Investigating Issues Relating to Effective, Large Group, Music Technology Teaching: The Portable Recording Studio Project

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Contents:

Chapter 1: Introduction

This project is concerned with the teaching and delivery of Music Technology related subjects within an Electronic Engineering department, and concentrates more specifically on those courses relating to the techniques used and the technologies found in the modern recording studio. Courses in Music Technology, as with most other Engineering related disciplines, are usually designed such that lectures and practical sessions are delivered in parallel, allowing students to explore the practical application of the theoretical concepts that are delivered through the more traditional lecture format. In the case of most traditional engineering or computer related courses, this practical work is organised and implemented through large scale electronics or PC lab exercises. As such a large number of students can work on an exercise simultaneously, either individually or in groups, usually with one academic directing or supervising the class together with a number of demonstrators who are available to offer support and help with the individual problems that are bound to arise.

Some specific music technology courses that making use of this typical format are as follows. In Year 3, MEng Music Technology Systems (MTS) students take the Music ECAD course, delivered in its entirety through practical lab exercises. This involves working through a comprehensive script consisting of a number of incremental exercises over the course of 15 hours of timetabled labs. Other courses, such as Advanced Music Technology Systems in Year 4 of the same degree programme use both lectures and individual lab exercises. The lab exercises use various software packages to allow the students to both explore some of the fundamental ideas delivered within the accompanying lectures and stimulate and encourage individual research into the broader subject material as a whole in preparation for the individual project that starts the following term.

However, these methods of delivery seem inappropriate for courses that are centred round the use of the highly specialised resource that is a recording studio. The studio environment consists of a complex suite of application specific tools that are designed and integrated to facilitate the capture, storage, processing and reproduction of sound. Fully appreciating and understanding how this environment works requires knowledge of a broad range of subject areas such as physics, acoustics, electronics and digital signal processing. The influence of the computer in a modern studio also implies that a typical studio engineer must have a good working knowledge of computer systems related subject areas such as real-time systems, networking and systems administration, together with general software and hardware

maintenance. It can be seen then that a course that initially seems highly specific will actually integrate well into a typical engineering degree programme as it calls upon much of the knowledge that is gained elsewhere in more "traditional" core courses. However it is not sufficient to learn about the theoretical technical operation of a typical studio facility in isolation, and there must be some opportunity to put the theory into practice. Unlike traditional engineering problems where there is often a unique solution, or at least a solution that can be considered as being either correct or incorrect, the results achieved from working in a studio can be very subjective in their nature as they are usually associated with the reproduction of an audio event. The successful use of the equipment that is available therefore comes down to a combination of the following:

- Understanding the theoretical concepts.
- Having a goal in mind as to the perceptual effect you are trying to achieve.
- Listening to the results of your actions and acting accordingly (feedback).

It is clearly important that students are given the opportunity to both listen to the results of these techniques being applied so that they might appreciate the techniques and subtleties involved, and more importantly have an opportunity to try out these techniques themselves.

1.1 Course Context

Currently there are two courses that fall under the remit of this study (Further details, including syllabus documents and assessment details can be found in Appendix A):

BEng/MEng Music Technology Systems; BEng/MEng Media Technology:

- Year 2: Recording Studio Techniques and Technologies
- Year 3: Advanced Recording Studio Production Techniques

The Year 2 course runs for 18 hours, 1 hour a week over the autumn and spring terms, and is assessed through an assignment consisting of a portfolio of recording work with supporting technical documentation handed in at the start of the summer term. Note that these timetabled hours are for lectures only. To support this delivery, the students also take part in two Field Recording Exercises, each one taking place over the course of a term where they work in unsupervised groups. Each group is given 10 hours of studio time scheduled over each term in which to complete a directed exercise, and these hours are timetabled as part of their broader lab-based work.

The Year 3 course builds upon the foundation put in place during Year 2 and consists of 9 hours, 1 hour a week, during the autumn term. A similar method of assessment is used and the portfolio of work is handed in at the end of the spring term. There is also one Field Recording Exercise working along similar lines as to those in Year 2, and lasting for the duration of the

autumn term only. Although the Field Recording Exercises are unsupervised, technical support and advice is available as and when required through our dedicated studio technician, or through myself assuming I have no prior commitments.

It is made clear at the start of the course that it the responsibility of the individual student to put lecture theory into practice in their own studio time. The Field Recording Exercises therefore serve an additional purpose in that the students are committed to at least some time in the studio (when they might usually be in another lab or workshop) so that they don't necessarily have to try and find additional time to complete their work in what is already a very packed and difficult course timetable. In this way the course has some scope to allow practical hands-on based work. Another point emphasised is that only through repeated practice and familiarity with the technology and the techniques involved will the students become confident and competent enough to embark upon more complex projects. An appropriate analogy is learning a musical instrument – something which all of our MTS students are able to do. Indeed the modern studio is often considered as a musical instrument of sorts due to the creative possibilities it offers in terms of the arrangement and manipulation of audio events. Many recording engineers also fulfill the role of producer where they will have significant creative control over the musical material being generated, often due to their experience as both musicians and engineers and their understanding of what musical possibilities can be achieved through the techniques and technology at their disposal.

Large scale lab or demonstration work is therefore made problematic by the fact that the studios themselves are small in size and few in number. The studio facility in the Department of Electronics consists of five acoustically treated and sound proofed rooms. Two of these are small PC Digital Audio Workstation (DAW) rooms capable of holding only one or two students. They are used mainly for pre- or post-production work to free up the main control room resources for other users. They can also be used for smaller scale projects where live recording might not be necessary. Studio 1 (see Figure 1a) is a traditional analogue-based studio consisting of a large format mixing desk and surrounding outboard equipment. The size of the equipment profile precludes the number of people who can be comfortably accommodated within the space, with an upper limit of six people plus a tutor. Studio 2 (see Figure 1b) is a newer digital suite that is much more compact in terms of the equipment profile and being almost twice the size of Studio 1, can comfortably accommodate seminar sized groups of about twelve students plus a tutor. However currently most students prefer to use the more traditionally designed Studio 1 for the majority of their work and as such the larger Studio 2 is actually of less use for demonstrating purposes. Studios 1 and 2 are separated by a common Live Room where the actual recording work can take place with performers and microphones in

relative isolation from both the engineer(s) in the control room and more general departmental activities.

(a) (b)

Figure 1: The Recording Studio Suite: (a) Studio 1; (b) Studio 2.

The small size of these spaces therefore prevents large scale teaching/demonstrating to the entire cohort (averaging 30 students) without significantly downsizing in numbers, resulting in sessions having to be repeated and a reduction in, and an inefficient use of allocated student contact time. Similarly there are not enough actual studio spaces to facilitate smaller groups undertaking directed work simultaneously as can be carried out in a traditional lab.

On the whole it seems that the courses are running well. Departmental student feedback forms are generally very positive with some useful constructive comments. However the one request that is repeated again and again is for more directed practical tuition. Hence the perceived need for this more in depth study and a discussion of how this request might be facilitated and implemented successfully.

In addition to the departmental feedback forms, discussions with our studio technician (being on the "front line" of student problems in the studio) and on a more informal basis with some students indicates that the student experience of practical studio work is often frustrating and unrewarding. There are repeated requests for more time, additional tutorials, and perhaps most worryingly, a particular lack of application and understanding when it comes to problem solving in the studio environment. The time students are allocated to carry out practical work is therefore often used inefficiently and considerable effort is spent re-learning skills that had been used some time previously and since forgotten. Therefore in addition to the request for more practical work there is a need to ensure that basic concepts are thoroughly understood so that the student can implement them more effectively. A more satisfying hands-on experience for the student should help considerably with this - if a picture is worth a thousand words, a good quality demo and the chance to try it out oneself must be worth a thousand more.

On the basis of student feedback at the end of the autumn term requesting more practical work and demonstrations, studio drop-in sessions were introduced in the spring term of this year for Year 2 Students. They consisted of a weekly, optional one-hour lunchtime slot where I made myself available in Studio 1 to answer questions and give tutorials on any topic that was suggested by those who turned up. These seemed to prove very successful with a number of students turning up most weeks. However the spread of topics discussed was very limited, with most students being happy to go over the same fairly basic procedures week after week in order to help them complete their own assignment work.

1.2 This Study

On the basis of the above discussion there is a clear need to examine the provision for enhancing recording studio courses with additional practical sessions in a manner that is appropriate for the framework within which the course is delivered. It is this perceived need to implement these goals that informs the hypothesis at the centre of this study. The aim is to offer some analysis of the perceived problem and offer a potential solution that may be of benefit in the delivery of these courses and by extension other similar related music technology subjects. The results produced in this report are based on a programme of work that has been put in place over the past 18 months. A cohort of Year 2 MTS students have participated in a questionnaire (See Appendix B) relating to their experiences of both the course and the completion of their assignment work using the studio facilities and have been subject to a variety of different teaching methods on which they offer comment. Note that this questionnaire is considerably more comprehensive and subject specific than the more general departmental student feedback mechanisms, being specifically designed for this study.

This project has been additionally supported through a Teaching Innovation and Development Committee (TIDC) funding bid that has enabled us to replicate a subset of our studio system in a portable format. The purpose of this facility is to:

- Allow some practical aspects of the course to be delivered more readily in large format lectures.
- Facilitate the use of audio demonstrations.
- More generally help to support the more traditionally delivered theoretical aspects of the subject matter and improve the lecture content and delivery.

Teaching material has been developed for this new portable facility and it has been used in a “test" workshop with the same cohort of students. The perceived effectiveness of its use has

been measured, again through the use of a questionnaire and the results and findings are presented in this report as follows:

Chapter 2 will consider some of the issues that have been raised in this introduction in an educational context, reflecting on established educational theory and how it might apply in this particular case.

Chapter 3 discusses the objectives of the actual study, how they were achieved through the use of the TIDC grant, and introduces the format of the questionnaires used.

Chapter 4 presents the results obtained from the questionnaires and judges the success or otherwise of the implemented solution.

Chapter 5 offers some conclusions and reflections on the basis of this work

A number of appendices are also included containing additional information or supporting documentation. The contents of which will be referenced in the body of this report as appropriate.

Chapter 2:
An Educational Context

Having identified a perceived need for improvement in terms of the design and delivery of recording studio related courses in Chapter 1 and presented some analysis as to their current status, it is appropriate to contextualise these ideas within a framework based on established learning theories.

2.1 The Kolb Learning Cycle

Kolb [Kolb, 1984] has developed a well known and widely quoted four stage cycle of learning based on the idea that a learner will learn most effectively when they are active, take responsibility for their own learning and development, and can relate and apply it to their own experiences [Jacques, 2000]. The four stages are:

- Experiencing
- Reflecting
- Conceptualisation
- Planning

And give rise to the familiar Kolb Learning Cycle:

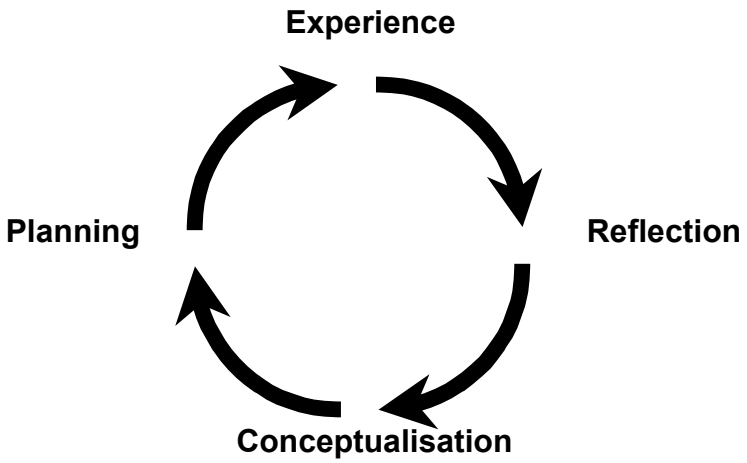

Figure 2: The Kolb Learning Cycle.

These four stages can be expanded upon as follows:

Experience: to simply carry out an exercise or a task, usually without any thought as to why a particular technique is being used. For instance in a typical recording studio exercise a particular task or experience might be to apply high mid band equalisation to a vocal track.

Reflection: this involves taking a step back from the experience, taking note of the results and asking key questions. In the cited example the learner may notice that the vocal sounds clearer. They may also notice that very little change is heard when the low mid-band equalisation control is altered instead and ask what is the useful range of frequencies that can be altered effectively.

Conceptualisation: the interpretation of the results of the reflection. For instance realising that you will only hear the effects of a particular equalisation control if the source material contains frequencies that fall with its defined range. At this point theoretical ideas can be introduced to help explain these events (the acoustics of human voice production; the frequency response of a particular EQ circuit) and abstraction can occur.

Planning: the new knowledge and abstracted models can be applied in a broader context and predictions can be made with some confidence. For instance how would you attempt to apply equalisation successfully to a recording of an acoustic guitar?

This final stage of course leads the learner back to the start of the cycle where they could then apply the concepts they have grasped in a new concrete experience. Hence the cycle provides feedback that gives a foundation for a new experience and evaluation process. Note that the cycle should therefore be repeated several times for successful learning, and although the starting point is arbitrary the important point is to proceed through the steps in sequence.

Analysing the courses as currently implemented reveals the potential for the learner to skip one or perhaps two of these stages. In the traditional lecture format a subject is introduced and the theory and background is covered in some depth with typical scenarios being given as appropriate (*Conceptualisation*). On the basis of this background, questions are formulated within the lecture as to how this knowledge could be applied in different scenarios to develop a wider understanding (*Planning*). It is then down to the student to *experience* these ideas for themselves and *reflect* upon their actions so that the cycle can be completed. At the moment this is facilitated through either the group or individual assessment work, both of which are completed without academic guidance. However if the student decides to leave it until the last moment to complete their work, only has time to complete one iteration of the cycle due to other work/time pressures or does not yet have the abstract concepts firmly in place after (often) a single lecture then the learning experience is rendered highly ineffectual. Note also that when the studio drop in sessions were introduced, most of the time was spent going round the same simple processes week after week – essentially providing the repeated iterations of the learning cycle that are clearly not being put in place by some of the cohort themselves.

Therefore the need to supplement the traditional series of lectures with a clear and guided course of hands-on practical work - as stated in the introduction to this study - actually has its foundations in established educational theory. It becomes highly desirable to close the loop on this learning cycle *before* the student leaves the lecture environment. The question remains as to how this can be best put in place given the limitations of the learning environment(s) and the demands of the course as discussed in Chapter 1.

2.2 Bloom's Taxonomy

An alternative to Kolb's cycle can be found in the work of Benjamin Bloom who proposed a six stage linear model of learning where a student's progression through a subject is measured through their depth of understanding and associated abilities in manipulating the subject matter [Bloom, 1956]. The six stages are as follows:

1. **Knowledge**: the learning and recall of information, facts and key concepts. Using the same example as before this could relate to information relating to the characteristics of voice production and what an equalisation circuit actually does. Can be assessed by questions relating to these fundamentals – what controls will be found on a typical equaliser?
2. **Comprehension**: understanding and interpreting knowledge. Can be assessed for instance by questions where the learner is asked to predict the outcome of an experiment based on the knowledge they have been given – how will equaliser "A" affect vocal track "B"?
3. **Application**: transferring knowledge and understanding to different scenarios so that new problems can be solved. Assessed through questions where the learner is asked to apply theory in an unfamiliar scenario - how will equaliser "A" affect guitar track "C"?
4. **Analysis**: examining the results obtained through the process of application, seeing appropriate patterns and organising these results to formulate or support a particular theory. In this case questions are designed to ask the learner to analyse a scenario and explain their findings including those results that fall outside of the norm – equaliser "A" can be seen to operate usefully over frequency range "D" with a useful gain factor of "E".
5. **Synthesis**: the use of established theories to develop new ideas; relating and using a range of knowledge and ideas across different areas to generalise a theory. The learner might be asked to compose, design or invent, or asked questions that bring ideas together and adapt a basic theory – use equalisation as part of the production process in one of your recordings for your assignment work although take care to ensure that you use it in a creative and appropriate manner.

