

Experiences in Trinidad And Tobago With The Administration of A Joint Degree Programme In Engineering

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Abstract

Academic institutions, colleges and newly established Universities often seek academic alliances with larger, more established Universities to bring value, recognition and acceptance to their programmes. This mechanism also helps to build educational capacity. Partnerships and alliances between Universities and Colleges are leading to the offering of joint degrees. The regional University of the West Indies (UWI), and the newly established national University of Trinidad and Tobago (UTT) have partnered to offer two Undergraduate degrees. This paper presents the mechanisms and experiences of administering these joint programmes; from conceptualization of the partnership, identification of the training needs and programme development to programme execution. Mechanisms for Quality Assurance and International Accreditation of the programmes are reviewed and a framework for the joint administration of such programmes is presented.

Keywords

Joint Degree, Chartered Engineer, Incorporated Engineer, Accreditation

1. Introduction

It is now becoming more common that joint degree programs are offered by tertiary level institutions. The objectives of such partnerships are to build a common capacity and enhance each others' programs by cooperating in areas of different strengths. Newly established universities benefit primarily from such arrangements by ensuring that the assessment of learning outcomes is in line with similar assessments in the partner institution, and establishes the common benchmarks required for the acceptance of the new programs. The established Universities benefit in such partnerships through a widening of their program offerings in a non-competitive environment, enhance their sphere of influence and also help to build national or regional capacities for education, research and development. The regional University of the West Indies, UWI, which serves the fifteen English-speaking countries of the Caribbean and which was established nearly 60 years ago, and the newly established national University of Trinidad and Tobago (UTT) have partnered through a Memorandum of Understanding (MOU), signed in 2002 to offer two Undergraduate degrees, viz. the Bachelor of Applied Technology Degrees (B.Tech) in Mechanical and Electrical Engineering. The primary outputs of these two degrees are technologists for the industrial and service sectors. The collaborative effort began through an initiative and presentation to the Board of the Faculty of Engineering of the UWI, by Professor Emeritus K.S. Julien, a former Dean of the Faculty and now President of UTT.

While operational issues like teaching and examining are handled by the UTT, program assessment and quality monitoring are done by the faculty belonging to the partnering university i.e. the UWI. Ideally also, the design of such joint degrees for accreditation purposes would be easier and consume less time

when compared to attempting the design of a new program by a newer institution acting alone. The graduates of such joint programs are also assured of better acceptance of their degrees by industry once the older institution confirms that the new offerings are of the same standard as the established programs.

2. Objectives of UWI-UTT B.Tech Program

These Bachelor of Technology Degrees in Mechanical and Electrical Engineering have been designed to produce an Engineering Technologist or an Incorporated Engineer, different from a Chartered or registered professional engineer. Their primary function is not in the design of, or development of new technologies, plants, processes etc. as would be expected for Chartered engineers, but rather in overseeing the design, construction, installation, operation and maintenance of known technology engineering installations, i.e. implementing and managing current and emerging technologies of the discipline. The main objective of the Applied Engineering Degrees is to provide a cadre of suitably qualified Engineering Technologists (called *Incorporated Engineers* in the U.K.) to strengthen the technical, supervisory and middle management levels of local industry. According to the U.K. specifications for what is expected of an Incorporated Engineer, they must maintain their competency throughout their working life by virtue of their education, training and experience to:

- a. Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology
- b. Apply appropriate theoretical and practical methods to design, develop, manufacture, construct commission, operate and maintain engineering products, processes, systems and services.
- c. Provide technical and commercial management.
- d. Manage continuous quality improvement

The UTT, by offering the Applied Degree programs on a part time basis, thus provides an avenue through which working engineering technologists can upgrade their qualifications to the professional level thus creating a path for continuous growth and development.

The economy of Trinidad & Tobago is mainly driven by the energy and chemical processing sectors. However, job opportunities for engineering skills are diversified, with an increasing trend in the past few years for employment in the manufacturing, service, construction and utilities sectors. The presence of the multinational majors, particularly in the oil & gas sector and their use of cutting edge technologies, demands technologists with pragmatic and interdisciplinary competencies. The B.Tech programs are therefore structured in keeping with the demands of industry, providing an appropriate blend of diversified courses with core technology content. These joint degree programs are quite different from the conventional B.Sc. program and have been able to attract about 300 students so far, most of whom are working in industry while they do these evening courses.

