ISSN: 1545-679X

Information Systems Education Journal

Volume 4, Number 17 http://isedj.org/4/17/ March 30, 2006

In this issue:

Is Database Curriculum Information Systems or Information Technology: An Accreditation Dilemma

Barbara J. Nicolai
Purdue University Calumet
Hammond, IN, 46323-2094, USA

Abstract: This paper addresses the dilemma of how the Database curriculum is positioned into an accreditation model, either the Information Systems (IS) 2002 Model Curriculum and the Guidelines for Undergraduate Degree programs in Information Systems or the Draft Accreditation Criteria - Baccalaureate Programs in Information Technology. In discussing these issues, the author will discuss the background of the IS 2002 Model, the Association for Computing Machinery (ACM) Special Interest Group for Information Technology Education accreditation draft document, the Accreditation Board for Engineering Technology (ABET) accreditation process, examples of database curriculum under both an Information Systems and Information Technology model, a comparison of the two perspectives and conclude with a recommendation choosing either the Information Systems or Information Technology Accreditation Model.

Keywords: database, Information Systems, Information Technology, curriculum, accreditation

---

Recommended Citation: Nicolai (2006). Is Database Curriculum Information Systems or Information Technology: An Accreditation Dilemma. *Information Systems Education Journal, 4* (17). http://isedj.org/4/17/. ISSN: 1545-679X. (Also appears in *The Proceedings of ISECON 2004:* §2445. ISSN: 1542-7382.)

This issue is on the Internet at **http://isedj.org/4/17/**

The **Information Systems Education Journal** (ISEDJ) is a peer-reviewed academic journal published by the Education Special Interest Group (EDSIG) of the Association of Information Technology Professionals (AITP, Chicago, Illinois). • ISSN: 1545-679X. • First issue: 8 Sep 2003. • Title: Information Systems Education Journal. Variants: IS Education Journal; ISEDJ. • Physical format: online. • Publishing frequency: irregular; as each article is approved, it is published immediately and constitutes a complete separate issue of the current volume. • Single issue price: free. • Subscription address: subscribe@isedj.org. • Subscription price: free. • Electronic access: http://isedj.org/ • Contact person: Don Colton (editor@isedj.org)

EDSIG activities include the publication of ISEDJ, the organization and execution of the annual ISECON conference held each fall, the publication of the Journal of Information Systems Education (JISE), and the designation and honoring of an IS Educator of the Year. • The Foundation for Information Technology Education has been the key sponsor of ISECON over the years. • The Association for Information Technology Professionals (AITP) provides the corporate umbrella under which EDSIG operates.

Is Database Curriculum Information Systems or Information Technology: An Accreditation Dilemma

Barbara J. Nicolai
Computer Information Systems & Information Technology
Purdue University Calumet
Hammond, IN, 46323-2094, USA

Abstract

This paper addresses the dilemma of how the Database curriculum is positioned into an accreditation model, either the Information Systems (IS) 2002 Model Curriculum and the Guidelines for Undergraduate Degree programs in Information Systems or the Draft Accreditation Criteria – Baccalaureate Programs in Information Technology. In discussing these issues, the author will discuss the background of the IS 2002 Model, the Association for Computing Machinery (ACM) Special Interest Group for Information Technology Education accreditation draft document, the Accreditation Board for Engineering Technology (ABET) accreditation process, examples of database curriculum under both an Information Systems and Information Technology model, a comparison of the two perspectives and conclude with a recommendation choosing either the Information Systems or Information Technology Accreditation Model.

Keywords: Database, Information Systems, Information Technology, Curriculum, Accreditation

1. HISTORY OF INFORMATION SYTEMS ACCREDITATION MODEL

The history of the Information Systems (IS) 2002 Model begins with its conception in 1985 when the Computer Sciences Accreditation Board was formed. The blending of business and computer science professionals directed the need for validating and accrediting academic programs in the field of computer science. As the field of computer science grew, redefinition of the field presented the concept of Information Systems. Supported by a National Science Foundation (NFS) project, criteria and procedures for an accreditation process was established. By December 2001, the IS Accreditation Board associated itself with the Accreditation Board for Engineering and Technology, Computing Accreditation Commission (ABET CAC) and finalized the criteria for the accreditation process. The IS 2002 Model is the result of this endeavor. (Kohun 2003)