6. **Evaluation**: an assessment of the value and use of a particular theory together with an appreciation of the importance and use of objective evidence and subjective opinion. The learner would be asked to argue and provide conclusions based on presented theory, evidence, ideas and opinions – the finished recording has too much "bass" due to an incorrect application of equalisation for the following reasons…

As with Kolb's cycle this framework can be applied to the matter at hand. Typical lecture content in a recording techniques course will deliver the fundamentals required (*Knowledge*) with the aim that learners achieve a level of basic understanding such that this knowledge can be applied in simple theoretical scenarios (*Comprehension*). However again there is the potential for a critical step to be missed (*Application*) as it can currently only happen outside of guided learning hours – there is no guarantee that successful *application* of the ideas presented will occur (hopefully more than once) before the course moves on to the next topic. If this is the case then one of the goals of the course will never be successfully achieved – being that a student given the appropriate levels of *knowledge*, *comprehension* and *application* of basic concepts can potentially be placed in an unfamiliar working scenario and be able to *analyse* the situation and *synthesise* a solution such that they could carry on with the given task. Typical examples of this might be the replacement of a mixing desk in one of our own control rooms with one of an unfamiliar design, or the student being asked to engineer a session at a commercial studio in town. It seems that currently the majority of our students develop skills sufficient to carry out a particular task (an assignment) to some degree of satisfaction, but these skills are not transferable to other scenarios and are often easily forgotten.

The importance of *synthesis* as part of the learning process is also of particular relevance in this study as our students usually have a high level of musical creativity as well as scientific/mathematical ability (see Chapter 2.3 on Gardner's Multiple Intelligences), and this is facilitated through the assessment process where there is a requirement for some form of composition based work to demonstrate the use of the technology and associated techniques. However it could be argued that synthesis might be better placed at step 6 at the end of this framework, with the evaluation process being better implemented as step 5 based on steps 1 – 4. There is potentially greater benefit to performing the evaluation based on a number of somewhat limited predetermined scenarios (following learning steps 1-4), giving the learner a sense of having completed the first stage of the learning process and improved their overall confidence before taking on a more open-ended project. This is especially so given the creative aspects of the work involved as part of the broader subject area as a whole where the synthesis of new ideas are likely to happen as a matter of course due to the undetermined variables encountered as part of the creative production process.

2.3 Gardner's Multiple Intelligences

Gardner's work on the theory of multiple intelligences as summarised in [Winters, 1995] and [Wang, 1996] has given a wider understanding on how people learn according to the eight modalities he defined as follows:

1. **Linguistic Intelligence:** assimilating information and learning from written texts by either saying, hearing or seeing the words themselves. The ability to commit facts, names, places etc to memory and manipulate the words usually makes for good academic writing [Jacques, 2000].
2. **Logical/Mathematical Intelligence:** ability with numbers and logical thought – learning through solving problems.
3. **Spatial Intelligence:** learning through visualisation, design and realisation – both the absorption and production of pictures and diagrams.
4. **Kinaesthetic Intelligence:** learning through movement and touch.
5. **Musical Intelligence:** the appreciation of music, the ability to emote and respond to the musical stimulus; the musical creative process.
6. **Interpersonal Intelligence:** working with others through co-operation, interaction, sharing and debate.
7. **Intrapersonal Intelligence:** working alone, developing individual interests, personal reflection.
8. **Naturalistic Intelligence:** the ability to make distinctions and relationships between natural phenomena without any reliance on the other intelligences.

Ultimately the definition of these styles indicates that the educator should develop variety in applied teaching strategies and avoid concentrating on their own dominant intelligence. Traditionally academic work tends to concentrate on (1) and (2) potentially excluding learners who work more naturally in one of the other modes. Variety in teaching will help to target the diverse range of intelligences that may exist across a cohort of students or indeed more locally within each individual learner. This theory is of particular interest when applied to a body of Music Technology students who are part of a broader engineering department. Certainly the traditional engineering student will be expected to work and learn within the domains of (1) and (2) and to a certain extent (3) (diagrams, charts and graphs being fundamental in electronic engineering). Considerable effort is applied within the degree programme as a whole to encourage group work (6) and exam preparation will certainly demand not inconsiderable work in isolation (7). However (4), (5) and (8) are harder to target within this traditional framework. But what of the courses in question as part of this study? Formal lectures are used to deliver key concepts, facts and theoretical ideas - (1), (3) (diagrams are again commonplace and a recording studio consists of many important visual cues). Logical thought is applied to the

problems found in any studio environment, usually involving consideration of the audio signal flow path from source (acoustic event) to receiver (the ear-brain combination) through a complex and often convoluted combination of devices – (2). The Field Recording Exercises involve group work (6) and the assessment portfolio must be completed individually (7). As such they are similar to any other engineering course. However further examination reveals that the learning strategies used also lend themselves to the other defined intelligences.

The studio environment is a highly tactile workspace, with a typical mixing console making use of repeated rows of (usually) colour coded dials, buttons and sliders. Altering and moving these controls gives the user positive tactile feedback and a visual-spatial map that works in conjunction with the primary aural feedback channel. In this way touch helps to reinforce the cause and effect of an action and provides an enhanced frame of reference in which a studio engineer can work. In fact the common mouse and QWERTY keyboard combination used to access the increasingly more common software equivalent of the hardware based studio is often criticised due to the lack of intuitive "hands-on" control offered when compared with the traditional analogue mixing console [Murphy, 2002]. Similarly a skilled engineer will often operate a mixer - and hence by extension control the resultant audio events – in a manner not dissimilar to that of a musician playing their instrument. Clearly touch has a large part to play in this particular learning experience and hence there is the potential for learning according to (4).

The context and framework for these courses obviously places an emphasis on some form of musical output, otherwise they become an abstract academic exercise in which the technology of the studio is learnt but not applied. Both the Field Recording Exercises and the assessment/portfolio work allow the student to explore the creative musical process. This can be facilitated either through exploring the work of someone they admire (recording a cover version of a favourite song or making a recording of a classical concert), or using the resources at their disposal to develop their own compositional ideas. All of our Music Technology students have some form of musical training, often to a high level (A Level Music or Grade 8 in a solo instrument are not uncommon, and a number of our students perform in one or other of the University ensembles – in fact some often consider a straight music related degree as part of their UCAS application), and so demonstrating the technological and engineering aspects of the subject in question through some form of musical creativity is at the core of all our Music Technology courses. Although it will usually be the technological aspects of the work that are under scrutiny in terms of assessment and the associated weighting in the final course mark, the creative and musical aspects are an integral part of the completed work and will be credited appropriately according to the mark scheme. It should be noted that not all of our students feel confident in a performance or compositional role so it is entirely possible to concentrate solely

on the engineering/production aspects of the work and rely on the musical talents of fellow students as appropriate source material for the actual recording. However, in either scenario the indicative creative output is an integral and fundamental part of the learning strategy and hence (5) is also valid.

A skilled musician will often demonstrate their instrumental skill through improvisation – the generation of appropriate musical content bounded by the rules of the compositional framework within which they are operating – tempo, key, arrangement, orchestration for example. This improvisation demonstrates a form of naturalistic intelligence (8) – the musician is responding naturally to a particular situation without necessarily resorting to the use of one of the other intelligences due to their familiarity with the instrument they are playing, the music they are making and the years of practice that they have invested in to develop this skill. This naturalistic intelligence is one of the goals of achieving mastery of the studio environment. Ultimately the student should not have to think – "How do I change the equalisation settings on the vocal to make it sound better?". Rather through experience, practice and a thorough understanding of the theory behind the process, the appropriate solution should become an automatic reaction to the scenario in question – the tools of the studio become a natural extension of the production process.

2.4 Patterns of Attention

No matter how interesting the lecture material, a student's attention and focus will inevitably drift at some point in a typical 50-minute formal lecture. Johnstone and Percival [Johnstone and Percival, 1976] recorded breaks in student attention across 90 lectures and twelve different lecturers and identified a general pattern. After about five minutes of settling down at the start of lecture, an attention dip would occur about 10-18 minutes later. As the lecture continues the attention span becomes shorter being of the order of 3-4 minutes towards the end. They went on to report that those lecturers who varied the pace of their teaching and, for instance, introduced short experiments, problem solving sessions or some other form of deliberate break, unsurprisingly, commanded the classes attention span more successfully. Often the attention break was eliminated altogether. Other reports have stated that even a break of only two minutes between 15-20 minute session seems to re-invigorate the students ready for the next spell of lecture time [Middendorf and Kalish, 2002]. Typically without these breaks, the pattern of attention for a student in a 50-minute lecture is as shown in Figure 3.

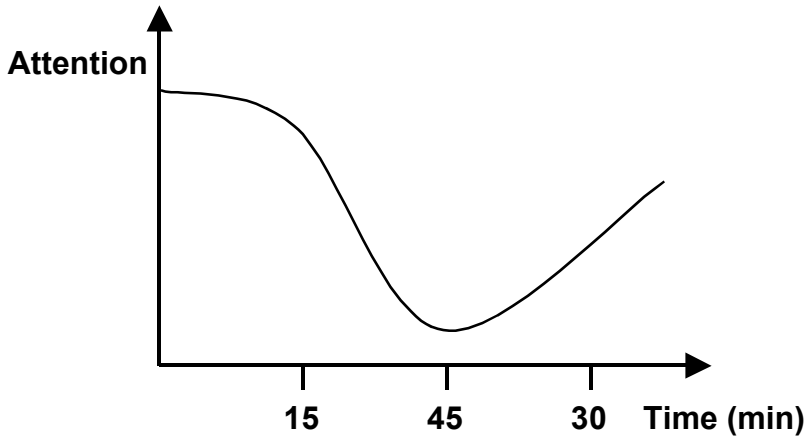

Figure 3: Typical pattern of attention for a student in a 50 minute lecture.

One explanation for these dips in a student's attention is offered due to the fact that information, when delivered in a traditional linear lecture format - that is, one without attention breaks - does not relate well with what current cognitive science research tells us about the learning process [Savion and Middendorf, 1994]. The brain does not record information in the same way as a linear audio tape recorder, rather it deals with information by reducing it into more meaningful and manageable segments or categories. The actual learning process then fits these segments into already existing categories or creates new ones as appropriate. This categorisation process helps to determine how an idea is acquired, retrieved from memory and used in making further deductions. Examples or worked scenarios are an important way of establishing links between existing old and potentially new categories, allowing the learner to make connections between the new, untested idea and what they already know. When a new idea has been introduced the learner needs to practice thinking in terms of that particular concept. Therefore in a lecture, providing a break where students get a chance to practice in this way will work according to the natural processes of the brain, and so improve the learning process

Therefore, current learning theory informs us yet again that the introduction of audio examples, practical demonstrations and an opportunity for hands on experience in a typical formal lecture should significantly enhance the overall learning experience for the student. In this case by providing all important attention breaks that will facilitate learning more akin to how the brain actually works.

2.5 Summary

Established learning theories have therefore helped to highlight some of the key points associated with this study as initially stated in Chapter 1. Using Kolb's learning cycle as a model has revealed that the courses as currently implemented can, for some students, leave a significant gap in the cyclical feedback process in terms of the opportunities for *experience* and

reflection. There is a need to close the loop in the learning cycle within the actual lecture itself so that the students are better prepared to move through the necessary additional iterations of the cycle unguided.

The stage of *application* is missed in a similar manner if Bloom's Taxonomy is considered as an alternative to Kolb. The result being that a student having completed the stages associated with the *knowledge* and *comprehension* of basic concepts are unable to satisfactorily *analyse* a new situation and *synthesise* an appropriate solution leading to a less that comprehensive *evaluation* process. Bloom's Taxonomy also highlighted the particular importance of synthesis as part of the assessment process allowing students to explore creative opportunities as well as demonstrate competence and understanding of the technological aspects of these courses.

An examination of Gardner's Multiple Intelligences demonstrates that Music Technology courses are potentially successful in using a variety of teaching strategies to target the diverse range of intelligences that may exist across both a cohort of students or within each individual learner. Finally, examining how the attention span of a typical student varies across a 50 minute lecture encourages the teacher to provide attention breaks that allow the learner to assimilate and process the information received in a manner similar to how the brain naturally works.

As initially hypothesised, it is clear that the introduction of guided audio examples, practical demonstrations and an opportunity for hands on experience within the traditional lecture format should significantly enhance the overall learning experience for the student. The question remains as to how this can be best put in place given the limitations of the learning environment(s) and the demands of the course. A potential solution will be discussed in Chapter 3.

Chapter 3:
The Portable Recording Studio Project

The brief review of related literature and theory in Chapter 2 has indicated that the use of demonstrations and some form of practical work in lecture time will be a useful addition to the varied teaching strategies currently employed as part of these courses, and should help to improve the learning experience for the student. However, as discussed in Chapter 1, implementing such demonstrations for an entire cohort is problematic, as the studios themselves are small in size and few in number. Splitting the cohort into smaller groups, results in sessions having to be repeated and a reduction in, and an inefficient use of allocated student contact time. An appropriate solution is therefore required.

3.1 An Example of Best Practice

An example of best practice can be gained from my previous institution. The School of Engineering at Leeds Metropolitan University is a traditional engineering department in a New University who decided that in order to encourage the recruitment and retention of students they had to diversify from their more traditional activities (straight engineering degrees were failing to recruit adequate numbers of students with the requisite A level points) to introduce a series of degree programmes that were more application driven. They already had a successful BSc Music Technology degree that was ran jointly with Leeds College of Music, but decided that to ensure quality (and save money) a similar programme (BSc Computer Music and Sound Technology) would be introduced that could be taught completely in house. Two studio facilities were developed for this reason although it became apparent that for the numbers being considered for this course (a new intake of 60+ each year) this would be insufficient. Initially, teaching was delivered through traditional lectures and practical sessions in the studios themselves. However, one of the problems stated above was encountered - splitting the cohort into smaller groups and delivering practical hands-on sessions to them for shorter periods of time (so that the whole year group could be dealt with) across two studio spaces was a highly inefficient use of contact time. More effective were the Computer Music Practicals that were taught in a classroom of PC based audio workstations, allowing the students to carry out both pre-prepared exercises and their own assignment work under the guidance of the academic in charge who could wander from student to student, listening to what they were doing, dealing with problems and offering advice where appropriate. Based on the experience of the successful delivery of the computer music related courses, the provision for teaching on the recording stream was improved through the installation in one of the larger lecture rooms of a

complete full size studio control room, replicating the setup found in the main studios. Although this was installed after my departure for the University of York, informal discussions with ex-colleagues have revealed that this facility is a welcome addition to the teaching of such courses. However the lecture theatre in question was used only by the School on Engineering and so was relatively easy to manage, maintain and timetable for use by the appropriate courses. Clearly this would not be possible within the current York system.

A number of colleagues in the Department of Electronics at York use portable workbenches of experimental and demonstration-based equipment that can be easily wheeled in and out of lecture rooms, and they have used them with some considerable success. It was decided that a solution based on a combination of both these ideas was needed – a high quality studio facility that replicated to some degree the facilities in our permanent installations but with the additional requirement that it was easily portable. Note that all-in-one digital portastudios are commonly available but these are not designed around the modular systems approach that most professional studios use, and as such much of the important detail is hidden from the user.

Therefore on the basis of these ideas and the broad aims of this study that have been hypothesised so far in this report, a number of objectives for this work can be summarised as follows:

1. To carry out a detailed survey of a cohort of Year 2 MTS students to obtain feedback on the quality of the delivery of the course to date; to attempt to establish the depth of their knowledge in one or more topics related to this course.
2. To design and build a portable studio facility to allow the introduction of guided audio examples, practical demonstrations and an opportunity for hands on experience within the traditional lecture format.
3. To test the use of this facility within a lecture/workshop with the same cohort of students.
4. To carry out a detailed survey of the same cohort of Year 2 MTS students to judge the success or otherwise of the use of this resource.

