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Education for professional career in acoustics

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There is a demand around the world for staff for acoustical consulting companies as evidenced by the "positions available" listings. Companies would ideally like to hire staff with a good engineering, physics or building background plus an understanding of acoustics. Programs of study at University may deal with the principles of acoustics and vibration but there is usually a need for supplementary education and training for new staff in practical applications of those principles. While larger companies may provide this 'in house' smaller companies do not have such resources and seek to supplement the basic knowledge with short courses or other educational opportunities. Most of these are available at specific times at restricted locations which may limit their applicability. In this paper we will discuss an approach to address this educational need with a fully flexible distance learning program. The program is loosely based on the UK Institute of Acoustics Diploma program. The modules comprising the program have been developed with the assistance of the senior acoustic consultants from a number of firms. The early experiences with implementing the program will be discussed.

1 Introduction

In many countries there is a high demand for staff to work for consultancies and agencies specializing in acoustics. For the right person with the right skills there are good opportunities for a career as an acoustics consultant in private industry or as an acoustics specialist in government or semi government agencies.

For new personnel wishing to enter the field, a basic degree in a science or engineering or building is required as stated by Walters from the ISVR [1]

"To get into an acoustically related career you will probably need to study for a degree in physics or an engineering related subject at a respected university."

Unfortunately a career in acoustics does not have a high profile in the general vocational information. This is understandable as the proportion of the total number of engineering students that would undertake a career in acoustics is very small. Consequently the careers information for prospective engineering and science students focuses on the broader areas for employment and rarely mentions acoustics; just a few examples are the web pages for the engineering promotion by ASEE [2], Studying Science and Technology Worldwide[3] and the Vocational Information Centre web page on careers in engineering, science and maths [4]. This latter page does have a link to the under education to 'Acoustical Programs' which links across to the web page for the American Acoustical Society on education and careers [5].

So for most students, knowledge about the opportunities for a career as a specialist in acoustics relies very much on chance, such as meeting someone who knows about the specialty, reading an article that highlights an acoustics achievement, seeing advertisements for acoustics specialists or attending a university where acoustics and vibration research is being undertaken.

Employers would ideally like to offer positions to graduates who already have a good understanding of acoustics. However there are few institutions offering an undergraduate degree in acoustics – the private American University in DC is one [6]. Within a program of engineering or science study most university programs do offer courses (ie subjects) which deal with sound, noise and vibration. The extent of such courses depends if acoustics and vibration is a research strength within the school and so there are staff who are particularly enthusiastic about the

subject. Education in acoustics is generally considered as a specialty and undertaken at post graduate level.

Once a graduate has decided on a career in acoustics developing and refining the appropriate skills is required and some form of post graduate study is recommended. Most major acoustical societies have links to post graduate opportunities for further study. There are some directories, for instance one maintained by the American Acoustical Society [7] and one by the European Acoustics Association Schola [8]. While it may be possible for some to undertake further full time studies and travel to the location at which the program of study is offered this is not an option for all new graduates commencing a career in acoustics.

Once a new staff member is employed by a consultancy or agency, their supervisor is usually seeking means to quickly develop their skills in acoustics. Some of this can be provided by in-house training, careful supervision and mentoring. However a responsible employer wishes to develop and enhance the skills and knowledge of their personnel by encouraging them to undertake continuing and further education in acoustics. It is at this point there can be a problem in that either the education opportunities do not exist within a reasonable distance from the place of employment or the requirements for the program are such that it is difficult to undertake the study while continuing to work effectively.

In the early part of this decade this was the situation faced by the consulting companies in Australia. The companies were expanding and seeking new staff but there were few, and decreasing, appropriate education opportunities for developing the skills of these staff. The Australian Acoustical Society (AAS on www.acoustics.asn.au) and the Australian Association of Acoustics Consultants (AAAC on www.aaac.org.au) investigated the problem, developed a set of criteria for an appropriate program of study and investigated the opportunities that currently existed within Australia and internationally. The outcome is the development of a fully flexible distance learning program for professional education in acoustics for which the first offering of the first module was made in 2007. This paper explains the rationale and development of this program and the early experiences of its implementation.