3. Program Structure & Philosophy

The programmes are structured as a '2 + 2' system *i.e.* students first complete a Technician's Diploma in 2 years on a full time basis (for high school graduates) or three to four years on a part-time basis for employed students. The full-time program also requires a work term in industry to follow each two-semester session. This means that a student will spend four 4-month academic semesters in the Diploma program, with three 4-month work terms in industry during this period. After this Diploma, graduates return to work in industry and may continue their studies part time *i.e.* the final 2 years full-time equivalent of the degree program. Some students may take a break after the Diploma but some continue immediately to the degree. This second 2 year full-time equivalent is offered on a 3 ½ -4 years part-time basis only. The program structure is shown diagrammatically in Figure 1. The Bridging Courses may be necessary for Technologists who have been working in industry for many years after their first engineering qualification, and this is decided on an individual basis. Through this method, by the time

students graduate with an Applied Degree, they would have acquired a minimum of 3 years of work experience to complement their academic qualification. This represents a major attraction of these programs – gaining engineering knowledge while at the UTT, and at the same time applying these skills and seeing their usefulness while working in industry.

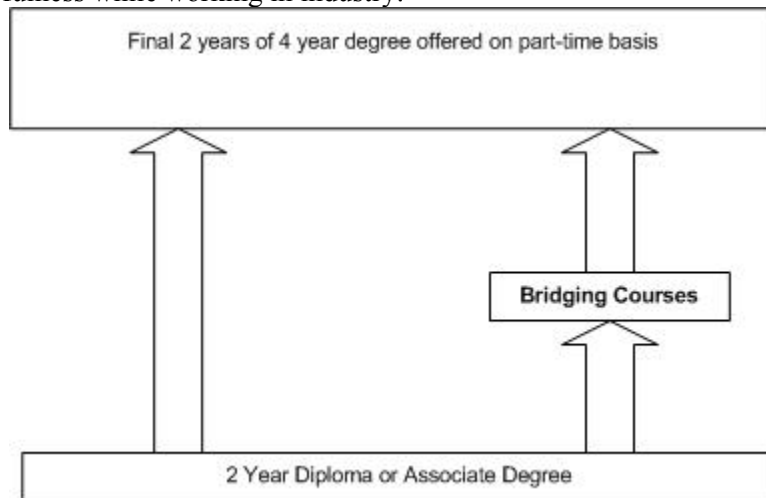


Figure 1. Structure of UWI – UTT Joint B.Tech Degree Programmes

The curriculum is designed to stress the basic tools of knowledge and skills in Mechanical or Electrical Engineering Technologies and helps students to launch their professional careers or pursue higher level studies. The programs cover the technical requirements of Mechanical Engineering or Electrical Engineering as well as exposure to liberal arts, management, economics and finance, leadership, and supervisory skills, as well as ethics and interdisciplinary applications. Students are involved in a developmental learner-controlled curriculum not just for engineering technology but also for applied math, science, soft skills and academic skills development that can pave the way to life long learning.

4. Program Composition

Through the Humanities and Social Sciences core, the student’s conceptual development is strengthened while gaining a strong appreciation for contemporary issues of national, regional or global significance. The technical management core provides the skills necessary for meeting the management challenges which the Incorporated Engineer or Technologist will face in bringing a systems orientation to the workplace. The Engineering/Technology majors provide the necessary engineering foundation and understanding of the key current technologies necessary to manage and solve the technical problems on the plant. The details of courses and credits for both the electrical and mechanical programs are presented in Table 1.

Table 1: Course Composition of the Joint Programs

Component	Number of Courses		Credits	
	Electrical	Mechanical	Electrical	Mechanical
Languages	2	2	3	3
Humanities	4	4	12	12
Basic Sciences	4	4	14	14
Mathematics	5	4	16	12
Inter-Disciplinary Technologies	4	4	8	9
Technology Management	7	8	21	24
Engineering	17	19	64	63
Total	43	45	138	137

The percentages of course components are shown in Figure 2.

