

Higher National Unit Specification

General information for centres

Unit title: Acoustics 2

Unit code: DR2V 36

Unit purpose: This Unit is designed to enable candidates to demonstrate competence and understanding of the nature of sound, how the human hearing system receives and interprets sound and how sound behaves in certain environments. It will provide advanced knowledge of the nature of sound for candidates who expect to be involved within the field of audio. It may also be relevant to those already involved in the field of audio.

On completion of the Unit the candidate should be able to:

- 1 Analyse the principles of psychoacoustics.
- 2 Analyse techniques of acoustic measurement.
- 3 Propose the acoustic requirements for an audio studio and control room.

Credit points and level: 1 HN Credit at SCQF level 9: (8 SCQF credit points at SCQF level 9*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Recommended prior knowledge and skills: Access to this Unit is at the discretion of the centre. It is highly recommended that candidates have completed the HN Unit Acoustics 1 (DJ1W 34) or equivalent.

Core Skills: There may be opportunities to gather evidence towards Core Skills in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: The Unit should be assessed using three separate instruments of assessment. Each Outcome should be assessed separately. Candidates must achieve the minimum evidence specified for each Outcome.

- Outcome 1 The assessment should consist of a set of restricted response questions. Evidence should be generated through assessment undertaken in closed-book controlled conditions.

General information for centres (cont)

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- Outcome 2 The assessment will take the form of a case study. Evidence should be generated through assessment undertaken in open-book controlled conditions.
- Outcome 3 The assessment will be in the form of a project requiring candidates to devise the acoustical design of a popular music studio and control room. Evidence should be submitted in the form of a report. Each candidate must generate evidence individually but may do so in unsupervised conditions, in their own time or at a time determined by them.

Higher National Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Analyse the principles of psychoacoustics

Knowledge and/or skills

- ◆ Psychoacoustic pitch perception
- ◆ Spatial audio psychoacoustics

Evidence Requirements

Each candidate will need to provide evidence to demonstrate their knowledge and/or skills by correctly describing the basic principles of psychoacoustics. Candidates will need evidence to show that they can:

- ◆ analyse psychoacoustic elements of pitch perception with respect to loudness of pure tones versus complex tones
- ◆ analyse the interaction effects of beat tones and combination tones
- ◆ demonstrate an understanding of using the precedence effect as a creative production technique
- ◆ demonstrate an understanding of the spatial cues as affected by different environments
- ◆ analyse the effect of spatial audio cues with reference to different listening formats
- ◆ analyse the effect of spatial audio cues with reference to Head Related Transfer Function (HRTF)

Evidence for this Outcome should be generated by solutions to a set of restricted response questions. The assessment should be undertaken in closed-book controlled conditions.

Assessment guidelines

The assessment for this Outcome should not be combined with other Outcomes.

Should there be ambiguity regarding a candidate's response, oral questioning may be used to eliminate any doubt as to the candidate's understanding. The lecturer should note questions and responses.

Higher National Unit specification: statement of standards (cont)

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Outcome 2

Analyse techniques of acoustic measurement

Knowledge and/or skills

- ◆ Acoustic measurement techniques
- ◆ Acoustic measuring equipment
- ◆ Criteria for acoustic measurement

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by, correctly analysing the techniques of acoustic measurement, showing that they can:

- ◆ analyse measurement techniques in relation to frequency, amplitude and RT60 in the field of audio
- ◆ identify and describe equipment used for acoustic measurement
- ◆ describe the criteria for acoustic measurement in common environments
- ◆ interpret audio measurement data to achieve desirable room acoustics

Evidence for this Outcome should be generated by responses to questions based on a case study. The assessment should be undertaken in open-book controlled conditions.

Assessment guidelines

The assessment for this Outcome should not be combined with other Outcomes.

Should there be ambiguity regarding a candidate's response, oral questioning may be used to eliminate any doubt as to the candidate's understanding. The lecturer should note questions and responses.

Outcome 3

Propose the acoustic requirements for an audio studio and control room

Knowledge and/or skills

- ◆ Design to acoustic criteria
- ◆ Room acoustics
- ◆ Reverberation properties
- ◆ Acoustic remediation/treatment
- ◆ Acoustic isolation
- ◆ Acoustic quality

Higher National Unit specification: statement of standards (cont)

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Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ provide a design of an audio studio and control room
- ◆ justify the design in terms of suitability for the performance and reproduction of audio
- ◆ justify suitable construction materials that fulfil the acoustic criteria in terms of absorption/reflection, isolation and reverberation time
- ◆ estimate the RT60 for the studio and control room

The assessment of this Outcome should take the form of a project requiring candidates to devise the acoustical design of a popular music studio and control room. Evidence should be submitted as a report. Each candidate must generate evidence individually but may do so in unsupervised conditions, in their own time or at a time determined by them. It is anticipated that evidence will be produced over a period of 4-6 weeks, towards the end of the period of study.

Assessment guidelines

The assessment for this Outcome should not be combined with other Outcomes.

It is envisaged that this Unit will be assessed independently. However it may be possible to integrate this Outcome with the Unit Audio System Design (DRON 35) and form a major report on the design and installation of a recording studio.

