University of Botswana
Faculty of Science
Department of Computer Science

TYPE OF PROPOSAL:
Major Revision

Revised Curriculum for
BIS (Computer Information Systems)

Approval	Date
Departmental Board	February 14, 2008
Departmental Board 2nd Revision	October 6, 2009
Advisory Board	October 13, 2009
Faculty Board	October 28, 2009
Faculty Executive	November 11, 2009
APRPC	January 12, 2010
APRPC 2nd Revision	October 6, 2011
Senate	February 8, 2012

Proposed Date of Implementation: August 2012

Contents

1. Introduction

1.1. Background

The University of Botswana has been offering the Bachelor of Information Systems (BIS) programme in three streams by the three departments: Department of Accounting & Finance, Department of Computer Science, and Department of Library and Information Studies since 2002. The Department of Computer Science has also been offering M.Sc. degree program in Computer Information Systems since 2004. Until recently, there was no major curricula revision carried out by the department on both programs. Taking into consideration the increasing demand of the industry for IT professionals and the fast development of the computing field, regular revision of curriculum is very important.
Curriculum development is a dynamic process and very much so in the field of computing. Regular revision and updating of the curriculum is vital to improve the quality and relevance of the programmes, to cope with the rapid changes in the computing field, and to adapt the curriculum in relation to the needs and conditions of the industry in the country. In light of this, the Department of Computer Science initiated evaluation of its curriculum in 2008 through external review, internal curriculum review committee, and surveys on ICT human resource needs in the country.

As a result of the curricula revision activity, the Department of Computer Science revised its Computer Information Systems stream and presented the revised curriculum at the APRPC meeting held on January 12, 2010. However, a concern was raised from the Faculty of Business that the revised curriculum presented by the Department of Computer Science has overlapping objectives with the Business Information Systems (BIS) stream run by the Department of Accounting and Finance. To resolve this issue, the APRPC mandated the Dean of Humanities to convene and chair discussions among the three sister departments to ensure harmony and distinctiveness in their respective programme offerings. At the first such meeting – which was attended by the Deans of Humanities, Science, and Business, as well as the Heads of Computer Science, Library & Information Studies, and Accounting & Finance and representatives from the three streams of the BIS degree – it was agreed that a BIS Technical Task Team be setup to thrash out issues of mutual interest and concern, and ultimately produce a report recommending the way forward.

The BIS Technical Task Team (comprising of 9 members) was set up in February 2010 with the mandate to review/revise the objectives of the three streams of BIS and identify the competencies and skills required of an ideal Information Systems graduate. In addition, the team was mandated to look at the best possible organizational structure to run the programme effectively and resolve the current implementation challenges.

The task team accomplished its task between February 2010 and March 2011 by carrying out SWOT analysis of the existing IS education at UB, collecting data from employers and IS graduates, benchmarking IS education both locally and internationally, reviewing of IS model curricula, and analysis of policy documents relevant to IS education at UB.

From the various data gathered, it was possible to observe that IS education at UB has a number of challenges. These challenges are due, in part, to lack of proper coordination among the departments offering the three stream of IS programme leading to duplication of courses and wastage of resources (both human and physical) and inadequate quality assurance. There were also no specific objectives and focus areas specified for each stream when the three streams were approved in 2002. The other part of the problem is related to organizational structure. Because the IS resource is scattered among different units of the University, the advancement of IS education in teaching and research was not visible both within and outside of the University. It is apparent that the concern raised by the Faculty of Business was a symptom of a combination of these challenges besetting the offering of IS at UB.

Some of the finding from the analysis of the current situation of IS education at UB are that IS graduates do not meet the market demand – skills gap; massive redundancies in IS offering; and lack of a balanced IS program.

On the basis of the findings and the corresponding assessment of the needs for harmonizing IS education at UB, the task team has made the following recommendations: (detail discussion provided in the BIS Technical Task Team Report, July 2010).

