

PROGRAM NARRATIVE

New Degree Program Proposal

Bachelor of Science in Information Technology

Department of Electrical Engineering & Computer Science

School of Engineering – The University of Kansas

November 2011

Basic Degree Information

Proposing Institution: The University of Kansas

Title of Proposed Program: Information Technology

Title of Proposed Degree: Bachelor of Science in Information Technology (BSIT)

The degree program will be offered at the KU Edwards Campus

Anticipated Date of Initiation: Fall 2012

Responsible Department: Electrical Engineering & Computer Science

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Degree Proposal Narrative

Executive Summary

The information-intensive industries in Kansas, estimated at 3,200, and especially those in Johnson County and the Kansas City metropolitan area, are a major component of the state economy contributing some \$3.7 billion to the economy each year. These industries are becoming increasingly important as they offer the economy the greatest potentials for future growth and development. Studies show that the enhancement of educational and research infrastructure related to information technology (IT) is the key to achieving this growth. These studies further recommend IT educational opportunities to support the needs of the information-intensive service industries, and to strengthen ties between business communities and the educational institutions.

Through this proposal, the Department of Electrical Engineering and Computer Science (EECS) of the School of Engineering is proposing to expand its course offerings at the KU Edwards Campus (EC) to include a new undergraduate degree program in information technology entitled *Bachelor of Science in Information Technology* (BSIT).

The new degree program will uniquely combine undergraduate courses with content such as web systems and technologies, information assurance and security, computer networking, information management, information technology management, systems administration and maintenance, system integration and architecture, multimedia systems, human computer interaction, social, ethical, and legal aspects of information technology to offer timely education in modern and contemporary information technology (IT) – a kind of hybrid knowledge and expertise that is essential to produce highly effective IT graduates.

It is imperative that if such IT expertise is not grown locally (i.e., if our local industries are not provided with appropriately educated and skilled graduates), it will have to either be imported or related jobs outsourced.

By enhancing our undergraduate program, together with our existing graduate programs at the KUEC, we anticipate opportunities for applied research.

In the short-term, the educational opportunities offered by the new degree (and its related activities) will help the graduates gain advanced knowledge, hence improved productivity and enhanced competitiveness for local economies. In the long-term, the educational varieties and its related applied research opportunities will help the area industries in Johnson County (and by extension, the state of Kansas) to more effectively retain their existing IT infrastructures and encourage their expansion.

A. Program Need and Student Characteristics

(1) Centrality to the KU Mission Statement

The Department of Electrical Engineering and Computer Science (EECS), School of Engineering (SoE), proposes a new undergraduate degree in Information Technology. The program will be offered in its entirety at the KU Edwards Campus (KUEC). The new program is one of the new programs recommended in response to the Johnson County Education Research Triangle initiative.¹

The proposed degree program reflects the mission statement of KU and its commitment “to offering the highest quality undergraduate, professional, and graduate programs.”

Centrality to the KU Edwards Campus Mission. The proposed degree equally reflects the mission statement of the KU Edwards Campus to “serve the workforce, economic and community development needs of the region by bringing the high quality academic programs, research and public service of the University of Kansas to the greater Kansas City community.”

Centrality to the KU EECS Department Mission. The proposed program also supports the EECS department’s mission “to promote economic development for the state, and to engage in service to the public and the profession.”²

In addition, the proposed degree addresses one of the many initiatives described in former Chancellor Hemenway's *Initiative 2015*³, and in particular, "For KU to be true to its mission, it must communicate knowledge more widely and become more visible and useful to those who need that knowledge" and "In truth, KU consists of four campuses ... [and] must make greater use of these sites and affiliations, and those of our partners to increase statewide visibility."

The proposed degree is in essence a direct response to the opportunities and challenges presented by the ever expanding information technologies as they relates to economic growth of the State of Kansas and the Kansas City metro area, and in particular, the Johnson County region.

(2) Student Demand for the BSIT Program

In 1998 the EECS department developed a graduate program to be offered at the Edwards Campus (EC) leading to the Master's of Science degree in electrical engineering. The primary objectives of the EECS program at EC was to enhance the presence of KU in the Kansas City metropolitan area. The program evolved during the 2000s, first by offering common computer science and software engineering courses and later in 2006 a new graduate program in information technology, entitled Master's of Science in Information Technology (MSIT). The EECS department currently has 40+ students in its MSIT program.

Research however has shown that existing demands cannot be met by graduate programs alone and a comprehensive and highly focused undergraduate degree program in IT will have to be developed from the ground to address longer term needs.

The proposed program is aimed at the high-tech industries in Northeastern Kansas and in particular in Johnson County, and will provide a hybrid curriculum that covers the most relevant computing and IT software concepts – the kind of knowledge and expertise that can be applied immediately. A number of surveys (some listed below) indicate great long-term outlook for such competencies. These studies are consistent with the national trend.

Pursuing Graduate Studies in Information Technologies. The EECS department has been offering a Master's degree in Information Technology (MSIT) since 2006. The program already has 45+ students. Yet another motivation for prospective students to join the BSIT program is the presence of a graduate program in the same area at the same campus should they decide to further their studies once they complete the BSIT program.

(3) Demand for the Graduates of the BSIT Program

The *Triangle Research Executive Summary* by DeSieghardt in particular states that "Topping the list among the tracked employers were careers requiring a Business or Finance degree (347 jobs per week), followed by Software or IT system design (334), or other Information Technology positions (307) ..."

The Kansas Department of Labor reveals more staggering numbers.⁴ According to the Kansas DOL, five IT related careers are among the top10 fastest growing occupations. Computer system administration, software technologies, computer networking, data communication, and similar occupations are among the top ten fastest growing occupations in Kansas. See Figure 2.⁵ In yet another report⁶, the Kansas DOL lists three of the IT-related occupations as the top five fastest growing ones (illustrated in Figure 2).

The above are further verified by a survey conducted by Zoomerang and sponsored by the Software and Information Technology Association of Kansas (SITAKS).⁷ According to the survey, 64% of respondents stated that there is a shortage of IT professionals in Kansas; of these 71% of respondents stated that they were located in Eastern Kansas. The regional focus is further emphasized by the Kansas DOL report, where it shows major growth in Northeast Kansas and in particular the Kansas City area. See Figure 3.⁸

SITAKS further highlights the 2009 national *Cyberstate Report*, showing that the Kansas IT sector is growing and that Kansas' high-tech industry increased in nearly every category over the previous year.