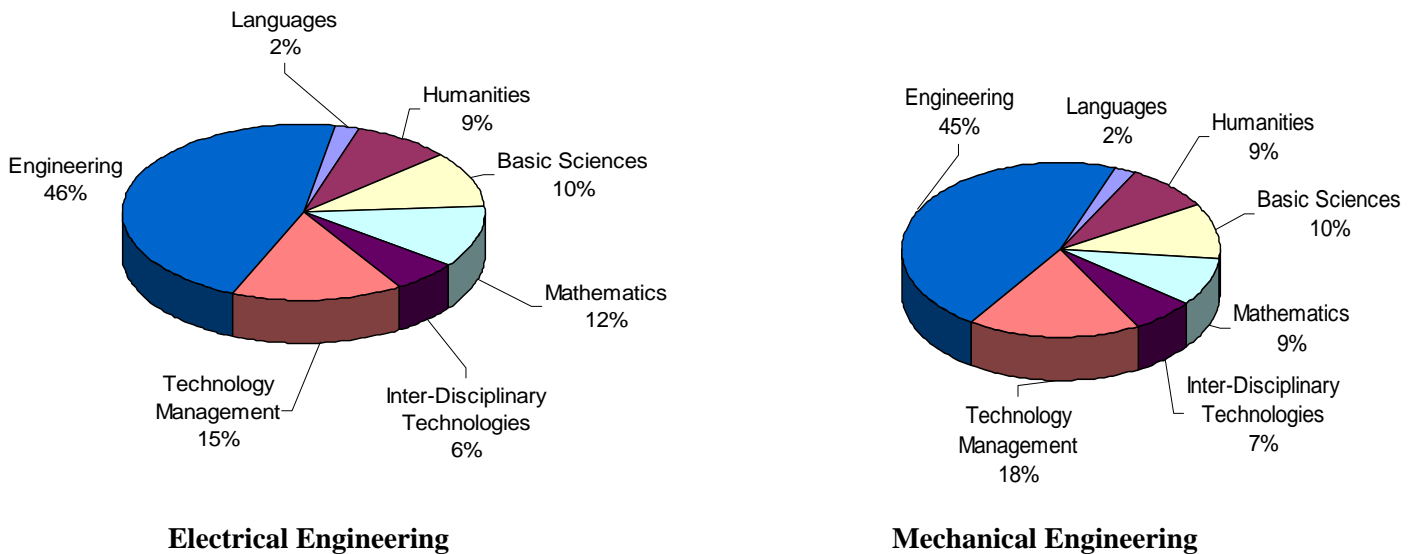


Figure 2. Course Composition of the Programmes

5. Profile of the Teaching Faculty

The full-time and part-time UTT Instructors teaching in these two programs have various qualifications and experience profiles. As these programs are applied in nature, UTT has identified and recruited Instructors for these two programs with relevant industry experience to complement their academic qualifications. The Instructors for these programs are either full-time staff, or are working in industry and are hired by the UTT on a contract basis to teach in the evening classes. The minimum academic qualification is an M.Sc/ M.A. in a relevant area. 83% of the Instructors have the minimum qualifications and 21% of them have Ph.D degrees with research publications to their credit. Some practising engineers who may not have the usual minimum qualification but have many years of specialist knowledge or experience in a required area also teach in the program. The details of the qualifications of Instructors for this program are shown in Figure 3.