2. HISTORY OF INFORMATION TECHNOLOGY ACCREDITATION MODEL

The history of Information Technology Accreditation Model begins soon after the finalization of the IS 2002 Model. An organization was established to representation the undergraduate Information Technology (IT) programs in the United States. This organization, the Society for Information Technology Educators (SITE), provided a forum for IT academics to discuss current trends and accreditation issues. SITE eventually established an association with the Association for Computing Machinery (ACM) forming the ACM Special Interest Group for Information Technology Education (SIGITE). By 2002, at their third conference in Rochester, NY a concerted effort was made to address the looming issues of accreditation for IT. By this time an accreditation model had been established for IS, defining and guiding academics to use a accreditation model supporting the IS academic and professional area. (SIGITE 2003)

3. IS 2002 MODEL CURRICULUM AND GUIDELINES FOR UNDERGRADUATE DEGREE PROGRAMS IN INFORMATION SYSTEMS

In the Executive Summary of the IS 2002 Model information systems coursework has been specifically identified into three separate levels:

1. General courses in information systems suitable for all students regardless of their majors or minors.
2. Specialized Information technology and application design courses for both majors and minors in information systems.
3. Specialized application development, deployment, and project management

> courses for majors in information systems. (Gorgone 2002)

Along with the identification of the three separate levels of IS coursework, an architecture of information systems curriculum was defined. This IS architecture consists of five curriculum presentation areas:

1. Information Systems Fundamentals
2. Information Systems Theory and Practice
3. Information Technology
4. Information Systems Development
5. Information Systems Deployment and Management Process (Gorgone 2002)

The body of knowledge for an IS graduate includes key skills at the culmination of their studies. The IS Model 2002 committee concluded that:

> IS analysts have specific skills at approximately IS '97 skill depth level 3 (the ability to USE knowledge) in areas of Interpersonal and Team Skills, Business Knowledge, Organizational Process Development (including IS Systems Analysis and Design), Project Management, Database, Software Development, Web Programming and Systems Integration. (Gorgone 2002)

The IS 2002 Model identifies specific IS courses that are a part of the core knowledge of an IS graduate. Three courses focus on database knowledge and learning outcomes.

IS 2002.7 Analysis and Logical Design

> Topics: Life cycle phases; requirements determination, logical design, physical designing, and implementation planning, structured versus object oriented methodologies, database design

IS 2002.8 Physical Design and Implementation with DBMS

> Topics: Conceptual, logical and physical data models, and modeling tools, structured and object design approaches, models for databases; relational and object oriented; design tools; data dictionaries, repositories, warehousing, and data mining; database implementation including user interface and reports

IS 2002.9 Physical Design and Implementation in Emerging Environments

> Topics: may include selection of development environments and standards; structured, event driven and object oriented application design; testing; software quality assurance; system implementation; user training; system delivery; post implementation review; configuration management; maintenance; multi-tired architectures and client independent design. (Gorgone 2002)

The representative capabilities and knowledge expected for IS Program Graduates in the Technology area of Database Design and Administration are:

Modeling and design, construction, schema tools, and DB systems, triggers, stored procedures, design and development of audit controls, Administration: security, safety, backup, repairs and replicating. (Gorgone 2002)

4. DRAFT ACCREDITATION CRITERIA: BACCALAUREATE PROGRAMS IN INFORMATION TECHNOLOGY

The Draft Accreditation Criteria – Baccalaureate Programs in Information Technology Model (Draft IT Model) addresses the required curriculum for the IT discipline. The major topic areas as defined the Draft IT Model are programming, networking, database and web computing. The Database area is defined in terms of context, objective and topics:

> The context is the uses of data processing in solving customer problems.
>
> Objective: Students must understand the concept of data and how information is derived from the data. Students must understand the concept of data integrity (consistency and reliability). Students must understand the various methods for storing and retrieving data. Students must understand how the data will be process and how storage method will affect processing. Students must be familiar with the concept of files and databases. Students should understand the role of databases and distributed databases in software applications, particularly, Internet applications. Students must be able to create simple databases and query them using SQL.
>
> Topics: Data and Information, Data vs. Information, data interpretation, information coding, Data storage methods, mass storage devices, unstructured stores (files), structured storage (databases), data representation, file access methods (read, read/write, etc), records, fields, database types (relational, object-relational, etc.) data independence (logical and physical), Data integrity, concurrent access, record locking, security, transactions, databases, data management, data integrity, synchronization, real-time systems, data mining, queries, SQL,

distributed databases, distributed network applications, Internet applications, e-commerce.

