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THE LAND SURVEYING DEGREE PROGRAMME AT THE UNIVERSITY OF THE WEST INDIES: A MODULAR APPROACH

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INTRODUCTION

The B.Sc Degree programme in Land Surveying at The University of the West Indies was established in 1983 to meet the shortfall in supply of Land Surveyors in the West Indies. After ten (10) years of existence, the programme has evolved into a six-modular course structure aimed to cover the breadth and depth of land surveying in particular and land administration in general. The paper provides an overview of the current programme, the curricula, resources, enrolment and the graduates. The new thrust of the programme is also discussed.

A demand analysis survey conducted by Professor D.R. Denman of the University of Cambridge, in 1974, estimated that the Caribbean region had a future demand of 336 additional land surveyors between the years 1979-1984. Trinidad and Tobago in particular had a shortfall of supply of 25 land surveyors over the same time period (Denman, 1975). Professor H.O. Phelps of the The University of the West Indies in an update, estimated additional demands of 164 and 302 by the year 1990 and 2000 respectively (Phelps, 1979). These two estimates and other evidence, influenced the establishment of a Land Surveying Degree programme at The University of the West Indies (U.W.I.) in September 1983. The programme is aimed to be *"the academic basis for the development and maintenance of a professional body of surveyors"* and *"an educational centre of excellence for surveying"* in the wider Caribbean region (Done, 1987), (Barnes, 1985).

Since its establishment, the programme situated at the Department of Land Surveying (DLS) in the Faculty of Engineering, has striven to achieve these goals despite the down-turn of the Trinidad and Tobago economy. The programme awards a B.Sc. (Land-Surveying) degree after a minimum of six (6) semesters and a maximum of fourteen (14) semesters of study. During this period, the candidates must accumulate a minimum of ninety-seven (97) credits from the suite of core and elective courses offered as shown in **Figure 1** and **Table 1**.

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ADMISSION REQUIREMENTS

A prospective candidate for admission into the programme is required to have satisfied the University's matriculation requirements. In addition, the candidate must possess any of the following qualifications:

a) G.C.E. Advanced Level passes in Pure Mathematics or Mathematics (Pure and Applied); and Advanced Level in Physics, Geography, Economics or other relevant subject; and Ordinary Level in Physics, where Advanced Level in Physics is not offered, OR

b) Passes at Preliminary Examinations in Natural Sciences at this University in the subjects: Pure and Applied Mathematics and Physics or at Introductory Examinations in Mathematics and Physics, OR

c) Diploma in Surveying from the College of Arts, Science and Technology, at a good standard, with good passes in mathematics, OR

d) Diploma at a good standard in an engineering discipline from a technical institute in the Caribbean with a significant content of mathematics, OR

e) Qualifications equivalent to the above, such qualifications will be reviewed on an individual basis.

MODULAR COURSE STRUCTURE

In lieu of the diverse areas of specializations available in the traditional land surveying, the Department designed its curricula into a modular structure.