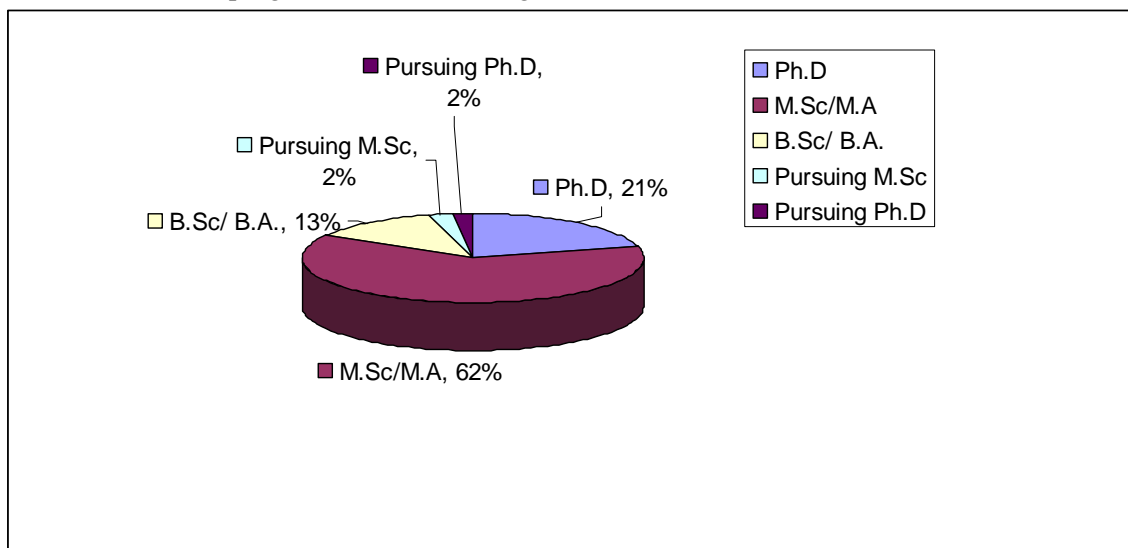


Figure 3. Profile of the Teaching Faculty at UTT

The profile of the supporting teaching staff from the whole of the Departments of Mechanical & Manufacturing and Electrical & Computer Engineering of UWI are shown in Figure 4.

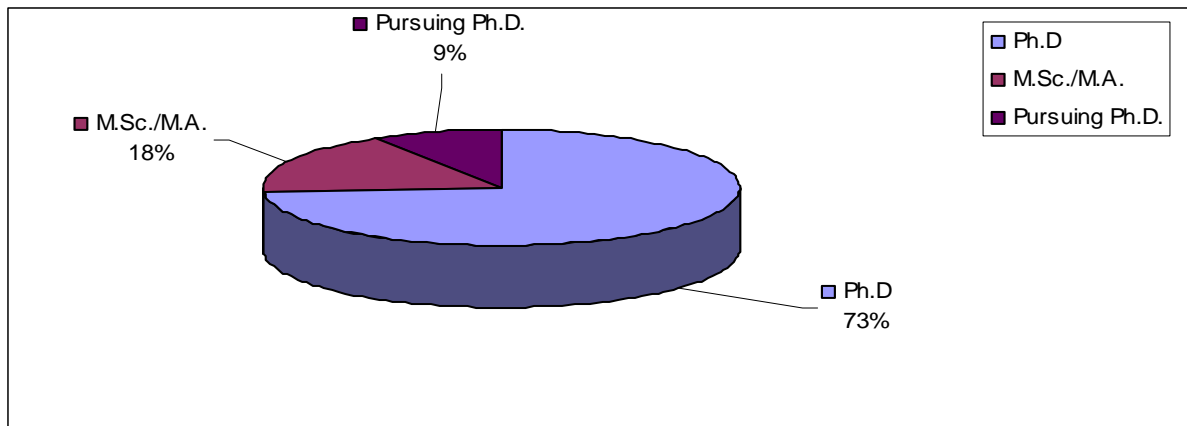


Figure 4. Profile of the Support Teaching Faculty at UWI (Mechanical & Electrical)

Many academic staff of the UWI and UTT also have very good research and publication records. It is this blend of industry Instructors and the experienced academics, working in a complementary, supporting manner that gives these programs their very special characteristics.