(SIGITE 2003)

The Draft IT Model has identified eight (8) General Criteria areas:

I. Objectives, Outcomes, and Assessment

II. Student Support

III. Faculty Qualifications

IV. Faculty Size and Workload

V. Curriculum

VI. Technology Infrastructure

VII. Institutional support and Financial Resources

VIII. Institutional Facilities (SIGITE 2003)

Specific curriculum coursework has yet to be identified as compared to the IS 2002 Model. Only general topic areas have been identified. This inequity of development between the IS 2002 model and the Draft IT Model causes a difficulty in the comparison research between the two models. In order to present a fair and equitable case comparison between the two models, this author will show examples of two existing curriculum models; one university using a curriculum in Information Technology and one university using a curriculum in both Information Systems and Information Technology. These examples will show how database is placed or not placed in the model.

5. A BACHELOR'S DEGREE IN INFORMATION TECHNOLOGY

George Mason University is committed to producing IT effective and competent professionals. When the School of Information Technology and Engineering (IT & E) investigated the development of an IT focused curriculum, the pivotal concern was to establish boundaries of the BS IT program. A choice had to be made that would provide for a stable curriculum of IT education. IT & E chose to develop standard concentration in one of two high-demand IT knowledge areas: Computer Graphics and Web Development or Information Security and Network Administration. (White, 2002)

The BS IT program structure at George Mason University is described as follows:

1. IT Foundation Courses. All BS IT majors must complete the following foundation courses:

   IT 101 Introduction to Information Technology

   IT 103 Introduction to Computing

   IT 108 Programming Fundamentals

   IT 212 How Computers Work

   IT 250 Introductory Statistics

2. IT Core Courses. All BS IT majors must complete the following core courses:

   IT 213 Multimedia and Computer Graphics

   IT 214 Data Base Fundamentals

   IT 341 Network and Operating Systems Essential

   IT 451 IT Resource Planning

   IT 491 IT Seminar

   CS 305 Ethics and law for the Computing Professional

   MSOM 302 Managing Information

   MSOM 303 Marketing in a Digital World

   TCOM 300 Introduction to Telecommunications

3. IT Capstone Design Project. All BS IT majors must complete a two-semester sequence of approved capstone design courses.

   IT 492 Synthesis I

   IT 493 Synthesis II

4. IT Concentration Courses. All BS IT majors must complete a total of at least 15 semester hours of IT concentration courses from the three categories of courses listed under the student's select IT concentration area. The student must select at least one of these five courses from each of the three categories of courses listed under the selected concentration. The number of courses in each category will increase as the BS IT program matures. To ensure the integrity of the concentration, any substitution for a course in a specific category requires prior approval from the BS IT program coordinator.(White 2002)

The establishment of the boundaries and defining IT as an academic discipline was the most difficult task for the School of IT & E. The success of this program has been the result of establishing two concentration areas within the BS IT program. The School of IT & E is anticipating their definition of an IT Program to improve retention, increase enrollment, while assuring a program that fits in the IT accreditation model. (White 2002)

6. A BACHELOR'S DEGREE IN INFORMATION SYSTEMS AND A BACHELOR'S DEGREE IN INFORMATION TECHNOLOGY

The mission of the Computer Information Systems & Information Technology Department (CISIT) at Purdue University Calumet is to continue to be recognized as an educational leader in information systems, through excellence in teaching, educational scholarship, applied research, and professional service and outreach.