A report, by the US Bureau of Labor Statistics⁹, shows that the

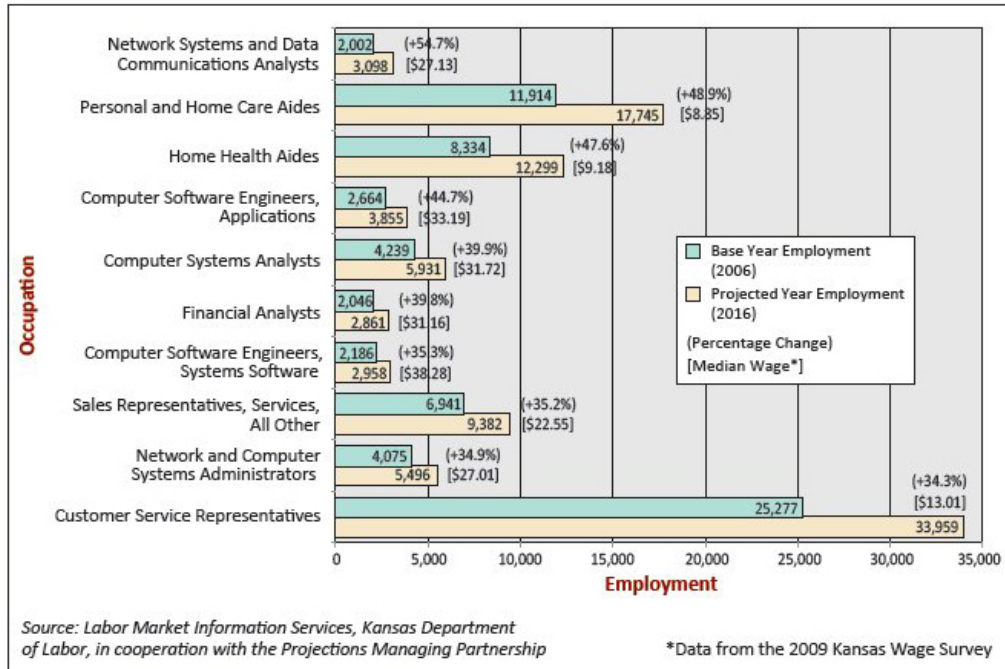


Figure 1: Top-10 Fastest Growing Jobs

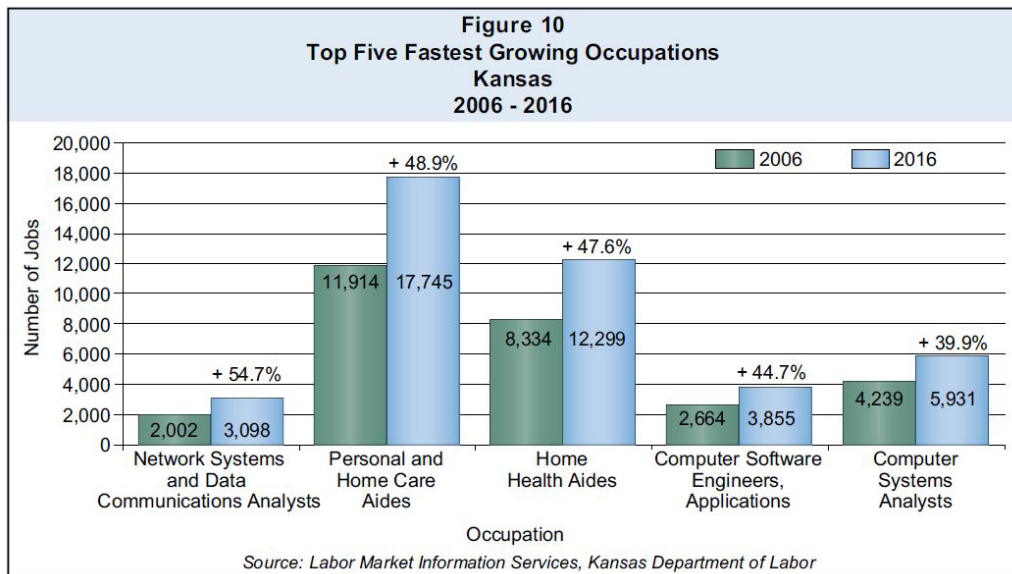


Figure 2: Top-5 Fastest Growing Occupations

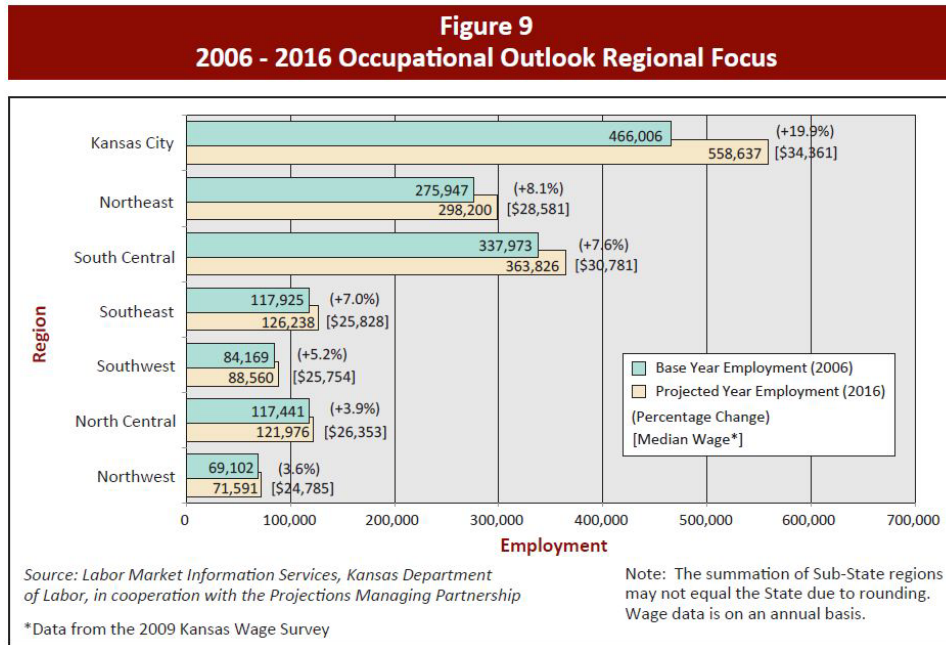


Figure 3: 2006-2016 Occupational Outlook Regional Focus

average annual job openings in areas addressed by the proposed degree to be among the largest (by a wide margin) compared to other engineering disciplines. In yet another report from the U.S. Department of Commerce, projected employment numbers (as well as job openings and growth rate) for the IT professions look significantly stronger than other disciplines (in engineering, life sciences, or physical sciences). Specifically, the Department of Commerce projects a 35% growth rate in IT, and expects that in 2012 there will be over 140,000 new available positions in IT with only 40,000 B.S. and M.S. new graduates.

Regardless of the state of the economy in information technology, all companies that provide engineering and technology services require the ability to provide their employees and customers with efficient, stable, and secure networking services. Based on the most recent U.S. Census economic survey of the greater Kansas City area, there are approximately 10,000 professionals working in the software and the computer systems design industries, while there are an additional 40,000 professionals working in the areas of networking, telecommunications, and engineering services industries.

