Model Curricula for Information Systems Auditing at the Undergraduate and Graduate Levels

prepared for:

Information Systems Audit and Control Foundation

prepared by:

ISACF Task Force for Development of Model Curricula
in Information Systems Auditing at the
Undergraduate and Graduate Levels,
Academic Relations Committee
and the
Research Board

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Obtaining Copies: Copies of the model curricula are freely available to all ISACA members, colleges, and universities and may be downloaded from www.isaca.org. Printed copies are available for a small fee through the ISACA bookstore, email <bookstore@isaca.org> for details.

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EXECUTIVE SUMMARY

The Impact of Technology

The need for well-educated Information Systems (IS) auditors and control professionals is increasing, thanks to technology's potential to dramatically change organizations and business practices, reduce costs, and create new opportunities.

Technology has impacted the business environment in three significant ways.

- First, it has increased our ability to capture, store, analyze, and process tremendous amounts of data and information, as well as changing production and service processes. This has empowered the business decision-maker greatly.

- Second, technology has significantly impacted the control process. While control objectives have remained fairly constant, except for some that are technology specific, technology has altered the way in which systems should be controlled. Safeguarding assets, as a control objective, remains the same whether manual or automated. However, the manner by which we meet the control objective is certainly impacted.

- Third, technology has impacted the auditing profession in terms of the knowledge required to draw conclusions and the skills to perform an audit. The need for auditors with specialized skills regarding technology was formally recognized by the founding of the EDP Auditors Association, now the Information Systems Audit and Control Association (ISACA) in 1969.

Information Systems Audit and Control Association, Inc. (ISACA)

ISACA was formed in 1969 to meet the unique, diverse and high technology needs of the burgeoning information technology field. In an industry in which progress is measured in nano-seconds, ISACA has moved with agility and speed to bridge the needs of the international business community and the information technology controls profession.

Today ISACA is the leading information technology organization representing nearly 18,000 members from more than fifty countries and comprising all levels of information technology professionals. Uniquely positioned and equipped to be the single provider of leading edge products and services, ISACA has expanded its depth and coverage to assume the role as the harmonizing source for information technology control practices and standards the world over. ISACA's services and programs have earned distinction by establishing the highest levels of excellence in certification, standards, professional education and technical publishing.

In addition to ISACA's work the Information Systems Audit and Control Foundation sponsors and conducts research to further the knowledge base available to the information technology and business community. Its research parallels, and often presages, technological advancements to help professionals stay breast of the ever-changing environment. The results of one of its most significant projects to date can be found in the product called COBIT™ (Control Objectives for Information and Related Technology). This work links information technology with control practices.

For more information on ISACA, visit its web site at www.isaca.org or contact by fax: +1.847.253.1443, or telephone: +1.847.253.1545.

Developing Model Curricula

ISACA and the Information Systems Audit and Control Foundation (ISACF) recognize the growing importance for model curricula at the undergraduate and graduate levels to assist in the development of programs for aspiring IS auditors. A global committee from 14 countries, representing faculty from 15 undergraduate and graduate schools and staff from 20 companies developed these model curricula over a two-year period. In addition, other ISACA specialists representing research, standards, education, and certification interests reviewed the curricula.

The purpose of the models is to propose IS auditing curricula at the undergraduate and graduate levels. The models are based on the needs and the expectations of the IS auditing profession and the prior research of academicians, practitioners, audit organizations, and professional societies. The model curricula are living documents and will be routinely updated by ISACF.

The 1996 *Control Objectives for Information and related Technology* (COBIT) and 1996 *Certified Information Systems Auditor* (CISA®) domains were used as guides to structure the core IS audit, security, and control courses at both the undergraduate and graduate levels. Although undergraduates may not possess the experience, the core courses are designed to provide the candidate with entry level skills and capabilities.

The proposed undergraduate and graduate model curricula are goals. For universities with a business education program in the United States, use of the American Assembly of Collegiate Schools of Business (AACSB) standards is an acceptable model for curricula design since the accreditation process is rigorous and held in high regard by universities. For universities in other countries, format, arrangement, and content of the proposed curricula will vary depending on university accreditation requirements and government requirements.

Undergraduate Model

Employers are demanding that their accounting and audit staff possess adequate backgrounds in computer science and IS. Typically, the student at this level lacks business experience and seeks to gain the required knowledge, skills, and abilities through academic/ business course work enhanced by internships. Traditional undergraduate accounting programs appear inadequate to meet these needs. The common approach is that after students take general business courses (i.e., marketing, business law), students take elective courses in IS or a single accounting course, usually without coordination of course content between the two disciplines.