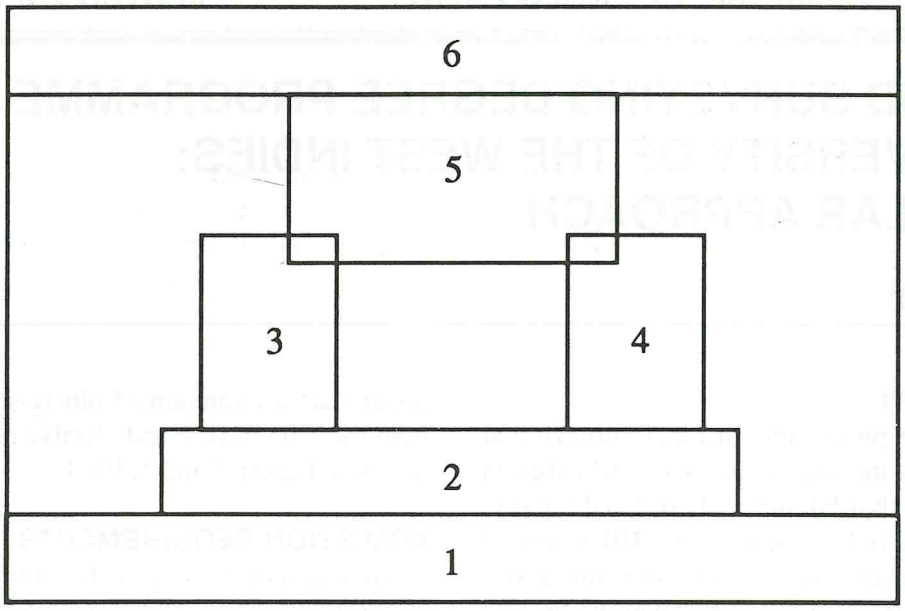

Figure 1: A Modular Course Structure

1. Foundation Module
- M17A Engineering Mathematics I
- M26A Engineering Mathematics II
- M26B Statistics
- CS12A Computing and Numerical Methods
- CS22B Information Systems Development
- e CS35C Database Management Systems
- e CS29C File Design Implementation

2. Land Surveying Module
- SV12A Plane Surveying
- SV13A Surveying Technology
- SV16B Advanced Plane Surveying
- SV18B Surveying Project
- SV20A Geodetic Surveying
- SV26B Measurement Systems

3. Geodesy Module
- SV14B Introduction to Geodesy
- SV25B Geodesy
- SV31A Adjustment Computation I
- e SV31B Adjustment Computation II
- SV32A Space Geodesy I
- e SV32B Space Geodesy II

4. Mapping Module
- SV15B Cartography and Graphics
- SV21A Photogrammetry I
- SV28B Mapping Project
- e SV37A Photogrammetry II
- e SV37B Photogrammetry III
- e SV38B Digital Mapping

5. Specialized Surveying Module
- SV27B Offshore and Underground
- SV33A Cadastral Studies
- SV33B Land Information Systems
- e SV34A Hydrography
- e SV35C Engineering Surveying
- e SV36A Remote Sensing

6. Support Module
- SV11A Engineering Fundamentals
- SV17B Earth Science
- SV22A Planning and Valuation
- SV23A Land Law
- ME30AEngineering Management
- SV36B Professional Practice
- SV39B Land Economy

PART I SEMESTER 1 (15 Credits)

M17A	Engineering Mathematics	E3
CS12A	Computing & Numerical Methods	E3
SV11A	Engineering Fundamentals for Surveyors	E3
SV12A	Plane Surveying	E3
SV13A	Surveying Technology	C3

PART I SEMESTER 2 (16 Credits)

SV14B	Introduction to Geodesy	E3
SV15B	Cartography & Graphics	E3
SV16B	Advanced Plane Surveying (SV12A)	E3
SV17B	Earth Science	E3
SV18B	Surveying Project (SV12A, SV13A)	C4

PART II SEMESTER 1 (15 Credits)

SV20A	Geodetic Surveying (SV18B, SV16B)	E3
SV21A	Photogrammetry I	E3
SV22A	Planning and Valuation (SV17B)	E3
M26A	Engineering Mathematics II (M17A)	E3
SV23A	Land Law	E3

PART II SEMESTER 2 (17 Credits)

M26B	Statistics (M17A)	E2
SV25B	Geodesy (CS12A, SV14B, M17A, SV15B, SV16B)	E3
CS22B	Information Systems Development (CS12A)	E2
SV26B	Measurement Systems (SV13A, SV11A)	E2
SV27B	Offshore and Underground Surveying (SV13A)	E2
SV28B	Surveying Project (SV20A, SV21A)	C4

PART III SEMESTER 1 (18 Credits)

ME30A	Engineering Management I	C3
SV31A	Adjustment Computations I (SV25B) (M27C)	E3
SV32A	Space Geodesy I (SV25B) (M27B)	E3
SV33A	Cadastral Studies (SV23A)	E3
SV340	Research Project	C2

together with the equivalent of FOUR (4) credits subject to the approval of the Head of Department, to be chosen from:

SV34A	Hydrography (SV27B)	E2
SV35A	Engineering Surveying (SV26B)	E2
SV36A	Remote Sensing (SV21A)	E2
CS35C	Database Management Systems (CS22B)	E4
SV37A	Photogrammetry II (SV21A)	E2

PART III SEMESTER 2 (16 Credits)