3.2 Methodology

The second objective was implemented first of all as funds would have to be secured in order to build the facility so that it could be tested and used in the field. Although there was a small chance that the use of the resource might not be as successful as it was hoped it would be, the equipment could always be put into service within the department as a more permanent installation. As such an application was made to the University Teaching Innovation and

Development Committee (TIDC) in May 2001 for the sum of £4584. This application was successful and a sum of £3209 was awarded.

A number of options were considered for this resource at the design and build stage, based on the current availability of products, trends in recording technologies and the equipment currently provided within out permanent facilities. The most appropriate solution was the construction of a portable rack-mounted facility that paralleled the typical components found in our main analogue studio control room. This was coupled with copies of the software used in our digital control room and on our digital audio computer workstations running on a standard portable computer (lecturer's own). It was not intended that the resource should be an exact copy of the equipment currently used as this is neither practical nor economical. Rather it should allow similar techniques to be explored using similar equipment and hence also demonstrate that the skills being learnt are transferable and not specific to one particular recording studio environment. The major components of this facility are detailed as follows:

Signal capture and recording:

- A small selection of microphones
- Direct Inject instrument interface
- CD player

A mixing and monitoring environment:

- Speakers
- Mixing Desk
- Headphones

A multitrack audio recording system:

- Laptop Computer (already supplied)
- Audio and MIDI interfacing
- Audio recording software (*Nuendo*)

External audio processing:

- Signal processors
- Reverb effects unit

Together with appropriate casing and cabling requirements. The facility was designed to be self contained and easily portable using standard audio rack casing, allowing it to be moved anywhere in our building, or indeed on campus. Furthermore when not in use for teaching purposes it could be made available to students for experimentation and general use providing additional support to our current studio resources. The full details of the TIDC application and the equipment purchased can be found in Appendix C. Once the funds were actually awarded there was a delay of almost nine months before all of the equipment was successfully ordered,

delivered and installed as part of the facility. Finally in May 2002 it was ready to be used and tested.

Prior to this, two questionnaires corresponding to objectives (1) and (4) were prepared for the cohort of students who were part of this trial, both of which can be found in Appendix B. Questionnaire 1 was given to the students at the end of the spring term 2002, coinciding with the end of the taught component of the Year 2 Recording Techniques course, leaving the students with only their main assignment to complete. The questionnaire was divided into four sections designed to find out information relating to a number of aspects associated with the course. These sections are detailed as follows:

A. Knowledge and Experience:

Designed to provide some background on our students relating to their studio experience prior to this Year 2 course. It also asks them to give some measure of their acquired skills and related confidence now that they have completed the taught part of the course. Formal departmental course feedback forms indicated a very wide range of experience – from the complete novice who found the course very difficult, to those with considerable experience who did not find it that challenging.

B. Course Delivery:

Designed to acquire greater detail relating to all aspects of course delivery than provided via the formal departmental course feedback forms. Includes questions on attendance, use of provided handouts, additional support material and perceived usefulness of drop-in sessions and workshops.

C. Studio Facilities:

Asks students for comments on how they used the departmental facilities. Includes comments on their hours and patterns of work in the studio, availability and use of studio time, preferred software/hardware and problems they encountered.

D. Specific Course Content: Audio Compression

This section asks questions relating to a specific course topic that had been delivered at some point earlier in the term. The purpose was to find out in an informal manner what they had remembered about audio compression prior to a one-off workshop that would introduce the use of the portable studio facility, and where this topic would be covered again.

New teaching material was then developed using the portable facility as the focal point for this new workshop, including audio examples, a demonstration of audio compression "in action"

and the opportunity for students to interact and have a go for themselves (See Appendix D for an overview of the workshop). A laptop was used in conjunction with the portable studio, running the software used in our main facilities, together with a projector to display the results to the whole class. This workshop was delivered at the start of the summer term after all assignment work for the course had been completed and handed in. Questionnaire 2, consisting of two further sections following on from questionnaire 1 was handed out and filled in by the students at the end of this session. The details are as follows:

E. Response to the Workshop:

This section of the questionnaire is designed to gauge the success or otherwise of the workshop. It considers both the lecture/workshop format as a whole, as well as individual aspects such as the use of the laptop/projector combination or the actual portable studio hardware. Questions are also asked to determine if these various aspects have helped with developing a better understanding of the particular topic under discussion.

F. Specific Course Content: Audio Compression

Finally, Section D of questionnaire 1 is repeated where questions relate to the application and understanding of audio compression, although now this subject has been covered again using the portable studio facility to help with the delivery. Although the topic will be fresh in the student's mind, they are asked to reflect honestly as to whether the workshop and the delivery method has helped their understanding.

Note that the students were informed before questionnaire 1 was handed out that their participation in this study was purely optional and that the questionnaires could be completed anonymously if they so desired.

3.3 Summary

The TIDC funded portable studio project has been introduced in an attempt to meet the needs that have been identified as important when teaching courses in studio recording/music technology, and the objectives of this study have been specified. Two questionnaires have been produced and their contents summarised, the first designed to gather feedback on current practice and the profile of the students within the cohort and the second used to measure the response to a new lecture/workshop revisiting previously taught material through the use of the portable studio. The workshop was delivered at the beginning of the summer term 2002 and the results are presented in the next chapter.

Chapter 4:

Results

This chapter presents the actual results obtained from questionnaires 1 and 2 as discussed in Chapter 3, based on a cohort of Year 2 MTS students. Questionnaire 1 was presented to them in the last formally taught session of the Recording Studio Techniques and Technologies course at the end of the spring term 2002. Questionnaire 2 was presented to this cohort at the end of an additional optional workshop on audio compression that took place at the beginning of the summer term, making special use of the portable studio facility as a means of enhancing the delivery of the taught material. The outcomes and results of these two questionnaires are analysed and presented as follows.

4.1 Questionnaire 1

Total Number in Cohort: 22

Total Number of Responses: 17

Section A:

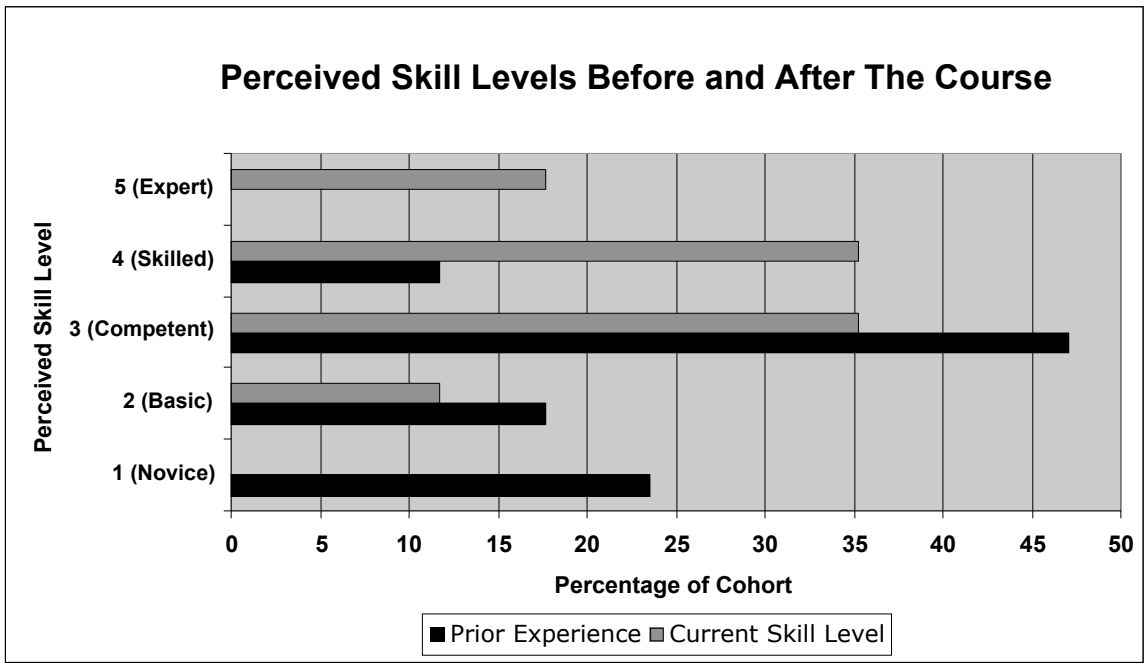

Figure 4: Measure of perceived skill levels.

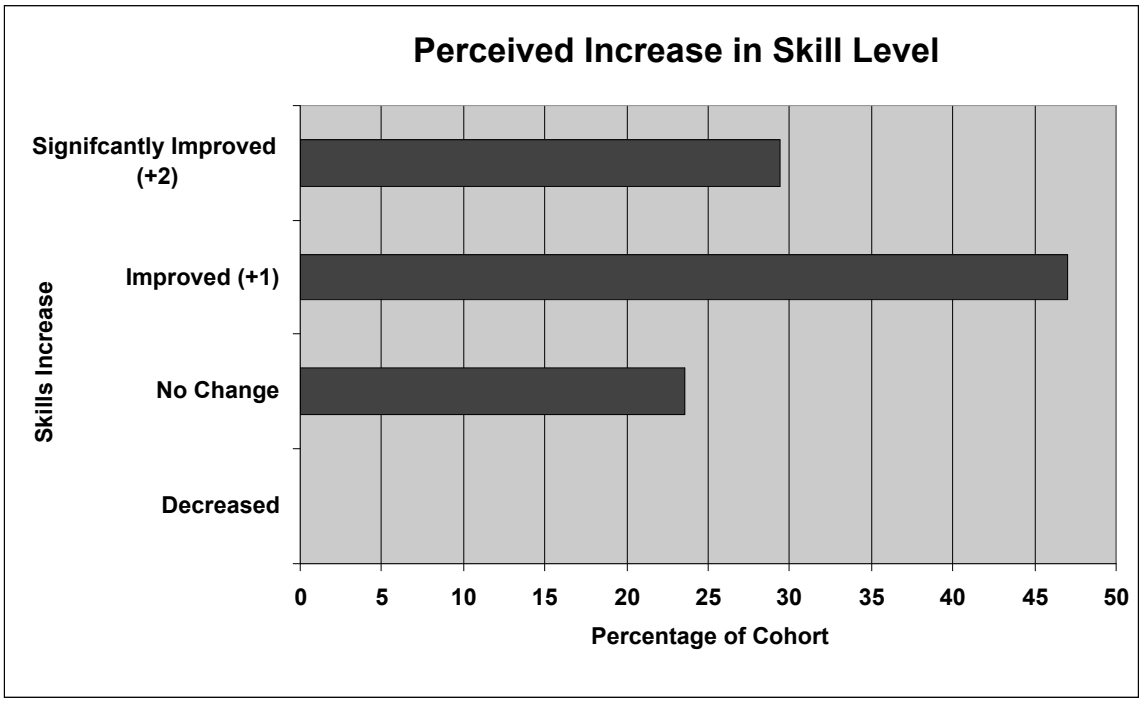

Figure 5: Measure of the related increase in perceived skill levels.

These results, based on current perceptions of the course show some encouraging trends. From Figure 4 it can be seen that before the course started 25% of the cohort considered their skill level as *Novice*, effectively having no prior experience, with no students considering themselves as being an expert. Notice that after the course no student considers themselves as being *Novice,* with a considerable upwards trend in the numbers of both the *Skilled* and *Expert* categories being evident. From Figure 5 it is clear to see that nearly 50% of the cohort state that their skill levels have increased. An additional 30% say that their skill levels have increased significantly - their self-assessed score having risen by two points. However nearly 25% (4 students) say that their skills have not really changed. Of these, one had significant prior experience but perhaps of more concern, three stated that after the course their skill level had remained static at *Competent*. Specific comments of note included:

> *"More practical experience, not enough time."*

> *"Experience must be a huge factor - getting used to listening critically. Despite the many assignments I've still not got much experience. I feel I've got the tools to go and get the experience now!"*

The first supports the hypothesis at the core of this study that more practical work is required. The second is more philosophical and encouraging and shows that some students appreciate the transferable skills and thorough grounding they are picking up as part of the course.

Section B:

This part of the questionnaire goes into some detail relating to aspects of the course as currently delivered. Generally, feedback is very positive although some points are worthy of further comment. 65% of the cohort questioned stated that they attended *all* of the lectures over the two terms, with the remaining 35% attending *most*. As such it can be seen that those students who returned the questionnaires give some validity to the study as they have experienced most if not all aspects of the course. On a scale of 1 (No use at all) to 5 (Very useful and essential) 24% rated the actual lectures with the highest score of 5, with a larger proportion of 47% rating them a 4 and the remainder rating them a 3. Therefore all students seem to have found the traditional lecture format useful and informative to at least some degree. Specific comments of note are as follows:

> *"Some obvious facts but that is because I have done A-Level Music Technology".*
>
> *"More practical aspects would be better".*
>
> *"Needed more of a link with studio/practical sessions".*
>
> *"Good reminder of things I had learnt before and informative for things I hadn't".*
>
> *"More lectures - perhaps two a week as there is a lot of content".*
>
> *"More audio examples".*
>
> *"More practical experience within lectures".*

All the students surveyed made their own notes based on the lecture content. Typically I will supply handouts although they are mostly based on the overheads I use that consist of diagrams, pictures and bullet points. It is then up to the student to annotate these handouts according to what they feel is needed. I felt that a comprehensive set of notes given out in the early stages of the course might be "too easy" an option for the student, whereas giving a set of partial handouts for completion during the actual lecture might encourage more active learning and participation. Most students scored the quality and usefulness of the handouts at either a 3 or a 4 (35% each - on a scale of 1 to 5 as before), with the remainder stating that they were a 5. However 16 out of 17 students said that a course handbook consisting of a complete set of printed notes and handouts would be a useful addition to the course with 53% stating that they

would definitely (rated 5) download all my lecture notes if I made them available online. 35% said they would probably download them (rated 4) with the last 12% rating this possibility as quite likely (rated 3). Interestingly, 65% of the cohort did not refer to any of the recommended textbooks (note that they are also all in the University's library), although correspondingly 65% did refer to some of the recommended websites and online resources. This is perhaps an indication that the modern student is much happier using the web for research and background reading than in previous generations. Especially as there is huge amount of information available, it is often considerably more up-to-date than that found in a textbook (especially in a subject dominated by the use and progression of technology) and most importantly of all, within the University system it is essentially free. It would therefore seem appropriate to attempt to try and deliver additional material to support the lectures in an online manner wherever possible - certainly not something I have had the opportunity to implement to date.

Regarding the studio drop-in sessions run as an option in the spring term, 72% of those who attended within the cohort questioned (11 out of 17) rated the drop in sessions as very useful (scoring 5 on the same scale as before) with 14 out of 17 stating that they would like to see more of these being timetabled. Specific comments included:

> *"Good to confirm lecture material in a practical sense. Helpful to be shown - it makes it easier when it comes to your own sessions".*
>
> *"Very useful for understanding how the course material relates to our own studio work".*
>
> *"Useful to find out and have help with the assignments we needed to do."*

The studio drop-in sessions have clearly been a success and have helped to bridge a skills gap for those students who attended. Again the hypothesis at the centre of this study is supported by the above comments, that directed practical sessions are a successful means of delivering material of this nature. This is further supported by some of the responses to question 16, *"What would you like to see covered by the course that isn't already?":*

> *"More practical sessions",* on a total of six questionnaires.
>
> *"Sound Examples".*
>
> *"More lectures in the studio with a hands on approach".*

"More advice on Nuendo - if you run the program and actually do stuff to demonstrate it", and similar responses on another two questionnaires (Note: Nuendo is our main studio software).

"Being actually shown how to use the equipment".

"More demonstrations".