The CISIT department intends to serve the citizens of Indiana, the Midwest, and the nation by providing the highest quality education to prepare professionals for existing and emerging careers in the application of information systems. The department also hopes to prepare professionals who can plan, analyze, design, construct, maintain, and manage business computer applications, management information systems, databases, and computer networks. (PUC-CISIT 2004)

In line with this mission the CISIT Department is proposing two separate Bachelor of Science (BS) degrees, Information Systems and Information Technology. This author will address the BS Information Technology Degree. The core courses of the proposed IT Degree required by an IT major are:

CIS 103 Survey of IS and IT

CIS 150 Introduction to Networking

CIS 111 Introduction to H-C Interaction

CIT 110 Introduction to Programming

CIS 180 Intro to IT Project Management

CIT 220 Introduction to Web Technologies

CIT 230 Introduction to Database Technologies

CIT 240 Introduction to Operating Systems

CIT 260 Fundamentals of Information Assurance

The fundamental courses of the proposed IT Degree by an IT major are:

COM 114 Fundamentals of Speech Communication

ENGL 104 English Composition I

MA 214 Linear Algebra & Linear Programming

ENGL 220 Technical Report Writing

MA 225 Calc for Business & Economic I

Natural Science Laboratory Elective

SOC 100 Introduction to Sociology OR

PSY 120 Elementary Psychology

STAT 301 Elementary Statistical Methods

PHIL 120 Critical Thinking

The concentration courses for the Database Track are:

CIS 242 E-Commerce Architecture

CIS 354 Database Mgmt. Sys. Analysis & Design

CIS 355 Database System Implementation

CIS 341 Web Development I

CIS 457 Database Administration

CIS 353 Advanced Dbase. Pl/SQL Programming

CIS 357 Data Warehousing & Mining

CIS 384 Database Integration

CIS 483 Computer Hardware/Software Selection (PUC CISIT 2004)

The courses that focus on database knowledge and learning outcomes are:

CIS 354 Database Mgmt. Sys. Analysis & Design

This course discusses the role of databases in the System Development Life Cycle, with an emphasis on rational base analysis and object-oriented database analysis and design techniques-logical data modeling. Additional topics include the functions and components of state-of-the-art commercial DBMS software,

distributed database, database models, and the role and function of the Database Administrator. Students will be assigned data modeling projects.

CIS 355 Database System Implementation

This course emphasizes the implementation of a relational DBMS. Students will use fourth generation languages and tools to implement design specifications. Additional topics include the implementation of physical data models, backup/ recovery facilities, concurrency control, integrity services and security mechanisms. Students will be assigned implementation projects.

CIS 457 Database Administration

Prerequisites: CIS 140, CIS 253, and CIS 286 This course covers database administration tasks and techniques. Students will install and implement two relational database management systems. Topics include RDBMS architecture, installation, creating databases, configuration, migrating data, database object management, user account management, tuning and backup and recovery.

CIS 353 Advanced Dbase. Pl/SQL Programming

This course is a continuation of CIS 355, Database Implementation. Advanced techniques of PL/SQL are covered. Topics include processing statements of PL/SQL blocks, procedures, functions, packages, dependencies, database triggers, built-in packages, dynamic SQL and Object Technology and code tuning. Students require advanced skills in a practice environment reinforcing concepts and techniques of PL/SQL programming.

CIS 357 Data Warehousing & Mining

This course is an overview of data warehousing and data mining together with in-depth explanations of critical issues in planning, design, deployment and ongoing maintenance of data warehousing. Students will gain a clear understanding of the techniques for extraction of data from sources, data transformations, data staging, data warehouse architecture and infrastructure and various methods for delivery. Additional topics will include an overview of On-Line Analytical Processing, Knowledge Discovery Database Process Model, Expert Systems, Neural Networks, Regression Analysis, Intelligent Agents as they relate to data warehousing.