1. *There must be a single IS common core that must be offered and followed by all IS students of the University.*

2. *A single unit must be established which is responsible for offering IS courses. The unit will draw its human resource from the existing IS expertise from across UB.*

3. *A new Faculty should be established that will consist of the new IS unit and all Computing and Information related disciplines of the University. This recommendation is informed by the current worldwide experience and the IS education situation at UB.*

On a meeting in September 2010, which was attended by the Deans of Humanities, Science, and Business, as well the Heads of Computer Science, Library & Information Studies, Accounting & Finance, and the BIS Technical Task Team, it was agreed that **Recommendation 1** be implemented as a short-term solution. It should be noted that the implementation of recommendation1 in isolation to the other recommendations retains the status-quo. In particular, issues of proper coordination, quality assurance, wastage of human and physical resources, and registration processes still need to be sorted out. It was also decided that **Recommendations 2 and 3** be explored in the process while implementing recommendation 1. The BIS Technical Task team's recommendation that IS should be administered within a single unit, seen as a potential solution that could circumvent most of these problems, still needs to be considered by the university.

Based on recommendation 1 above, for the IS common core, the BIS Technical Task team identified 78 credits of course work which constitute foundation courses, core IS courses, and context specific IS courses, which must be used as a common core for the three streams. This recommendation was based on the premise that a typical four year degree programme at UB requires a student to accumulate a minimum total of 120 credits. In a subsequent meeting, it was decided that the remaining 42 credits (minimum) of courses be developed/identified by each of the three departments separately to complete their own

BIS streams. These 42 credits of courses are supposed to provide each of the three departments the opportunity to focus on the areas of paramount importance to their specific stream. In addition, the BIS Technical Task team proposed to equally share the teaching of the IS common core courses among the three departments and that proposal has been approved by the general meeting attended by the Deans of the three Faculties, HoDs of the three departments and members of the BIS Technical Task team. The general meeting also decided that the three departments can proceed with the approval of their programs/streams independently.

Therefore, this proposal presents a complete curriculum for the BIS (Computer Information Systems) program based on the agreed upon IS Common core with an emphasis on technology supporting Information Systems.

1.2. Aims of the Programme

The programme aims to provide students with the necessary theoretical and practical knowledge and skills which enable them in gathering, processing, storing, distributing and use of information, and its associated technologies for improving the efficiency and effectiveness of an organization in its operations. It also aims to provide students with a solid background in the analysis, design, development, deployment and maintenance of computer based information systems by integrating appropriate and latest information technologies with organizational processes. Furthermore, the program aims to equip students with the ability for critical thinking and life-long learning that helps them keeping in pace with the rapid development of the technology in information systems.

1.3. Objectives of the Programme

The objectives of the programme are to equip students with the following graduate attributes:

a. *Ability to understand concepts and theories that explain or motivate methods and practices in the development and use of information systems in organizations.*
b. *Ability to understand and apply the methods, techniques, and tools in information technology for achieving business and organizational goals.*
c. *Interpersonal communication skills, leadership, business analysis and project management skills, strong sense of social commitment and professional ethics.*
d. *Ability to understand and apply new skills and procedures efficiently and effectively*
e. *The foundation necessary for advanced study in information systems*
f. *Critical and creative thinking skills*
g. *Entrepreneurship and employability skills in the emerging opportunities in IS sphere*
h. *Organizational and teamwork skills underpinning IS professionals*

1.4. Graduate Profile

In line with the mission of the department, the graduates of this programme will have enhanced capacity for the following;

a. **Design and implement information technology solutions that enhance organizational performance**. Possess skills in understanding and modeling these processes and data, defining and implementing technical and process solutions; Be fluent in techniques for acquiring, converting, transmitting, and storing data and information; Focus on the application and management of information technology in helping individuals, groups, and organizations achieve their goals managing projects.

b. **Strong analytical and critical thinking skills***:* Be problem solvers and critical thinkers; Apply systems concepts (both traditional and new) for understanding and framing problems, understand that a system consists of people, procedures, hardware, software, and data.
c. **Exhibit strong ethical principles and have good interpersonal communication and team skills;** Apply knowledge of professional codes of conduct, posses excellent communication and collaboration skills including persistence, curiosity, creativity, risk taking, and a tolerance of these abilities in others.
d. **Serve as an effective bridge between the technical and management communities within an organization**: students will demonstrate advanced analytical skills and knowledge needed for technical and managerial endeavours in the field of IS
e. Knowledge advancement in the discipline: students will obtain and demonstrate proficiency in basic research, advanced analytical skills and knowledge
f. Adaptability to new IS environments
g. **Self-directed, lifelong learning skills**

2. Expected Intake and Outputs

The following table presents the current and projected student intake into the Computer Information Systems programme of the department. An anticipated output of 50 for the first cohort of 60 is based on current through-put rates in Computer Information Systems.