2 Development of the Program

The first step was to establish the brief for the education program that would best meet the needs of the various

stakeholders. It was agreed that the essential requirements for the program included:

Rigorous yet practical program offering courses covering the range of topics that are encountered in consultancies and agencies

Formal assessment process involving submissions and examination for each course

Available in the distance learning mode with no requirement to attend one particular institution at a specified time

Number of modules, each dealing with a different topic to allow for the priorities of each student

References to relevant Australian standards, Policies, regulations and guidelines

Flexible completion time to allow for the varying work pressures

No formal education prerequisites to commence the program

Possibility to convert or upgrade to a formal post graduate program of study

The AAS/AAAC education committee looked at the options that existed in Australia and internationally for appropriate further education programs. A number of Universities offered courses within other programs of study but these required the student to attend that particular institution for the classes and this did not fit with the working requirements. Some limited number of opportunities existed for specializing in acoustics subjects within a more general Master program of study. But again these were specific to certain locations and required attendance at the specific institution either throughout the term or for a residential period. A Master of Engineering Science in Noise and Vibration had been offered by the University of NSW. This did have a distance learning option but did require attendance for the experimental sessions. However this program had been disbanded as the number of enrollments did not meet the University minimum requirements. The AAS/AAAC education committee investigated possibilities for reviving this program but resolved this was not a viable option. Various short courses of 3 to 5 days were being offered at locations around Australia and provided some continuing education but it was considered that a more rigorous program of study was required.

The Postgraduate Diploma in Acoustics and Noise Control offered by the UK Institute of Acoustics (IOA) [9] seemed to best meet most of the requirements that had been identified. It has been running since 1975 and:

“...was set up to provide specialist academic training to meet the educational requirements for Corporate Membership of the Institute of Acoustics. Over the years the course has become well established as providing high level training in real-world practical acoustics.”

While this diploma is normally undertaken by part time study at an Institution there is also the option of a tutored distance learning scheme. The committee began communication with the IOA to ascertain further detail on the program and assess its suitability for Australia. It soon became clear that this program did provide an excellent basis for an Australian program but that it needed

considerable revision and updating to include Australian standards, policies, regulations, building methods etc.

From negotiations with educational institutions it was realised that it would be difficult and time consuming to formally establish the program of study within a University structure. It was therefore agreed that the best course of action was to develop the program as a short course program in the first instance. This meant it was set up under the Business Service Office of the University of New South Wales at the Australian Defence Force Academy. This offered flexibility in terms of development and presentation of the modules to best meet the needs. Once the full program was in operation, arrangements for credit for completion for any students seeking to pursue further formal study could then be sought.

Wonderful cooperation was achieved with the IOA and the material for the distance learning version of the first and compulsory module of the IOA Diploma course, General Principles of Acoustics, was provided to form the basis for the first module of the Australian program. The IOA also provided a sample test and sample tutorials. While the basic concepts of acoustics are clearly the same, considerable work was necessary to revise and update this material but the overall syllabus was maintained. It was then decided that the general structure of the IOA program would be used as a guide but that the further modules would be developed within Australia.

3 Structure of the Program

The Australian Professional Education Program in Acoustics will comprise a number of modules of which the first, General Principles of Acoustics, is compulsory. It will be recommended that the module on Experimental Methods will be undertaken second. This experimental module differs from those with similar titles in other programs as it focuses on the basis requirements for the range of measurements that are encountered in practice and is not based on measurements in a laboratory. The subsequent modules will include; Architecture and Building Acoustics, Environmental Acoustics, Noise and Vibration Control, Vibration and Shock and a project

Enrolment for each module is individually processed with the only prerequisite being successful completion of the General Principles of Acoustics module. The fully flexible nature of the program means that students can register at any time during the year. They are sent the material electronically for that module via secure pdf files. Each module provides assignments and experimental projects which are returned for assessment. There is no specific date by which these must be submitted. The students can decide to take the examination on one of the four dates throughout the year. There is no requirement to go to a common centre for the experimental work or the examination. These are done with the support from the senior staff of the consulting companies from the AAAC.

