

TOWARDS A CONSISTENCY OF INFORMATION SYSTEMS CURRICULUM

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ABSTRACT

Many MIS/CIS/CS/IT programs are closely following the curriculum guidelines of a widely recognized IS model. However, the decrease in enrollment in Information Systems (IS) programs has motivated many institutions to be innovative in the design of their curricula in order to attract more students to their programs. Therefore it is important to study how to redesign the curriculum for survival in the current economic environment. An understanding of these programs will help us create a more consistent MIS/IS/CIS curriculum that will be challenging and yet attractive to more students. Seventy two (72) IS programs are evaluated in the United States. The main purpose is to compare these programs with 2010-IS model and show the differences that exist between these programs regarding core and elective courses credit hours.

Keywords: Management Information System, Computer Information System, Information Technology, Curriculum, Information Systems

INTRODUCTION

Business managers are very convinced information systems (IS) are changing their business and must ensure that their organization develops and uses information systems to add real value [18]. As the significance of information systems in the business world increases, so does the importance of the quality of our information system college graduates and information systems curriculum. Therefore, the proper education of information systems graduates is becoming more critical. Designing a consistent IS curriculum is a challenging yet necessary process for all educational institutions. Having different curricula offered by various colleges can lead to a chaos in IS education field. Moreover, we have not be able to meet the requirements of our society and our industry in particular. This is the reason that there are different IS models introduced over the past 20 years.

In addition, the technology skills shortage combined with low enrollments in IS related programs indicate a harsh picture for the future of the IT (Information Technology) industry. Many IS programs have experienced enrollment decline of about 70 percent [15, 11]. Indeed, the cost of paying no attention to this phenomenon is severe. Many CIS/IS/MIS programs have been eliminated or disbanded, and tenured faculty have been laid off [12, 15, and 27]. The perception of an increasing dependency on outsourcing and the “dot com” bust can contribute to declining enrollments. If enrollments continue to decline and if IS-related programs do not deliver graduates with the skills to succeed in the IT industry, the shortage will be worse than originally predicted [1, 26]. We need to take action to improve enrollment. One main strategy is curriculum redesign.

Designing and redesigning curriculum is a continuous process [10]. There have been many studies and curriculum proposals for IS programs in recent years. The author believes that there are important differences between IS curriculum and IT curriculum. IT curriculum is more technology oriented than IS/CIS/MIS curriculum. One of the best IT curriculum is ACM/IEEE [2]. According to ACM/IEEE-IT [2], an IT academic discipline is defined as following:

As an academic discipline, Information Technology focuses on preparing graduates who are concerned with issues related to advocating for users and meeting their needs within an organizational and societal context through the selection, creation, application, integration and administration of computing technologies.

According to IS-2010 model, an IS academic field defined as following: “Computer-based information systems continue to be a critical part of the products, services, operations, and management of organizations. Indeed, information systems and information technology can be so critical as to disrupt classic business models, threatening traditional revenue streams and even driving industry sectors to extinction. The print newspaper industry, travel agencies, real estate agencies...” As one may notice this definition is not clear compared to IT academic discipline.

The author believes that IT is the umbrella under which other groups or divisions fall [17]. From a brief examination of IT curricula it appears that IT programs, like IS programs, are very different and typically multi-disciplinary [31, 27]. This study focuses on an IS curriculum model and not the IT curriculum model. In one of the earliest studies, Nunamaker et al. [24] proposed a conceptual model for information systems program. Nunamaker et al. [24] presented the detailed recommendation to Association of Computing Machinery (ACM) curriculum committee.

In a field like IS that is quickly changing, it is important for institutions offering undergraduate programs in IS to periodically evaluate their curriculum and make necessary modifications to meet the demand and requirements of industry [22]. In this study, the IS curriculum of institutions are compared to determine the differences between these curricula. The intention is to study and understand different curricula in IS and determine how a curriculum can be improved. This knowledge of what other institutions are offering should help us redesign our curriculum to stay competitive and attract more students to our IS programs.