Table 1: Projected student intake and output

Academic Year	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Intake	60	60	80	80	80
Output					50

3. Resources

3.1. Human Resources

The revised curriculum being proposed will allow the department of Computer Science to attract more students into its programme. This will essentially require more teaching staff and assistants. However, as some courses already exist in the current CIS programme and some courses (12 Information Systems common core) are to be taught by other departments offering IS programme (i.e., six by the Department of Accounting & Finance

and the other 6 by the Department of Library & Information Studies), the requirement for new staff members is not urgent (for details on the allocation of IS courses to the three departments, see Appendix). The programme can be run with the existing staff. As can be seen in the appendix, out of the 18 Information Systems core courses, the department of Computer Science will teach only 6 courses and this reduces the teaching load of the department. However, it is important to fill those positions as per the department's establishment in order to strengthen the programme. The major problem for the department so far has been the difficulty of recruiting senior staff members to fill the existing positions. Currently, the department has 2 associate professors, 4 senior lecturers, and 17 lecturers.

3.2. Physical Resources

3.2.1.Available physical Resources

The department of Computer Science has six laboratories dedicated to undergraduate students and two laboratories to graduate student research. There are two other research laboratories for lecturers and students. Find following how the laboratories are designated:

- *Computer labs 232-117 and 232-118 are used for teaching programming in the Unix environment.*
- *Computer labs 232-119 and 232-120 are used for teaching programming in the Microsoft Windows environment.*
- *Computer labs 232-105 and 232-106 are dedicated for final year projects and primarily used by final year students.*
- *Computer labs 232-111 and 232-112 are used for graduate students research and teaching.*
- *Computer lab 233-G05 is used for computer network teaching and research (this is also a faculty lab).*
- *Computer lab 229-2 and others within the university are for ICT121 and ICT122.*

3.2.2.Additional Physical Resources Requirements

The department of Computer Science takes cognizance of the plan to provide more computing laboratories in the new multi-disciplinary and health sciences buildings. However, the current laboratories need to be upgraded to improve the quality of service we are offering to our students and the University. The computers, especially our server farm, are in dire need of larger uninterrupted power supply units to cater for the incessant power disruption within campus. Hopefully, the new laboratories will be equipped appropriately and in line with the department's mission and vision.

Therefore, as part of this revised program, what the department requires is the upgrading of the existing laboratories (as shown in Table 2 below) and fully furnishing the new computing laboratories in the new building which can be handled according to the normal budget process.

3.2.3. Available Physical Facilities and Future needs

Table 2: Available physical resources and future needs.

	Laboratory	Current State	Future Requirement
1	232/105 Fourth Year Laboratory	– 23 PCs(MS Windows XP) – 1 security camera – 2 x 24 port Cisco switches – 30 garden chairs	– Newer Machines – 17 " TFT Screens – Mounted overhead projector – Extra security camera – New network switch – Proper laboratory chairs
2	232/106 Fourth Year Laboratory	– 23 PCs(MS Windows XP) – Limited to 30 PCs – 1 Security camera – 2 x 24 port Cisco switches – 30 garden chairs	– New machines – 17 " TFT Screens – Mounted overhead projector – Extra security camera – New network switch – Proper laboratory chairs
3	232/109 Server Room	– 3 Linux/Servers – 3 MS Windows Servers – No security camera	– Security camera – New master network switch
4	232/111 Master's Laboratory	– 8 PC's(MS Windows XP) – 1 security camera – 1 x 24 port Cisco switch	– 15 PC's – Mounted overhead projector – Extra security camera – New network switch – Proper laboratory chairs
5	232/112 Master's Laboratory	– 30 thin clients – 1 security camera – 1 x 24 port network switch	– Mounted overhead projector – Extra security camera – New network switch – Proper laboratory chairs
6	232/116 Research Laboratory	– Connection to network via UTP cabling – CCNA Bundles for networking course.	– Fibre optic cabling – Mounted overhead projector – Security camera – New network switch – Proper laboratory chairs – Blade server for High performance computing.
7	232/117 Second Year Programming Lab	– 40 PC's running Linux – 2 x 24 port Cisco switches – 1 security camera – 40 garden chairs	– Mounted overhead projector – Extra security camera – New network switch – Proper laboratory chairs
8	232/118 Second Year Programming Lab	– 30 PC's running Linux – 2 x 24 port Cisco switches – 1 security camera – 30 garden chairs	– Mounted overhead projector – Extra security camera – New network switch – Proper laboratory
9	232/119 Third Year	– 30 PC's(MS Windows)	– Mounted overhead

