American Journal of Engineering Research (AJER)
E-ISSN: 2320-0847 p-ISSN: 2320-0936
Volume-8, Issue-2, pp-64-71
www.ajer.org
Research Paper Open Access

Developing Curriculum of Bachelor Programs for College of Computing

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ABSTRACT: *Curriculum planning and designing is the decision-making process in regards to the content and the organization of learning in a program. This paper presents the framework developed by the Faculty of Computing and Information Technology, Northern Border University, while revisiting the curriculum for three computing programs. The programs are Computer Science, Information Technology, and Information Systems. In addition, the process and the formation of curriculum development are described, where it addresses the needs of community, research, industry and academia. Constituencies are formed to deliberate and decide on the content and issues concerned with the educational needs of computing students, in line with the mission, vision and objectives of the University.*

KEYWORDS: *Program Curriculum; Student Outcomes; Program Objectives; Indirect and Direct Assesment.*

Date of Submission: 05-01-2019 Date of acceptance: 08-02-2019

I. INTRODUCTION

The Faculty of Computing and Information Technology (FCIT), Northern Border University was established in June, 2007. The faculty consists of three departments: Computer Science, Information Technology, and Information Systems. Each department constitutes a Bachelor of Science program. The first batch of students enrolled in the academic year 2007-2008. The Northern Border University is a multi-campus university consisting of three campuses – Arar, Rafha, and Tarif. In addition, the FCIT has two sections one for male and a separate one for female students.

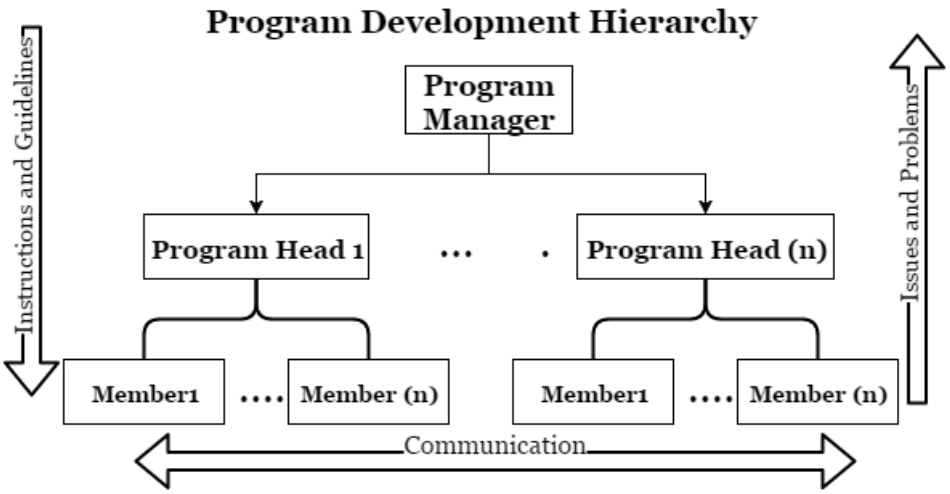

Fig. 1. Program Development Hierarchy.

The university commissions the task of program development to a program manager, which gets consultancy from educational experts, and guides and directs the program heads. Program head constitutes a

committee of members within the department with the task to develop or revise the program components. The Fig. 1 depicts the scenario of program development hierarchy.

II. CURRICULUM DEVELOPMENT COMPONENTS

The curriculum development model shown in Fig.2 presents the broad view of various components of curriculum. The details components are described below.

A. Reasons for Development of the Programs and Curriculums

The following areas summarize the reason for developing the curriculum:

1) Economic Reasons: To meet the urgent needs of the labor market for graduates of the computing programs, both in government sectors or private sectors.

2) Social and Cultural Reasons: Contribute to community service through the definition of the benefits of modern technologies in the service of society. Spreading the culture of the demand for higher education.

3) Technological Development Reasons: Employ modern technologies in various fields.

4) National Policy Developments Reasons: Development of belonging and loyalty to the homeland through the availability of suitable job opportunities.

B. Mission, Vision and Objectives of the Programs

The mission, vision and objectives of the programs are devised in-line with that of institution, these includes:

- Academic aspects
- The cultural aspects of the society in all sectors in line with Islamic law, customs and traditions of the community.
- To develop the ability to work individually and collectively.

C. Program and Study Plan Specification of Bachelor's Degree

The devised curriculum has to shares some of the courses from other programs in the faculty in order to support the broad concepts of computing within the premises of the university.