RESEARCH METHOD, PROCESS, LIMITATION AND QUESTIONS

The primary purpose of this study is to design and adopt a MIS/IS/CIS curriculum that meets various skills required by our society. Based upon the literature review and my experience, the type of skills that the industry requires are as following: 1-Programmer, Problem solver, Project Manager, Business Analysis, Network and Security Management, and D.B developer (SQL, BI). By doing this we may be able to overcome the low enrollment in this field. This study exerts to put in plain words the concept of MIS/IS/CIS curriculum by reviewing various IS curricula and their relationships with ACM and AACSB. The research introduced draws upon social system theory in the functionalist sociology defined by Burrell and Morgan [6]. This study approaches the subject matter from an objectivist perspective. The proposed model presented is based on the "holistic view" school (Social System Theory). The methodology is based on a literature review, college's web sites and the author's experiences as an IS educator and an IS consultant in numerous universities and organizations.

To obtain a complete list of AACSB schools the author visited The Association to Advance Collegiate Schools of Business website (AACSB). On the website the author was able to view all of the accredited schools in the world. For this research the author focused on those colleges in the United States. A complete lists was generated; then between 1-5 schools from each state were randomly selected, reducing to 104 schools from the original 471 schools for review. By the time of preparing this paper data were collected from 72 universities. The intention was to choose a diverse group of institutions regardless of size and reputation. Next was an online search conducted for institutions with IS programs. Schools were chosen if they had their IS curricular available completely online. The data on total number of credit hours (TCH), IS core course credit hours (ISCCH), business core course credit hours (BCRCH), general education core course credit hours (GECCH), and elective course credit hours (ECCH) were collected and analyzed. From the author's point of view, good research requires a sequence of well-defined steps planned in advance. The following steps were included in this study: Generate research idea, review literature, select schools, review IS curricula, collect data, analyze data and publish the study.

As with any research, this study has limitations. The author believes that there are important differences between IS curriculum and IT (Information Technology) curriculum. IT curriculum is more technology oriented than IS/CIS/MIS curriculum. This study focuses on 2010-IS model (Fig.-1). The data were obtained from 72 different schools. All participating schools in the study were from USA. Another limitation is, this study only considered the schools which were accredited by AACSB. Moreover, there are many other factors that could be part of continued study, such as: considering schools from other accreditation bodies, number of students, internship programs, location of the schools, the name of the programs, job placement and so on. The author faced limitations based upon available resources in order to conduct the study. Further studies might identify additional factors related to the development of CIS curricula. This study as a whole attempts to answer the following research questions (RQ):

RQ: Is there consistency in Information Systems programs offered by AACSB accredited institutions.

H1: There is no consistency in ISC credit hours of IS programs offered by AACSB accredited institutions.

H2: There is no consistency in Elective course credit hours of IS programs offered by AACSB accredited institutions.

LITERATURE REVIEW

Many researchers have studied undergraduate IS curricula over the years. For example, [7, 9, 14, 16, 19, 20, 21 and 27] studied IT curricula. Moreover, much time has been dedicated to developing model curricula for IS programs in business schools, yet there is no consistency in the department that oversees the degree or in the name of the major. Some common major titles are Management Information Systems (MIS), Information Systems (IS), Computer Information Systems (CIS), and Business Information Systems (BIS) [28]. Educators in this field want to make sure that all the programs continue to meet the requirements of their stakeholders [25]. Curriculum degree programs guidelines for undergraduates in Information Systems (IS) known as an IS model have been developed by the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS). The IS model is widely endorsed and accepted by many institutions. However, there may be noticeable differences between the IS curriculum at various institutions including those who are accredited by different accreditation bodies such as [3, 4]. The main purpose of this research is to examine the IS programs at different institutions to determine how closely they are following the guidelines of the IS model.

The Association for Computing Machinery (ACM) and Association for Information Systems (AIS) has proposed a model curriculum and guidelines for undergraduate degree programs in information systems [29].