The proposed undergraduate model is interdisciplinary in nature and may require resources from two or more departments or schools within a university. This is a very positive aspect of the model, because interdisciplinary programs are highly encouraged by the AACSB and other accrediting bodies.

The courses to be offered in this proposed undergraduate model excluding the general business courses (i.e., business finance, business management, business communications) or the business core required, are classified into three groups:

1. Accounting;
2. Information Systems (IS); and
3. Internal Auditing.

Graduate Model

The proposed graduate model is designed for an individual interested in pursuing a graduate level degree in IS auditing. Typically, these candidates have completed their undergraduate requirements and/or have 1-5 years experience in IS, accounting, business, commerce, finance, or IT-related engineering. At a minimum, students qualified for participating in such a program should possess an undergraduate business-related degree in either IS, accounting, commerce, finance, or related subject matter. Students deficient either in business education or experience (such as non-IS-related engineering, arts, etc.) would generally be required to take prerequisite IS, business or commerce courses typically expected of first-year graduate business students.

The courses/topics within this proposed program are classified into four sections:

1. Basic Understanding;
2. Required IS Auditing Related Courses;
3. Directed Electives; and
4. Business Research Methods and Project/Thesis.

MODEL CURRICULA
for
INFORMATION SYSTEMS AUDITING
at the
UNDERGRADUATE AND GRADUATE LEVEL

Introduction and IS Auditing Trends

High speed information processing has become indispensable to organizations' activities. *COBIT*™ (Control Objectives for Information and Related Technology) emphasizes this point and substantiates the need to research, develop, publicize and promote up-to-date, internationally accepted information technology control objectives. The primary emphasis of *COBIT* (Information Systems Audit and Control Foundation, 1996) is to ensure that information needed by businesses is provided by technology and that the required qualities of information are met. The IS processes need to be controlled. In their discussion paper, "Minimum Skill Levels in Information Technology for Professional Accountants" and their final report, "The Impact of Information Technology on the Accountancy Profession," the International Federation Of Accountants (IFAC) acknowledged the need for better university level education to address growing information technology control concerns and issues. The Institute of Internal Auditors 1992 document "Model Curriculum for Information Systems Auditing" was developed to define the knowledge and skills required by internal auditors to be proficient in the information age of the 1990s and beyond. Around the world reports of white-collar crime, information theft, computer fraud, information abuse and other information/technology control concerns are being heard more frequently. Organizations are more information conscious of the pervasive nature of technology across the business enterprise. The increased connectivity and availability of systems and open environments have proven to be the lifelines of most business entities. Information Technology is used more extensively in all areas of commerce.

Due to the rapid diffusion of computer technologies and the ease of information accessibility, knowledgeable and well educated IS auditors are needed to ensure that effective IS controls are in place to maintain data integrity and to manage access to information. The need for improved control over IS has been advanced in studies such as the AICPA's Committee of Sponsoring Organizations of the Treadway Commission (COSO), ISO 9000, OECD's Guidelines for the Security of IS by the Organization for Economic Cooperation and Development (OCED), IIA's Systems Audibility and Control Report and the US President's Council on Integrity & Efficiency in "Computer Audit Training Curriculum." The most recent addition to these major studies is the aforementioned COBIT research. Essentially, technology has impacted three significant areas of the business environment:

- It has impacted what can be done in business in terms of information and as a business enabler. It has increased the ability to capture, store, analyze and process tremendous amounts of data and information, which has increased the empowerment of the business decision maker. Technology has also become a primary enabler to various production and service processes. It has become a critical component to business processes. There is a residual effect in that the increased use of technology has resulted in increased budgets, increased successes and failures, and increased awareness of the need for control.
- Technology has significantly impacted the control process. While control objectives have generally remained constant, except for some that are technology specific, technology has altered the way in which systems should be controlled. Safeguarding assets, as a control objective, remains the same whether it is done manually or is automated. However, the manner by which the control objective is met is certainly impacted.
- Technology has impacted the auditing profession in terms of how audits are performed (information capture and analysis, control concerns) and the knowledge required to draw conclusions regarding operational or system effectiveness, efficiency and integrity, and reporting integrity. Initially, the impact was focused on dealing with a changed processing environment. As the need for auditors with specialized technology skills grew, so did the IS auditing profession.

Initially, IS auditing (formerly called electronic data processing [EDP] auditing) evolved as an extension of traditional auditing. At that time, "Recognition of the need for an EDP audit function came from two directions.

- First, auditors realized that computers had impacted their ability to perform the attestation function.
- Second, both corporate and information processing management recognized computers were valuable resources that needed controlling like any other valuable resource within the organization."[i]

In the beginning the theory and methodologies of IS auditing were integrated from four separate disciplines:

1. traditional auditing;
2. IS management;
3. behavioral science; and
4. computer science.