	Laboratory	Vista capable – 2 x 24 port Cisco switches – 1 security camera – 30 garden chairs	projector – Extra security camera – New network switch – Proper laboratory chairs
10	232/120 Third Year Laboratory	– 30 PC's(MS Windows) Vista Capable – 2 x 24 port Cisco switches – 1 security camera – 30 garden chairs	– Mounted overhead projector – Extra security camera – New network switch – Proper laboratory chairs
11	209/2 GCE Laboratory	– 29 PC(MS Windows)	

4. Departmental Regulations

4.1. Preamble

The department has found it prudent to update its entrance requirements to be able to compete fairly for students with its competitors. The current practice of 6–semester structure does not adequately prepare students for advanced undergraduate courses required for the right calibre of graduates. In addition, based on our experience in implementing the program and considering the computing body of knowledge required of graduates for the market, the 6-semester structure is inadequate. Therefore, the BIS degree program in Computer Information Systems has been revised into an 8-semester framework so that it commences in Semester I, rather than in Semester III as it is the case presently. Therefore, entry to the program will be direct entry to year 1 as opposed to the current practice where students enter into the program after completing their first year at the Faculty of Science.

4.2. General Provisions

Subject to the provisions of General Academic Regulations, the following Departmental Regulations shall apply:

4.3. Title of Programme

The program is a single major program leading to the award of BIS (Computer Information Systems).

4.4. Entry Requirements

Subject to the General Academic Regulation 00.5, the following departmental programme entry requirements shall apply for the program BIS (Computer Information Systems).

i) For entry into 100-level, candidates must have a minimum grade of C in Mathematics and two other science subjects with computer studies recognized as a science subject, with a minimum grade of D in English.

ii) For entry into the programme at higher level, the following shall apply.

a. Transfer student from a Computer Science or Information Systems or equivalent programme from a higher institution considered equivalent to the University of Botswana, subject to General Academic Regulation 00.313.
b. Candidates holding a post Secondary qualification which is considered by the department as being at least equivalent to the 100-level of the programme and so deemed to earn the candidate an exemption from the 100-level of the programmes.
c. Candidates holding a post Secondary qualification who do not meet criteria b) above may be required to take some 100-level courses.

4.5. Assessments

Subject to the General Academic Regulation 00.81, the following special regulations shall apply:

a. Where examination is involved in the assessment of a course, the weighting between CA and examination shall be 1:1 for practical courses and 1:2 for theoretical courses and the final grade shall be calculated as weighted average of CA marks and Final Exam marks.
b. Duration of Final Exams – 2 to 3 hours.
c. CA marks will be calculated based on at least three assessments for a course
d. Specific requirements for CA marks calculations shall be as specified for each course.
e. The final year project course, ISS402, shall be assessed according to the guideline provided by the department.

4.6. Progression from Semester to Semester

Regulation governing progressions are as set out in General Regulations 00.9.

4.7. Award

To be awarded a degree, a student must satisfy appropriate provision of General Academic Regulation 23.71.

5. Programme Structure

5.1. Preamble

- The courses in bold format in the following tables are courses introduced as part of the BIS (CIS) program's curriculum. Some of these courses already exist in the University (e.g., ECO111, ACC100) and others are new courses (e.g., CSI414, CSI416) designed for this program. The main reason for making these courses differentiated from other courses is to indicate the courses added to complete the BIS (CIS) program curriculum on top of the IS common core (which is common to all the 3 BIS streams). In other words, those courses which are not in bold are those courses common to the 3 BIS programmes.
- For IS specific common core (i.e., those with code ISS), course codes are not attached to any department code as these courses are owned by all the three departments. Allocation of courses to departments is for teaching purpose only and hence does not indicate ownership of courses.