Core Courses or IS Courses

- IS 2009.1 Fundamentals of Information Systems
- IS 2009.2 Data and Information Management
- IS 2009.3 Enterprise Architecture
- IS 2009.4 IS Project Management
- IS 2009.5 IT Infrastructure
- IS 2009.6 Systems Analysis and Design
- IS 2009.7 IS Strategy, Management and Acquisition

Elective Courses

- Application Development
- Business Process Management
- Enterprise Systems
- Fundamentals of Human-Computer Interaction
- IT Audit and Controls
- IT Innovation
- IT Security and Risk Management

Figure 1. IS model [29]

This model is focused only on IS education requirements. The core-also known as Information Systems Education Requirement (ISER) and Elective Course (EC) specifications of the latest model IS 2010 are provided below.

Core Courses or IS Courses

- IS 2010.1 Fundamentals of Information Systems
- IS 2010.2 Data and Information Management
- IS 2010.3 Enterprise Architecture
- IS 2010.4 IS Project Management
- IS 2010.5 IT Infrastructure
- IS 2010.6 Systems Analysis and Design
- IS 2010.7 IS Strategy, Management and Acquisition

Elective Courses

- Application Development
- Business Process Management
- Enterprise Systems

Human-Computer Interaction
IT Audit and Controls
Data mining / Business Intelligence
Collaborative Computing
Information Search & Retrieval
Knowledge management
Social Informatics
IT Security and Risk Management

Figure 2. IS model [30]

Association for Computing Machinery (ACM), Association for Information Systems (AIS), and Association of Information Technology Professionals (AITP) have all proposed a model curriculum and guidelines for undergraduate degree programs in information systems [8, 13]. The main distinction is the total number of credits offered by the models. The 2002 model is focused more on IS education requirements [26]. The 2002 model offers eleven core courses while the 2009 model offers fourteen courses and 2010 model offers seventeen courses. The 2009 model has made a distinction between the “Core” courses” and “Elective” courses (Fig.1) as well as 2010 model (Fig.2). The 2010 model is almost similar to 2009 model. The only difference is the number of elective courses. The elective courses have increased from 7 courses to 11 courses in 2010 model. Both 2009 and 2010 models have less emphasis on programming courses [5, 27]. Some believe that this could help increase the enrollment in IS as many students are driven away from IS programs because of programming requirements. But, the job market requires the programing skills.

It is common for institutions to have different names for their computing programs such as Information Systems (IS), Computer Information Systems (CIS), Information Technology Management (ITM), Business Information Systems (BIS), and Management Information Systems (MIS). In addition, some of the IS programs are Bachelor of Business Administration (BBA) and some are Bachelor of Science (BS). BBA programs emphasize more business courses while BS programs emphasize technology and programming. The primary objective of the IS program is to provide graduates with knowledge, abilities, and attitudes to function effectively as an applications designer/project manager/ programmer /analyst, with the educational background and desire to pursue lifelong professional development. The IS program is very versatile because of the business requirements.

ANALYSIS AND T-TESTING

The IS programs at the 72 institutions all located in USA were examined and analyzed. A summary of findings is shown in Table-1 and details of each program by institution are provided below. The factors evaluated include the general trend of total credit hours offered by different institutions, Business Education Requirements, Information Systems Education Requirements, General Education Requirements, and Elective Requirements.

In Table-1.2, column two provides the name of institution. Column three (STNA) shows name of state in USA. Column four (TCH) shows the total credit hours required from each university in order to graduate from the program. Last column shows the accreditation of the program by AACSB. In Table-1.2, column one provides the name of institution, column two (TCH) as in Table-1.2 column three (BCRCH) represents the total credit hours requirement for business courses. Column four (%) shows the percentage of business courses requirement credit hours. Column five (ISCCH) gives the total credit hours requirement for IS courses. Column six (%) represents the percentage of ISC requirement credit hours. Column seven (GECCH) provides the total credit hours requirement for general education core. Column eight (%) represents the percentage of general education requirement credit hours. Column nine (ECCH) shows the total elective requirement credit hours. Column ten (%) provides the percentage of elective requirement credit hours.