The Vice Chancellor Task Force Study. A few years ago, a task force appointed by the Vice Chancellor of the Edwards Campus used an outside marketing research firm, Fresh Perspectives, to analyze new program needs. As part of their analysis Fresh Perspectives evaluated the demand for an information technology degree. They interviewed companies such as Black & Veatch (*engineering*), Cerner (*health care systems*), Cisco (*network equipment*), H&R Block (*tax preparation, financial services*), and Trabon Solutions (*web design, development*). Their conclusions were that an IT degree was of value to the Kansas City companies. Specifically the report by Fresh Perspectives stated that:

“Significant technology changes and an uncertain business climate have continued to impact employers in the technology arena. Some consolidation has occurred. Some areas such as information security have been less impacted. Continued growth is expected in important yet immature technologies such as Internet security and for those employees who are capable project managers and business analysts in addition to having strong technical skills... Given the expectations for continued job growth, particularly in some key areas such as Information Security, we recommend continued development of this program with specific focus on the key areas of growth... These individuals [company officials interviewed] consider this masters’ program to be of value to their companies and their employees. Having a substantive program locally is perceived as a great resource base. They also believe that employees who have not previously completed a masters’ degree would be interested in this program.”

The report by Fresh Perspectives provides further support for the expected demand by Kansas City industry and professionals for the proposed degree.

The nation’s cyber-infrastructure, i.e., the intersection of the physical network with the services it provides, has been identified by federal funding agencies as a major priority for research in the immediate future (for example, the National Science Foundation has invested millions of dollars in cyber-infrastructure research). The research in cyber-infrastructure will focus on issues of information security, Internet services, and information retrieval, the kind of expertise and skills offered by the proposed degree.

The JCCC Feeds. Yet another source of prospective students for the proposed program is the feed from the JCCC. Last year, the JCCC graduated 22 students with an Associate degree in IT¹⁰. That is the third highest Associate (AAS) graduate rate behind graphics design (40) and dental hygiene (26) and matches the number of business administration graduates (22) that represent the primary student source for the undergraduate business program at the KUEC.

(4) Location and its Competitive Advantages

The proposed BSIT program will be offered in its entirety at the KUEC by the EECS department. It will be a collaborative 2+2 program with the JCCC and will provide high quality education to the increasing number of IT professionals at the high-tech industries in the Kansas City metropolitan area and particularly to the IT professionals in Johnson County. The proposed program is unique to the Edwards Campus, KU, and the Regents. No other Kansas Regents university offers a similar program. An Internet search showed that a number of such programs have recently been created throughout the U.S. and are becoming very popular. By locating the program at the Edwards Campus, we will be able to better address the KU's mission statement in serving the workforce and economic and community development needs, especially in Johnson County and Kansas City metropolitan area.

The Location and Contextual Impact. The availability of an AAS degree from the JCCC, the option of completing a KU undergraduate degree at the KUEC and the option of graduate studies at the same location will provide extra incentives for many individuals who, because of daily employment, are unable to attend Lawrence programs. The BSIT program will provide an opportunity for individuals who would like to pursue a program in computing that is more relevant to their daily employment and social interactions. Many in the IT industries have realized that an undergraduate degree in traditional computing degrees are no longer sufficient, and that the new graduates should possess skills needed to serve as security and forensic specialists, Web application development, network administrators, have a reasonably comprehensive knowledge of IT standards and best practices, know about modern platform technologies and have an ability to effectively integrate best solutions, and be knowledgeable about the social, professional, and ethical issues of information technologies. The characteristics of the BSIT program also

have the potentials to attract individuals with more diverse background. Furthermore, as outlined below, we plan to utilize the existing efforts at the KUEC to recruit and retain females and other underrepresented students.

(5) Expected Student Characteristics

The program is aimed at both practitioners seeking to enhance and upgrade their technical knowledge, and at recent community college students who have chosen to work during day time and would like to seek higher education during evenings. The educational opportunities offered by the new degree will help such practitioners gain advanced knowledge, hence improved productivity and enhanced competitiveness.

Expected students of the program will be primarily from the Johnson County community, however, but with the presence and ever expanding IT-based industries in the Kansas City metro area, e.g., Garmin, Honeywell, Sprint, Cerner, Hallmark, we anticipate students from other Kansas counties to consider the program.

Internet engineering, web services and technologies, information assurance and security, information technology management, computer networking, and similar technologies are rising in prominence within corporations not only in Kansas City but also elsewhere as more business functions are implemented in software and offered through the Internet. Such challenges put a premium on being able to understand what has to be achieved from a business and technology perspective.

During the 1980's and even 1990's, ad hoc, informal approaches would suffice. But in today's economy and technology, the scale and the criticality of such challenges demands that the graduates understand the state of the art and practices in information technologies.

Furthermore, the new generation of prospective students are that of the "Net" generation. The Net generation characterizes the students who may have never known life without the Internet. Their early and ubiquitous exposure to technology has defined their styles, their modes of communication, and their learning preferences and expectations. Additionally, the realities of the computing industry for which the Net generation need to prepare have shifted from the foundational beliefs and practices of traditional computer programming and electrical and computer engineering disciplines.

The proposed degree is designed for and will be responsive to the needs of such industries.

Attracting Underrepresented Groups. The KUEC has a defined diversity plan¹¹ that guides the campus efforts toward gaining and retaining a more diverse student population. We plan to utilize this plan and its mechanisms to attract underrepresented student groups. The plan has four defined objectives as follows: (1) Build awareness of the welcoming and supportive environment the KUEC offers to diverse populations (e.g., better showcase KUEC within the metro by working with PR/marketing departments to use at targeted events, review targeted campus events and determine the best ways to infuse the desired multicultural messages directly, creation of a video of the campus to use in social media and online, and so forth), (2) Recruit a diverse student population that aligns with the definitions and goals of KU (e.g., conducting focus group research with current KUEC students of color, establish scholarship in partnership with KU Endowment targeting such students, personalize contact via phone, etc.), (3) Develop a consistent tracking system for retention that accurately reflects student population (e.g., thru partnership with Office of Multicultural Affairs), and (4) Enhance current retention activities to influence barriers to retention (e.g., by utilizing monthly must read student newsletter to increase awareness of retention, writing student spotlights, include student advisory board in diversity issues, and incorporating retention issues into an orientation and enrollment program).

B. The BSIT Curriculum

What is Information Technology and How Does it Differ from Computer Science?

Prior to the 1990s, the most common undergraduate degree programs in computing-related disciplines were electrical and computer engineering, computer science and information systems. Each of these areas was easily recognized by its intended audiences: students interested in hardware would choose electrical and computer engineering. Those interested in the theoretical aspects of computing would select computer science. And finally, students interested in solving business problems using computers and software technology would choose information systems (IS).