5.2. Structure

Semester I

Courses	Type	Credits	Prerequisite
STA101 Mathematics for Social Sciences I	Core	4	
ISS101 Information Systems Foundations I	Core	3	
CSI161 Introduction to Computing	**Core**	**3**	
ECO 111 Basic Microeconomics	**Core**	**3**	
COM141 Communication and Study Skills I	GEC	*3*	
ICT121 Computing Skills Fundamentals I	Exempt		
Total		***16***	

Semester II

Courses	Type	Credits	Prerequisite
STA102 Mathematics for Social Sciences II	Core	4	
ISS102 Information Systems Foundations II	Core	3	ISS101
ISS112 Introduction to Programming	Core	3	
ACC100 Introduction to Accounting	**Core**	**3**	
COM142 Communication and Study Skills II	GEC	*3*	
ICT122 Computing Skills Fundamentals II	Exempt		
Total		***16***	

Semester III

Courses	Type	Credits	Prerequisite
ISS211 Intermediate Programming	Core	3	ISS112
ISS221 Data & Information Management I	Core	3	
CSI242 Data Structures	**Core**	**3**	**ISS112**
FIN200 Business Finance	**Core**	**3**	
MGT202 Small Business Management	**Core**	***3***	
Total		***15***	

Semester IV

Courses	Type	Credits	Prerequisite
ISS212 Advanced Programming	Core	3	ISS211
ISS202 IT Tools and Productivity	Core	3	ISS112
CSI263 Computer Architecture	**Core**	**3**	**CSI161**
STA114 Business Statistics	Core	3	
Elective	**elective**	***3***	
Total		***15***	

Semester V

Courses	Type	Credits	Prerequisite
ISS321 Data & Information Management II	Core	3	ISS221
ISS331 Network Management	Core	3	
ISS323 Information Systems Analysis	Core	3	ISS102
CSI354 Operating Systems	**Core**	**3**	**CSI263, CSI242**
Elective	**elective**	***3***	
Total		***15***	

Semester VI

Courses	Type	Credits	Prerequisite
ISS324 Information Systems Design and Implementation	Core	3	ISS323
ISS332 System Administration	Core	3	ISS331
ISS334 Information Systems Security	Core	3	ISS331
CSI315 Web Technology and Applications	**Core**	**3**	**ISS221, ISS331**
Min 3 credits from:			
MGT303 Entrepreneurship & New Business Formation	**Optional**	**3**	**MGT202**
CSI392 Human Computer Interaction	**Optional**	**3**	**ISS221**
Total		***15***	

Winter Semester

Courses	Type	Credits	Prerequisite
ISS302 Industrial Attachment	Core	3	ISS202 & ISS211

Semester VII

Courses	Type	Credits	Prerequisite
ISS431 Enterprise Architecture	Core	3	ISS324
ISS441 IS Project Management	Core	3	ISS324
ISS443 IS Research	Core	3	STA114
CSI414 Decision Support Systems	**Core**	**3**	**ISS321**
Elective	**elective**	***3***	
Total		***15***	

Semester VIII

Courses	Type	Credits	Prerequisite
ISS402 IS Project	Core	4	ISS212, ISS321, ISS324
ISS442 IS and society	Core	3	
ISS446 Strategic IS Management	Core	3	ISS102
CSI416 Web Computing	**Core**	**3**	**CSI315**
Elective	**elective**	***3***	
Total		***16***	

Total Credits: 78 +48 = 126.The 48 credits are introduced on top of the 78 credits (which is common to the 3 BIS streams) to create the BIS (CIS) curriculum.

6. Credit Summary

		Core	Optional	Elective	GEC	Total
Year 1	Sem. 1	13			3	16
	Sem. 2	13			3	16
Year 2	Sem. 1	15				15
	Sem. 2	12		3		15
Year 3	Sem. 1	12		3		15
	Sem. 2	12	3			15
	Winter Sem.	3				3
Year 4	Sem. 1	12		3		15
	Sem. 2	13		3		16
Total		**105**	**3**	**12**	**6**	**126**

APPENDIX

Course allocations to Departments

Department of Library & Information Studies	***Department of Computer Science***	***Department of Accounting & Finance***
• *ISS221 Data & Information Management 1* • *ISS321 Data & Information Management 2* • *ISS334 IS Security* • *ISS441 IS Project Management* • *ISS443 IS Research* • *ISS442 IS & Society*	• *ISS112 Introduction to Programming* • *ISS211 Intermediate Programming* • *ISS212 Advanced Programming* • *ISS331 Network Management* • *ISS332 Systems Administration* • *ISS431 Enterprise Architecture*	• *ISS101 IS Foundations 1* • *ISS102 IS Foundations 2* • *ISS202 IT Tools & Productivity* • *ISS323 IS Analysis & Design 1* • *ISS324 IS Analysis & Design 2* • *ISS446 Strategic IS Management*