Table 2 provides descriptive statistics on the total credit hours, core courses, and elective courses of all the institutions examined in this study along with the core and elective courses of institutions with AACSB accreditation.

Testing H1 (two tail test)

Just to restate our hypothesis-1 (H1) of the study “There is no consistency in ISC credit hours of IS programs offered by AACSB accredited institutions”. Using the following formula:

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} \quad -1.99 \leq \frac{\bar{x} - \mu}{s / \sqrt{n}} \leq +1.99$$

One gains $t = 5.23$ after inserting all the values ($\bar{x} = 29$, $\mu = 21$, $S = 13$, $\alpha = 0.05$, $n = 72$ and t value is 1.994) in the above mentioned formula. As the value of $t = 5.23$ lies in the region to right 1.99, then H_0 is rejected at the 0.05 significant level in favor of H_1 , i.e., the data support H_1 . So, one can conclude that there is a significant difference in the Information Systems Courses Requirements (ISC) program in those listed universities.

Testing H2

Just to restate our hypothesis-2 (H2) of the study “There is no consistency in Elective courses credit hours of IS programs offered by AACSB accredited institutions”. One gains $t = -8.40$ after inserting all the values ($\bar{x} = 11$, $\mu = 33$, $S = 10$, $\alpha = 0.05$, $n = 72$ and t value is -1.994) in the above mentioned formula. As the value of $t = -18.64$ lies in the region to left 1.99, then H_0 is rejected at the 0.05 significant level in favor of H_2 i.e., the data support H_2 . So, one can conclude that there is no consistency in elective courses credit hours of IS programs offered by AACSB accredited institutions.

Therefore the research questions of this study are answered that there is a lack of consistency in core and elective courses credit hours among the accredited institutions of higher education offering the IS program.

CONCLUSIONS

The Information Systems (IS) discipline faces greater challenges now than at any time; the main challenge is low enrollment (Sagheb-Tehrani 2011). The college curriculum in Information Systems (IS) is revisited and often changed in institutions of higher education to reflect the changes in the field. It is important to make necessary changes to the IS curriculum to make programs challenging and to better prepare graduates for today’s job market. Examining the seventy two institutions’ IS curricula shows differences in each program (Tables 1.1, 1.2). It is also shown statistically that these programs differ based on core and elective courses credit hours offered regardless of AACSB accreditation. A curriculum is suggested in Figure-3 based on studying these seventy two IS programs and 2010-IS model.

This curriculum consists of business classes and computer information system classes. The degree would be a bachelor of business administration in computer information systems or management information systems. The business courses would be Accounting, Corporate Finance, Micro Economics, Macro Economics, Business Law, Principles of Marketing, and Business Communication. Computer information systems classes would be programming language, Database Management, Systems Analysis and Design, Management Information Systems, Project Management, Networks Management, ERP Systems, Information Security & Risk Management, IT Management & Strategy. An Implementation / Internship course will complete the required IS courses. The implementation course / internship would be along the lines of a design project where the student uses everything that he/she has learned and put it into one project. This will give the student experience and maybe a job opportunity at the completion of the program. The IS electives will be required to complete the degree. These classes may be an extra programming course, Computer forensics, Advanced DB, Advance networking management or Advance Webpage Development. Thus, about 30 percent of courses should focus on general college core requirements, 23 percent on BBA core requirements, 39 percent on major specific requirements and about 8 percent open electives (See Figure 3). The findings of the study supported Hypothesis-1 (H1). This can help programs to move towards designing a more consistent CIS curriculum. The result of this study is useful for schools in designing or redesigning the IS program. More detailed research would be required to obtain a better understanding of the deviation uncovered in this paper.