Significant developments took place in the 1990s: dramatic expansion and application of desktop and laptop computers and software technologies changed the computing landscape, multimedia systems evolved significantly, the WWW emerged, E-commerce was introduced, and the Internet became a household name. During and after the 1990s a number of new academic degrees also emerged, the most notable of which was software engineering. In 2000s, yet another degree program, known as *Information Technology*, was introduced. The focus and the core knowledge base of an IT degree program is, admittedly, as not well-known as those of computer science, computer engineering, or even software engineering. We try to clarify. To do so, we rely primarily on the IT curriculum guideline known as the *Information Technology 2008: Curriculum Guidelines for Degree Program in Information Technology*, produced jointly by the ACM¹² and the IEEE-CS¹³ Joint Task Force. We will refer to this document as *CC-IT'08*. The ACM and IEEE-CS represent the world's largest educational and scientific computing professional societies and deliver resources that advance computing as a science and a profession.

While in the broadest sense, the term IT refers to all of the computing discipline, *CC-IT'08* defines it as “undergraduate degree programs that prepare students to meet the computer technology needs of business, government, health-care, schools, and other kinds of organizations.” While the traditional information system programs focus on the information aspects of computing technology, an IT degree program complements that perspective by emphasizing the technology itself. Degree programs in IT were introduced because the existing IS and computer science programs were not preparing an adequate supply of graduates handling the above need.

One of the common questions that frequently arises is why offering a new program when an existing computer science program exists, or in what ways will an IT program differ from a CS program. To more specifically define an IT degree program, and more importantly, to show its differences from other computing disciplines, and in particular computer science, we will employ the following:¹⁴

- Illustration through the “computing space,”
- Required body of knowledge,
- Expected program outcomes, and
- Characteristics of IT graduates

Illustration Through the Computing Space: IT vs CS

Consider the graphical depiction from the *CC-IT'08* (Figure 4), showing the “computing space” in which each computing discipline, e.g., computer science, information technology, computer engineering, etc., occupies a part. The horizontal dimension runs from theory and principles (on the left) to application and deployment (on the right). The vertical dimension covers hardware (on the bottom) to organizational and people issues on the top. If the horizontal and vertical dimensions are to be considered together, we will be able to briefly illustrate what space each computing discipline covers and by doing so we’ll illustrate how an IT

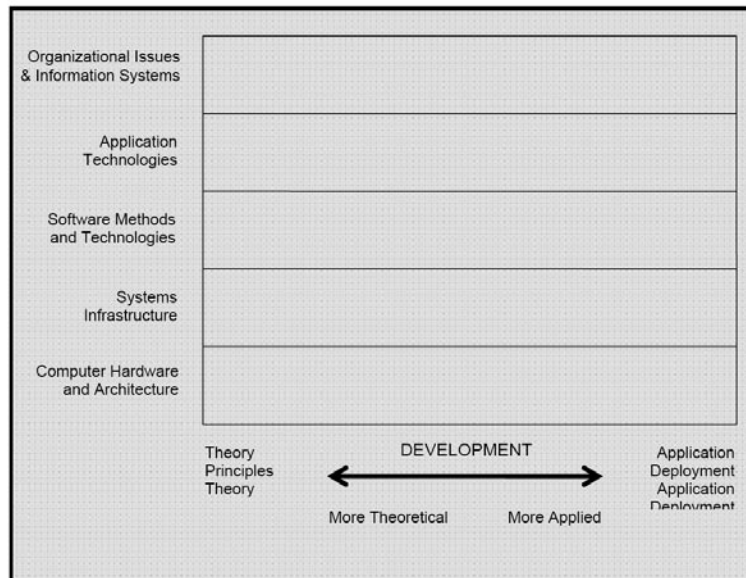


Figure 4: Dimensions of Computing (CC-IT'08)

program relates to and is different from other such degree programs, in particular, a computer science (CS) program.

Computer Science (CS) covers most of the area between the extreme top and extreme bottom and is interested in the design and implementation of capabilities such as operating systems, compilers, databases, search engines, and such. See Figure 5. The deployment and management of such system is not part of the responsibilities of the computer scientist's.

Information Technology (IT), on the other hand, covers most of the right edge as it focuses on the application, development, and configuration needs of an organization and people over a wide spectrum. Although the IT role may initially show some overlap with those of IS, the IT personnel have a special focus on addressing human needs that arise from computing technology. See Figure 6.

Next, we present the required body of knowledge for an IT program vs one for a CS program.

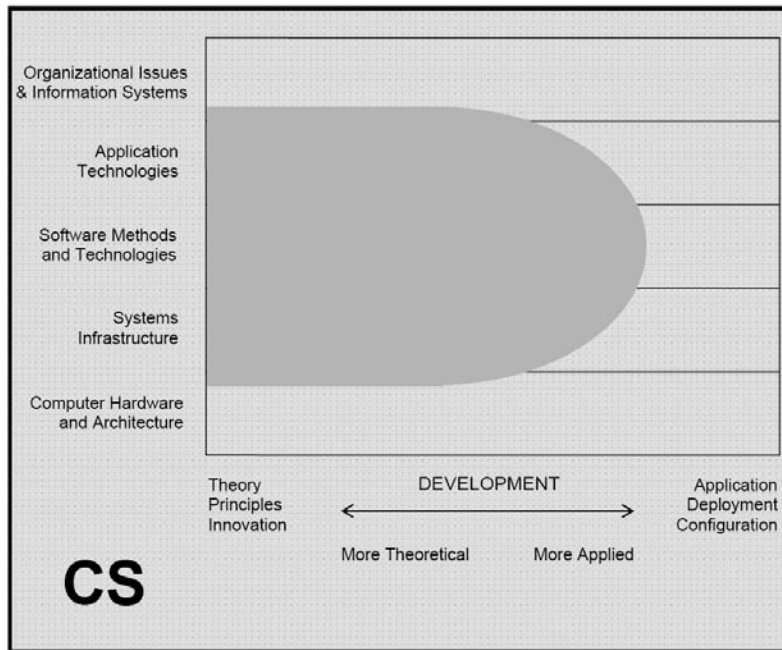


Figure 5: Dimensions of Computing - Computer Science (CC-IT'08)

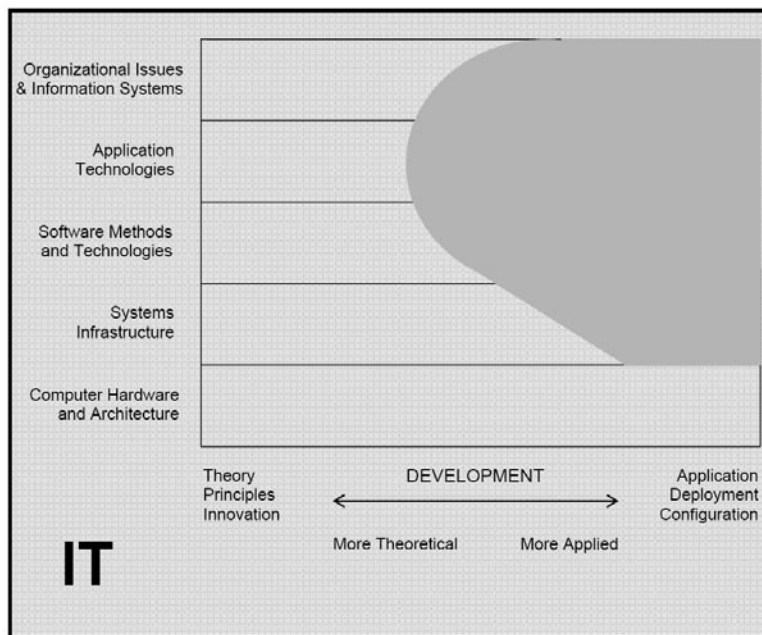


Figure 6: Dimensions of Computing - Information Technology (CC-IT'08)