Section C:

This part of questionnaire 1 relates to how the cohort used the studio facilities to complete their assignment work and allows them to record their associated experiences. Most of the students questioned used Studio 1 as their main workspace (59%), with 18% deciding to work at home with their own equipment and 23% using a combination of spaces (although it seems that the favoured option in this case was to complete the actual recording in Studio 1 and then work on the mixing and production at home). What is of most concern here is the distinct under-use of Studio 2 and the PC DAW rooms. It is felt that Studio 2 was not used due to the lack of satisfactory audio connections between it and the live room, essentially limiting it to post-production and mixing work. The perceived complexity of the facility is also no doubt a factor, with few students making full use of the features available within the digital-desk/PC combination (although one Year 2 student did successfully complete an excellent piece of work at a clearly professional standard using this room alone although was not present when questionnaire 1 was handed out and so did not contribute to this study). It is possible that the students did not use the PC DAWs as their own PCs may have been of a higher specification. Measures have been put in place to improve the connectivity between the suite of rooms, and the PCs will also be upgraded in the near future. Only 60% of the cohort said that they felt confident in the use of the studio facilities, and this clearly needs to be improved.

At the beginning of the spring term negotiations took place to extend the studio opening hours for our undergraduate students so that they could use it in the very early morning and early evening (Up until 8pm on a week night). 41% of the students made use of this additional facility and although this seems low, it is felt that this is encouraging for what was a trial run only. The most important point was to give students extra time to complete their assignment work if they required it and clearly a number made some use of this. The longer opening hours will now remain in place for the foreseeable future. However when asked if there was enough time allowed to complete the course assignments 64% replied with a negative response. Of the nine students who said that they did not have enough time, five did not use the out of hours access facilities, and four did. Of the five who said that they did have enough time, three used the studio out of hours. It is difficult to draw any conclusions from these particular figures (note

that three questionnaires did not provide any response to some or all of these specific questions and hence are not included in this particular result). It is possible that had those particular five (of nine) students made some use of the studio out of hours, they might have felt that the time allowed was adequate. By way of contrast the two (of five) students clearly thought they had enough time to complete their work in line with the requirements of the assignment but without having to work in the studio out of hours. A more concrete conclusion could be arrived at if the marks awarded for the assignment work were analysed against the questionnaires, but this is not possible due to the anonymity of the completed responses.

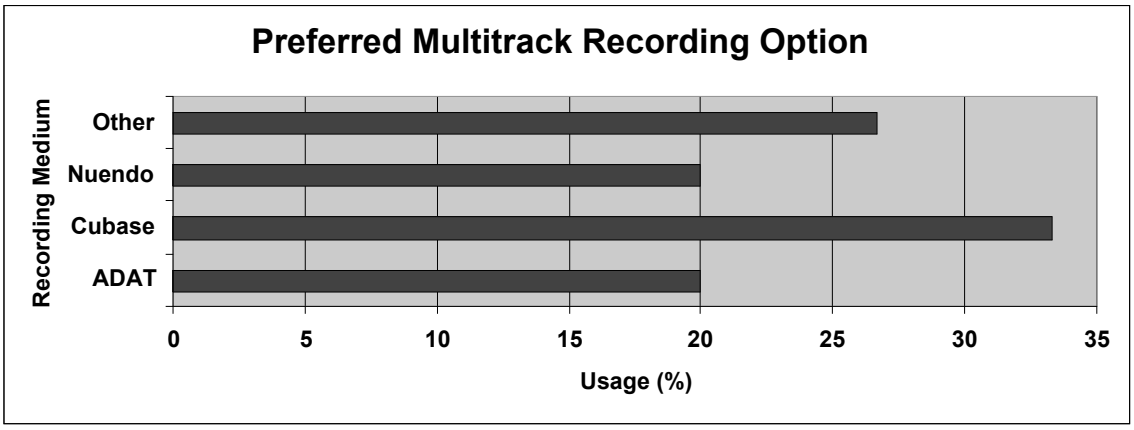

Figure 6: Measure relating to the students' preferred recording medium.

Figure 6 shows the results of asking the cohort what is their preferred solution when multitrack recording. One of the advantages of our facility is the provision of the professional *Nuendo* recording and production software – something that will rarely be found outside of a professional or academic environment due to its high cost. The cohort has been encouraged to use the software and tutorials have been given in how to use it. However it seems that for their actual work the students prefer to go with what they know – either *Cubase* (a common "low-end" version of *Nuendo*) or some *Other* software usually running on their own home PC.

Only one general consensus arrived out of specific comments in this section and it ties in with the results of Figure 6, where three responses asked for a simplification of the studio design. This has actually been considered independently and implemented for the start of the academic year 2002, and is perhaps due to an earlier mistake on our part – we (the studio manager and studio technician) felt that the previous studio layout allowed maximum flexibility, giving the user a chance to select and develop a favoured way of working with the equipment to achieve their required goals. However from the perspective of the student who already has a considerable learning curve to deal with when using this new environment, the extra flexibility often directly relates to additional and unnecessary complexity. As a result of this analysis, the equipment available in Studio 1 has been consolidated and considerably reduced, and non-

essential software has been removed from the PCs - students will now have to learn to use the *Nuendo* software rather than perhaps opting for something they are already familiar with. Hopefully this will result in a more efficiently arranged working environment and a better experience for the students.

Section D:

The questions in this section ask the student to explain particular points relating to the subject of audio compression, an aspect of the course covered in some detail. Compression was selected as it has a strong theoretical basis, but for a complete understanding really has to be heard and applied in real-world scenarios as the perceptual result is very subtle and as such it is easy to make mistakes. The responses to the questions asked have been gauged using the following scale:

Correct:	A complete and correct response
Good Attempt:	A partial response; one aspect may be omitted or incorrect.
Mostly Incorrect:	A poor response; mostly incorrect or with many important points omitted.
Not Attempted:	No response has been given.

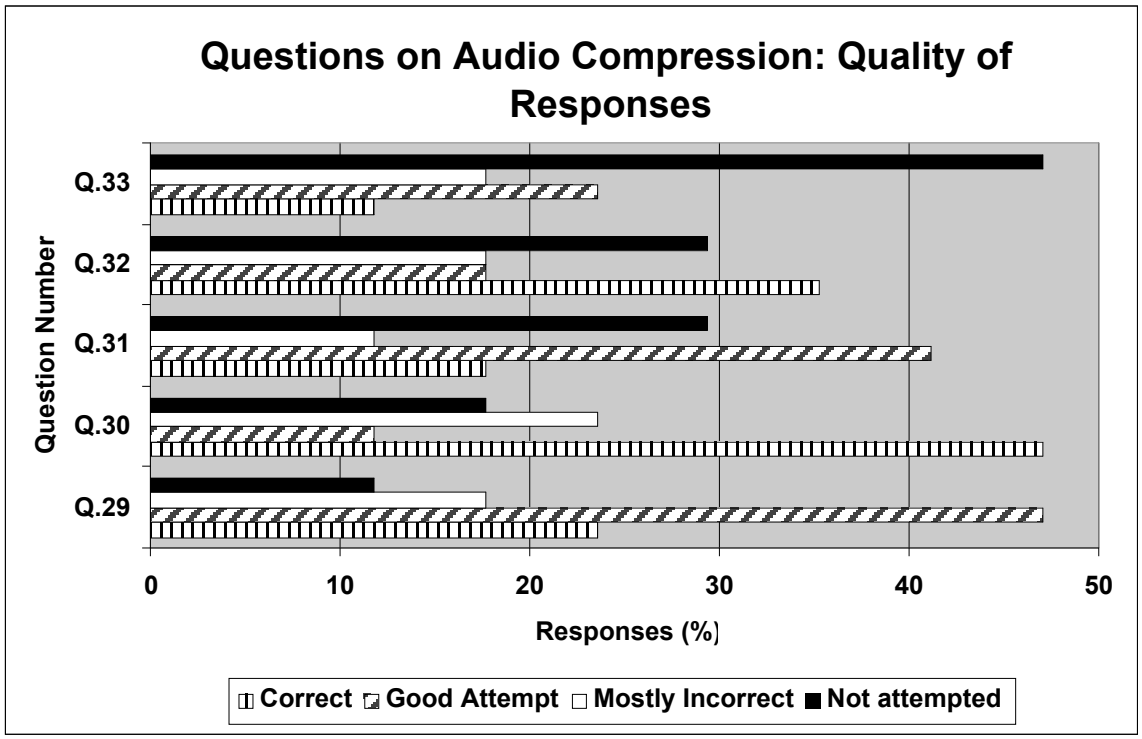

Figure 7: Measures relating to the quality of the responses on particular specific aspects of using audio compression.

A number of points can be noted from the results presented in Figure 7. Question 29 asks for a definition of what compression is and this has been well answered in general with 24% of the responses being correct and 47% being almost correct, giving a total of 71% having a good understanding of what the subject matter is about. Question 30 relates to how a compressor is actually used and is also generally well answered with 47% of the cohort getting it absolutely correct, and a further 12% making a good attempt at the answer, giving a total of 59%. Similarly with question 31, although only 18% provide an absolutely correct answer, 41% make a good attempt, giving a combined total of 59% having a good appreciation of one of the more subtle theoretical details relating to how a compressor works. Note however that 29% of the cohort make no attempt at an answer. The next two questions are more difficult and require a deeper appreciation of the subject matter and preferably some experience of actually using compression in a typical studio session. For question 32, 35% of the cohort answer correctly, with only 18% give an answer that is mostly correct giving a combined total of 53%, but again the number who make no attempt is high at 29%. Question 33 has the poorest response with 47% making no attempt at an answer that requires a multipart solution (that should either be remembered as a fact or found out through experience). 12% get the complete answer correct with an additional 24% making a good attempt, giving a combined total of 36%. These results seem to indicate that in general the cohort has a reasonable understanding of the concepts behind the operation and use of a compressor but there is a real need for this to be consolidated such that its use becomes more a *naturalistic* action [see Chapter 2.3]. This is supported by some of the specific comments supplied. Four of those students who say that they feel confident in using compression as part of their studio work put it down to a combination of lecture notes and applied practice. Another two state that it is due to practice alone. Of those who say that they are not confident in the use of compression, three say that more practice would help and another two state that guided tutorials would be a significant help.

4.2 Questionnaire 2

Total Number in Cohort: 22

Total Number of Responses: 15

Section E:

This questionnaire was handed out immediately after the workshop and designed to gauge the success of the delivery according to the perception of the students who attended. About 40% of those questioned rated the workshop as 5 (very useful), 53% rated it at 4 with 7% (1 student) saying it was only okay. Questions were also asked relating to individual aspects of the delivery – the use of the laptop, projector and Nuendo software; the use of the actual studio hardware; the use of audio examples – to attempt to discover how successfully they were used within the

workshop and whether they actually helped in the understanding of the subject material. The results are presented in Figures 8 and 9.

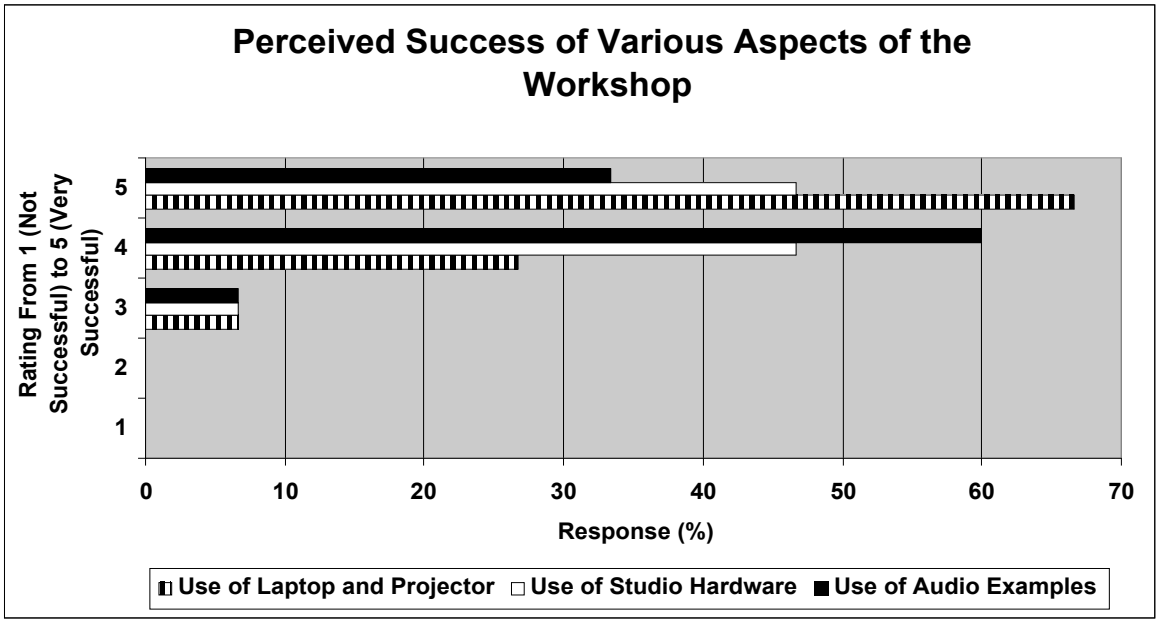

Figure 8: Measure of the perceived success of various aspects of the workshop delivery.

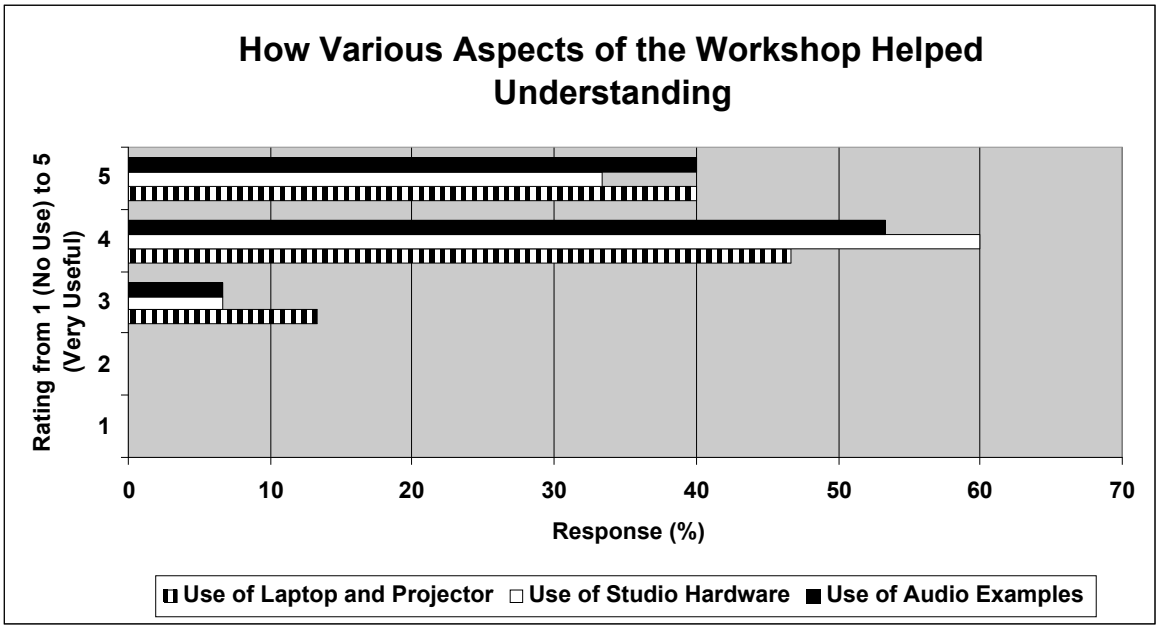

Figure 9: Measure of whether or not these aspects of delivery helped to develop an understanding of the particular subject matter.

According to Figure 8 the laptop presentation appears to be the most popular and successful aspect of the workshop, although note that all three aspects are scored equally when added across the top two ratings. However the success of this presentation method does not transfer too well to an overall improved understanding of the subject, as can be seen in Figure 9, with

more students feeling less confident in giving the top rating and instead opting for the "safer" score of 4. In general though, these results are very positive and there could be other reasons for this slightly poorer performance (Eg. the students already understood the subject area quite well). 40% of the cohort stated that the demonstrations and scenarios presented as part of the workshop were very relevant to their studio work (rated 5) with another 40% rating this aspect with a score of 4. Asked whether they could actually apply these examples to their own work gave a response that was again a little less confident with only 33% saying that they could with some confidence and skill (rated 5). A larger proportion (53%) rated this question with a score of 4, perhaps not totally happy with the concepts taught unless they actually have a chance to try it out for themselves in their own projects. Specific comments on the workshop are as follows:

> *"Use of actual hardware and audio examples much more interesting and useful than simple overheads and lecturing".*
>
> *"I have had a much fuller grasp and understanding of compression from this workshop".*
>
> *"It's not possible to see through a lecturer!"*
>
> *"Workshop was MUCH more useful than lectures that don't involve practical examples".*

Despite the comment relating to the implementation of the demonstrations (noted!) the feedback has been very positive as already suggested by the statistics presented above.