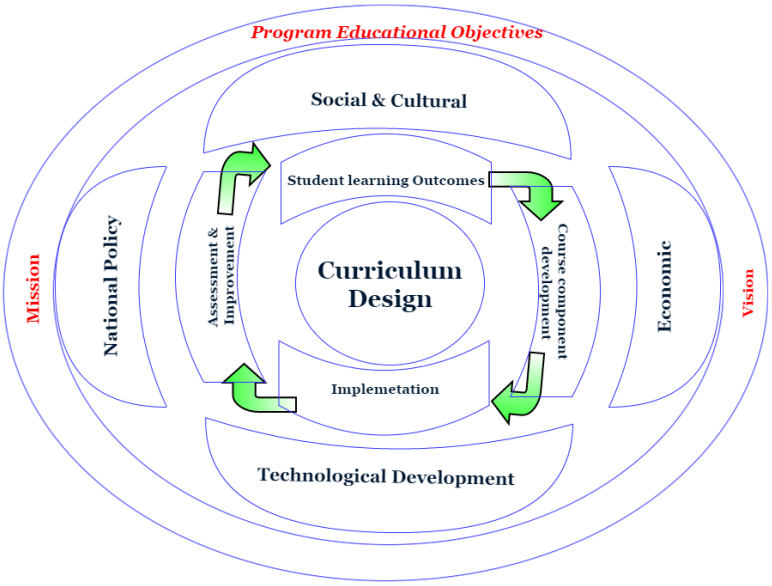

Fig. 2. Curriculum Development Model.

The curriculum pre-requisite requirements are defined and are properly assessed and evaluated.

D. Student Outcomes

The student outcomes are knowledge, skills, attitudes or values acquired after completion of one of the subsequent learning level i.e. program, course, project or an activity. The exercised specification of student outcomes for the developed computing programs are referenced from Accreditation Board for Engineering and Technology (ABET) with minor adjustments [13], in line with the mission, vision and objectives of the university.

E. Degrees Awarded by Faculty and Program Codes

The faculty developed three programs computer science, information technology and information system. The degree title are formed as "Bachelors of Science in Program name", e.g. Bachelors of Science in Computer Science. The program code is four digits, where the first two digits represent the faculty and the last two digits specify the program as shown in Table. I.

TABLE I. PROGRAM TITLE AND PROGRAM CODE

No.	Program Name	Degree Title	Program Codes
1	Computer Science	Bachelor of Science in Computer Science	3101
2	Information System	Bachelor of Science in Information Systems	3102
3	Information Technology	Bachelor of Science in Information Technology	3103

F. General Framework for Distribution of Program Units

The developed general framework shown in Fig.3 for the revised Bachelors of computing programs addressees the following five knowledge domains: 1. Computer Science, 2. Mathematics, 3. Science, 4. Communication Skills and 5. Social and Ethical Values.

Specialization tracks in computing program curricula cover at least 40-50% of the curriculum. Which includes but not limited to architecture & organization, programming, algorithms, database and information retrieval, software engineering, computing systems, computer networks, information security, intelligent systems, information strategies and policies, multimedia, web system and technologies, information and business management systems and project management. The graduation project is one of the pivot requirements of the program, it engages student to apply and develop the knowledge and skills acquired, and furthermore to enhance communication skills.

The Faculty also requires supporting and cross knowledge of other computing programs. The supporting units are concerned with natural sciences, formal sciences, social and applied sciences. This covers about 30-40% of the curriculum.

The university necessitates that each program achieves social, ethical and cultural values of the community. The computing programs allocate 10-15% of the curriculum to realize these requirements.

The program needs to be flexible and it allows students to select units autonomously outside the faculty, offered within the university. The maximum allowance is from 2-3% of the curriculum. Furthermore, field training is introduced to develop the practical and professional skills. Its participation in the curriculum is 1-2%.