The primary purpose of this study is to show the existence of differences in the IS curricula of different institutions of higher education accredited by AACSB. The findings show lack of consistency in core and elective courses credit hours offered by various institutions offering IS degree programs. This inconsistency exists regardless of the claim for following the IS model curriculum and receiving AACSB accreditation. More institutions should be investigated in different regions with additional criteria such as size, differing accreditation bodies, and reputation. To further validate the differences between the IS programs, more IS curricula in other countries should also be examined. Future studies should identify additional factors related to the value of IS curricula. The focus should also be geared toward the AACSB accredited institutions and be compared to non-accredited institutions. Further studies can focus on other factors mentioned above such as size of the schools and location of the schools.

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Appendix

Table 1.2. IS Undergraduate Curriculum by Various Universities in USA

NO	University	ST	TCH	BCR	%	ISC	%	GEC	%	EC	%	AA-
	Name	NA	-	CH	-	CH	-	CH	-	CH	-	CSB
1	University of South Alabama	AL	123	46	37%	15	12%	53	43%	9	7%	Yes
2	Arkansas Tech University	AR	124	40	32%	41	33%	37	30%	6	5%	Yes
3	Arizona State University	AZ	120	31	26%	21	18%	60	50%	8	7%	Yes
4	University of Colorado-Denver	CO	120	42	35%	18	15%	52	43%	8	7%	Yes
5	Georgetown University	DIC	120	36	30%	48	40%	24	20%	12	10%	Yes
6	Florida Atlantic University	FL	120	54	45%	21	18%	36	30%	9	8%	Yes
7	Florida International University	FL	120	54	45%	30	25%	36	30%	0	0%	Yes
8	Emory University	GA	138	30	22%	33	24%	64	46%	11	8%	Yes
9	Columbus State University	GA	123	36	29%	21	17%	57	46%	9	7%	Yes
10	Kennesaw State University	GA	123	18	15%	15	12%	42	34%	48	39%	Yes
11	University of Hawaii at Monoa	HI	124	24	19%	21	17%	54	44%	25	20%	Yes
12	Drake University	IA	124	42	34%	21	17%	52	42%	9	7%	Yes
13	Iowa State University	IA	122	50	41%	21	17%	30	25%	21	17%	Yes
14	Boise State University	ID	129	36	28%	37	29%	35	27%	21	16%	Yes
15	Idaho Stae University	ID	128	43	34%	18	14%	37	29%	30	23%	Yes
16	loyola University Chicago	IL	128	42	33%	15	12%	45	35%	26	20%	Yes
17	University of Illinois at Springfield	IL	120	21	18%	30	25%	42	35%	27	23%	Yes
18	Purdue University	IN	124	57	46%	12	10%	48	39%	7	6%	Yes
19	University of Notre Dame	IN	126	49	39%	9	7%	39	31%	29	23%	Yes
20	Kansas State University	KS	126	24	19%	24	19%	63	50%	15	12%	Yes
21	Pittsburg State University	KS	124	36	29%	27	22%	58	47%	3	2%	Yes
22	Eastern Kentucky University	KY	128	43	34%	42	33%	30	23%	3	2%	Yes
23	Morehead State University	KY	128	43	34%	18	14%	58	45%	9	7%	Yes
24	Grambling State University	LA	125	36	29%	36	29%	53	42%	7	6%	Yes
25	Nicholls State University	LA	122	36	30%	39	32%	42	34%	5	4%	Yes
26	Southern University and A&M College	LA	142	15	11%	68	48%	59	42%	6	4%	Yes
27	University of Louisville	LA	124	18	15%	42	34%	70	56%	0	0%	Yes
28	Bentley University	MA	122	24	20%	24	20%	46	38%	28	23%	Yes
29	Howard University	MA	123	44	36%	27	22%	36	29%	16	13%	Yes
30	Morgan State University	MD	127	48	38%	33	26%	46	36%	6	5%	Yes
31	Towson University	MD	120	12	10%	52	43%	56	47%	9	8%	Yes
32	University of Maine	ME	122	0	0%	53	43%	69	57%	0	0%	Yes
33	Central Michigan University	MI	124	45	36%	33	27%	42	34%	4	3%	Yes
34	Grand Valley State University	MI	134	45	34%	58	43%	31	23%	0	0%	Yes