Section F:

Finally, some of the questions presented in Section D of questionnaire 1 are repeated again, with the subject matter having just been covered during the workshop. Question 10 corresponds with question 30 of Section D where 47% of the cohort had given an absolutely correct answer, with a further 12% making a good attempt, a total of 59%. In this instance 53% gave a correct answer, with 27% making a good attempt giving a total of 80% and hence an improvement of 21%. Question 11 corresponds to question 32 in section D, with 53% now giving a correct answer and 20% making a good attempt, giving a total of 73%. Previously this resulted in 35% with a correct answer and 18% with an answer that was mostly correct giving a total of only 53% and hence an improvement on this occasion of 20%. Note further that previously 29% of the cohort made no attempt at answering this question, whereas this time 0% gave no answer with the remaining 27% giving a response that was mostly incorrect. Question 12 corresponds with question 33 in Section D where previously 47% made no attempt at an answer, only 12%

gave a correct response with a further 24% making a good attempt giving a total of 36% positive responses. This time 35% of the cohort gave a correct answer and 18% made a good attempt giving a total of 53% and hence an improvement of 17%. 29% did not give any response, a number which has decreased by 18%. Note again that, as in Section D, these last two questions require a deeper appreciation of the subject matter and preferably some related practical experience. Note further that a better response would be expected in any case for Section F as the subject matter being asked about had just been covered in the workshop. When Section D in questionnaire 1 was completed this information would not have been as fresh in the students' minds as it was covered earlier in the term. Of the 15 completed questionnaires, 14 students claim that they could now set up and use a compressor successfully all of which say that the workshop helped in this respect. 10 say that they could have, *"A Good Go"*, with the remaining 4 saying that they would expect to have, *"No Problems"*. The one student who did not answer positively to these last two questions states that this was because they already had sufficient prior knowledge in this area. One other student commented that they would only feel truly confident using a compressor after, *"Trying it myself"*. Finally, and also rather interestingly, another student comments that:

"Leave the audio examples in the studio and so encourage people to play with it more"

4.3 Summary

Two questionnaires have been completed by the same cohort of students at two different points in the delivery of the Year 2 Recording Studio Techniques and Technologies course, one some time before and one immediately after a workshop that made use of the newly designed and implemented Portable Studio Facility. This resource made it possible to introduce audio examples, practical demonstrations and some element of interactivity as part of the traditional lecture format. Results have been presented and analysed based on the responses that were received and some conclusions are arrived at in the final chapter of this study.

Chapter 5: Conclusions

The ultimate objectives of this study as stated in Chapter 3 are as follows:

1. To carry out a detailed survey of a cohort of Year 2 MTS students to obtain feedback on the quality of the delivery of the course to date; to attempt to establish the depth of their knowledge in one or more topics related to this course.
2. To design and build a portable studio facility to allow the introduction of guided audio examples, practical demonstrations and an opportunity for hands on experience within the traditional lecture format.
3. To test the use of this facility within a lecture/workshop with the same cohort of students.
4. To carry out a detailed survey of the same cohort of Year 2 MTS students to judge the success or otherwise of the use of this resource.

Objective (1) was carried out via questionnaire 1 and the results were presented in the previous chapter. The response to this was good (17 out of 22 returns) and although it would have been desirable to be able to analyse the results based on the whole cohort, this number should be more than representative. Despite a number of problems that had occurred over the course of the two terms through which this course ran, the initial feedback was very encouraging. The problems were mainly associated with studio provision for assignment work, and it was felt that this resulted in undue difficulties and frustrations for the students. However there was a definite upwards trend in terms of the students' own perceived skill level from before the course to afterwards when the questionnaire was delivered. The studio drop-in sessions that were introduced at the start of the spring term as a means of facilitating more informal practical demonstrations were a clear success, emphasising the need for this type of provision. Students also seemed to want a more comprehensive set of pre-prepared notes or a course guide and would be happy to download this type of information from a web-site. In fact the students seemed much happier making use of more general online resources than referring to the suggested course textbooks. Above all, what is highlighted from these results is that there is a distinct need to augment the delivery of the current lecture series with additional practical work, demonstrations and the use of audio examples as was hypothesised at the start of this report. Further, it would also seem appropriate to start to provide some additional online material to provide another means of support for the current lecture delivery.

The positive feedback received should be put into some context. In many respects the Music Technology related courses on the MTS undergraduate programmes are perceived as being a welcome break from the rigours of more exam-oriented general engineering courses. It is often the case that our highly creative cohort of students become somewhat frustrated by the lack of music technology related options within their degree programmes and as such those provided are generally enjoyed, are well attended and receive not inconsiderable praise on their departmental feedback forms. This is not to say that the courses are any easier - often the assignments demand considerably more effort that simply revising for an exam - rather it is because the students see the relevance of the academic content, there is often some familiarity of the application before the associated theory is encountered, the results of which reflect in their own musical experiences. So whereas we as academics recognise the flaws in how the course has been implemented and are quick to criticise, our students, for the most part, are generally just happy to be able to do a course that stimulates both their academic and extra-curricular interests. However this also means that the high level of expectation from such courses can lead to some frustrations and often fair criticism. I feel this is reflected in the results obtained - generally they are very positive despite my initial reservations about the success of some aspects of the course. Where critical comments are made however, they are often clearly and accurately communicated, obviously due to the particular interests, experiences and expectations of the cohort, and as such are often highly relevant and worthy of serious consideration.

The hypothesis as put forward was supported by examining some aspects of educational theory in Chapter 2. Using Kolb's Learning Cycle as a model, these additional methods of delivery should help to close the cycle of learning such that the students are better prepared to move through the additional iterations of the cycle unguided. Alternatively, analysing the current methods of delivery using Bloom's Taxonomy as the model, reveals that the important stage of *application* is missed leading to an inability to satisfactorily *analyse* new situations in a studio production environment and *synthesise* an appropriate solution. This leads to a less than comprehensive *evaluation* process. Examining how the attention span of a typical student varies across a 50-minute lecture encourages the teacher to provide attention breaks that allow the learner to assimilate and process the information received in a manner similar to how the brain works naturally. Clearly the use of practical sessions, audio examples and demonstrations with the potential for interaction with both fellow students and the course lecturer provides an appropriate way of facilitating these attention breaks in an interesting and exciting manner.

Objective (2) was realised through the design and implementation of the Portable Studio Facility as outlined in Chapter 3. This provided an environment paralleling our own studios in which demonstrations etc. could take place within a traditional lecture theatre. It also allowed

the use of a laptop computer running the software provided in our studios. This, together with the projection facilities available within campus lecture rooms, makes it possible to deliver tutorials and demonstrations relating to the hub of the studio production environment to a much larger audience than would be possible in any of our actual studio spaces.

Using this facility, a test workshop was developed based around a lecture on audio compression that had been delivered earlier in the course using only overheads and notes, and as such objective (3) was achieved. This workshop was delivered to the same cohort of students at the start of the summer term after all aspects of the course in question had been completed (both formal teaching and all assignment work). Finally objective (4) was implemented through the completion of questionnaire 2 by the students at the end of this workshop.

Unfortunately there were only 15 returned questionnaires out of a possible 22 on this occasion which was again somewhat disappointing. However again it is also thought that this is representative of the whole cohort, especially as those most likely to attend are either those who find the subject matter difficult and have a need to find out more, or those who enjoy the course and genuinely want to find out more. For the latter group it is thought that their skill levels would most likely range from generally "OK" to "Very Confident", and hence both groups would provide a representative sample. This suggestion is supported by the results of Section A and Figure 4 which shows a good spread of experience before and after the course.

Feedback on this workshop was very positive with the majority of students responding well to the material, with the use of *Nuendo* presented on a laptop via a projector being particularly successful. When asked about particular aspects of the subject matter, there was a significantly improved range of answers that were correct or almost correct, being of the order of 20% higher. This is very encouraging, although should be considered alongside the fact that when the students completed questionnaire 2 they had just covered this material again whereas when they were given questionnaire 1 it had been taught some weeks previously.

Despite this positive feedback at least two students realised the value of having to show some of their own initiative in this learning process - they made explicit comments stating that the only way they would really get to grips with this subject was if they made the effort to experiment with the techniques and technologies under discussion for themselves. This is perhaps the most encouraging result of all, and even with the enhancements that have been thus far put in place, is something that has to be reinforced at every opportunity throughout the course. Additionally, note that in questionnaire 1, section C, only 60% of the cohort said that they felt confident in the use of the studio facilities. Testing how this could be improved upon through the implementation of these suggested improvements is clearly beyond the scope of this study, but

is a statistic that should be monitored carefully and in an ongoing and proactive manner. Again, perhaps true confidence can only really be achieved through solo experience as these two students have identified. However it is fair to say that the Portable Studio Facility, whose success has been highlighted in this report, will become a regular and welcome sight in our studio related courses from now on.

Appendix A:

Course Documents

A.1 Course Syllabus

A.1.1 Year 2 - Autumn Term

Details of the Year 2 Recording Techniques and Technologies have been highlighted in the extract from the departmental undergraduate syllabus document below:

DEPARTMENT OF ELECTRONICS

Module Title: EEMTS & BEng IV Module Number: 072025

Credit Units = 40 360 hours

Aims

To build on the understanding of electronic engineering gained during the first year, with an emphasis towards systems-related issues. To broaden and deepen students' understanding, knowledge and appreciation of the impact that fundamental concepts have on real systems. To develop further skills in design in general and in particular in problem analysis and solving. To continue to introduce the concepts of music technology and demonstrate its relationship to electronic engineering.

Description

The courses that make up the module are an integrated set of lectures, assignments, tutorials, workshops and laboratories on a range of electronic engineering topics. All courses have been designed to develop the students' understanding, knowledge and skills in the discipline.

Courses & their Syllabi:

Computer Programming using C **6 lecture hours**

Introduction to computer programming; the Borland Integrated Design Environment, the ANSI C programming language. Problem solving: Analysis of problem; requirements and specification; choice of algorithms. Program design: Choice of data structures; top-down program design; modularisation; pseudo code; programming style; iteration and recursion; use of libraries. Program verification: Debugging, testing and assertions; common programming errors.

Digital Circuits **9 lecture hours**

Logic elements as electronic components; logic families; design and characteristics; bipolar logic, MOS logic families, MSI logic device and the problems of testability; Multiplexers; demultiplexers; and examples of their application, problems associated with noise and digital interfacing. Timing diagrams.

Electromagnetism in Materials **18 lecture hours**

Electromagnetism: Review of free space electrostatics; Gauss' Law; electric flux density; dielectric materials - dielectric polarisation; boundary conditions for electric fields at interfaces; dielectrics in capacitors; energy in electric field; Laplace/Poisson Equations; Solutions of electrostatic fields; review of free space magnetostatics; magnetic materials; magnetic flux density; boundary conditions for magnetic fields at interfaces; magnetic circuits; inductance and

energy in magnetic fields; Ampere's Law; Faraday's Law. Displacement current; Maxwell's Equations.

Networks for Communications **9 lecture hours**

Overview, protocols: ISO OSI and TCP/IP. Network topologies, connection-based and reliable protocols and packet-based networks. Flow control and error control schemes. Detecting errors: parity, checksums and CRCs. Multiple access schemes: definition and examples. ALOHA, CSMA and Ethernet.

Noise **9 lecture hours**

Introduction to circuit noise: Introduction to noise and noise models for circuit design, sources of noise, voltage and current noise models, noise temperature, noise figure, the effect of bandwidth, noise build-up in systems, kTB and their uses.

Recording Studio Techniques & Technologies **9 lecture hours**

Studio layout and organisation; Signal flow paths and the architecture of an analogue mixing desk; Introduction to Nuendo; Digital mixers; Audio cables and connections; Setting up monitor and foldback mixes; Introduction to microphone types and techniques; Stereo mic. Techniques; Tracing the development of the multitrack tape machine; Recording Formats; Hard Disk and The Alesis ADAT.

Solid State **9 lecture hours**

Bipolar process: Buried collector BJT, indicate location of R's and C in equivalent circuit; capacitive effects in p-n junctions; depletion, diffusion, and the effects on ac models; Bipolar transistor advanced circuit models: Ebers-Moll model, application of Ebers-Moll model to practical transistors, charge control model, switching transistor circuit, higher order effects, base width modulation, SPICE transistor model and applications, derivation of hybrid _ model, high frequency application of hybrid _ model.

Transform Techniques **27 lecture hours**

Fourier: Applications of signal processing and the transform approach. Signal analysis and synthesis, Fourier series; trigonometric form, exponential form; generalised orthogonal functions; waveform symmetries; odd and even functions, half-wave symmetry, Parseval's theorem; Fourier transform for aperiodic signals. Fourier transform theorems; convolution; correlation, power spectra, application and use of tables. Linear, time-invariant systems; frequency response, impulse response; the psuedo-random binary sequence; system identification.

Laplace: Definitions, integral definition, the inverse transform; functions and operations: Transform of simple time functions, transform of operations - differentiation and integration; transients in circuits and systems, notion of system functions derived from differential equations describing a system, analysis of simple circuits; Laplace models for circuit components, inverse transformations through the partial fraction expansion. Poles and zeros, pole/zero description of a system, the impulse response and its relationship to stability, assessment of the system behaviour from the pole/zero plot; initial and final value theorems, derivations and applications of these important theorems; shifting theorems, the derivation and application of the first and second shifting theorems in the determination of the Laplace transforms of complex time waveforms; convolution.

A.1.2 Year 2 - Spring Term

Details of the Year 2 Recording Techniques and Technologies have been highlighted in the extract from the departmental undergraduate syllabus document below:

DEPARTMENT OF ELECTRONICS

Module Title: EEMTS & BEng V Module Number: 072026

Credit Units = 40 360 hours

Aims

To continue to develop an understanding of the fundamentals of electronic engineering. To broaden and deepen understanding, knowledge and appreciation of the impact that fundamental concepts have on real systems. To continue to introduce the concepts of music technology and demonstrate its relationship to electronic engineering.

Description

The courses that make up the module are an integrated set of lectures, assignments, tutorials, workshops and laboratories on a range of electronic engineering topics. All courses have been designed to develop the students' understanding, knowledge and skills in the discipline.

Courses & their Syllabi:

Analogue (Power Electronics) 14 lecture hours

Power Transistors: Bipolar and MOS power transistors; safe-operating area, heat sinks requirements and thermal stability, power amplifiers, classes A, B, AB, and C, single-ended and push-pull circuits, class B design. Switch mode power supplies.

Communication Transmission 9 lecture hours

Review of probability distributions; baseband digital transmission: formats and spectra; distortionless transmission: Nyquist filtering and line coding; optimum reception in noise matched filtering, calculation of BER.

Computer Programming using C 6 lecture hours

Advanced data structures; dynamic memory allocation; linked lists; recursion; miscellaneous operators.

Digital Circuits 9 lecture hours

LSI devices: Simple array devices: PLA, FPGA. Counters, cascading asynchronous and synchronous designs. Memory structures: Static and dynamic memory; applications. Tri-state logic.

Distributed Circuits 9 lecture hours

Distributed Circuits: The Smith chart and stub matching methods; the use of scattering, and transmission matrices for microwave components; single state amplifier design; microstripline design; directional couplers:network analysers.

Electromagnetic Waves 9 lecture hours

Electromagnetic Waves: Vector wave equation for free space; solutions of the wave equation in free space; energy flow - the Poynting vector; wave polarisation - linear, circular, elliptical; vector wave equation for media; solutions of the wave equation in media; special solution - perfect dielectrics, conductors, lossy dielectrics.