IT Body of Knowledge	
IT Fundamentals	Programming Fundamentals
Human-Computer Interaction	Platform Technologies
Information Security and Assurance	Information Management
Integrative (Scripting) Programming	Computer Networking
Web Systems and Technologies	System Admin & Maintenance
Social and Professional Issues	System Integration & Arch

Table 1: The IT Body of Knowledge as Defined by the ACM/IEEE-CS

CS Body of Knowledge	
Discrete Structures	Programming Fundamentals
Programming Languages	Computational Science
Graphics and Visual Computing	Algorithms and Complexity
Intelligent Systems	Architecture and Organization
Information Management	Operating Systems
Social and Professional Issues	Net-Centric Computing
Human-Computer Interaction	Software Engineering

Table 2: The CS Body of Knowledge as Defined by the ACM/IEEE-CS

Body of Knowledge: IT vs CS

The required body of knowledge for an IT degree is different from that of a CS program. The ACM/IEEE-CS curriculum guidelines for IT defines the body of knowledge as shown in Table 1. On the other hand, the ACM/IEEE-CS curriculum guidelines for CS¹⁵ defines the body of knowledge shown in Table 2.

While there are some similarities, the bulk of the body of knowledge in the two disciplines differ substantially.

Expected Program Outcomes: IT vs CS

The *CC-IT'08* and the corresponding ACM/IEEE-CS guidelines for CS separately characterize the expected outcomes of the respective degree programs. The ABET¹⁶ consolidates these characteristics into a set of common ones for various computing disciplines and those that are specific to each one. The common characteristics, highlighting the expected abilities of the students, are as follows:

- (a) An ability to apply knowledge of computing and mathematics appropriate to the discipline
- (b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
- (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- (d) An ability to function effectively on teams to accomplish a common goal
- (e) An understanding of professional, ethical, legal, security and social issues and responsibilities
- (f) An ability to communicate effectively with a range of audiences
- (g) An ability to analyze the local and global impact of computing on individuals, organizations, and society
- (h) Recognition of the need for and an ability to engage in continuing professional development
- (i) An ability to use current techniques, skills, and tools necessary for computing practice.

IT Specific Outcomes. Specific outcomes expected of the IT students is as follows:

- (j) An ability to use and apply current technical concepts and practices in the core information technologies
- (k) An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.
- (l) An ability to effectively integrate IT-based solutions into the user environment.
- (m) An understanding of best practices and standards and their application.
- (n) An ability to assist in the creation of an effective project plan.

CS Specific Outcomes. Specific outcomes expected of the CS students are however different:

- (j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices.

(k) An ability to apply design and development principles in the construction of software systems of varying complexity.

To summarize the above, we conclude that information technology graduates will be prepared to work effectively at planning, implementation, configuration, integration, and maintenance of an organization's computing infrastructure. They will advocate for the users, meet their needs within an organizational context through the selection, creation, application, integration, and administration of computing technologies.

Computer scientists, on the other hand, will be prepared to work in a broad range of positions involving tasks from theoretical work to software development (OS, compiler, and application development) and will design and implement software (via abstraction, knowledge of algorithms), and devise new ways to solve computationally intensive problems.

Accreditation: IT vs CS

The *CC-IT'08* recognizes IT as a formal discipline that is distinct from computer science. The IT programs are however accredited by the same ABET committee, that is, the ABET Computing Accreditation Commission (CAC). Even though the IT programs are relatively new, at least 16 of them have already been accredited by the ABET. See <http://abet.org>.

Admission and Completion Criteria

Admission to the BSIT Program. Since the proposed program is a 2+2 collaborative program with the JCCC, the incoming students are viewed as transfer students. The School of Engineering (SoE) criteria for transfer students (from the JCCC) is as follows:

- GPA of 3.0+
- Credit is granted only for the courses on the transfer list (below we will identify a set of courses that students may take at the JCCC; these courses were already on the transfer list defined by the SoE)

The BSIT Curriculum The *CC-IT'08* explicitly defines 12 body of knowledge for a BSIT program and explicitly defines how many hours of classroom coverage should be devoted to each body of knowledge. These knowledge areas need not necessarily be mapped one-to-one into a particular course; each knowledge area may be covered in one course, in multiple courses, or multiple knowledge areas may be covered in one particular course.¹⁷

The IT body knowledge defined by *CC-IT'08* and the required minimum classroom coverage is as follows:

- Information Technology Fundamentals (25 hours)
- Human Computer Interaction (20 hours)
- Information Assurance and Security (23 hours)
- Information Management (34 hours)
- Integrative Programming and Technologies (23 hours)
- Networking (22 hours)
- Programming Fundamentals (38 hours)
- Platform Technologies (14 hours)
- Systems Administration and Maintenance (11 hours)
- System Integration and Architecture (21 hours)
- Social and Professional Issues (23 hours)
- Web Systems and Technologies (22 hours)

Using the above guidelines, the ABET¹⁸ requirements, and a careful study of the BSIT programs in over 12 accredited institutions in the US, we have defined a 4-year program model that includes the necessary EECS and KU and School of Engineering requirements, complies with the ABET requirements, and includes the body of knowledge characterized by the *CC-IT'08*. The proposed program will have 121-124 credit hours.

Degree Completion Requirements. The general education requirements will be as follows:

- English9 hours
- Natural Sciences10 hours
- Mathematics12 hours
- Humanities and Social Sciences15 hours
- Oral Communications/Public Speaking3 hours
- Business and Management9 hours
- IT(excluding electives)55 hours
- Electives8-14 hours
- Total 121-124 hours

The specifics of the above are as follows:

English: 9 hours:

- English Composition I: 3 hours (JCCC ENGL121)
- English Composition II: 3 hours (JCCC ENGL122)
- Technical Writing, 3 hours (KU ENGL362)

Natural Sciences: 10 hours

- Physics/Lab: 5 hours (JCCC PHYS130)
- Chemistry/Lab: 5 hours (JCCC CHEM124 and CHEM125) or
- Alternate: Prin. of Cell/Molecular Biology: 4 hours (JCCC BIOL135)

- **Mathematics (12 hours):**
- College Algebra: 3 hours (JCCC MATH171)
- Discrete Mathematics I: 3 hours (JCCC CS210)
- Discrete Mathematics II: 3 hours (JCCC CS211)
- Statistics: 3 hours (KU MATH365)