> Traditional auditing contributes knowledge of internal control practices and overall control philosophy. Information systems management provides methodologies necessary to achieve successful design and implementation of systems. Behavioral science indicates when and why information systems are likely to fail because of people problems. Computer science contributes knowledge about control theory and the formal models that underlie hardware and software design as a basis for maintaining data integrity.[ii]

> IS auditing is an integral part of the audit function because it "supports the auditor's judgment on the quality of the information processed by computer systems." Initially, auditors with IS audit skills are viewed as the technological resource for the audit staff. The audit staff often looks to them for technical assistance. Within IS auditing there are many types of audit needs, such as organizational IS audits (management control over information technology), technical IS audits (infrastructure, data centers, data communication), application IS audit (business/financial/operational), development/implementation IS audits (specification/ requirements, design, development and post-implementation phases) and compliance IS audits involving national or international standards. The IS auditor's role has evolved to provide assurance that adequate and appropriate controls are place. Of course, the responsibility for ensuring that adequate internal controls are in place rests with management. Audit's primary role, except in areas of management advisory services, is to provide a statement of assurance as to whether adequate and reliable internal controls are in place and are operating in an efficient and effective manner. So, whereas management is to ensure, auditors are to assure.[iii]

IS auditing is a profession with conduct, aims and qualities that are characterized by worldwide technical standards, an ethical set of rules (ISACA Code of Ethics) and a professional certification program (Certified Information Systems Auditor, CISA®). Together, they require specialized knowledge and practicable ability, and often long and intensive academic preparation. Often, where academic programs were unavailable, significant in-house training and professional development had to be expended by employers. Most accounting, auditing and IS professional societies believe that improvements in research and education will definitely provide a "better-developed theoretical and empirical knowledge base for the IS audit function."[iv] They feel that emphasis should be placed upon education obtained at the university level.

The breadth and depth of knowledge required to audit information technology and systems is extensive. For example, IS auditing involves the:

- application of risk-oriented audit approaches;
- use of computer assisted audit tools and techniques;
- application of standards (national or international) such as ISO-9000/3 to improve and implement quality systems in software development;
- understanding of business roles and expectations in the auditing of systems under development as well as the purchase of software packaging and project management;
- evaluation of complex Systems Development Life Cycle (SDLC) or new development techniques (e.g., prototyping, end-user computing, rapid systems or application development).

Evaluation of complex technologies and communications protocols involves electronic data interchange, client servers, local and wide area networks, data communications, telecommunications and integrated voice/data/video systems.

IS Auditing Education

Worldwide, universities have been responding to the needs of the IS audit profession. At the undergraduate level, they have begun to integrate IS courses into their accounting programs and accounting or finance courses into their IS programs. At the graduate level, several universities have successfully implemented and maintained IS audit programs. These universities have attempted to meet the growing demand for entry level knowledge, skills and abilities.

Traditionally, there have been three commonly accepted sources of obtaining formal IS auditing education:

- The first source is to participate in a mixture of on-the-job training and in-house programs. These are most appropriate where the technology presented has been adopted and implemented by the organization.
- The second source is to participate in work shops/seminars presented by professional organizations or vendors. These are valuable in presenting information that is new, or for exploring various approaches to IS auditing problems. In the work shop/seminar environment, a peer group can share perspectives not available from a single instructor. However, work shops/seminars are usually more expensive and take time away from the office. Also some seminars do not provide the in-depth technical hands-on competence required in IS auditing.
- The third source is found in the traditional university academic environment. It should be noted, however, that past studies have shown that as much as 70 percent of audit training is on-the-job, compared to only 8 percent learned in school.[v]

Thus, one of the purposes of proposing a model curriculum for undergraduate and graduate education in IS auditing is to focus the level of formal education received in this field. This is the *Number One* objective. Further, a model curriculum provides a framework for universities in structuring or restructuring their existing course offerings as well as developing new courses to meet the needs of employers of their graduates.

Globally, there have been universities who have offered education and/or formal undergraduate and/or graduate programs for the IS audit and control community as well as those aspiring to enter the profession. To their credit these universities have been successful in generating employable candidates for this demanding field. Besides general education such as math, grammar/writing and speech, these universities have provided general business education in management/organizational behavior, finance, law, business mathematics and statistics, accounting, marketing, IS accounting and business communications to their candidates. To provide real world experience, some universities have emphasized more hands-on internships or academic/industry projects in university education for preparing their graduates for the IS audit profession. With internship experience such graduates are now employed in the IS audit, security and control profession or have advanced into corporate management. Graduates have been encouraged to produce written professional products (published articles, papers, or

presentations) to attain professional certification and transfer their experience and expertise to others.