Networks for Communications 9 lecture hours

IEEE Project 802 and the LLC. Bridging LANs. Linking LANs to the Internet. The Internet: IP Addresses: classes, and classless addressing. Routing: RIP and OSPF. Names and DNS. UDP and TCP. The future: IPv6.

Recording Studio Techniques **9 lecture hours**

Audio Compression; All about Equalisation. General use of effects units and a review of the use of the Auxiliary bus; Reverberation; Delay based effects; Putting it all together – Mixing Down; Production Techniques: Recording a vocal, recording a drum kit, recording electric guitar.

Solid State **4 lecture hours**

Breakdown in p-n junctions, avalanche mechanism, applications, MOSFET second order effects on band structure, flat band voltage and threshold shifts, MOSFET SPICE models and applications.

A.1.3 Year 3 - Autumn Term

Details of the Year 3 Advanced Recording Studio Production Techniques have been highlighted in the extract from the departmental undergraduate syllabus document below:

DEPARTMENT OF ELECTRONICS

Module Title: EEMTS (MEng/BEng) & HW63 VII (BEng) Module Number: 073035

Credit Units = 40 360 hours

Aims

To extend knowledge, skills and understanding in a set of core courses. To expand understanding of Music Technology in electronic engineering by introducing specific material.

Description

This module consists of an integrated set of lectures, assignments, laboratories, tutorials and workshops on a range of key electronic engineering and music technology topics. All courses of the module have been designed to extend understanding, knowledge and skills in the discipline.

Courses and their Syllabi:

Accounting and Finance **18 lecture hours**

Wealth and profit measurement, balance sheets, profit and loss accounts, worksheet methods, stock and work in progress, debtors, creditors, accruals and pre-payments, costs, final account preparation, managerial use of financial information and budgeting and financial control.

Advanced Digital Synthesis **9 lecture hours**

Design studies of digital circuit design for music synthesis under CAD. Implementation of signal processing algorithms both in hardware and digital signal processing, with applications drawn from interactive audio signal processing.

Advanced Recording Studio Production Techniques **9 lecture hours**

Mastering, post production and audio CD preparation; the computer based digital audio workstation; the use of timecode in the recording studio; the software based recording studio vs. the traditional hardware based approach; digital mixing; common DSP techniques for application specific creative audio processing; surround sound.

Analogue/Digital Filters **18 lecture hours**

Analogue Filters: The approach to filter design: The notion of approximation, synthesis and realisation as the essential parts of the design process. Approximations to ideal filter amplitude response: Butterworth, Chebychev and Elliptic. Synthesis: Darlington insertion loss technique for resistively terminated LC filters. Active filter synthesis; Sallen and Key, Rauch, Ring-of-three configurations.

Realisation: Impedance level denormalisation. Realisation of lowpass, highpass, bandpass and bandstop filters. Appropriate technologies. Active filter design: Single, dual and multi-amplifier biquads, effect of tolerances and amplifier limitations. Lowpass to highpass/bandpass. Use of design tables. Delay equalisation and realisation. Digital Filters: Introduction to Digital Signal Processing; the sampling theorem, aliasing, the anti-alias filter, the reconstruction filter. Digital filter design: concepts, structure, symbols, mathematical notation; the moving average filter; impulse response, frequency response, the discrete-time Fourier transform, linear phase, nonrecursive filter design by the Fourier method, windowing. Introduction to the z transform: relationships between Fourier, Laplace and z transforms, the pole-zero z plane plot, generating a recurrence expression, simple recursive filter design; notch filter, bandpass filter/comb filter combination.

Communication Systems **18 lecture hours**

Voice, video and data traffic: grades of service, characteristics and traffic modelling. Circuit-switched networks and blocking. Erlang and Engset distributions. Packet-switched networks and queuing theory. Network capacity and discard strategies. Congestion control. Priority. Overview and historical perspectives. Basic elements of a typical optical communications system. Fundamental system topologies (coherent and direct detection). Optical sources and transmitters for optical communications. Optical detectors and receivers for optical communications. Optical fibres and cables. Fundamental system limitations (bandwith and distance), system design considerations. Example optical fibre communications systems (Long haul, LANs etc)

Digital Engineering **18 lecture hours**

Design, simulation and testing of large digital systems: Design building blocks and basic design optimization methods, introduction to a design description language (VHDL). System implementation technologies including field programmable gate arrays (FPGA). Simulation tools for design evaluation. Fault models and design of test vectors, use of signature analysis, boundary scan and other test methodologies.

Object Oriented Programming using Java (MEng Only) **9 lecture hours**
18 laboratory hours

Overview of object oriented design, object-oriented programming; Java - introduction and philosophy, Java byte-code and the Java virtual machine, Java applets and applications, the Java programming language, introduction to graphical API.

BEng Project **27 private study hours**

Initial literature search of project area, formulation of initial project milestones, initial project costings, feasability study, production of initial project timetable, production of initial report.

OR

MEng Software Engineering Project **9 lecture hours**

Software life cycle: Specification, design, production, testing, maintenance, documentation, system integration and testing. Object-orientated design methods UML. Quality assurance scheme: Examples of analysis and implementation tools. Project management: Problems of programming as a group.

A.2 Assessment Documentation (Year 2 Only)

A.2.1 Field Recording Exercise Part 1:

THE UNIVERSITY of York

DEPARTMENT OF ELECTRONICS

2nd Year EEMTS

Field Recording Exercise
Part 1 - Autumn Term:
Sequenced Composition of Backing Track

Task

You are required to submit a CD to the Departmental Office by 2:30 on Friday of Week 10 (14th December 2000). The CD should contain an original composition (lasting approximately 3 minutes) and should be accompanied by a report (outlined in this document).

The Composition

The composition must be created using an appropriate MIDI sequencer, and can be created using Cubase VST or Nuendo running on the studio PC workstations or on your own equipment if required. If you do not require your allotted studio time please tell Damian Murphy (dtm3@ohm) so that your group can be removed from the timetabled slots. Note that the composition should use only MIDI devices as your sound sources. Audio tracks are not to be used at this stage. The piece is expected to contain many tracks of sequenced music and you should demonstrate the use of MIDI Continuous Controllers as a means of enhancing and modifying your music, in order to give it a more natural and varied quality.

You are to record the final output from the sound module's Audio Outs to the input of a DAT recorder. (If you use more than one MIDI synth or module you will have to use an appropriate mixer to balance the sound levels and record to DAT from the output of the mixer). If you are not working in the Studio or Mixdown rooms then you can book the loan of a portable DAT machine from the Computing Workshop. From your DAT master produce a CD for submission using either the standalone CD recorders in the Studio Control Room or Mixdown Room or the CD Writers in the PC workstations.

There are no restrictions on the musical style of the composition.

Work Groups

Time in the Studios will be allocated for you throughout weeks 2-8, on days when you have no labs. You may also use the Practice Room PC workstations but you must book these yourself. You should sign up to be in a particular group (denoted by letters A-P) on the noticeboard by the Departmental Office. Note that those in Lab Groups 1-27 must sign up as groups A-H and those in Lab Group 28-54 must sign up as groups I-P. Try to ensure that you are all are in the same half of the year group as you are for labs. Please try and spread yourselves evenly across both halves of the group allocation. From an organisational point, it will also help to sign up for your lab groups at the same time. Any changes to working groups must be reported to Damian Murphy by Email (dtm3@ohm).

Each group has 12 hours allocated in the studios over weeks 2-8. If you choose NOT to use some of the time please remove your group letter from the studio sheets so that others can use it.

A typical group will work together on both the composition and the write-up. All members of the group will receive the same mark.

Scope of Composition/Time Management

Note that this assignment is as much an exercise in time management as in compositional ability. In the real world studio time is expensive and so has to be used efficiently to maximise productivity. The more planning and preparation you do prior to your studio slots, the better use you will make of them. It is also recommended that you get a working version of the piece recorded to DAT tape and onto CD as soon as possible, using any remaining time to add to, edit and improve the piece. In other words, MAKE SURE YOU HAVE SOMETHING TO HAND IN!

Documentation

The submitted CD must be clearly labelled. You are expected to provide accompanying documentation. We recommend 6-12 pages which should include:

- Musical programme notes for the piece. (eg. What might appear on a CD cover or concert programme)
- Details of the contribution of all the people involved in the composition, recording and write-up.
- Description of how the piece was technically created.
- Lists of sounds and effects used on the sound module or synthesizer(s).
- Track sheet listing of what is playing on each track (of the sequencer) at different times.

Marking Scheme

The following criteria will be used by a panel of judges to assess the work:

CD: 50%

- Audio production standard and quality of the finished piece.
- Musical quality of composition and/or performance
- Effective and Creative use of technology and equipment.

Report: 50%

- Presentation of document.
- Quality of technical description.
- Quality of musical description.

Part 2

The second part of this exercise takes place during the Spring Term. It will involve building upon the skills and work developed in this exercise by adding audio tracks to your MIDI backing track. You should consider this and how your piece might develop as you write and create it for Part 1.

Details will be given at the start of the Spring Term.

Studio Times:
These are listed overleaf, by group numbers, and will appear as block bookings on the appropriate studio sheets.

Studio Allocations

Week 2

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	A	I
3:15-5:15	B	J

TUESDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	C	K
3:15-5:15	D	L

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	E	M
3:15-5:15	F	N

FRIDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	G	O
3:15-5:15	H	P

Week 3

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	I	A
3:15-5:15	J	B

TUESDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	K	C
3:15-5:15	L	D

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	M	E
3:15-5:15	N	F

FRIDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	O	G
3:15-5:15	P	H

Week 4

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	I	M
3:15-5:15	J	N

TUESDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	K	O

3:15-5:15	L	P

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	A	E
3:15-5:15	B	F

FRIDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	C	G
3:15-5:15	D	H

Week 5

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	M	I
3:15-5:15	N	J

TUESDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	O	K
3:15-5:15	P	L

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	I	M
3:15-5:15	J	N

FRIDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	K	O
3:15-5:15	L	P

Week 6

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	E	A
3:15-5:15	F	B

TUESDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	G	C
3:15-5:15	H	D

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	A	E
3:15-5:15	B	F

FRIDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	C	G
3:15-5:15	D	H

Week 7

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	M	I
3:15-5:15	N	J

TUESDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	O	K
3:15-5:15	P	L

Week 8

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	E	A
3:15-5:15	F	B

TUESDAY	***MAIN STUDIO***	***MIXDOWN STUDIO***
1:15-3:15	G	C
3:15-5:15	H	D

2nd Year Music Technology Field Recording Exercise Groups

Lab Groups 1-27 choose from Groups A-H, Lab Groups 28-54 choose from I-P

	Group Letter	Names
Lab Group 1-27	A	
	B	
	C	
	D	
	E	
	F	
	G	
	H	
Lab Group 28-54	I	
	J	
	K	
	L	
	M	
	N	
	O	
	P	

Second year Field Recording Exercise
Part 1: Feedback Form

Name:

Marking Criteria	Maximum Marks	Mark Awarded	Comments
Audio production standard and Quality	**10**		
Musical quality of composition or performance	**10**		
Effective and creative use of technology	**10**		
Presentation of documentation	**10**		
Quality of Technical Description	**10**		
Quality of Musical Description	**10**		

TOTAL MARKS:	**/60** **%**

A.2.2 Field Recording Exercise Part 2:

THE UNIVERSITY of York

DEPARTMENT OF ELECTRONICS

2nd Year EEMTS
Field Recording Exercise
Part 2 - Spring Term:
Instrumental Overdubbing

Task

You are required to submit a CD to the Departmental Office by 3:30 on Friday of Week 10 (15th March 2002). The CD should contain a short, original composition (lasting approximately 3 minutes) and should be accompanied by a report (outlined in this document).

The Composition

The composition must contain a backing or accompaniment track created using an appropriate MIDI sequencer such as Cubase VST or Nuendo running on the studio PC workstations or on your own equipment if required. If you do not require your allotted studio time please tell Damian Murphy (dtm3@ohm) so that your group can be removed from the timetabled slots. In addition there must be at least one musical part which has been recorded live and mixed with the backing track. You may either use the audio recording and processing facilities of VST/Nuendo, or the ADATs for your audio tracks. You may wish to rework or adapt the piece submitted for the previous part of the exercise, or you might find it easier to start again with a new composition. The exercise must involve the use of multi-track recording, but no more than 8-tracks of audio altogether. (This allows you to keep your work on one ADAT tape (if you use this recording medium) and will prompt you to think about the order of recording and how to use track bouncing techniques if you feel they are necessary).

You are to record the final mix to DAT. If you are not working in the Studio or Mixdown rooms then you can book the loan of a portable DAT machine from the Computing Workshop. From your DAT master produce a CD for submission using either the standalone CD recorders in the Studio Control Room or Mixdown Room or the CD Writers in the PC workstations.

There are no restrictions on the musical style of the composition.

Work Groups

You are expected to work in the same groups as for Part 1 of this exercise, and as such the sign up sheet from last term is still in place on the 2nd year noticeboard. Note that as before, those in Lab Group A are signed up as groups A-H and those in Lab Group B are signed up as groups I-P. Please let Damian Murphy (dtm3@ohm) know if there are any subsequent changes. Slots in the two studio rooms (weeks 3-10) have been allocated for you at times when you have no labs or lectures. Each group has 12 hours allocated in the Studios. If you choose NOT to use some of the time please remove your group letter from the studio sheets so that others can use it. You may also use the Practice Room PC workstation but you must book this yourself.

A typical group will work together on both the composition and the write-up. All members of that group will receive the same mark.

Scope of Composition/Time Management

As with Part 1, this assignment is as much an exercise in time management as in compositional ability. In the real world studio time is expensive and so has to be used efficiently to maximise productivity. The more planning and preparation you do prior to your studio slots, the better use you will make of them. It is also recommended that you get a working version of the piece recorded to DAT tape and onto CD as soon as possible, using any remaining time to add to, edit and improve the piece. In other words, MAKE SURE YOU HAVE SOMETHING TO HAND IN!

Documentation

The submitted CD must be clearly labelled and may benefit from some artwork in order to give a professional and complete presentation, although this is not an absolute requirement of the assignment.

You are expected to provide accompanying documentation. We recommend about 2000 words which should include:

- Musical programme notes for the piece (eg. What might appear on a CD cover or concert programme).
- Details of the contribution of all the people involved in the composition, recording and write-up.
- Description of how the piece was technically created.
- Lists of sounds and effects used on the sound module or synthesizer(s).
- List of acoustic sound sources and how they have been recorded.
- Track sheet listing of what is playing on each track (both on the sequencer and on the audio multi-track at different times).

Marking Scheme

The following criteria will be used by a panel of judges to assess the work:

CD: 50%

- Audio production standard and quality of the finished piece.
- Musical quality of composition and/or performance
- Effective and Creative use of technology and equipment.

Report: 50%

- Presentation of document.
- Quality of technical description.
- Quality of musical description.

Studio and Practice Room Times

These are listed overleaf, by group numbers, and will appear as block bookings on the appropriate studio sheets.