CIS 384 Database Integration

This capstone course combines database skill sets and techniques, providing students with an integrated comprehensive experience of various database platforms and programming languages. Topics include the latest development tools, database features and strategies, embedded SQL programming, administrative API's, CLI.ODBC and OLE DB programming, JAVA programming, stored procedures and more. Students develop database applications in a variety of environments using a variety of programming tools, maximizing database performance, availability and efficiency (PUC CISIT 2004)

The establishment of two separate BS degrees, Information Systems and Information Technology by the CISIT Department at Purdue University Calumet was created to fulfill the mission " to continue to be recognized as an educational leader in information systems, through excellence in teaching, educational scholarship, applied research, and professional service and outreach." (PUC CISIT 2003)

7. COMPARISON OF TWO DEGREE PROGRAMS TO THE REQUIREMENTS OF MODEL CURRICULA

The George Mason University (GMU) BS IT degree program structure includes four major areas:

1. IT Foundation Courses
2. IT Core Courses
3. IT Capstone Design Project
4. IT Concentration Courses

The sub-disciplines of Web development, computer graphics, information systems, telecommunication, network administration and information security are providing the ability to fill the emerging technologies in the technology industry. This focus of filling business needs by providing a solid body of knowledge for the new information technology professionals is the primary goal for GMU BS IT program. (White 2002) The issue of accreditation requirements was structured to meet degree requirements in general education and major related requirements. The GMU BS IT program was formulated around the model of clear objectives, performance-based assessment and constant feedback and planning. (White 2002)

The IT Model Curricula includes a curriculum core and discipline topics that are covered in networking, database, programming, web, math and communication. (SIGIT 2003) In allowing for flexibility in the design of as degree program curriculum, the IT accreditation requirements provide a comparable model as such used in the George Mason University BS IT Program. The database requirement as stipulated in the both the SIGIT Draft Accreditation Criteria documents and the GMU BS IT Program provides for the foundational structure for an information technology body of knowledge. Neither the accreditation body nor the university discussed requires expert level of knowledge in the database area. (White 2002, SIGIT 2003)

Purdue University Calumet (PUC) BS IT degree program as discussed previously in the paper provides a similar program structure as GMU:

1. IT Core Courses
2. IT Fundamental Courses
3. IT Concentration Courses (which includes a capstone project).

PUC BS IT Database track provides the graduated student with an expert level of database body of knowledge. The course descriptions (see 6. A Bachelor's degree in Information Systems and a Bachelor's degree in Information Technology) of the PUC BS IT Database track fall better in line with the IS 2002 Undergraduate Information Systems Model Curriculum. Observing the IS 2002 Course Architecture and Sequence (See Figure 1), The introduction of IS 2002.1 Fundamentals of Information Systems, followed by IS 2002.7 Analysis & Design, IS 2002.8 Physical Design & Implementation with DBMS, and IS 2002.9 Physical Design & Implementation in Emerging Environments, one is able to draw a direct comparison to the PUC BS IT Database Track course structure and sequence (see 6. A Bachelor's degree in Information Systems and a Bachelor's degree in Information Technology). The similarity of the two structures, PUC BS IT Database Track and the IS 2002 Undergraduate Information Systems Model Curriculum is additionally substantiated by comparing the PUC BS IT Database track course descriptions and the IS 2002 Course Number, Title and Catalog

Description Table (see Table 1).

The two programs, PUC and GMU provide an entirely different body of knowledge in the database area. GMU provides a more foundational body of knowledge and PUC providing a more expert level body of knowledge. George Mason University BS IT program "combines major related requirements with general education requirements and electives to prepare students for professional employment in the information technology workforce, for further study in information technology, and for other careers requiring competencies in IT." (White 2002) Purdue University Calumet BS IT program fulfils the Information Technology Accreditation Criteria by including network, web technologies, and security sub-disciplines in their BS IT degree program as typically found in IT accredited programs. Because PUC's BS IT Database track was just recently created, there statistics are not yet available. (PUC-CISIT 2004)

8. CONCLUSION

In coming to a conclusion about the issue, "Is Database Curriculum Information Systems or Information Technology?", this author analyzed and compared the recommended curriculum coursework for the IS Model and the general criteria for the Draft IT Model. Database was defined under the IS Model as "Modeling and design, construction, schema tools, and DB systems, triggers, stored procedures, design and development of audit controls, Administration: security, safety, backup, repairs and replicating." (Gorgone 2002)

The Draft IT Model defines Database as

> "Students must understand the concept of data and how information is derived from the data. Students must understand the concept of data integrity (consistency and reliability). Students must understand the various methods for storing and retrieving data. Students must understand how the data will be process and how storage method will affect processing. Students must be familiar with the concept of files and databases. Students should understand the role of databases and distributed databases in software applications, particularly, Internet

applications. Students must be able to create simple databases and query them using SQL." (SIGITE 2003)

The comparison of the two models, IS and IT, shows that IS expects database student to achieve a higher level of learning (application) and IT expects database student to achieve the first level of learning (understanding).