At the undergraduate level, the student has the opportunity to receive valuable experience through an internship or university/industry audit project. Otherwise, most of the education they receive will be academic. Through the use of current textbooks, training materials and outside speakers, more discussion about IS audit and control issues and real world experiences are being included in undergraduate business/commerce courses. When these business/commerce students (with accounting, IS or finance emphasis) graduate, they have some awareness and understanding of IS audit and control issues. For example, they may lack the actual business experience to test computer-based controls as presented in the AICPA's Statements on Auditing Standards (e.g., 48, 55, 78 and 82) or ISACF's *COBIT*, but they understand the theory and mechanics of what needs to be done.

The more advanced level of education in IS auditing comes at the graduate level. Candidates at this level typically have business experience (at least one or more years) and a bachelor's degree in a business/commerce field (e.g., accounting, IS or finance/commerce). If they do not have this background, many universities require business/commerce courses similar to the general business education mentioned earlier, to be taken in preparation for a business/commerce oriented graduate program.

Internationally, several universities have been offering IS audit education. At the undergraduate level, some examples include:

- Bentley College (US);
- Bowling Green State University (US);
- Curtin University of Technology (AUST);
- Eastern Michigan University (US);
- Florida Atlantic University (US); and
- Queensland University of Technology (AUST).

Used as input for this study the European Commission document "A Proposal for Postgraduate Curriculum in Information Security, Dependability and Safety" shows the educational resources and course offerings of:

- Dublin University (IR);
- Stockholm University (SW);
- University of London (UK);
- University of Vienna (AUS); and
- Others to support graduate level IS audit, security and control courses.

Other examples of graduate programs and education in this area are:

- Arizona State University (US);
- Bowling Green State University (US);
- California State Polytechnic University-Pomona (US);
- Curtin University of Technology (AUST);

- Georgia State University (US);
- ITESM-Campus Guadalajara (MX);
- Universite de Paris Dauphine (FR); and
- University of New South Wales (AUST).

Certainly, for many years, support for IS-related education and the need to share experiences have been recognized and training materials have been provided by professional associations, such as the Information Systems Auditing and Control Association/Foundation, the American Institute of Certified Public Accountants, the Institute of Internal Auditors and the Institute for Management Accountants. The Association of Information Technology Professionals (Formerly DPMA), in the issuance of its Model Curriculum for Undergraduate Computer IS Education in 1981, included the need for an elective course on IS auditing. This elective course is still included in their most recent model curriculum. From an international perspective, organizations such as the International Federation of Accountants and IFIP/WG11.8 (Information Security Education and Training) have published documents advocating the need for university-developed training in IS auditing, security and control.

In the design of a model curriculum for undergraduate and graduate education in IS auditing, we recognize that there are two conflicting views about how IS audit should be organized.

> "Some view that there should be a separate IS auditing function. Others prefer IS auditing integrated into the operational and financial auditing function."[vi]

The debate over which approach is better makes it difficult to design academic programs for IS auditors. We believe we must focus on the typical background this person should have to be successful under either organizational scenario.

Another difficulty in designing a model curriculum for IS auditing is that there are generally two categories of individuals in IS auditing. One category comprises those individuals who have several years of IS auditing experience. They are either business professionals who are competent in IS or IS professionals competent in business, or hardware/software engineering operations. They have practical experience and specific industry expertise. The other category comprises new IS audit program graduates or accounting program graduates who enter IS auditing directly from a university. These graduates usually have a clear understanding of accounting or IS, but generally not both unless they graduated with a double major in IS and accounting. Furthermore:

> "…direct entry into the profession is the situation today, may change with entry-level requirements, including experience in business process, systems and technology, as well as sound knowledge of general auditing theory supplemented by practical experience. In addition, IS auditors may require specific industry expertise, such as telecommunications, transportation, or finance and insurance to adequately address the industry specific business/technology issues."[vii]

There is a need for model curricula in IS audit, security and control at the undergraduate and graduate levels. Though the undergraduate candidates may not have the business experience necessary (even though more universities are requiring internships), they are being given professional opportunities worldwide. As the primary, international professional association for IS audit and control professionals, ISACA/F is in a unique position to provide a model curricula for IS auditing. **This document represents needed guidance to the university community.**

Proposed IS Auditing Education Curricula

The purpose of this model is to propose IS auditing curricula at the undergraduate and graduate levels. The model is based on the needs and the expectations of the IS auditing profession and the prior research of academicians, practitioners, audit organizations and professional societies. The objective of this proposal is to identify the fundamental course components of IS auditing and integrate them into the accounting, auditing, business, commerce, finance IS-related engineering and IS education provided by universities around the world. The goals of the model curricula are to prepare students for careers in the IS auditing profession and to assist students in becoming marketable in the auditing profession. The *COBIT: Framework* and 1996 CISA domains were used as a guide to structure the core IS audit, security, and control courses at both the undergraduate and graduate levels (see Illustrations I-IV Pages 18-21). Although undergraduates may not possess actual work experience, the core courses are designed to provide the candidate with entry level skills and capability.