- **Humanities and Social Sciences: 15 hours**
- Psychology: 3 hours (JCCC PSYC130)
- Economics: 3 hours (JCCC ECON132)
- Social Science: 3 hours (student/adviser choice)
- Humanities: 6 hours (student/adviser choice)

- **Oral Communications/Public Speaking: 3 hours**
 - Public Speaking: 3 hours (JCCC SPD121)

- **Business and Management: 9 hours**
- Accounting: 3 hours (JCCC ACCT121)
- Management Science: 3 hours (KU MGMT305)
- Project Management: 3 hours (KU SA&D402)

- **IT courses: 55 hours** . The following courses will cover the ACM/IEEE-CS IT knowledge units topics (and more topics). The prefix "IT" will be used for new KU EECS courses in the proposed program:
 - Programming Fundamentals: 4 hours (JCCC CIS134)
 - Programming Algorithms: 4 hours C++ (JCCC CS200)
 - Data Structures C++: 4 hours (JCCC CS250)
 - Unix Scripting and Utilities: 3 hours (JCCC CIS204)
 - Database Systems: 4 hours (KU ITxxx)
 - Computing Organization: 3 hours (KU ITxxx)
 - Comp & Information Security: 3 hours (KU ITxxx)
 - Web Systems and Technologies: 3 hours (KU ITxxx)
 - Systems Architecture and Integration: 3 hours (KU ITxxx)
 - System Administration: 3 hours (KU ITxxx)
 - IT Security Mgmt: 3 hours (KU ITxxx)
 - Computer Networks: 3 hours (KU ITxxx)
 - Social and Professional Issues: 3 hours (KU ITxxx)

- Operating Systems: 3 hours (KU ITxxx)
- Software Engineering: 3 hours (KU ITxxx)
- Multimedia and HCI: 3 hours (KU ITxxx)
- IT Capstone: 6 hours (KU ITxxx, two semesters)

JCCC Transfer List. The following is an explicit list of the JCCC courses that students can take and transfer:

- College Algebra (JCCC MATH171)
- Discrete Mathematics I (JCCC CS210)
- Discrete Mathematics II (JCCC CS211)
- Physics/Lab (JCCC PHYS130)
- Chemistry/Lab (JCCC CHEM124 and CHEM125) or Alternate:
Principles of Cell/Molecular Biology (JCCC BIOL135)
- Philosophy (JCCC PHIL143)
- Psychology (JCCC PSYC130)
- Economics (JCCC ECON132)
- Social Science: 3 hours (student/adviser choice)
- Public Speaking (JCCC SPD121)
- English Composition I (JCCC ENGL121)
- English Composition II (JCCC ENGL122)
- Accounting (ACCT121)
- Programming Fundamentals (JCCC CIS134)
- Programming Algorithms (JCCC CS200)
- Data Structures (JCCC CS250)
- Unix Scripting and Utilities (JCCC CIS204)
- Database Systems (JCCC CIS260)

A 4-Year Program Table 3 displays a four-year program illustrating the sequence of courses a student may take to complete the BSIT undergraduate program:

Mapping the IT Knowledge Units into the Proposed BSIT Courses

In this section, we show where the IT knowledge units, as described in the *CC-IT'08*, are covered by the new courses in the proposed BSIT program. To do this, we will use the acronym used in the guidelines as shown in Table 4 to refer to the corresponding knowledge sub-unit.

JCCC CIS 134: Programming Fundamentals will cover

- ITF. History of Information Technology
- IPT. Overview of Programming Languages
- Other common topics (abstraction, numbering systems, modular programming, other introductory programming concepts)

JCCC CS200 and CS250: Algorithms/Data Structures will cover

- PF. Fundamental Programming Constructs
- PF. Object-Oriented Programming
- PF. Fundamentals Data Structures
- PF. Algorithms and Problem-Solving
- PF. Event-Driven Programming
- Other topics
- MS. Basic Logic

	Fall	Spring
Year 1 JCCC	3 ENGL121 (Composition I) 3 MATH171 (College Algebra) 4 CIS134 (Prog Fund) 3 ACCT121 (Accounting I) 3 SPD121 (Public Speaking) 16 Hours	3 ENGL122 (Composition II) 3 CS210 (Discrete Structure I) 4 CS200 (Prog Algorithms) 3 PHIL143 (Ethics) 3 PSYC130 (Psychology) 16 Hours
Year 2 JCCC	4 CS250 (Data Structures) 3 CS211 (Discrete Structures II) 4-5 CHEM124&125 or BIL135 3 ECON132 (Survey of Econ) 14-15 Hours	4 CIS 260 (Database Mgmt) 3 CIS204 (Unix Scripting) 5 PHYS139 (Physics) 3 <i>Humanities Elective</i> 15 Hours
Year 3 KU	3 MATH365 (Statistics) 3 MGMT305 (Survey of Mgmt) 3 ITxxx (Computer Org) 3 ITxxx (Computer and Info Sec) 3 ENGL362 (Technical Writing) 15 Hours	3 SA&D402 (Sys Proj Mgmt) 3 ITxxx (Sys Admin) 3 ITxxx (Web System & Tech.) 3 ITxxx Info Sec Mgmt) 3 <i>Social Science Elective</i> 15 Hours
Year 4 KU	3 ITxxx (Comp Networks) 3 ITxxx (Operating Systems) 3 ITxxx (Social Prof Issues) 3 ITxxx IT Capstone 3 ITxxx Senior Elective 15 Hours	3 ITxxx (HCI and Multimedia) 3 ITxxx (SW Engineering) 3 ITxxx (Sys Arch Integration) 3 ITxxx IT Capstone 3 ITxxx Senior Elective 15 Hours

ACM/IEEE-CS Knowledge Units Acronyms	
ITF: IT Fundamentals HCI: Human Computer Interactions IAS: Information Assurance and Security IM: Information Management IPT: Integrative and Technologies WS: Web Systems and Technologies NET: Networking	MS: Math and Statistics for IT PF: Programming Fundamentals PT: Platform Technologies SA: <u>Syst</u> Administration and Maintenance SIA: System Integration and Architecture SP: Social and Professional Issues

Table 3: A 4-Year Plan for the BSIT Program

Table 4: Knowledge Units Abbreviations

JCCC CS210/CS211 Discrete Mathematics and KU MATH365 courses will cover

- MS. Discrete Probability
- MS. Functions, Relations, and Sets
- MS. Hypothesis Testing
- MS. Sampling and Descriptive Statistics
- MS. Graphs and Trees
- MS. Application of Math and Statistics to IT
- Other topics

JCCC CIS204: Unix Scripting and Utilities will cover

- IPT Scripting Techniques
- Other topics (Unix history, file and directory structure, commands, scripting for automation, memory and disk management, device management, manage and schedule processes, and other common Unix topics)