My recommendation when considering IS or IT accreditation for Database Curriculum is that if the Database Curriculum expands the level of learning from remedial to expert, the model of choice is the IS 2002 Model. If the Database Curriculum is an addendum to existing "bodies of knowledge", then the Draft IT Model may be the model of choice.

9. REFERENCES

Gorgone, John T., Davis, Gordon B., Valacich, J.S., Topi, H., Feinstein, David L., Longenecker, Jr. H.E., "IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information systems", 2002, ACM, New York, NY, AIS, and AITP (formerly DPMA, Park Ridge, IL.http://webfoot.csom.umn.edu/ais/02IS2002.pdf (accessed on July 5, 2004)

Kohun, Frederick G., Wood, David F., "The ABET CAC Accreditation Experience – Intent and Reality – The Information Systems Perspective", Proceedings ISECON 2003, Session 2415, http://isedj.org/isecon/xref/toc.html, (accessed on July 5, 2004)

PUC CISIT, Department of Computer Information Systems & Information Technology, 2004, http://www.calumet.purdue.edu/cisit/, (accessed on July 9, 2004)

SIGITE, "SIGITE Newsletter" Fall 2003, Volume 1, Issue, http://www.sigite.org (accessed July 5, 2004)

White, E. Bernard, "Opportunities and Challenge to Developing A Bachelor's Degree Program in Information Technology", 2002, Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition, Session 2558.