Studio Allocations

Week 3

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	I	
3:15-5:15	J	

TUESDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	M	O
3:15-5:15	N	P

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15		I
3:15-5:15		J

FRIDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	O	M
3:15-5:15	P	N

Week 4

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	A	C
3:15-5:15	B	D

TUESDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	E	G
3:15-5:15	F	H

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	C	A
3:15-5:15	D	B

FRIDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	G	E
3:15-5:15	H	F

Week 5

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	I	
3:15-5:15	J	

TUESDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	M	O

3:15-5:15	N	P

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15		I
3:15-5:15		J

FRIDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	O	M
3:15-5:15	P	N

Week 6

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	A	C
3:15-5:15	B	D

TUESDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	E	G
3:15-5:15	F	H

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	C	A
3:15-5:15	D	B

FRIDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	G	E
3:15-5:15	H	F

Week 7

MONDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	I	
3:15-5:15	J	

TUESDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	M	O
3:15-5:15	N	P

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15		I
3:15-5:15		J

FRIDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	O	M
3:15-5:15	P	N

Week 8

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	A	C
3:15-5:15	B	D

FRIDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	E	G
3:15-5:15	F	H

Week 9

THURSDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	C	A
3:15-5:15	D	B

FRIDAY	*MAIN STUDIO*	*MIXDOWN STUDIO*
1:15-3:15	G	E
3:15-5:15	H	F

2nd Year Music Technology Field Recording Exercise Groups Part 2

Lab Group A choose from Groups A-H, Lab Group B choose from I-P

	Group Letter	Names
Lab Group A	A	
	B	
	C	
	D	
	E	
	F	
	G	
	H	
Lab Group B	I	
	J	
	K	
	L	
	M	
	N	
	O	
	P	

Second year Field Recording Exercise
Part 2: Feedback Form

Name:

Marking Criteria	Maximum Marks	Mark Awarded	Comments
Audio production standard and Quality	**10**		
Musical quality of composition or performance	**10**		
Effective and creative use of technology	**10**		
Presentation of documentation	**10**		
Quality of Technical Description	**10**		
Quality of Musical Description	**10**		

TOTAL MARKS:	**/60** **%**

A.2.3 Recording Studio Techniques Assignment:

THE UNIVERSITY of York

DEPARTMENT OF ELECTRONICS

2nd Year MTS
Recording Studio Techniques
Assignment
(Autumn and Spring Terms)

Overview:

The Assessment is divided into three distinct tasks as follows:

Task 1: Stereo recording and production of acoustic source material.
Task 2: Multitrack recording and production of a creative musical work.
Task 3: A short written guide to selecting and using microphones.

The outcome of this assessment consists of three deliverables that are to be handed in and marked:

- A fully produced CD containing a stereo mix-down of Tasks 1 and 2
- Supporting technical documentation for Tasks, 1 and 2.
- A tutorial style document for Task 3 (possibly with an additional supporting CD of audio examples).

The deadlines for these submissions to the Departmental Office are:

Task 3 - 2:30pm, Friday Week 10, Spring Term, 15th March 2002
Tasks 1 and 2 - 2:30pm, Friday Week 1, Summer Term, 26th April 2002

Note that you can work in groups to complete the assignment but it is expected that each individual makes an ***original and unique submission***. Note further that you are left to manage your own time in completing this assignment – *particularly with regard to your studio bookings.*

Breakdown of Tasks

Task 1

Make a direct to stereo recording to professional standards using an appropriate acoustic source as the subject and produce ready for release on CD.

The aim of this task is to build on your first year Field Recording Exercise and make a high quality, natural sounding stereo recording of an acoustic instrument (including, for instance,

singing or spoken word) without the use of additional processing or post-production. The length of the recording should be about 3 minutes.

Your first consideration will have to be what you are going to use as your subject, and then where you are going to record them. Although the most obvious location is in the Recording Studio performance space you may be able to negotiate the use of another room or location as appropriate. Given the acoustic properties of the space and the acoustic source you will then have to consider the type of microphone(s) to use and how they should best be placed. Set your levels carefully for optimum recording quality and record directly to DAT.

From this DAT master, record the track onto CD for submission. You may wish to use basic digital editing facilities (topping and tailing, normalisation) between these two stages to prepare the track for writing to CD. However please note the previous comment relating to the fact that the submitted track should be a direct stereo recording without any additional post-production. As such EQ, compression, limiting, noise reduction or any other similar process should not be used.

Note that this is a studio recording project and not a field recording exercise and hence it is not appropriate to just use the portable recording kits to complete this part of the assignment.

You are expected to provide technical documentation to support this task which should include:

- Musical programme notes.
- Details of the recording environment and the source material.
- Details of the contribution of performers or assistant engineers.
- Description of the recording process.
- List of microphones used, together with any special considerations, details of positioning and the reasoning behind your selection.

The assessment process will examine the quality, naturalness and detail of the finished recording, as well as the quality of the final CD track in terms of it being considered as a high standard, professionally finished piece of work.

Task 2

Use creative multitrack recording techniques to professional standards to produce a creative musical work using appropriate acoustic sources as the subject and produce ready for release on CD.

The aim of this task is to make a high quality multitrack recording using additional processing where necessary to produce a creative musical work. Note that the *creativity* can be considered as being in the arrangement, editing, production or composition of the finished piece. Remember that your role is as musician, engineer *and* producer. The length of the recording should be about 3-4 minutes.

The first thing you must consider is what piece of music you are going to record – original or already existing? – and how this is to be facilitated. What instruments or musicians will you need? How should you organise your studio time to record the track? Will you need to sequence some elements of the piece? Can you record it live with minimal overdubs? Or will it require a track-by-track approach? Note that this assessment is primarily an exercise in recording techniques, therefore it is not applicable to sequence the majority of the piece using MIDI or audio samples. However, you can use either ADAT or Hard Disk as your recording medium. You should aim to keep your composition to a maximum of eight tracks of audio.

Think about how you are going to record your instruments and the use and placement of the microphones that are available to you. What, if any, post processing do you think you will

need? Compression, EQ, reverb? Remember it is often better to spend longer in the recording process getting the sound right, rather than thinking you can "fix it in the mix". Finally, mix your completed recording to DAT.

From this DAT master, record the track onto CD for submission. You may wish to use digital editing facilities (topping and tailing, normalisation) between these two stages to further produce the finished track to ensure a professional, quality product. However if you do, ensure that the quality of the original recording is maintained at all times.

You are expected to provide technical documentation to support this task which should include:

- Musical programme notes.
- Compositional ideas, description and development.
- Structure plan of the piece.
- Details of the recording process, how you have organised it and the sound sources used.
- Details of the contribution of performers or assistant engineers.
- List of microphones used, together with any special considerations, details of positioning and the reasoning behind your selection.
- Details of any effects or processing used.
- A critical review of the final piece.
- Technical diagrams, track sheets and connection diagrams as appropriate.

The assessment process will examine the quality, balance and detail of the finished recording, as well as the quality of the final CD track in terms of it being considered as a high standard professionally finished piece of work.

Task 3

Brief:

A popular music technology magazine has asked you to write a tutorial article for its next issue. This tutorial should be a short guide on the principles behind and the practical use of different types of microphone as part of the recording process. You should aim to write no less than 1500 words.

Content:

You should explain the differences between the fundamental microphone types, and how their design influences the applications they may be used for. You may wish to review a selection of specific microphones, examining their properties and citing examples of their use. You could also include a guide on how to use particular microphones in the recording of particular sound sources, discussing selection, positioning, associated techniques, potential problems and how they might be surmounted.

Make full use of diagrams and graphs to illustrate your written work and the examples you mention. You may also wish to supply audio examples to accompany your text, perhaps demonstrating different microphone techniques or how different microphones affect the quality of a particular sound. Make sure that you clearly refer to any diagrams or audio examples at the appropriate point in the body of your text. Audio examples, if used should be supplied on an accompanying CD.

Make sure you supply references as and where appropriate – This should include refs for magazine articles, websites, commercial recordings etc. Do not cut and paste from internet articles and always reference direct quotes.

Further CD Submission Details

The CD masters should be finished to a professional standard with an appropriate cover, track inlay with track numbers, titles and running times, your name as principal producer of the finished product together with any other appropriate credits as applicable. Again, use of non-original pre-recorded samples should be referenced.

Recordings should always be of a professional standard. They should be clear of excessive background noise and external noise. Levels should be high enough so as to make the best use of the dynamic range of the recording media being used. Make sure recordings start and stop in a smooth manner using fade ins and fade outs rather than just stopping the machine.

Make sure all recordable CDs have been finalised.

Your CDs should be labelled appropriately to professional standards. This should include jewel case covers and artwork, on body CD labels, and a listing of all tracks with timings.

Breakdown of Marks:

Task 1 (30%)

- Audio production standard and quality of the finished piece.
- Clarity, balance, distance of sound sources.
- Quality of musical and technical description, together with structure and presentation of report.

Task 2 (40%)

- Audio production standard and quality of the finished piece.
- Musical quality of composition and production.
- Effective and creative use of recording studio techniques.
- Quality of musical and technical description, together with structure and presentation of report.

Task 3 (30%)

- Overall presentation and structure of report.
- Quality of musical and technical description.
- Relevance and quality of supporting diagrams and any audio examples used.

Second Year Recording Studio Techniques Assignment
Name:

Task	Marking Criteria	Maximum Marks	Mark Awarded	Comments
1	Audio production standard and quality	10		
1	Effective and creative use of recording studio techniques	10		
1	Quality of report contents, presentation, structure	10		
2	Audio production standard and quality	10		
2	Musical quality of composition and production	10		
2	Effective and creative use of recording studio techniques	10		
2	Quality of report contents, presentation, structure	10		
3	Overall presentation and structure of report	10		
3	Quality of musical and technical description	10		
3	Relevance/quality of supporting diagrams and audio examples (if used)	10		

TOTAL MARK:	%

A.3 Course Plan (Year 2 Only)

THE UNIVERSITY of York

DEPARTMENT OF ELECTRONICS

Recording Studio Techniques
2nd Year Music/Media Technology 2001/2002

Autumn Term

Week 2
- Course Introduction. Studio Layout and organisation.

Week 3
- It's All in the Mix(er) – Overview of a typical Mixing Desk.

Week 4
- Assignment Handout and Discussion;
- Using the desk - Record, overdub, mix, monitor, foldback.

Week 5
- An Introduction to Nuendo

Week 6
- The Mackie d8b

Week 7
- "Test… One…" Microphone types and their design.

Week 8
- Tracing the development of the multitrack tape machine.

Week 9
- Once again from the top - Organising Your Recording Sessions

Week 10
- Introduction to Digital Recording Formats

Spring Term

Week 2
- Stereo Microphone and Recording Techniques 1 - Directional Hearing

Week 3
- Stereo Microphone and Recording Techniques 2 - Setting Up and Using Stereo Microphones

Week 4

- Squash, Limit and Expand - Audio Compression.

Week 5

- Boom or Sizzle? All about EQ

Week 6

- Catching the auxiliary bus - Using effects units.
- Reverberation and Delay – lay – lay – lay - lay

Week 7

- Putting it all together - Mixing Down
- 1st and 2nd Year Concert - National Centre For Early Music

Week 8

- Production techniques - Recording a Vocal
- Workshop Session, Tuesday 12:15, PL001

Week 9

- Production techniques - Recording a Drum Kit

Week 10

- Production techniques - Recording Electric Guitar

Appendix B:

Questionnaires

B.1 Questionnaire 1

THE UNIVERSITY of York

DEPARTMENT OF ELECTRONICS

Studio/Course Feedback Questionnaire

This questionnaire is part of a study I am conducting into the effective and efficient teaching of Music Technology and related subjects. It will provide valuable data that can be used both for analysis and to help form the basis for improvements in the provision and delivery of such courses within the department.

Note that this is distinct from the departmental end of course questionnaire that should still be completed as normal (online), although your responses will still be treated as confidential and you do not have to put your name on the form unless you wish to.

Note further that if you do not want your responses to be included in this study then please do not complete the form – by entering any data you are agreeing to it being used as a study that forms part of a University of York postgraduate professional qualification.

There will be a follow up workshop to this questionnaire next term, which you will be invited to attend. This will take the form of a short lecture and a second questionnaire. Please answer all questions as fully and honestly as possible and let me take this opportunity to thank you for taking the time to complete this form.

A. Knowledge and Experience:

1. How would you rate your recording and studio experience prior to attending this course on a scale of 1 (novice, never been in a studio before or used a sequencer) to 5 (I have managed a number of sessions as engineer/producer):

   Give Details (if appropriate):

2. Now that you have completed the course, and using the same scale of 1 to 5, how would you rate your studio related abilities?

Please summarise what you feel are you are best at, and what you feel you need to work on more:

B. Course Delivery:

3. Did you attend the weekly course lectures: **All/Most/Some/None**

4. Did you find them useful or informative? Please rate them on a scale of 1 (No use at all) to 5 (Very useful and essential):

   Please add any additional comments regarding the course lectures:

5. Did you make your own notes during the course of the lectures? **Yes/No**

6. Did you find the handouts useful? Please rate them on a scale of 1 (No use at all) to 5 (Very useful and essential):

7. Did you refer to any of the suggested books? **Yes/No**

   If so which?

8. Did you refer to any of the recommended websites?

   If so which?

9. Would you find a handbook (consisting of a complete set of printed notes and handouts) a useful addition to the course: **Yes/No**

10. If this material was made available on-line, would you download a copy for your own personal use? Please Rate from 1(No) to 5 (I would definitely download all of it)

    Please add any additional comments on lecture support material:

11. Did you attend the weekly studio drop-in sessions in the Spring Term:

    All/Most/Some/None

12. Did you find them useful or informative? Please rate on a scale of 1(No use at all) to 5(Very useful):

13. Would you like to see more or less drop in sessions? **Yes/No**

    Please add any additional comments on the drop in sessions:

14. Did you attend the workshop in the Spring Term: **Yes/No**

15. Did you find it useful or informative? Please rate it on a scale of 1(No use at all) to 5(Very useful):

    Please add any additional comments on the workshop:

16. What would you like to see covered by the course that isn't already?

17. Can you suggest anything that might enhance the overall quality or improve your understanding of the Recording Techniques lecture course?

C. Studio Facilities:

18. Did you work mostly in:
Studio 1/Studio 2/PC Practice Room/Own Studio/A Variety

19. Would you say you were confident in the use of the above facility/facilities?
Yes/No

Please Comment

20. Did you make use of your allotted Field Recording Hours? **Yes/No/Some**

If not why not?

21. Did you make use of out of hours access? **Yes/No**

If Yes did you have any specific problems with booking or use?

22. Approximately how many hours did you spend in the studio in the Autumn Term?

23. In the Spring Term?

24. Do you feel you had enough time in the studio(s) to complete your assignments within the bounds of the stated requirements? **Yes/No**

25. Did you make use of any of the portable recording kits? **Yes/No**

    If Yes did you have any specific problems with booking or use?

26. What did you use as your main multitrack recorder?
    ADAT/Cubase/Nuendo/Wavelab

27. What do you perceive as being the biggest problem in your use of the studio as it is currently implemented?

28. What changes would you like to see implemented in studio provision?

D. Specific Course Content: Audio Compression

29. Summarise as briefly as possible what audio compression is/does:

30. How do you connect a compressor to the mixing desk?

31. What is the difference between a hard and soft knee compressor?

32. What does the attack control do?

33. What would be a typical compressor setting for recording a vocal?

34. Do you feel you understand how to set up and use a compressor? **Yes/No**

If yes, why is this?

If no, what would help you most in your understanding?

Many thanks for your time and the information you have given. If you are happy to be approached for possible further questioning regarding your answers then please leave you name and Email below. PLEASE NOTE THAT THIS IS NOT COMPULSORY! Please be assured that whether you leave your name or not, all information will be treated in strictest confidence.

Name:…….Email:……

B.2 Questionnaire 2

THE UNIVERSITY of York

DEPARTMENT OF ELECTRONICS

Studio/Course Feedback Questionnaire Part 2

This questionnaire forms the second part of a study I am conducting into the effective and efficient teaching of Music Technology and related subjects, with the first part of the questionaire having been completed at the end of the Year 2 Recording Techniques course. It will provide additional valuable data that can be used both for analysis and to help form the basis for improvements in the provision and delivery of such courses within the department.

Note that your responses will still be treated as confidential and you do not have to put your name on the form unless you wish to. If you do not want your responses to be included in this study then please do not complete the form – by entering any data you are agreeing to it being used as a study that forms part of a University of York postgraduate professional qualification.

Please answer all questions as fully and honestly as possible and let me take this opportunity to thank you for taking the time to complete this form.