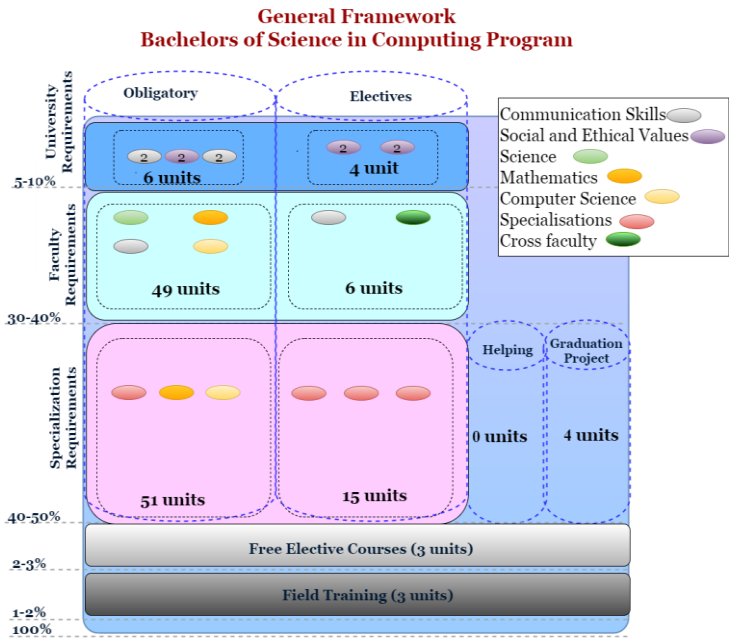

Fig. 1. General Curriculum Framework of Computing Programs.

G. Course Distribution Plan

The course distribution is structured in three major levels i.e. beginner, intermediate and advance during the four year programs. Each course has to fulfill the pre-requisite requirements according to the levels in the semesters, thus course distribution follows a sequential approach.

The courses assignment in a semester details the course title, credit units, unit type (theory and practical) and course pre-requisites.

The graduation project requisites the related courses with approval of the faculty, and with at least 70% of the curriculum completed.
The field training module needs faculty approval, having covered at least 70% of the curriculum. The minimum actual contact of the training is 120 hours.

H. Course Syllabus

The course description briefly specifies the subject matter, approach, breadth and applicability of the course. It focuses on the contents and extendable to the list of topics. Output of each course contributes to course learning outcomes, they are design to achieve but not limited to following skills and domains i.e. knowledge, cognitive, interpersonal and capacity to carry responsibility, communication, numerical, information technology and psychomotor etc.

The textbooks are assigned based on the consistency of objectives and goals of the textbooks with that of the courses. Finally, the grading policy of a course provides breakdown of the assessment and evaluation components.

I. Facilities and Infrastructure

The main components for efficient delivery of the program are facilities, infrastructure and manpower. The manpower of the program encompasses professors, associate professors, assistant professor, lecturer, teacher assistance, technician, and administrator. The appropriate faculty-student ratio lies between 1:15 and 1:20.

III. CASE STUDY

The curriculum developed for the computing programs (Computer Science, Information Systems and Information Technology) are based on the scanning of the following benchmarks. All scanned programs are accredited by Accreditation Board for Engineering and Technology (ABET) [13] or British Computer Society (BCS) [14].

TABLE II. SCANNED BENCHMARKS

Computer Science	**Information Systems**	**Information Technology**
[1] California State University, USA	[7] Liverpool University, UK	[10] Oakland University, New Zealand
[2] American University Cairo, Egypt	[8] State University of New york, USA	[11] United Arab Emirates University, UAE
[3] University of Bahrain, Bahrain	[3] University of Bahrain, Bahrain	[4] King Abdul Aziz University, KSA
[4] King Abdul Aziz University, KSA	[9] King Faisal University, KSA	[12] King Saud University, KSA
[5] King Fahd University of Petroleum & Minerals, KSA	……	…….
[6] Northern Border University, KSA	[6] Northern Border University, KSA	[6] Northern Border University, KSA

IV. REVIEW AND REVISION

The curriculum review and revision process is an ongoing critical inquiry to improve curriculum delivery and achievement of the outcomes. The FCIT has established Quality and Academic Accreditation Unit (QAAU) for this purpose. Here, the two vital components are assessment and evaluation, further assessment is carried out with direct and indirect methods, while the evaluation is a group of structured activities, and it evaluates the achievements of student outcomes that are aligned with the courses. The process of review and revision is elaborated in Fig.4.