The proposed undergraduate and graduate model curricula in this paper are goals. It is recognized that universities can be on a quarter or semester basis and suggest that the model is a guide for specific topic courses or courses that may cover multiple topics. For universities within the US having a business education program, the use of the American Assembly of Collegiate Schools of Business (AACSB) standards is an acceptable model for curricula design since the accreditation process is rigorous and held in high regard by universities. For non-US universities, format, arrangement and content of the proposed curricula will vary depending on university accreditation, and government requirements. No matter where the university is located, there may be limitations in using resources across department and university boundaries.

Undergraduate Model

Employers are demanding that their accounting and audit professionals possess adequate backgrounds in computer science and IS. Typically, the student at this level lacks business experience and seeks to gain the required knowledge, skills, and abilities through academic/ business course work enhanced by internships. Traditional undergraduate accounting programs appear inadequate to meet these needs. The common approach is that after students take general business courses (i.e., marketing, business law), students take elective courses in IS or a single accounting IS course, usually without coordination of course content between the two disciplines.

The proposed undergraduate model is interdisciplinary in nature, and may require resources from two or more departments or schools within a university. This is a very positive aspect of the model. Interdisciplinary programs between the departments within a university and between schools of business and other universities are highly encouraged by the American Assembly of Collegiate Schools of Business (AACSB) and other accrediting bodies in the US.[viii] In Europe, the proposed Postgraduate Curriculum in Information Security, Dependability and Safety is one example of universities sharing resources to offer postgraduate education in this field.

The courses to be offered in this proposed undergraduate model, besides the general business courses (i.e., business finance, business management, business communications) or the business core required, are classified into three groups: Accounting, Information Systems (IS), and Internal Auditing.

<u>Accounting</u>

Accounting Principles I
Accounting Principles II
Intermediate Accounting I or Management Accounting
Process Control/Internal Control
Accounting Information Systems

<u>Information Systems</u>

Introduction to Computers
Computer Programming
Systems Analysis & Design
Data Base Management Systems
Computer-based Communication Networks
Management of Information Systems

<u>Auditing</u>

Internal Auditing I
Introduction to Information Systems Auditing/CAATs
Special Topics (e.g., IS Integrity and Confidentiality, Audit Ethics)

Except for the "accounting principles" and "introduction to computers courses", which are normally taken within the common body of knowledge in any AACSB-accredited institution, all other courses are normally taken after the core portion of a business program. As mentioned earlier the core portion typically provides the student with a basic understanding of business/ commerce. Courses may include management/organizational behavior, finance, law, math and statistics, marketing, business ethics, international finance/business, accounting, information systems and business communications. Exhibit I (Page 22) displays an example of how an IS audit emphasis undergraduate curriculum can be structured in a simple sequencing appropriate for most US academic institutions. Some of the recommended courses to build IS audit skills are Accounting Information Systems, Management or Business Information Systems, Auditing, Process Control/Internal Control (a course which might focus on internal control theory and models and evaluation techniques [COSO, Cadbury, COCO, ISO9000, COBIT] and the Introduction to IS Audit/CAATs. The inclusion of a special topics course is to allow modification of coverage to encompass recent technological advances, contemporary business philosophies, international business systems, newer audit domains such as quality audits, as well as IS integrity and confidentiality issues. Audit ethics, not-for-profit issues and other topics such as business communications and project management are among the courses not covered sufficiently elsewhere.

In the computer programming course, languages such as C++, 4GL, COBOL or others are usually covered. An additional course might be desirable, although more advanced courses, such as computer based communications networks, can include additional technical or object-oriented programming languages such as JAVA or ActiveX. Furthermore, general knowledge of operating systems programming issues, client/server, the Internet/Intranet and other current global networking issues are important. IS related courses provide both exposure to, and awareness of, the complexities of information technology (IT) operations and the management of IT. For example, courses may include discussion on IT project management, and/or IT risk management, recognizing success and failure factors in IT related projects. Also, these courses would include modern emerging issues such as the technology enabled extended enterprise, electronic commerce and the Internet/Intranet.