6. Unique Features of the Programs

Some of the unique features of this program are:-

- Instructors are drawn from academia or from industry on a part-time basis to deliver a number of courses. This helps students to get first hand exposure on industry practices and standards in the respective areas in addition to regular academic subject treatment. The course team normally includes members with considerable industry experience and networks.
- The B-Tech program is offered on a part time basis and requires work experience for entry. Most students have full time jobs in different industries and thus the important link with the industry sector is automatically achieved. Further, UTT offers a Co-Op program and internship placements, which allow students to take up positions in industry directly related to their fields of study. Students normally receive a stipend from employers during the Co-Op period.
- Apart from the above, very good industrial links have been forged by the UTT with both local and international employers through, for example, industry representatives on the UTT Board of Governors, program advisory committees, and contract instructors from industry.
- Complementary to the above, academic staff from the UWI, some of whom are directly involved in course delivery, invariably act as the second examiners of a particular course, providing a cross-check on the academic quality and standards of these programs.
- This is the first time in Trinidad & Tobago that an Engineering Technology/ Incorporated Engineering Degree has been offered and therefore a new group of Engineering professionals is being created by the UWI/UTT so as to facilitate industrial growth and competitiveness.
- This is also a first for the regional Faculty of Engineering of the UWI in that it is certifying two joint degree programs offered and delivered by a national institution – the UTT.

7. Program Environment

The facilities for these programs are located at the new UTT campus at Point Lisas. Class rooms, library and laboratory facilities have been designed for ergonomic comfort; facilities and ample space and do provide a good ambience for study. In addition to these facilities, students are entitled to use the UWI library facilities. UWI's library has been in existence for more than 60 years and is well stocked and equipped and has membership in several international organizations. Students of this program quite often rely on this facility for working on their projects. The Point Lisas campus of the UTT is located near Couva, about 35 kilometers from the UWI campus at St. Augustine.

To administer these joint programs effectively, an Executive Program Management Committee of the UWI and the UTT has been established. Major aspects of the programs are closely monitored by this Executive Program Management Committee. The Executive Program Management Committee meets at least once in every semester to review various aspects of the programs. All the major entities involved in administration and delivery of the program are shown in Figure 5.