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35	Oakland University	MI	128	38	30%	27	21%	41	32%	28	22%	Yes
36	Minnesota State University Mankato	MN	127	31	24%	36	28%	44	35%	16	13%	Yes
37	Minnesota State University Moorhead	MN	115	32	28%	34	30%	40	35%	9	8%	Yes
38	University of Minnesota	MN	120	20	17%	74	62%	46	38%	0	0%	Yes
39	University of Minnesota Duluth	MN	120	18	15%	21	18%	40	33%	0	0%	Yes
40	University of Missouri	MO	120	48	40%	36	30%	60	50%	0	0%	Yes
41	Jackson State University	MS	120	48	40%	36	30%	36	30%	0	0%	Yes
42	Mississippi State University	MS	124	32	26%	18	15%	58	47%	16	13%	Yes
43	The University of Mississippi	MS	126	12	10%	24	19%	60	48%	3	2%	Yes
44	The University of Montana	MT	120	51	43%	24	20%	60	50%	39	33%	Yes
45	East Carolina University	NC	120	42	35%	18	15%	42	35%	18	15%	Yes
46	Midwest: University of North Dakota	ND	128	49	38%	23	0.18	42	33%	14	11%	YES
47	University of Nebraska, Kearney	NE	125	36	29%	21	17%	45	36%	13	10%	Yes
48	University of Nebraska, Omaha	NE	125	30	24%	47	38%	48	38%	0	0%	Yes
49	University of New Hampshire	NH	128	32	25%	16	13%	80	63%	0	0%	Yes
50	Montclair State University	NJ	123	33	27%	21	17%	69	56%	0	0%	Yes
51	Rider University	NJ	120	24	20%	18	15%	77	64%	14	12%	Yes
52	New Mexico State University	NM	128	62	48%	27	21%	39	30%	0	0%	Yes
53	The University of New Mexico	NM	128	51	40%	15	12%	60	47%	2	2%	Yes
54	University of Nevada, Las Vegas	NV	124	44	35%	27	22%	47	38%	6	5%	Yes
55	University of Nevada, Reno	NV	128	24	19%	27	21%	33	26%	15	12%	Yes
56	Clarkson University	NY	120	33	28%	27	23%	42	35%	18	15%	Yes
57	Cornell University	NY	124	18	15%	30	24%	62	50%	6	5%	Yes
58	New York University	NY	128	48	38%	12	9%	68	53%	0	0%	Yes
59	Saint Louis University	PA	120	18	15%	18	15%	84	70%	0	0%	Yes
60	Clemson University	SC	122	24	20%	47	39%	47	39%	4	3%	Yes
61	East Tennessee State University	TN	124	22	18%	55	44%	41	33%	6	5%	Yes
62	Middle Tennessee State University	TN	120	24	20%	24	20%	44	37%	6	5%	Yes
63	University of Houston-Clear Lake	TX	120	48	40%	24	20%	42	35%	6	5%	Yes
64	Brigham Young University	UT	123	42	34%	24	20%	39	32%	18	15%	Yes
65	University of Utah	UT	120	45	38%	30	25%	27	23%	18	15%	Yes
66	James Madison University	VA	120	39	33%	28	23%	41	34%	12	10%	Yes
67	Norfolk State University	VA	121	51	42%	21	17%	40	33%	9	7%	Yes
68	University of Vermont	VT	122	36	30%	24	20%	36	30%	26	21%	Yes
69	Washington State University	WA	120	42	35%	9	8%	0	0%	12	10%	Yes
70	Marquette University	WI	128	36	28%	34	27%	52	41%	6	5%	Yes

71	University of Wisconsin-Eau Claire	WI	120	60	50%	54	45%	8	7%	6	5%	Yes
72	University of Wisconsin-La Crosse	WI	120	28	23%	36	30%	56	47%	0	0%	Yes
73	ACM-AIS		54	NA	NA	21	39%	NA	NA	33	61%	NA