Administrative Information

Unit code: DR2V 36
Unit title: Acoustics 2
Superclass category: RC
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History of changes:

Version	Description of change	Date
02	Removal of Word Count and Presentation Length.	02/06/11

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Higher National Unit specification: support notes

Unit title: Acoustics 2

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit is intended to provide candidates with advanced knowledge and understanding of acoustics and the importance of acoustics to the production of popular music. Candidates should be able to relate knowledge of the nature of sound, gained in the HN Unit Acoustics 1 (DJ1W 34), to the Outcomes in this Unit. Therefore, it is highly recommended that candidates possess the HN Unit Acoustics 1 (DJ1W 34) before progressing to this Unit.

Outcome 1 — Analyse the principles of psychoacoustics

- ◆ Psychoacoustic pitch perception
 - precedence effect — feature of transient sounds in relation to amplitude and timeframes involved
 - effect of temporal fusion
 - the work of Haas
 - pitch perceptions: relationship between pitch and loudness of pure tone; how effect varies depending on initial pitch of tone; psychoacoustic effective — subjective for the listener — more prominent in lower registers
 - interaction effects of beats and combination tones: beats being an example of interference of two sound waves that differ in frequency by a small amount; combination tones — sum tones ($f_1 + f_2$) and difference tones ($f_1 - f_2$) where f_1 and f_2 are positive integers. Sum and difference tones occur where two tones differ by more than 50 Hz. Subjective tones
- ◆ Spatial audio psychoacoustic factors
 - cues involved with the head related transfer function for sound source localisation (time, amplitude and spectral cues)
 - distance and depth perception
 - apparent source width
 - envelopment and spaciousness

Outcome 2 — Analyse techniques of acoustic measurement

- ◆ Industry standard measurement techniques: time-delay spectrometry, maximum length sequence signal analysis, impulse measurement and weighted measures.
- ◆ Measuring equipment: sound level meter, oscilloscope, spectrum analyser and calibrated microphone.
- ◆ Criteria for acoustic measurement: preferred reverb time, frequency response of rooms, equalisation of rooms, direct and reflected sound interaction, sound levels with regard to Health and Safety guidelines.

Higher National Unit specification: support notes (cont)

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Outcome 3 requires the application of acoustic theory to a design project. Candidates will produce the design for an audio studio and control room and justify the design in terms of suitability for the performance and reproduction of audio including comments on suitable construction materials in terms of absorption/reflection, isolation and reverberation time.

Guidance on the delivery and assessment of this Unit

This is an optional Unit in the framework for the HND Sound Production Group Award. It will enable candidates to demonstrate competence and understanding of the nature of sound, how the human hearing system receives and interprets sound and how sound behaves in certain environments. It will also provide advanced knowledge of the nature of sound for candidates who expect to be involved within the field of audio. It may also be relevant to those already involved in the field of audio.

Some commercial video resources are available and can aid the facilitation of learning. There are numerous internet sites from which information can be obtained.

Each of the Outcomes should be assessed individually:

Outcome 1 — The assessment should consist of restricted response questions, with the assessment event undertaken in closed-book controlled conditions.

Outcome 2 — The assessment will take the form of a case study. The assessment should be undertaken in open-book controlled conditions.

Outcome 3 — The assessment should be in the form of a design project. Candidate responses in the form of reports. Each candidate must generate evidence individually but may do so in unsupervised conditions, in their own time or at a time determined by them.

Open learning

Open or distance learning could be used in the delivery of this Unit. However, it would require planning by the centre to ensure the sufficiency and authenticity of candidate evidence. Arrangements would have to be made to ensure that the assessment(s) are delivered in an appropriate manner.

For further information and advice please refer to *Assessment and Quality Assurance for Open and Distance Learning (SQA,-2001 — publication code A1030)*

Candidates with additional support needs

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on the SQA website www.sqa.org.uk.

General information for candidates

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This Unit is intended to provide you with advanced knowledge and understanding of acoustics and the importance of acoustics to the production of popular music. It will enable you to demonstrate competence and understanding of the nature of sound, how the human hearing system receives and interprets sound and how sound behaves in certain environments. It will also provide underpinning knowledge of the nature of sound for those of you who expect to be, or are already, involved within the field of audio.

This Unit is intended as a progression from the HN Unit: Acoustics 1 (DJ1W 34). Therefore, it is highly recommended that you possess the Acoustics 1 Unit before undertaking this Unit. You will then be able to relate knowledge of the nature of sound gained in Acoustics 1 to Outcomes in this Unit.

On completion of the Unit you should be able to:

- 1 Analyse the principles of psychoacoustics.
- 2 Analyse techniques of acoustic measurement.
- 3 Propose the acoustic requirements for an audio studio and control room.

Each of the Outcomes will be assessed individually:

Outcome 1 — The assessment is a set of restricted response questions and the assessment event will be undertaken in closed-book controlled conditions.

Outcome 2 — The assessment is a case study. The assessment will be undertaken in open-book controlled conditions.

Outcome 3 — The assessment will be in the form of a project. You must produce your own report in unsupervised conditions, in your own time or at a time determined by you.