The ISACF task force believes that the education received by these graduates will allow them to sit for more relevant professional examinations such as the Certified IS Auditor (CISA) (see Exhibit VII Page 67 and Illustrations III Page 20 and IV Page 21). Those that pass the CISA exam, must also meet the experience requirements before they can be awarded certification, and must continue to update their skills and knowledge level to maintain CISA certification by adhering to continuing education requirements.

The proposed curriculum is designed to educate IS auditors within the scope of a normal four-year undergraduate program. Within the US it appears that the accounting profession is heading toward a five-year, 150-hour program, and IS audit students wishing to become CPAs as well could take Intermediate Accounting II, Governmental Accounting, Tax Accounting and other courses within a five-year plan. To date more than 33 States in the US have passed the 150 hour requirement. With management consulting, Outsourcing, IS auditing, and security and control functions becoming a

larger percentage of a public accounting firm's revenue, such a university based program could provide these firms with employees capable of meeting these expanded services demands. Depending upon the university's basic study and business core requirements, a student may be able to take these courses as electives in a four-year program. Internationally, this requirement is not currently a factor. However, it is interesting to see organizations such as IFAC and IFIP examining the need for additional education in IT Audibility, Security and Control issues in their studies and reports.

A sample syllabus of the undergraduate version of the Introduction to IS Auditing/CAATs course is provided in Exhibit I (Page 22). At a minimum the content of this course should cover the most current CISA domains so that the student has a basic knowledge and awareness of the field. If course work can include simulated or actual IS audit projects that involve the use of CAATs, then the student can apply what has been learned. Also, through oral presentations and written materials (audit reports, working papers, write-ups, etc.), students can build their writing skills for documenting work performed and preparing reports to management. Presenting their results to a real or simulated board meeting or audit committee meeting can enhance the students' oral presentation skills. Finally, guest speakers or lecturers from local ISACA chapters, business and industry can add immense value to this and other courses by sharing their real world experiences. Such a curriculum at the undergraduate level can provide the basic IS audit skills and abilities (minimal experience) required to be competent and function as an entry level IS audit professional.

In lieu of the above, undergraduates who major in both accounting and information systems, or major/minor in both areas, can also be recognized as possessing the basic skills for entry into the IS audit profession. The "Introduction to IS Auditing/CAATs" course as a senior elective could be recognized as a capstone course for such an emphasis. Several universities cited earlier have been very successful in providing organizations and firms with new external and internal IS audit hires. A measure of success is the fact that employers for this career field continuously seek candidates from these universities and are active in providing speakers and funding for joint research/education.

Graduate Model

The proposed graduate model is designed for an individual interested in pursuing a graduate level degree in IS auditing. Typically, these candidates have studied and/or have 1-5 years experience in IS, accounting, business, commerce, finance or IT related engineering. At a minimum potential students qualified for participating in such a program should possess an undergraduate business-related degree in IS, accounting, commerce, finance or a combination of these. Students deficient either in business education or experience (such as non-IS related engineering, arts, etc.) would generally be required to take prerequisite IS, business or commerce courses typically expected of first-year graduate business students.

The courses/topics within this proposed program are classified into four sections:

- *Basic Understanding;*
- *Required IS Auditing Related Courses;*
- *Directed Electives;* and
- *Business Research Methods and Project/Thesis*.

The corresponding courses within each section are listed below.

Basic Understanding*	Weighted Unit
Information Systems Management	4
Auditing Practice and Theory	4
International Business/Business Organization/Finance	4
	8*

Required IS Auditing Related Courses	
Legal Environment of Information Systems	4
Information Systems Auditing/CAATs	4
Security and Privacy in Information Systems	4
Advanced Networks and Communications Issues	4
Advanced Information Systems Auditing	4
	20

Directed Electives (see Exhibit V, Page 65)	
Directed Elective I	1
Directed Elective II	4
Directed Elective III	4
	9

Business Research/Project Electives	
Business Research Methods	4
Business Research Project or Thesis	4
	8
	45

* Must take 2 of 3 based on undergraduate business degree.

Exhibit III (Page 31) shows the model curriculum for graduate IS auditing. Exhibit IV (Page 32) shows example syllabi for the IS audit core courses. Under the *Basic Understanding* section, students are required to take two courses from those available. However, the Computer Information Systems (CIS) degree holder cannot take Information Systems Management; the Accounting degree holder cannot take Auditing Practice and Theory; and the Commerce/Finance degree holder cannot take International Business or Business Organization/Finance Theory. This means IS graduates can take only "Auditing Practice & Theory" and "International Business" or "Business Organization/Finance Theory;" accounting graduates take only "IS Management" and "International Business" or "Business Organization/Finance Theory;" and international business/finance/commerce graduates can take only "IS Management" and "Auditing Practice and Theory." The purpose of these *Basic Understanding* courses is to build a base of common knowledge for IS auditing.