Table 2. Descriptive Statistics for Credit Hours (CH)

<i>Function</i>	<i>TCH</i>	<i>Function</i>	<i>BCR</i>	<i>Function</i>	<i>ISC</i>	<i>Function</i>	<i>GEC</i>	<i>Function</i>	<i>EC</i>
Mean	124	Mean	36	Mean	29	Mean	47	Mean	11
Median	123	Median	36	Median	27	Median	45	Median	9
Mode	120	Mode	36	Mode	21	Mode	42	Mode	0
Standard Deviation	4	Standard Deviation	13	Standard Deviation	13	Standard Deviation	15	Standard Deviation	10
Range	27	Range	62	Range	65	Range	84	Range	48
Minimum	115	Minimum	0	Minimum	9	Minimum	0	Minimum	0
Maximum	142	Maximum	62	Maximum	74	Maximum	84	Maximum	48

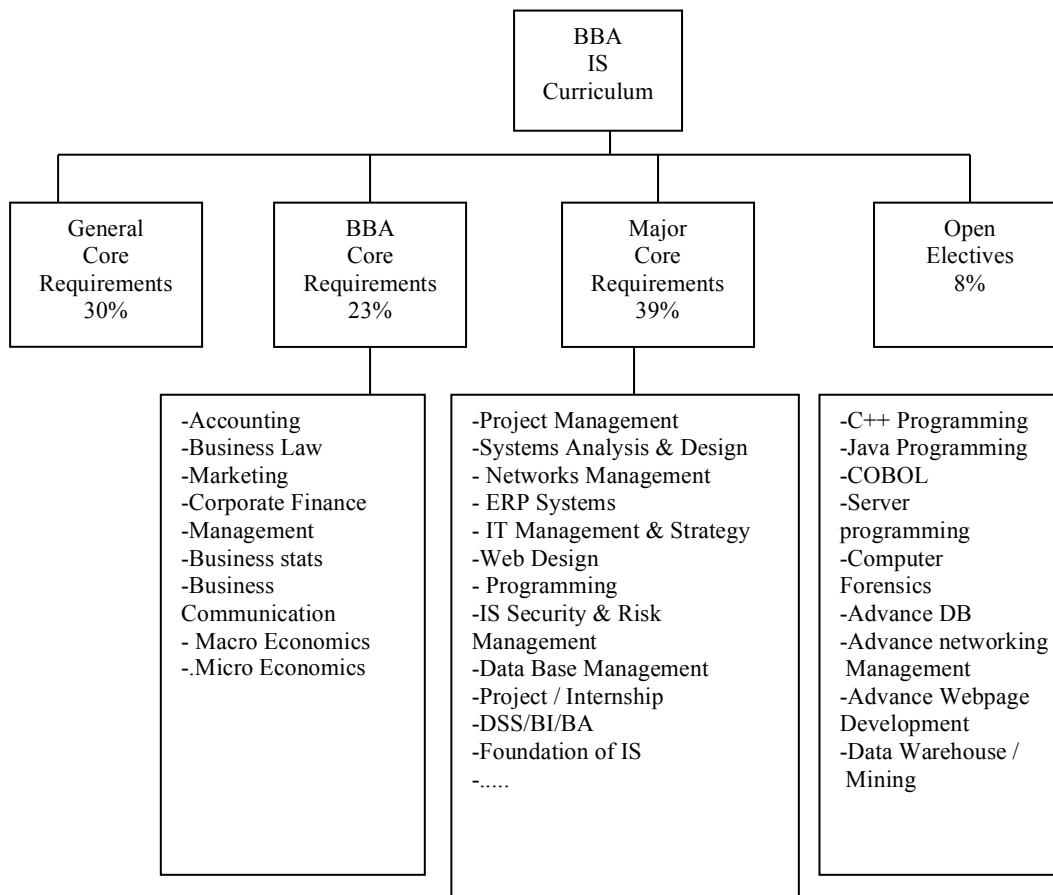


Figure 3. Proposed IS Curriculum