E. Response to The Workshop:

35. Have you found this workshop useful or informative? Please rate it on a scale of 1(No use at all) to 5(Very useful):

36. Do you think that the use of the *Laptop/Nuendo/Projector combination* was *successful*? Please rate on a scale of 1(Not Successful At All) to 5(Very Successful):

37. Do you think that the use of *Laptop/Nuendo/Projector combination* was *useful and helped your understanding* of the topics under discussion? Please rate it on a scale of 1(No use at all) to 5(Very useful):

38. Do you think that the use of the *studio hardware* was *successful*? Please rate on a scale of 1(Not Successful At All) to 5(Very Successful):

39. Do you think that the use of the *studio hardware* was *useful and helped your understanding* of the topics under discussion? Please rate it on a scale of 1(No use at all) to 5(Very useful):

40. Do you think that the use of the *audio examples* was *successful*? Please rate on a scale of 1(Not Successful At All) to 5(Very Successful):

41. Do you think that the use of the *audio examples* was *useful and helped your understanding* of the topics under discussion? Please rate it on a scale of 1(No use at all) to 5(Very useful):

42. Do you think you could relate these demonstrations/scenarios to your own studio work either past, current or future? Please rate on a scale of 1(Of no relevance to my studio work at all) to 5 (Very relevant to my work):

43. Do you think you could now successfully apply these or similar examples in your own studio work? Please rate on a scale of 1(Would still not know where to start) to 5 (Would be able to use them with confidence and skill):

Please add any additional comments or feedback on the delivery of this workshop and how it might be improved:

Please add any additional comments on the format of this workshop:

F. Specific Course Content: Audio Compression

44. How do you connect a compressor to the mixing desk?

45. What does the attack control do?

46. What would be a typical compressor setting for recording a vocal?

47. Do you feel you understand how to set up and use a compressor? **Yes/No**

48. Do you think the workshop has helped in this respect?

No – I knew anyway/
No – I will still need additional help/
Yes – I could have a good go at this now/
Yes – No problems.

If you answered NO to either 13 or 14, what would help you most in your understanding?

Many thanks for your time and the information you have given. If you are happy to be approached for possible further questioning regarding your answers then please leave you name and Email below. PLEASE NOTE THAT THIS IS NOT COMPULSORY! Please be assured that whether you leave your name or not, all information will be treated in strictest confidence.

Name:…….Email:……

Appendix C:

TIDC Funding Application

UNIVERSITY OF YORK

Fund for Innovation and Development in Teaching and Learning - APPLICATION FORM

SECTION 1 - SUMMARY DETAILS

Title of Project: The Portable Recording Studio – Supporting Large Group Music Technology Teaching with Practical Demonstrations

Duration of Project: 6 months (Autumn and Spring Terms 2001/2002)

Name(s) of applicant(s): Dr Damian Murphy **Department/Centre/Unit:** Electronics

Telephone: 3221 **E-Mail:** dtm3@ohm.york.ac.uk

Are you presently participating in YCAP? **YES/~~NO~~**

New members of staff are encouraged to discuss their application with the Director of Staff Development (see section 5). The Committee accepts that applications from new members of staff are likely to have a different focus to those of more established teaching staff.

Synopsis of Project (not more than 100 words):
Current Recording Studio Techniques courses are delivered to large groups of students in a lecture format being supported by unsupervised small-group practical sessions in the studios themselves. It has become clear through course feedback that more practical techniques need to be covered during lecturing time. However, the studios are too small to lecture in and dividing up the group into smaller numbers is an inefficient method of delivery. This project proposes to construct a small self-contained portable recording facility, paralleling the equipment typically found in our studio spaces, that can be used during lectures to provide audio demonstrations and allow student interaction.

Summary of Project Costs	**£**	
Departmental Presentation	£30	(see Section 3)
Equipment	£4554	(see Section 4a)
Staffing		(see Section 4b)
Materials and Consumables		(see Section 4c)
Other Expenses		(see Section 4d)
TOTAL PROJECT COSTS	£4584	
(Support from other sources)	£0	
TOTAL FUNDS REQUESTED	£4584	

Departmental Support

Does the project have the support of your Head of Department and departmental Teaching Committee?
YES/~~NO~~

What support will the Department be providing (in financial or material form)?

The Department is providing support for this project in a number of ways. The teaching of the Recording Studio Techniques related courses is generally supported via the department's own recording studio suite, which is considered as an application driven and highly specialised lab area. The equipment provided by the proposed project will work alongside this currently existing resource complementing what is already in place. Ongoing maintenance of the funded equipment will be facilitated through our studio consumables budget, and further practical support is available through our dedicated studio lab technician. The software and hardware supplied by the bid is designed to work in conjunction with a laptop computer that has been purchased earlier this year by the department for the member of staff concerned. This will potentially extend the range of the techniques that can be demonstrated while still remaining true to the concept of a portable studio facility. The Department has also recently purchased a computer display projector allowing the demonstration of appropriate software based techniques and computer based presentations to a large audience.

Why does the project require an initial outlay beyond existing departmental resources?

This is a specific requirement that has risen from course feedback and from listening to the requests of the students that have so far been taught on these courses. The current studio budget allocation could not cover this level of outlay as there are more urgent needs in maintaining the running and upgrading of this heavily used resource.

SECTION 2 - PROJECT DETAILS

This section should give details, of no more than two sides in length, of the proposals for innovative/developmental teaching or learning for which funding is sought. You may wish to include, where relevant, details of financial or other support sought (e.g. from external bodies). Details of any related projects financed by the Fund for Innovation in Learning and Teaching should also be given.

It is a difficult task to find an effective and satisfactory method of delivering a typical Recording Studio Techniques based course. The subject is highly theoretical but this underlying knowledge has to be coupled with practical experience and a chance for the student to see, hear and understand the outcomes of the theory when implemented in a real-world situation. The groups taught are typically large (25-40) and our studio labs are relatively small prohibiting large group teaching in these spaces. Dividing up the cohort into smaller groups proves to be inefficient given the length of time the courses are to be delivered in (18 hours for 2nd year cohort, 9 hours for 3rd year cohort).

As with other courses delivered within the Department of Electronics, the lectures are supported with practical lab exercises for the students in groups of two or three, where a specific task is given. However, due to the nature of the lab resource being used these exercises are structured somewhat differently from traditional lab based work. The students work unsupervised (although technical support is on hand if required for dealing with problems and for general troubleshooting) for short periods of time (usually two hour blocks) in weekly sessions over a single term (note that the nature of the facility implies that only two groups can ever work at any one time). This ensures that all student groups can be accommodated with a fair and equal distribution of studio time. Often the student's unfamiliarity with the use of the equipment leads to an inefficient use of this time in the early stages of the lab exercise, putting undue pressure on them completing to a satisfactory standard in their last few sessions.

These problems are further compounded with issues of access relating to the use of the studio facilities. Currently, during term time the studio suite is under very heavy use as it is available to all four years of our undergraduate Music Technology Systems students. Further, the large amount of timetabled lectures and labs that our students are subject to implies that there are only certain periods of time where they actually can book the studio to carry out additional supporting work or complete other studio related assignment work. As a result the students often use the pre-booked lab time that they are assured of (it is block-booked for them during times when other members of the year group are in standard labs) to complete more tasks than is practically feasible.

Although the familiarity and use of the studio equipment is part of the learning experience, standard lecturing time cannot hope to cover all possible techniques or consider all the possible problems that might arise. Currently the students are encouraged to practice the theory and techniques that are discussed in lectures in their own studio time, be this pre-booked lab sessions, or in additional sessions organised by themselves – timetable permitting. However in reality, this is not a viable option as their actual studio time is very limited, and currently there is a steep learning curve in becoming proficient in its use. It would therefore seem that there is a need to address this issue by providing the opportunity to

become more experienced and proficient in the practical skills required at a much earlier stage and under lecturer direction.

This project is therefore involved with the enhancement of the current Recording Studio Techniques lecture courses so that:

- practical demonstrations can be carried out within the actual lecture theatre/classroom,
- students can see and experiment for themselves with appropriate guidance as to how such equipment is operated in typical real-world scenarios
- students can interact more effectively with the learning experience
- real world audio examples can be auditioned enabling students to understand the possible implications of making appropriate recording related decisions

A number of options have been considered as to how this might be facilitated based on products that are currently available, trends in recording technologies and the equipment that we currently provide for our students. The most appropriate solution would appear to be the construction of a portable rack-mounted facility that parallels the typical components that are found in our main analogue studio control room. This would be coupled with copies of the software used in our digital control room and on our digital audio computer workstations running on a standard portable computer (already supplied). It is not intended that the proposed portable facility should be an exact copy of the equipment currently used as this is neither practical nor economical. Rather it should allow similar techniques to be explored using similar equipment and hence also demonstrate that the skills being learnt are transferable and not specific to one particular recording studio environment. The major components required (which are detailed with appropriate costing information in Section 4) are as follows:

Signal capture and recording:

- A small selection of microphones
- Direct Inject instrument interface
- CD player

A mixing and monitoring environment:

- Speakers
- Mixing Desk
- Headphones

A multitrack audio recording system:

- Laptop Computer (already supplied)
- Audio and MIDI interfacing
- Audio recording software

External audio processing:

- Signal processors
- Reverb effects unit

Together with appropriate casing and cabling requirements. Note also that this system provides only a subset of what currently exists in our studio facility as often items of equipment are duplicated to allow more instances of them to be used in a typical recording session. In a teaching environment only one example of each would be required.

The facility is designed to be self contained and easily portable using standard audio rack casing allowing it to be moved anywhere in our building, or indeed on campus. Furthermore when not in use for teaching purposes it could be made available to students for experimentation and general use providing additional support to our current studio resources.

SECTION 3 - INNOVATION AND BENEFITS

This section should give a clear indication of the expected outcomes of the project.

Project Objectives

*Please state a maximum of **three** key objectives for the project. How will the progress of the project be monitored against these objectives?*

To improve the student learning experience during course delivery by:

- Allowing a greater level of interaction between lecturer and student

- Coupling theoretical audio engineering concepts with practical examples, demonstrations and instant feedback of results
- Familiarising the students with typical recording equipment at an early stage to enable them to make more effective use of their studio time.

Given the construction of the Portable Studio it will be utilised in large group teaching as of October 2001. The success or otherwise of this project will be monitored initially via the standard procedure of course questionnaire feedback. This will be supported more informally with an additional questionnaire that is related to the studio facilities available to the students and the teaching they receive. The purpose of which is to elicit from the students information as to how the facilities are used, how successful the results obtained are, and how specific courses can be better tailored to suit their perceived needs and requirements.

Innovation and Development
Please summarise why the project is innovative/developmental in terms of teaching or student learning.

Based on the reasons discussed above I feel that this project could provide a satisfactory solution to the problem of teaching the practical elements of this subject to large groups of students. This therefore allows me to develop new teaching materials and investigate new modes of delivery. This approach could prove to be innovative and novel, however I personally feel that I have still as yet to find the best mode of delivery for such courses (which I have been teaching for over 4 years in various institutions) that addresses both the requirements of the module learning outcomes and the needs and wishes of the students themselves. Other potential avenues worthy of exploration over a longer period of time may incorporate the use of software/computer based learning and/or the use of multimedia tools and materials.

Assimilation into Teaching
Please indicate how the project outcomes will be assimilated into the normal run of teaching.

Clearly this project and the resource that it creates is designed to be directly and immediately assimilated into the current Second and Third Year Recording Studio Techniques courses. When not being specifically used for teaching related purposes and as already stated, the self-contained facility can be made available to students as a bookable resource, supporting that which is currently available within the department. It will also provide a useful on-location recording facility, particularly useful for allowing the students to make a permanent record of the First and Second Year Music Technology concert, an important event in the undergraduate Music Technology Stream's calendar.

Dissemination
One of the conditions of a Teaching Innovation and Development award is that the project outcomes must be disseminated within the University. This may be done through the Committee's annual conference, through a short presentation/workshop or by other means. The Committee provides a nominal sum of £30 for this. Sums over and above this required for dissemination should be included in the overall project costs. Please give brief details of how the project outcomes could be applied by other departments and how you propose to disseminate the outcomes .

It is intended that the outcomes of the project, as well as a demonstration of the portable facility itself will be presented at next year's annual TIDC conference. A discussion of the implementation and outcomes will also form a part of my intended YCAP major project that will look more generally at the subject of Music Technology related teaching (the exact nature of this report is as yet to be decided although it will most certainly be focusing on this area). I am also involved in teaching on the Music Technology MSc course delivered jointly by the Departments of Electronics and Music. It is suggested that the facilities that this project intends to fund have a clear potential application in similar teaching carried out on this course in both departmental areas.

SECTION 4 - DETAILED COSTINGS

(a) EQUIPMENT SUPPORT

Details of equipment required	**Cost £** *Include VAT where appropriate*
Genelec Active Speakers	£551
Behringer Powerplay HA4000 headphone amp	£121
Beyer DT100 Headphones	£106
Behringer Ultra DI100	£40
Behringer Multigate Pro XR4400	£164
Behringer Composer MDX2200	£140
Yamaha REV500	£269
Marantz CD4000 CD player	£159
MOTU Firewire Audio Interface	£795
MIDIman MIDIsport USB interface	£70
Alesis Studio 32 Mixing Desk	£600
6 8-way cable looms	£318
2 Behringer Ultrapatch Patchbays	£78
2 Shure SM57 Microphones	£172
2 SKG C1000s Microphones	£280
3 Neutrik Mic Cables 5m	£33
Cubase VST v5	£250
Metroworks Codewarrior	£85
10 pack of Patch Cables	£23
Quicklock Portable Rack Casing for above equipment	£300

(b) STAFFING SUPPORT (Please refer to **additional information** relating to staff in the Guidance notes).
Calculations should be based on University pay scales. Please indicate the period of appointment.

Name of staff	Grade	Year 1			Year 2		
		Salary £	NI/USS £		Salary £	NI/USS £	£

NB Please attach C.V.s for staff.

(c) MATERIALS AND CONSUMABLES

Details	Year 1	Year 2

(d) OTHER EXPENSES

Details	Year 1 £	Year 2 £

SECTION 5 - CONDITIONS
Successful applicants accept a grant on the understanding that they must subsequently fulfill the following conditions:

(a) Reports - Staff must provide annual progress reports for the duration of the project, at the request of the Committee Secretary, for inclusion in the Committee's Annual Report.

(b) Presentations - Staff must undertake to disseminate the project outcomes within the University. This may be done through the Committee's conferences, through a short presentation/workshop or by other means. The Committee provides a nominal sum of £30 for this.

Signature of Applicant: .....

Date: .....

***

I believe that this project would be valuable to the Department and the University.

Signature of Head of Department: .....

Date: .....

NOTE: Where appropriate, the Head of Department may submit a letter of support for the project. If more than one application is being submitted for a particular deadline, the Head of Department may wish to rank the applications.

***

I have discussed this application with the applicant.

***Signature of Director of Staff Development** .....

Date: .....

for YCAP participants

Appendix D:

Workshop Overview

Plan of Workshop: Summer Term 2002

Introducing the Portable Studio:
Audio Compression - A Review

Workshop Plan:

1. **Review Questionnaire Part 1**

2. **Introduction to the Portable Studio:**
   The Alesis in-line Mixing Desk
   Outboard Equipment (Effects and Patchbays)
   Nuendo, Laptop and audio interfacing

3. **Introduction to the Nuendo multitrack project**
   A track by track analysis
   Signal routing through Nuendo to mixing desk, outboard and monitoring
   Effects possibilities - internally in software; externally in hardware.

4. **Review Compression [Review previously used overheads]:**
   What is it?
   Why do we need it?
   How does it work?

5. **Demonstration 1 - Hardware compression in action:**
   Apply gating effect to the kick-drum track:
   Set Threshold
   Set Ratio
   Adjust Attack and Release to suit
   Apply Makeup Gain
   Repeat process for snare drum track

6. **Demonstration 2 - Software compression in action:**
   Apply gating effect to the kick-drum track:
   Set Threshold
   Set Ratio
   Adjust Attack and Release to suit
   Apply Makeup Gain
   Repeat process for snare drum track

7. **Questions?**

8. **Ask for a volunteer to have a go themselves…**

9. **Summary of Compression**

10. **Hand out Questionnaire Part 2.**

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