Figure1. IS 2002 Course Architecture and Sequence

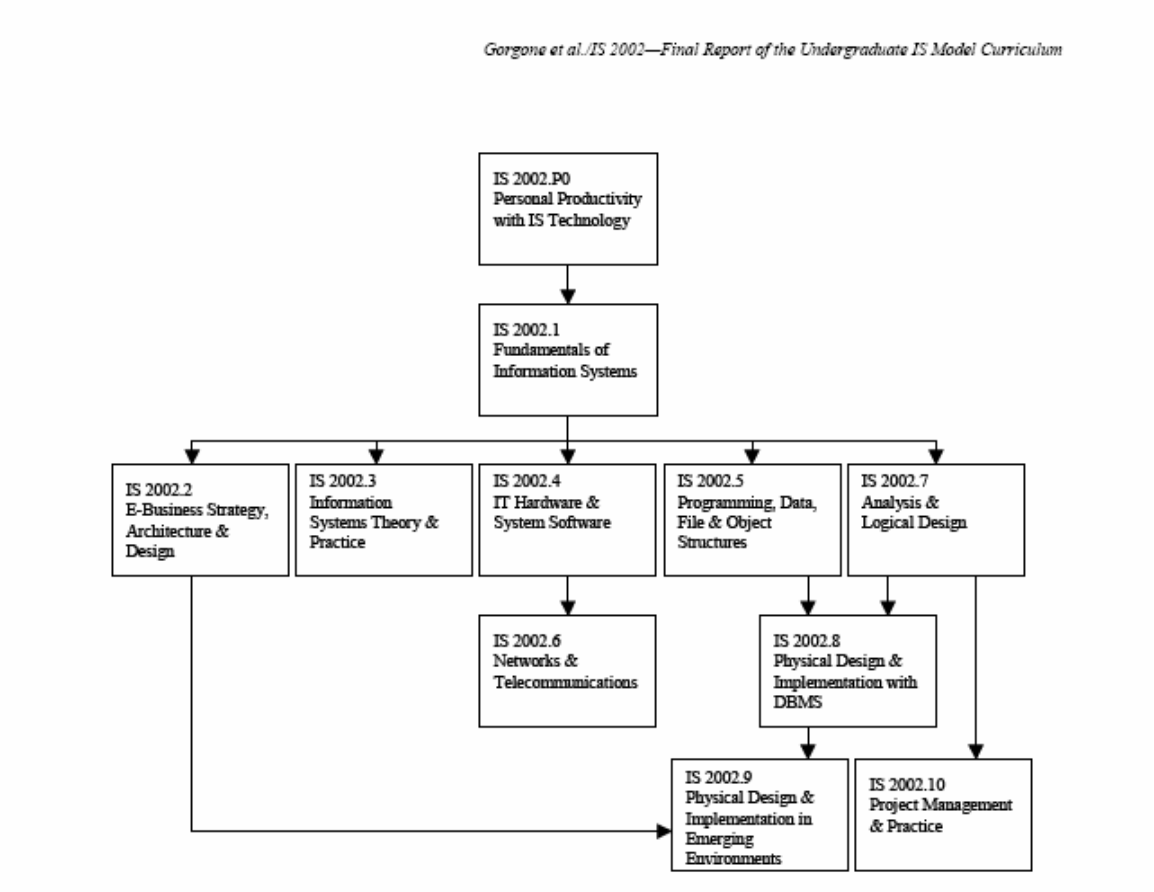

Table 1. IS 2002 Course Number, Title, and Catalog Description

Course Number & Title (prerequisite)	Catalog Description
IS 2002.P0 – Personal Productivity with IS Technology (basic word processing, spreadsheets, e-mail, and Web browsing)	Students with minimal skills will learn to enhance their personal productivity and problem solving skills by applying information technologies to problem situations and by designing and using small information systems for individuals and groups.
IS 2002.1 – Fundamentals of Information Systems (IS 2002.P0)	Systems theory, quality, decision-making and the organizational role of information systems are introduced. Information technology including computing and telecommunications systems are stressed. Concepts of organization and information system growth and re-engineering are introduced.
IS 2002.2 – Electronic Business Strategy, Architecture and Design (IS 2002.1)	The course focuses on the linkage between organizational strategy and networked information technologies to implement a rich variety of business models in the national and global contexts connecting individuals, businesses, governments, and other organizations to each other. The course provides an introduction to e-business strategy and the development and architecture of e-business solutions and their components.
IS 2002.3 – Information Systems Theory and Practice (IS 2002.1)	Students who have constructed personal information systems will be exposed to the theory of the IS discipline. Application of these theories to the success of organizations and to the roles of management, users and IS professionals are presented.
IS 2002.4 – Information Technology Hardware and System Software (IS 2002.1)	Principles and application of computer hardware and software will be presented through lecture, installation, configuration, and operations experiences.
IS 2002.5 – Programming, Data, File and Object Structures (IS 2002.1)	This course presents object oriented and procedural software engineering methodologies in data definition and measurement, abstract data type construction and use in developing screen editors, reports and other IS applications using data structures including indexed files.
IS 2002.6 – Networks and Telecommunication (IS 2002.4)	Students will gain in-depth experience of networking and telecommunications fundamentals including LANs, MANs, and WANs. Data communication and telecommunication concepts, models, standards, and protocols will be studied. Installation, configuration, systems integration and management of infrastructure technologies will be practiced.
IS 2002.7 – Analysis and Logical Design (IS 2002.1)	Students with information technology skills will learn to analyze and design information systems. Students will practice project management during team oriented analysis and design of a departmental level system.
IS 2002.8 – Physical Design and Implementation with DBMS (IS 2002.5 and IS 2002.7)	Students who have completed the analysis and logical design course will develop a detailed physical design and implementation based on a logical design utilizing a DBMS. The course integrates intensive project work with relevant concepts.
IS 2002.9 – Physical Design and Implementation in Emerging Environments (IS 2002.2 and IS 2002.8)	Students who have completed the analysis and logical design course will extend their knowledge by implementing an information system using a contemporary development environment capable of interacting with a local or a remote DBMS. Teams will use project management principles to implement an information system.
IS 2002.10 – Project Management and Practice (IS 2002.7)	Advanced IS majors operating as a high-performance team will engage in and complete the design and implementation of a significant information system. Project management, management of the IS function and systems integration will be components of the project experience.