The second section, *Required IS Auditing-Related Courses*, consists of five IS auditing core courses. The five courses cover eleven areas, which can be identified within the domains of *COBIT: Framework* (see Illustration II Page 19) and the 1996 ISACA CISA examination domains (see Exhibit VII Page 67 and Illustration IV Page 21). These courses cover eleven areas recognizable in the IFAC study "The Impact of Information Technology on the Accountancy Profession" and the follow-on discussion paper "Minimum Skill Levels in Information Technology for Professional Accountants." Thus, the blend of accounting, business and IS education at the graduate level can enrich a person with the basic skills to perform in the area of IS auditing. The eleven areas to be included in the Required IS Auditing Related courses are listed below:

1. *Information technology and use;*
2. *Systems analysis, design, development, purchase and implementation;*
3. *Internal control and documentation of IS;*
4. *Data structures and data base concepts and management;*
5. *Information systems applications and processing cycles;*
6. *Management and monitoring of IS;*
7. *Computer programming languages and procedures;*
8. *Communications and networks;*
9. *Model based systems (decision support and expert systems);*
10. *Systems security and disaster recovery planning; and*
11. *Auditing of IS and it's role in business.*

A program beyond the bachelor's degree should be designed to satisfy the eight technical proficiency requirements[ix] below:

1. *Proficiency as an auditor;*
2. *Ability to review and evaluate IS internal control, management of IS project management, and recommend the extent of audit procedures required;*
3. *Understanding of IS system design and operations;*
4. *Knowledge of programming languages and techniques and the ability to apply computer assisted audit techniques and assess their results;*
5. *General familiarity with computer operating systems and software;*

6. *Ability to identify and reconcile problems with client data file format and structure;*
7. *Ability to bridge the communications gap between the auditor and the IS professional, providing support and advice to management; and*
8. *Knowledge of when to seek the assistance of an IS Professional*

The proposed program includes these proficiencies.

The model curriculum for IS auditing at the graduate level has also taken into account the technological challenges and issues involving improvement of oral and written communication abilities. IS auditors are constantly working with new technology. They cannot lose sight of the changing technology and its impact on the controls surrounding business functions. They need to be able to cope with the pace of rapid technological changes and to update themselves regularly with competent technical knowledge. The role of IS auditors and the basic audit methodologies remain unchanged. However, the IS auditor must understand the new technologies, be capable of determining their impact on the control process and audit procedures, and communicate clearly that evidence collection tools and techniques have been developed.

> "It is not enough that IS auditors have technical skills to successfully diagnose control issues or problems, but they must be able to communicate key issues to higher levels of management in oral and written form."[x]

As a result, the five required courses offer students basic, intermediate and advanced exposure to concepts and methodologies in the application of IS audit, security, and control knowledge, risk analysis and applicable laws and regulations, and technological challenges in IS auditing. The additional challenges come from having to communicate audit results to faculty and/or management, their project members and peers in an oral and written form, and meeting the professional demands placed on the IS auditor.

To the extent possible, team audit projects should be assigned in each of these required core courses so that students can gain IS auditing experience, such as developing audit steps and work papers, interviewing clients, putting together audit projects, planning for and using CAATs and presenting audit findings. This way the students will have actual hands-on audit experience and can improve their communication skills.

After the completion of the *Basic Understanding* section and the *Required IS Auditing Related Courses* section, students will be able to proceed to the third section, *Directed Electives*. At the end of this section, students will have gained substantial knowledge in the selected area of study (Exhibit VI Page 66). Notice that directed elective I is only weighted for 1 unit hour. This is because students are expected to develop a proposal for their research project. Students can take various approaches in achieving this one-unit course. Students already working in accounting, commerce, finance or IS can perform research on a topic within their workplace that examines IS internal control. Non-working students can take this opportunity to participate in an internship program in the related areas. Directed electives II and III require students to take courses relating to their research project topic or thesis. Directed electives can be

focused toward relevant support courses offered by other Universities or departments or off-campus distance learning.[xi]

The last section, *Business Research/Project Electives*, consists of a Research Project or Thesis, and Research Methods and Internal IS Control Application. The Business Research Methods and Internal IS Control Application course will provide the student training, direction and guidance in state of the art research/sampling tools, techniques, and methodologies. This course will assist in the development of their final research project or thesis as the terminal requirement for the graduate degree. The application of these tools, techniques and methods to complex environments can help the student better understand and apply these advanced concepts. A major advantage to the students conducting this research project is that they can begin to develop their specific industry expertise in IS auditing before they enter the profession.