JCCC CIS260: Database Systems will cover

- IM. Info Management Concepts & Fundamentals
- IM. Data Organization Architecture
- IM. Data Modeling
- IM. Database Query Languages
- IM. Managing the Database Environment
- IM. Special-Purpose Databases
- IPT. Data Mapping and Exchange
- Other common topics

ITxxx Computer Organization will cover

- PT. Architecture and Organization
- PT. Computing Infrastructure
- PT. Firmware
- PT. Hardware
- PT. Operating Systems
- IPT. Intersystems Communications
- PT. Enterprise Deployment Software
- Other common topics (platform technologies)

ITxxx Computer & Information Security will cover

- IAS. Fundamental Aspects

- IAS. Security Mechanisms/Countermeasures
- IAS. Operational Issues
- IAS. Policy
- IAS. Attacks
- IAS. Threat Analysis Model
- IAS. Vulnerabilities
- IAS. Security Domains
- IAS. Forensics
- IAS. Information States
- IAS. Security Services
- NET. Security
- IPT. Software Security Practices

ITxxx Web Systems & Technologies will cover

- WS. Web Systems and Technologies
- WS. Information Architecture
- WS. Digital Media
- WS. Web Development
- WS. Vulnerabilities
- WS. Social Software
- Other topics (XHTML, flash and CGI programming, CSS, and other emerging technologies)

ITxxx Information Security Management will cover

- Policy Development
- Personnel and Security
- Developing a Security Program
- Security Awareness
- Asset Classification
- Accountability, Monitoring and Reporting
- Risk Management
- Planning for Contingencies
- Auditing and Audit logs

ITxxx System Architecture and Integration will cover

- SIA. Requirements
- SIA. Acquisition and Sourcing
- SIA. Architecture
- SIA. Integration and Development
- IPT. Integrative Coding
- IPT. Scripting Coding
- IPT. Miscellaneous Issues
- Other topics (architectural mismatch, architectural patterns, architectural connections, deployment)

SA&D Project Management (SA&D402) will cover

- SIA. Project Management
- SIA. Organizational Context
- SP. Teamwork Concepts and Issues
- SP. Professional Communications
- NOTE: some sub-topics of the above, e.g., oral presentations, technical writing will be covered in the corresponding courses on public speaking and technical writing

- Other topics (the Project Management Body of Knowledge, PM-BOK, phases of the project life cycle, tools and techniques for planning such as PERT and CPM, team work and communication, common project management topics)

ITxxx IT Social and Professional Issues will cover

- ITF. Pervasive Themes in IT
- SP. Social Context of Computing
- SP. Intellectual Property
- SP. Legal Issues in Computing
- SP. Professional and Ethical Issues and Responsibilities
- SP. History of Computing
- SP. Privacy and Civil Liberties

ITxxx System Administration will cover

- SA. Administrative Activities
- SA. Administrative Domains
- SA. Applications (maintenance, patches, service packs)

ITxxx Computer Networks will cover

- NET. Foundation of Networking
- NET. Routing and Switching
- NET. Physical Layer
- NET. Network Management
- NET. Application Areas
- Other topics (TCP/IP DLL, NL, transport layer and other common undergraduate networking topics)

ITxxx Operating Systems will cover

- SA. Operating Systems
- Other common OS topics (process management, scheduling, memory management, virtual memory, mass storage management, I/O systems, other common OS topics)

ITxxx HCI and Multimedia will cover

- HCI. Human Factors
- HCI. HCI Aspect of the Application Domain
- HCI. Human-Centered Evaluation
- HCI. Developing Effective Interfaces
- HCI. Accessibility
- HCI. Emerging Technologies
- HCI. Human-Centered Computing
- Multimedia topics

ITxxx Software Engineering will cover – ITF. Application Domains

- IPT. Software Security Practices
- IPT Miscellaneous Issues (e.g., version control management)
- SIA. Testing and Quality Assurance
- Other topics (software development models and common life cycle and maintenance activities)

ITxxx IT Capstone

- Six credit hours; two consecutive semesters
- The capstone course will provide an opportunity for the BSIT students to demonstrate that they have achieved the program goals through practical work with local businesses
- The capstone course will foster interdisciplinary partnership and will promote local business cooperation

In the following section we list the minimal resources needed to launch the program. The source of funding for the resources will be the Johnson County sales tax as part of the Johnson County Education and Research Triangle.¹⁹ No financial or other academic support is expected from the EECS resources in Lawrence.

C. Program Faculty

(1) Faculty Needs and Quality

The BSIT curriculum will be delivered using a combination of tenure and non-tenure track faculty. Five new faculty lines or equivalent are requested. These positions will be added incrementally as the program expands.

Hossein Saiedian (Full Professor, Ph.D., Kansas State, 1989), the primary point of contact for the program, will deliver lectures as well as providing advising and administrative support.

The new BSIT faculty will be primarily professors of practice and contracted lectures who have advanced degrees (Ph.D. or minimally an MS degree in a computing field but with substantial practical IT experience). As illustrated earlier, we expect to offer 22-25 courses each year. The new faculty will be teaching 5 courses each year while being fully engaged in advising. We thus anticipate five new faculty members for the proposed BSIT program.

The positions will be non-tenure track, with three-year renewable contracts. Open positions will be advertised nationally; many reputable institutions have advertised similar open positions.

(2) Graduate Assistants

No need for graduate (teaching) assistants is anticipated.

(D.) Academic Support

(1) Academic Support Services

The general advising services, library, student success (career) services, the writing center, audio-visual, and academic computing resources needed to support the program will be provided by the existing Edwards Campus resources.

However, we anticipate one new full-time office staff for application processing, to interface with the EECS and SoE in Lawrence, and to provide other administrative support (e.g., career services, advising, and recruiting).

(2) Library Resources

The existing library infrastructure at the KUEC will be sufficient and no new resources will be needed.

(3) IT/Facilities Support

We also anticipate an IT, equipment, and facilities staff to support BSIT-specific needs. According to VC Clark, this position will be provided through the existing KUEC budget and infrastructure.

E. Facilities and Equipment

(1) Anticipated Facilities

Necessary faculty offices and computing lab are planned for and will be provided in the Regnier Hall and the new BEST building at the KUEC.

(2) Lab Resources/Equipments

A new lab devoted to the BSIT program is already planned at the new BEST building and it will be equipped with workstations and the primarily networking connections. We anticipate additional networking equipment for instructional purposes (e.g., routers). Our initial proposal calls for one such item per two seats. The estimated cost of these plus the cost of specialized software (e.g., Adobe CS5 and similar application software) is \$41,000.00.

Program Review, Assessment, and Accreditation

(1) Program Review Process

The proposed program will be regularly reviewed and evaluated by the departmental undergraduate committee and by the department Advisory Board. Furthermore, the proposed program is expected to be accredited by ABET and will be reviewed for accreditation after its fourth year. The ABET has specific guidelines for evaluating the undergraduate IT programs.