SV36B	Professional Practice (SV23A)	E3
SV39B	Land Economy (SV22A)	E2
SV33B	Land Information Systems (SV33A), CS22B)	E3
SV340	Research Project	C4

together with the equivalent of FOUR (4) credits subject to the approval of the Head of Department, to be chosen from:

SV31B	Adjustment Computations II (SV31A)	E2
SV37B	Photogrammetry III (SV37A)	E2
SV38B	Digital Mapping (CS12A)	
CS29C	File Design Implementation (CS12A)	E4
SV32B	Space Geodesy II (SV32A)	

Table 1: The B.Sc. (Land Surveying) Degree Programme

The rationale for the modular structure are as follows:

a. to provide as much as possible, a clear distinction between the various courses by classifying them into modules;

b. to provide flexibility in the design, development, and delivery of the courses;

c. to ensure that students are well grounded in both the basic principles and the specialized areas;

d. to assist the Department in ensuring that its focus is relevant to current regional needs and aspirations;

e. to ensure that subjects within a module are not only related but also provide for a progressive transition from simple to complex concepts;

f. to provide students the flexibility to focus or specialize in a chosen area of interest.

The curricula is therefore designed around six modules: the foundation module; the land surveying module; the geodesy module; the mapping module; the specialized surveying module and the support module. A graduating student must obtain credits in all the land surveying and support modules, as well as over 75% of courses in all the other modules.

The *Foundation Module* contains courses in mathematics and computer science. These courses are cross-faculty courses offered in the Faculty of Natural Sciences of the St. Augustine campus. It provides the students the fundamental knowledge necessary for the understanding of principles associated with the other modules. A total of seven courses are offered in this module, five of which are core courses to the degree programme.

The *Land Surveying Module* is in the realm of traditional land surveying curriculum. Courses are designed to cover both the classical as well as modern surveying methodologies. The theories and uses of electronic instruments, pre-analysis and post-analysis of geodetic networks are designed into this module to prepare the student for professional undertakings. An important part of the module is the SV18B (Surveying project) which is a 4-credit course, assessed mainly by coursework and report writing. Students undertake a topographic survey of a selected site, the characteristics of which must be representative of a tough terrain. All students must take the courses in the module.

The *Geodesy Module* is a suite of courses designed to gradually provide the student the theories and principles of geodesy as a unified field of discipline. Global positioning systems (GPS) as a modern, cost-effective technology is taught within the module. The necessary tools of least squares adjustment principles for the handling of redundant data is also an integral component of the module. The module has two electives, which are: Adjustment Computation II and Space Geodesy II. These electives are designed for final-year students who intend to do post-graduate studies in Geodesy or related fields.

The *Mapping Module* provides a collective understanding of the principles and practice of the mapping process. Cartography, analogue and analytical photogrammetry techniques, as well as the emerging digital mapping process are taught within this module. The Department's mapping laboratory is well equipped to facilitate the students in undertaking the mapping project (SV28B) which is a 4-credit course, assessed wholly by coursework and report. Seventy-five percent of the marks are based on the individual work of the student (photogrammetric plotting and cartography).

The *Specialized Surveying Module* contains three core courses: Offshore and underground surveying; Cadastral studies; and Land information system which are designed to strengthen the breadth of the degree programme. In addition, students may take any of the three elective courses in this module to widen their job opportunities or to prepare them for graduate programmes in these fields.

The *Support Module* is a suite of courses designed to prepare the students for various land administration activities. It contains courses in planning, valuation, land law and land economy. These courses, it is hoped, would enable the land surveyor to intelligently interact with other land administration professionals. Engineering fundamentals for Surveyors, Earth Science, and Engineering Management, also provide the interface which the Land Surveyor requires for communicating with the larger engineering profession. The Professional Practice course is aimed to wrap-up the whole learning process and ensure that the graduating student can understand professional ethics and conducts. All the seven courses in this module must be offered by the graduating students. The courses have Caribbean flavour in contents, projects and case studies.

In total, the modules consist of a total of thirty-nine (39) courses excluding the final-year research project (SV340). Twenty-nine (29) of these courses are core to the degree, while a total of ten (10) are electives. In the current semester system, an academic year consists of two semesters. Each semester is made up of 13 weeks of lectures. The required 97 credits therefore, correspond to 12,361 hours of lecture (97 x 13) excluding practical and tutorial hours.