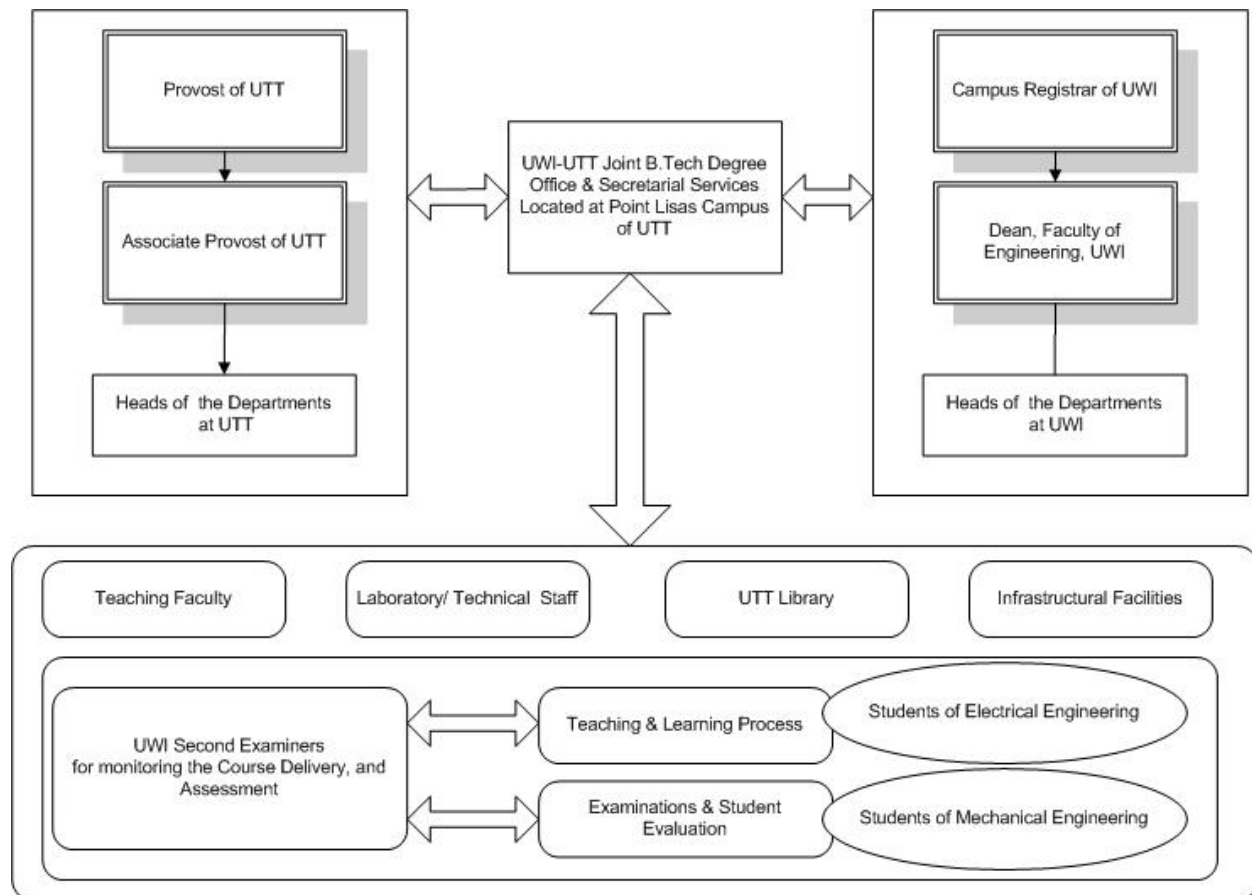


Figure 5. Organizational structure & Administration of the Joint Programmes

The programmes are managed by a joint steering committee which includes the Campus Registrar of the UWI together with The Dean of the Faculty of Engineering, UWI and the Associate Provost of UTT who are the Co-Chairs of this committee. Other members of this committee are the Heads of the Departments of Electrical and Mechanical Engineering from UWI and UTT. The terms of reference of this steering committee and some of the key issues to be handled are as follows.

- Both the Universities shall jointly review and validate the curriculum for all courses that constitute the programs, including changes and modifications that may be required from time to time.
- UWI will be involved in jointly supervising the delivery of courses for the programs particularly with regard to quality requirements as established by the international accreditation bodies.
- UWI shall conduct an audit of all materials, curriculum, laboratories, staffing and delivery methods utilized by UTT in the programs.
- UWI will seek to secure accreditation of the programs from the IIE, UK.
- UWI will provide the services of second examiners as required for the various courses in the programs.

8. Program Administration

- Applicant selection and counseling processes** - Student intakes are done on an annual basis. The process begins with the participation of the UTT in regional and national career fairs and visits to high schools and community groups to sensitize the public about the programs offered. This is followed by advertisements in the national print and electronic media. Selection is based on merit and availability of spaces. Applicants who do not meet the requirements are counseled on alternatives, or on steps they should take to gain admission.
- Course Loading/ Progression** – Every student is permitted to register for a maximum of 9 credit-hours per semester. This has been set due to the fact that the students are full-time employees in the industry and attending the program on a part time basis. Well-defined regulations are in place at the UTT for aspects like course loading, leave of absence, class room attendance, student projects, student progression etc.
- Assessment Strategy** - Students of this program are assessed continuously throughout the semester. The continuous assessment strategy has shown good results in terms of knowledge gain and students' abilities to apply theoretical skills to practical technological problems. Instructors of this program use different methods to examine the students, depending upon the nature of their courses, and to engage the students in a continuous learning process. Various assessment components that are generally used by Instructors include quizzes, assignments, special projects, group discussions, student seminars, mid term and final exams etc.
- Quality Assurance** - The quality of course contents, course delivery, examination papers and student assessment in every course in the program are monitored by a second examiner from the UWI. The second examiners from the UWI are appointed by the respective Heads of Departments of the UWI. Course Instructors modify and develop courses for enhancement on the feedback provided by the UWI second examiners and their own experiences in teaching the courses.

The UTT, like the UWI provides feedback/evaluation by students for particular course delivery in every semester for every course in this program. For this, a detailed feedback form is used which asks students specific questions on the communication skills, presentation skills etc of the Instructor. Also, the students can provide any other information/suggestions to improve the course delivery and Instructor's teaching methodology. This feedback is passed on to the Instructors and also reviewed by the Program Coordinator.

Heads at UTT and Program Coordinators closely monitor the assessment procedures in each course. The student affairs section of the UTT cross-checks all the results of the examinations conducted. Also, UTT has an internal committee which reviews all the semester results after Instructors have completed their marking and grading of the examinations.

