference between analogue and digital recordings		
		The advantages and disadvantages of analogue recordings		
		Valves		
		Soft clipping		
		Tape saturation		
		Solid State (Transistor) amplifiers/ distortion for hard clipping		
		Maintenance issues and variations in frequency and pitch: Wow and Flutter		
	3.2.2 Tape machines	Editing and splicing		
		Multitrack tape formats		
	3.2.3 Analogue consumer formats	Vinyl		
		Cassette tape		
		Mono and stereo releases		
		Mixing and mastering principles for analogue formats (e.g. vinyl and casette)		
	3.2.4 Analogue effects	Delay: Tape		
		Delay: Bucket Brigade		
		Mechanical reverbs: plate		
		Mechanical reverbs: spring		
		Rotary speaker (Leslie)		
		Vinyl scratching		

		Pitch changes using vinyl and tape		
		Reversing using vinyl and tape		
	3.2.5 Analogue synthesisers	Advantages and disadvantages of analogue synthesisers		
		modules and patching (modular synethisers)		
	3.2.6 Electric instruments	Electric guitar		
		Electric bass guitar		
		Theremin		
		Mellotron		
		Electric organ		
		Electric piano		
		Clavinet		

Component-specific knowledge

Topic	Content	Skills, Knowledge and Understanding	RAG	Evidence
4.1 - Component 3	4.1.1 Understanding of the instruments and sounds associated with the following styles:	Jazz		
		Blues		
		Rock 'n' Roll		
		Rock		
		Metal		
		Punk		
		Soul		
		Disco and Funk		
		Reggae		
		Acoustic and folk		
		Commercial pop		
		Urban		
		Electronic and dance		
	4.1.2 History and development of recording and production technology through the following eras:	Digital audio workstations and emerging technologies (c. 1996-present day)		
		Digital recording and sequencing (c. 1980-present day)		
		Large-scale analogue multitrack (c. 1969-1995)		
		Early multitrack recording (c. 1964-69)		
		Direct to tape mono recording (c. 1930-1963)		