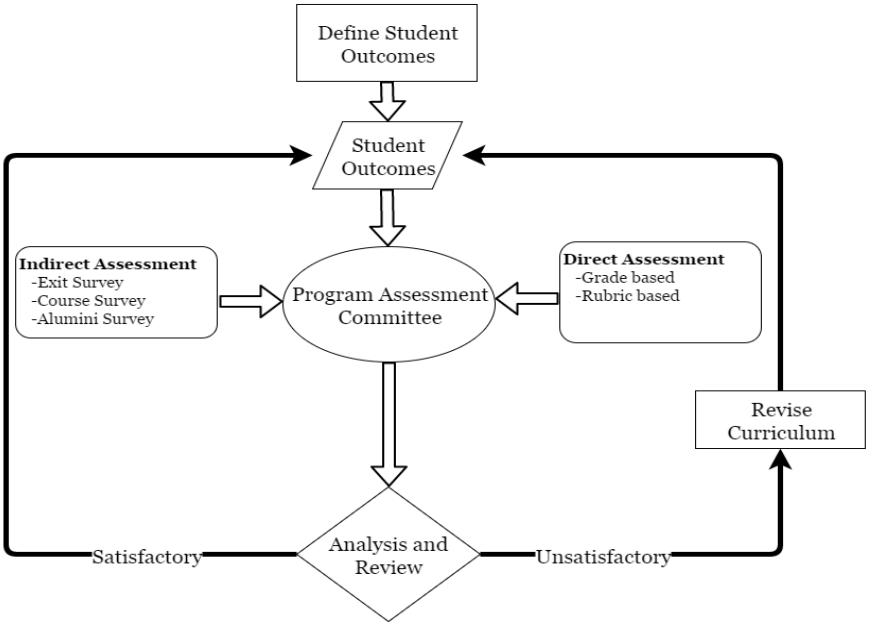

Fig. 3. Curriculum Review and Revision Process.

V. CONCLUSION

The extended abstract presents the practical experience of curriculum development process followed by Faculty of Computing and Information Technology, NBU, KSA. The revised three computing programs are development in light of the ABET specifications with support of Quality and Academic Accreditation Unit, (QAAU), FCIT, NBU. The developed programs are implemented from the academic year 2015-2016.

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APPENDIX -1 COMPUTER SCIENCE PROGRAMS

Scanning Mechanism of Selected Computer Science Programs (Similar Programs)

Comparison Between Similar Programs		First program (CSU)		Second program (KFUPM)		Third program (UOB)		Fourth program (KAU)		Fifth Program (AUC)		Current Program (NBU)	
Total of Program Units & Courses		Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses
		148	41	131	40	126	41	133	49	140	50	136	47
Distribution of Units & Courses on :		Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses
University Requirements	Obligatory	6	2	12	6	18	6	33	11	26	10	26	10
	Elective	12	3	4	2	–	–	7	2	15	5	15	5
College Requirements	Obligatory	63	15	40	13	42	13	27	11	24	9	20	7
	Elective	0	0	0	0	0	0	3	1	9	3	9	3
Specialization Requirements	Obligatory	37	12	47	14	48	16	39	15	53	17	53	17
	Elective	24	6	12	4	6	2	18	6	9	3	9	3
	Project	6	3	4	2	3	1	3	2	4	2	4	2
Free Elective Courses		0	0	12	–	9	3	3	1	0	0	0	0
Field Training		0	0	0	0	0	0	0	0	0	1	0	0
Technical Aspect													

Scanning Mechanism of Information Technology Program

APPENDIX -3
INFORMATION TECHNOLOGY PROGRAMS

Comparison Between Similar Programs		first program		Second program		Third program		fourth program		fifth program		Current Program	
Total of Program Units & Courses		Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses
		140	65	130	36	128	29	131	41			132	44
Distribution of Units & Courses on :		Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses
University Requirements	Obligatory	41	32	42	14	28	7	12	4			8	4
	Elective			6	2			0				4	2
College Requirements	Obligatory	24	8	49	17	20	5	0				36	13
	Elective	9	3	0		12	3	0				9	3
Specialization Requirements	Obligatory	57	19	21	3	36	9	103	34			59	19
	Elective	9	3	0		20	5	16	3			9	3
	Project	1		0		9		0				4	
Free Elective Courses				0		8		0				3	
Field Training		0		12		4		2				2	
Technical Aspect								0					

APPENDIX -1
INFORMATION SYSTEMS PROGRAMS

Scanning Mechanism of Information Systems Program

Comparison Between Similar Programs		First Program (KFU)		Second program (UoB)		Third program (Liverpool Univ)		Fourth program State University of New York		Fifth program		Current Program	
Total of Program Units & Courses		Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses
		121	42	133	45	105	36	120	41			130	49
Distribution of Units & Courses on :		Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses
University Requirements	Obligatory	4	2	21	7	27	9	15	5			41	15
	Elective	4	2									-	-
College Requirements	Obligatory	48	16	33	11	36	12	25	8			20	7
	Elective	9	3									9	3
Specialization Requirements	Obligatory	39	13	63	21	3	1	53	22			53	19
	Elective	9	3	9	3	39	13	6	2			9	3
	Project	2 (5 credits)		1 (3 credits)		1		1 (3 credits)				2 (4 credits)	
Free Elective Courses		-		1 (3 credits)		-		3 (8 credits)				-	
Field Training		1 (3 credits)		1 (1 credit)		-		-				-	
Technical Aspect													

Atiq Ur Rahman" Developing Curriculum of Bachelor Programs for College of Computing" American Journal of Engineering Research (AJER), vol.8, no.02, 2019, pp.64-71