9. Experiences to Date

The graduates of the predecessor ABET-accredited B.Tech programs of the University of Houston run by the UTT (formerly the Trinidad and Tobago Institute of Technology) have already begun to create an impact in industry. Many have already been promoted to senior managerial positions and companies have been reporting a high degree of satisfaction with them. Some have been accepted and are pursuing graduate studies at the UWI. Their performance at the UWI in such graduate programmes is being closely monitored. Accreditation is being sought for these joint programs from the Institution of Incorporated Engineers (IIE), UK. Though the programs have not yet graduated any students, it is expected that a few who are now completing their final projects will graduate in the next few months. Students are being encouraged to pursue their projects in industry, particularly at their places of employment. It is clear that feedback from local industries on such students is encouraging. Students of these programs may expect to be promoted by their employers after their graduation and a higher level of professional output would be required of them.

10. The Road Ahead

The UWI and the UTT have made an effort to cooperate in offering the joint undergraduate level Bachelor of Technology degree programs. UTT is a new institution that is currently rapidly expanding its full-time teaching staff complement by recruiting both regionally and internationally. It is strongly supported by the government of Trinidad and Tobago, and has excellent laboratories and teaching resources.

Table 2: Accreditation details of Programs of the Faculty of Engineering, UWI

Programmes	Accrediting Institution/S	Date Of Last Accreditation Visit	Period Of Accreditation/ Re-accreditation
Undergraduate Programmes			
Chemical & Process Engineering	IChemE	March 2003	2003 - 2007
Civil Engineering & Civil with Environmental Eng	JBM: ICE and IStructE	October 2004	2003 - 2008
Electrical & Computer Engineering	IEE	May 2004	2004 - 2006
Industrial Engineering, Mechanical Engineering, Mechanical Engineering with Biosystems	IMechE	March 2006	Awaiting Re-accreditation Results
Petroleum Geoscience	The Geological Society	February 2004	2004 - 2010 (2007 Intake)
Surveying & Land Information	RICS	November 2003	2003 - 2006 I
Postgraduate Programmes			
MSc. Civil Engineering MSc. Civil with Environmental Engineering	JBM, ICE and IStructE Recognized by IHT	October 2004	2003 - 2007
MSc in Petroleum Engineering	The Institute of Materials, Minerals, & Mining (UK)	May 2006	Expected for 5 years, beginning in 2004

UWI, on the other hand, is a unique Regional university of its own kind, with a proven track record of excellence, serving 15 English speaking countries of the Caribbean. The St. Augustine Campus in Trinidad and Tobago has a large percentage of nationals of Trinidad & Tobago ($\approx 85\%$). Hence, the UWI and the UTT are together filling the professional manpower needs, particularly in Engineering and Technology, for Trinidad and Tobago. Also, UWI has well-organized resources and facilities and is particularly strong in terms of its experienced staff. Because of its longer history, the UWI and its

Faculty of Engineering has been engaged in a steady process of quality enhancement with this being driven at all levels of the Departments, Faculties and University. All the Engineering/ Surveying/ Geo-Science programs of the UWI are accredited by the leading institutions of the UK as shown in Table 2. Together with the experience of the professionals at UTT, this experience is being brought to bear on the B.Tech programs being delivered by the UTT. The UWI and the UTT will continue to collaborate very closely in the delivery of the applied degree programmes described in this paper and in complementing each other in meeting the needs for tertiary education in Trinidad and Tobago.

11. Conclusions

In conclusion, degrees offered jointly by two universities, the new national UTT and the established, regional UWI in Trinidad and Tobago are discussed in this paper. These developments will bring dramatic changes in a culture of academic & professional collaboration, harnessing the strengths of both organizations to build a national capacity for Engineering/ Technology education to meet industry needs. These institutions are therefore working in a complementary way to meet mutual and national interests. The students of such programs are the main beneficiaries by having the experience of both Universities, of the old and the new.

It is expected that greater and deeper collaboration between the Faculty of Engineering of the UWI and the UTT will occur in the near future, particularly in areas other than in teaching, e.g. in research & development for national industry competitiveness. This collaboration may also serve as a model for the future beneficial relationships between a Faculty dedicated to servicing a region like the West Indies through the UWI and a vigorous, new national institution, like the UTT, where the Government of Trinidad and Tobago is one of the main pillars of support for both Institutions.

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