AVAILABLE RESOURCES

The Department's teaching team is made up of six full-time academic staff and a teaching assistant. Cross-faculty academic staff as well as part-time lecturers are engaged in the teaching of courses in the support module. The part-time lecturers are professionals engaged in the public or private sectors. Their wealth of knowledge in their respective discipline, has been of tremendous advantage to the delivery of the courses. Site visitations and case studies are typical lecture modes. In order to support teaching, the Department maintains two laboratories: the Mapping/GIS Laboratory and the Surveying Instrument Laboratory. Apart from traditional instruments and equipment, the laboratories are adequately equipped with modern instruments, computer hardware and software (Done, 1987). In its current development plan, the Department shall acquire GPS receivers, Image processor and UNIX-workstation computers to compliment teaching and research.

ENROLMENT

Table 2 shows the Department's enrolment figure since inception (1983-1992). In its nine years of existence, 188 candidates have registered into the B.Sc. Degree, and of this, 100 students have graduated with varying classes of degree as shown in Table 3. Trinidad and Tobago nationals are the core of students in the Department. Over the years, however, students have been attracted from the other Caribbean islands e.g. Barbados, Jamaica, Commonwealth of the Dominica and Montserrat. The programme is slowly becoming attractive to prospective candidates outside of Trinidad and Tobago. The current economic disparity between the islands and the lack of scholarships is a major deterrent for prospective candidates outside Trinidad and Tobago.

ACCREDITATION AND PROFESSIONAL RECOGNITION

In 1992, the Department sought and obtained official accreditation for its B.Sc. (Land Surveying) degree

Academic Year	Part I	Part II	Part III	Graduated
1983/84	9	-	-	-
1984/85	24	8	-	-
1985/86	23	18	7	7
1986/87	26	20	16	16
1987/88	15	21	16	16
1988/89	17	16	21	21
1989/90	17	14	16	14
1990/91	12	13	13	13
1991/92	7	12	13	13
1992/93	12	8	9	-
Totals	188	130	111	100

Table 2:
Enrolment Figure 1983 - 1992

Academic Year	1st Class	2nd Class (Upper)	2nd Class (Lower)	Pass
1985/86	-	3	3	1
1986/87	-	4	10	2
1987/88	-	1	11	4
1988/89	-	2	13	6
1989/90	-	3	7	4
1990/91	-	4	4	5
1991/92	1	4	5	3
Totals	1	21	53	25

Table 3:
Degree Classification
Awarded 1986 - 1992

from the Royal Institution of Chartered Surveyors (RICS). The accreditation team of RICS visited the Department in December 1992, to assess its curriculum and resources. On the local scene, thirteen (13) of the graduates have obtained the professional land surveyors license in Trinidad and Tobago, while fourteen (14) others are currently being assessed for the same license. The aim of the programme is thus being fulfilled.

CONCLUSION

Despite the current economic constraints, the Department is striving to maintain academic excellence through teaching and research. The new thrust of the Department is information technology and land information management. Resources are being

acquired to orient the degree programme around this new thrust. To this end, the Department is soon to change its name from the Department of Land Surveying to the Department of Surveying and Land Information. This is to ensure that the course content reflects the title of the degree awarded and the research activities of the Department.

In the last four years, the Department has actively been involved in increasing the level of awareness of the land administration and natural resource management communities of the region on the importance of land information management and the use of information technology. This awareness drive is being accomplished through the hosting of seminars, workshops; short-courses and collaborative projects throughout the region. The computer resources and peripherals of the Department are also being upgraded. The UWI/IDB Staff Training Programme has provided a steady vehicle for long-term and short-term training in critical areas of expertise required by the Department.

The demands estimated by Dean Denman and Phelps are currently being met, but the impact of technology on those demands identified in 1974 and 1979 has changed the nature and quality of the demands. Post-graduate studies leading to Master of Philosophy, Master of Science, and Graduate Diploma in Geographic Information Systems currently exist in the Department, and have provided opportunities for the graduates to further their academic knowledge. It is expected that the Department will soon become the Caribbean Centre of Excellence in Surveying and Land information systems/management in the nearest future.

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