The experimental work has been designed to be undertaken using equipment that is widely available in consultancies. For example the work for module one includes an investigation of the importance of the time period for the measurement of time varying noise sources' ie measurement of the L_{Aeq} and L_{A10} over three different time periods for a constant sound and two different time varying

sounds. A second part requires measurement around a constant source such as a vacuum cleaner in two different acoustic environments. The vibration experiment requires measurement on the casing of a machine and on a suspended floor which someone is walking on. A senior consultant provides the supervision locally for the experiments. The registrants from one city are encouraged to undertake the experimental work together, again under local supervision. Each registrant must submit an individual report and the main part of the assessment is their interpretation and comments on the findings of the experiment.

The examination is offered four times a year. Supervision is provided by a supervisor from the registrant's employer. The examination file is sent in confidence to this nominated person who arranges for the invigilation of the test and return of the test paper and answer books.

No formal tutorial system has been implemented. The consulting companies have indicated strong support for the program and provide assistance to the registrants as necessary. The registrants can also contact the program organisers by email or phone to obtain assistance.

4 Implementation of the program

The first module, General Principles of Acoustics, has now been available for 1.5 years. The content is based on the IOA module of the same name but updated and amended to include modern measurement and analysis methods and relevant Australian standards, regulations, guidelines etc. Each section of this module has been prepared by Burgess and reviewed by two senior acoustic consultants from the AAS/AAAC education committee. Subsequent modules will not be based as strongly on the IOA modules. Reviewers with appropriate experience and expertise will be selected either from the consulting industry or from academia.

The promotion is via a web page and an item in the AAS journal. The demand from consulting companies for this education for their new staff was immediately apparent with almost 40 registrants during the first year, of which only three were not employed as acoustic consultants. In the following six months a further twenty have registered with four from agencies or smaller consultancies.

Only 25% of the 2007 registrants have completed the module within the year. The reasons for non-completion are varied. A few have left their employer and are no longer interested in pursuing the program. A few are taking a break from work for extended travel and intend to return to the program. The majority have stated that work pressures have made it not possible yet for them to devote the time necessary to work through the content of the module. For some, their supervisor has confirmed this is the case. For others it is very likely that there is a lack of motivation to complete the work. This is a common experience with distance learning programs. The fully flexible nature of the program contributes as there is no hard deadline to be met to assist with setting priority. As the employer has paid for the registration for most of these registrants it is anticipated that the necessary motivation to complete will be provided in due course. As the program continues and more registrants come from outside

consultancies, thus without the in house support, various options making use of the internet for communication amongst the registrants is being considered in order to maintain motivation for completion.

5 Conclusion

To address the high demand for education programs to develop the skills of new staff for acoustical consulting companies a fully flexible distance learning program has been developed in Australia. This program is based on the model of the IOA diploma with the first module covering the same syllabus of the first module of that program. The content has been updated and revised with relevant Australian references to standards, policies and guidelines. The individual modules of the program will be offered via a short course program managed by a University. The content of the program has been developed with the advice from the experienced consultants and each section of each module is carefully reviewed. The supervision for the experimental sessions and the examination is provided by experienced acoustics consultants. The demand for this education has been shown by the high number of registrants for the first module, General Principles of Acoustics. The low percentage of completions after the first year is a little disappointing but reflects the difficulties of undertaking distance learning programs of study while working full time. Further modules for the program are being developed with the strong support from the acoustic consultancies.

References

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