(2) Evaluating Student Learning Outcome

The following common ABET criteria, used by the EECS department for its other undergraduate programs, along with the specific ABET criteria for IT graduates, will be used for evaluating the BSIT students expected abilities upon graduation:

- (a)** An ability to apply knowledge of computing and mathematics appropriate to the discipline
- (b)** An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
- (c)** An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- (d)** An ability to function effectively on teams to accomplish a common goal
- (e)** An understanding of professional, ethical, legal, security and social issues and responsibilities
- (f)** An ability to communicate effectively with a range of audiences
- (g)** An ability to analyze the local and global impact of computing on individuals, organizations, and society
- (h)** Recognition of the need for and an ability to engage in continuing professional development
- (i)** An ability to use current techniques, skills, and tools necessary for computing practice.
- (j)** An ability to use and apply current technical concepts and practices in the core information technologies

(k) An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.

(l) An ability to effectively integrate IT-based solutions into the user environment.

(m) An understanding of best practices and standards and their application.

(n) An ability to assist in the creation of an effective project plan.

The above outcome will be evaluated internally by the EECS department through surveys and feedback obtained from graduating students, questionnaires sent to the employers, classroom evaluations, input from the external stakeholders of capstone courses (i.e., the external organizations sponsoring the interns' work), and input received from the departmental advisory board. The feedback will be used for continuous enhancement and improvements in the program.

Student Learning Outcome Aligns with the BOR Expected Skills.

Note that the above learning outcomes also address the expected skills identified by the Kansas Board of Regents²⁰ :

1. Oral and written communication skills – this expected skill is met by outcome (f)
2. General technical and numerical literacy – this expected skill is met by outcome (a)
3. Critical thinking and problem-solving capacity – this expected skill is met by outcome (b)
4. The ability to work collaboratively and in teams – this expected skill is met by outcome (d)

In addition to the above, we will encourage and provide the same opportunities for the BSIT students as we have done for other EECS students, to enhance their learning, as explained below:

- Industrial IT positions require a fundamental IT education as well as the ability to work productively and collaboratively in a team environment. We will provide opportunities for practice-oriented and team-oriented projects where students will be required to work in a team. Team projects have a high positive impact on students and are becoming the preferred method of teaching IT and computing courses. In such disciplines, the objective is not to merely meet the real world necessities, but also to enhance teaching in the educational institutions. *Learning by doing is essential.*
- We will encourage students' membership in and participation in the regular meetings of the professional societies in the KC metropolitan. The local chapters offer opportunities for the students to broaden their learning and hands-on skills and to participate in discussion, guest lecture notes, competitions and contests, and similar activities.

Examples of professional groups or local chapters of national societies include the following: The Kansas City Chapter of IEEE²¹, Kansas City Chapter of Project Management Institute²², KC Agile Alliance²³, Kansas City International Society for Process/Performance Improvement²⁴, Kansas City Linux User Group²⁵, Kansas City SQL Server Users Group²⁶, and the Kansas City Area Development Council²⁷.

(3) Plans Regarding Program Accreditation

The undergraduate degree programs currently offered by the EECS Department are accredited by ABET,²⁸ which is the accreditor for university programs in computing and engineering. The Information Technology programs are accredited by the Computing Accreditation Commission (CAC) of ABET. Accreditations are peer reviews and intended to ensure high quality of undergraduate education. Currently, the Computer Science program at KU is accredited, along with Computer Engineering and Electrical Engineering. We will seek accreditation for the proposed BSIT program through the same channels.

Notes

¹The Research Triangle was created in November 2008 when the county residents voted for a one-eighth of a cent sales tax. The proceeds are expected to generate more than \$15 million annually to fund higher education and degree offerings through institutional partnership between KU, K-State, and the JCCC. The initiative includes the development of the Business, Engineering, Science and Technology (BEST) building and new degree programs at KU Edwards Campus in Overland Park. Additional detail: www.jocotriangle.com.

²<http://www.eecs.ku.edu/prospective/undergraduate>

³Robert E. Hemenway, *Initiative 2015: Shaping KU's Future*, p. 6, May 12, 2008.

⁴*Hot Jobs in Kansas*, Kansas Department of Labor, in cooperation with the Projections Managing Partnership, 2009.

⁵2006-2016 Kansas Occupation Outlook Executive Summary, and Hot Jobs in Kansas. Details available at: <http://www.dol.ks.gov>

⁶*Labor Market Information Services, 2006-2016*, Kansas Department of Labor.

⁷SITAKS "is designed to lead, serve, educate and advocate for Kansas' software and information technology sector to help Kansas' software and IT companies grow and succeed." Its membership includes major educational and industrial organizations in Kansas, including the University of Kansas and Kansas State University.

⁸*Labor Market Information Services*, 2009 Kansas Wage Survey, Kansas Department of Labor.

⁹<http://www.bls.gov/>

¹⁰Source: Johnson County Community College 2009-2010 Graduates in AAS Programs, Johnson County Community College Office of Institutional Research, 3/11/2011.

¹¹KU Edwards Campus Diversity Plan.

¹²Association of the Computing Machinery (ACM), www.acm.org.

¹³IEEE-Computer Society, www.computer.org

¹⁴We rely heavily on *CC-IT'08* and the ABET (www.abet.org) definitions.

¹⁵*Computer Science Curriculum 2008: An Interim Revision of CS 2001*, Report from the Interim Review Task Force includes update of the CS 2001 body of knowledge plus commentary, December 2008, Association for Computing Machinery and IEEE Computer Society.

¹⁶The Accreditation Board for Engineering and Technology (ABET) is the recognized accreditor for college and university programs in applied science, computing, engineering, and technology.

¹⁷*CC-IT'08* further breaks each area into units and offers the amount of time, in contact hours, not credit hours, that each unit should be covered. We will use those guidelines when we define a 4-year model curriculum for our proposed BSIT program. Note that a credit hour in a semester-based system like KU is expected to have about 750 minutes of classroom time. Thus a 3-credit-hour course will amount to $3 \times 750 = 2,250$ minutes or approximately 38 hours. Thus if the *CC-IT'08* suggests 38 hours of coverage for a particular body of knowledge, it implies a 3-credit-hour course in a semester-based system.

¹⁸ABET is an accreditation body of responsible for the specialized accreditation of educational programs in applied science, computing, engineering, and technology. One of the ABET units, CAC, accredits computer science and IT programs.

¹⁹The objective of the Triangle project is to enhance Johnson County's competitiveness through strategic investment in educational excellence.

²⁰Kansas Board of Regents, *Foresight 2020: A Strategic Agenda for Higher Education in Kansas*, www.kansasregents.org

²¹<http://www.ieee-kc.org/>

²²<http://www.kcpmichapter.org>

²³<http://agilekc.org/>

²⁴<http://www.kcispi.org>

²⁵<http://www.kclug.org>

²⁶<http://kansascity.sqlpass.org>

²⁷<http://www.kcadc.com>

²⁸ABET is the recognized accreditor for college and university programs in applied science, computing, engineering, and technology in the US: <http://www.abet.org>