Liverpool John Moores University

Title:	SOUND TECHNOLOGY THEORY 1
Status:	Definitive
Code:	**4512STE** (118563)
Version Start Date:	01-08-2016
Owning School/Faculty:	Electronics and Electrical Engineering
Teaching School/Faculty:	Liverpool Institute for Performing Arts

Team	Leader
Karl Jones	Y

Academic Level:	FHEQ4	**Credit Value:**	12	**Total Delivered Hours:**	35.5
Total Learning Hours:	120	**Private Study:**	84.5		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	24
Workshop	10

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Test	QUESTIONS	TUTORIAL QUESTIONS	10	
Report	SPREADSHEE E	SPREADSHEET ASSIGNMENT	30	
Exam	EXAM	WRITTEN EXAM	60	1.5

Aims

This module will provide students with the theoretical knowledge underpinning the practical techniques taught in Core Recording Skills and will form the foundation for many of the other modules on the course. Whereas the theoretical elements of Core Recording Skills are very much rooted in specific practical techniques, the theory in this module is intended to apply to many general sound engineering applications.

There is an element of mathematics in this module and students will be expected to understand and apply simple formulae using both calculators and spreadsheets - but this will always be presented within the context of sound recording.
The workshops will introduce spreadsheet based software techniques for dealing with the theory of audio signals and will be used to demonstrate how much of the objective consideration of these signals can be dealt with by using simple equations and graphs.

Learning Outcomes

After completing the module the student should be able to:

1	Demonstrate a theoretical understanding of the physical principles and metrics associated with basic acoustics, audio systems and psychoacoustics
2	Explain the basic operating principles of transducers, metering systems and digital audio devices.
3	Perform calculations using acoustic pressure, decibels, time, frequency, wavelength, distance and other common measurement scales.
4	Use spreadsheets in the context of audio and acoustic systems parameter calculation and graphing

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

TUTORIAL QUESTIONS	1	3	
SPREADSHEET ASSIGNMENT	1	3	4
WRITTEN EXAM	1	2	3

Outline Syllabus

The Physics of Sound
Objective vs subjective; What is sound?; Wavelength, period and frequency; Graphical representation; Sine wave; Small and large numbers; Fourier addition and complex sounds; Harmonic and Enharmonic sounds; Pitch; Envelope.

Decibel Scales
Root Mean Square; Linear and non-linear scales; Powers and ratios; Logarithmic func-tions; Exponents; The Bel; Decibels; Sound Power, Sound Intensity and Sound Pressure; Voltage Levels; Common dB scales; Inverse Square Law.

The Human Ear
Anatomy. Outer, middle and inner ear; Loudness perception; Equal loudness contours; Frequency and pitch perception; Masking; Precedence (Haas) Effect; Localisation; Head Related Transfer Function; Hearing Damage.

Sound Source Interaction

Adding signals; Coherence and Correlation; Phase relationships; Adding decibels; Comb filtering.

Technical Specifications
Sound Quality; Frequency Response; Noise; Signal to Noise Ratio; Dynamic Range; Harmonic Distortion, THD; Modulation Distortion; Wow and Flutter; Crosstalk; Graphical representation; Weighting curves; Gain Structure.

Digital Audio
Description versus representation; Analogue and Digital compared; Binary Numbers and Codes; Sampling basics; The Nyquist Theory; Quantisation and bit depth; Quantisation Error and Noise; Dither; Digital Clocks and Synchronisation; Error correction and concealment; Digital audio in practice.

Electroacoustic Transducers
Microphone mechanisms; Microphone directivity; Sensitivity; Moving Coil Loudspeakers; Loudspeaker mounting; Cabinet Types; Multiple Drivers and Crossovers; Efficiency; Active Loudspeakers; Other mechanisms.

Stereo and Metering
Psychoacoustic principles of stereo; Basic Stereo Microphone Techniques; Stereo Reproduction; Stereo Panning; Metering conventions.

Room Acoustics
Direct and Reverberant Sound; Reflection and Absorption; Reverberation Time; Equation; Recommended RT; Room Modal Resonances; Modal Frequency Distribution; Room Behaviour; Frequency Regions; Absorber Types; Reflection and Diffusion.

Studio Design
Sound Isolation Problems; Stiffness Region; Mass Law Region; Critical Frequency and Coincidence; Noise Rating Curves; Control Room Acoustics; Early Reflections; Control Room Approaches.

Learning Activities

Teaching in this module is delivered primarily through lectures and workshops over a 10-week period. Each week, there is one lecture of 2 hours. A weekly tutorial sheet containing questions relating to the lecture material will be handed out for the first 5 weeks.
On alternate weeks students are required to attend a 2-hour computer based workshop where a spreadsheet will be used to perform calculations and plot graphs relevant to the material covered in the lecture. There are 5 workshops in total.

Notes

It is vitally important in this module that students keep up with any suggested

reading, and ensure that they have worked through any topics covered in a lecture in their own time. Because much of this module is of a theoretical nature, private study forms an important part of this module.
Students are also encouraged to conduct their own research into books and websites for assistance in this module.