Supplemental Skills

In addition to the specific courses listed in both the undergraduate and graduate Model Curricula, effective IS auditors possess a variety of skills which enable them to add value to their organizations and clients. Technical training does not fully prepare IS auditors for the communication and negotiation skills, among others, that are required for success.

These additional skills may be referred to as supplemental skills. The student who is seeking a degree in IS auditing, should consider completing a minimum of two of these courses as part of their elective or general business requirements if their curriculum has not included training and exposure to these skills. An example of these courses, and the specific skills they address is listed in Exhibit VI (Page 66).

The courses that address technical skills, in many cases, are concerned primarily with gathering and interpreting information from automated and manual systems. Many of the non-technical or supplemental skills are concerned with gathering information from and, of comparable importance, presenting information to, people. As such, these supplemental skills are readily transferable to other disciplines; e.g., finance, management and marketing. The final product IS auditors create is the information presented in their audit reports. If this information is not effectively and efficiently delivered, via solid oral and written communication skills, all value accruing from the audit process could potentially be lost.

Conclusion

The IS Audit Security and Control profession continues to evolve rapidly. The recent publication of COBIT is an example of the information technology control objectives confronting management, auditors, IS professionals and users. Universities must understand the needs of the professional community in order to provide them with graduates possessing the required skills and knowledge. A Model Curricula provides the universities with a basic framework of what education is required to develop the basic skills needed to be employable in the profession.

In the information based business environment, business professionals who are technically competent in IS, or IS specialists who understand the accounting, commerce and financial operations, are in great demand for IS auditing careers. The IS specialist and the IS auditor must continuously receive training to upgrade their knowledge, skills and abilities. Universities with the appropriate curricula can generate employable candidates for the IS Audit, Security and Control profession. A proactive university sponsored IS audit curricula at the undergraduate and graduate levels is very desirable to those professionals wishing to change their career path or upgrade their skills for job enhancement. The Model Curricula for IS Auditing Education at the Undergraduate and Graduate Levels should be viewed as a guideline and starting point, not an absolute criteria. The undergraduate and graduate model curricula provide a goal for universities worldwide to strive toward in meeting the demand for educating future IS auditing, security and control professionals.

In addition, these models can serve those who are interested in obtaining an IS auditing education as well as interested educational institutions worldwide which are developing curricula in IS auditing. The sample syllabi of courses identified (Exhibit II Page 23 and Exhibit IV Page 32) are offered as examples of what content and requirements courses may include or contain. They were provided by universities that have been successful in originating and maintaining IS programs at the undergraduate and graduate levels. Educational institutions outside the US may substitute sequence, courses and content with government, educational and other requirements/restrictions imposed within their particular environments.

[i] Weber, Ron. EDP Auditing Conceptual Foundations and Practices, (New York: McGraw-Hill, Inc. 1998), p. 16.
[ii] Ibid.
[iii] Ibid.
[iv] Ibid.
[v] Cangemi, Michael P. and Frederick Gallegos. "Computer Information Systems (CIS) Auditing: A Career Plan", New Accountant (February 1991), pp. 27-28.
[vi] Kneer, Dan, Josef Vyskoc, Dan Manson and Frederick Gallegos. "Information Systems Audit Education", IS Audit and Control Journal (1994) Vol. IV, p. 14.
[vii] Parker, Robert. "EDP Auditing: The Heights Still Have Not Been Reached", IS Audit and Control Journal (1994), Vol. IV, p. 10.
[viii] McCombs, G. and M. Sharifi. "Meeting the Market Needs: An Undergraduate Model Curriculum for IS Auditing", IS Audit and Control Journal (1997), Vol. 1, pp. 50-54.
[ix] Kneer, et al., *op. cit.,* pp. 13-20.
[x] Gallegos, Frederick. "A Decade of Excellence in EDP Audit Education", The EDP Auditor Journal (1991), Vol 1, p. 39.
[xi] Katsikas, S. K. and D. A. Gritzalis, eds., "A Proposal for a Postgraduate Curriculum in Information Security, Dependability and Safety", Athens, Greece: New Technology Publications, September 1995.

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Katsikas, Sokratis K. and Dimitris A Gritzalis, editors, "A Proposal for A Postgraduate Curriculum in Information Security, Dependability and Safety," Athens, Greece: New Technology Publications, September 1995.

Kneer, Dan, Jozef Vyskoc, Dan Manson, and Frederick Gallegos. "Information Systems Audit Education," IS Audit & Control Journal 1994, Vol. IV, pp. 1-20.

McCombs, G. and M. Sharifi "Meeting the Market Needs: An Undergraduate Model Curriculum for Information Systems Auditing," IS Audit & Control Journal , 1997, Vol. I, pp. 50-54.

Owen, Laura. "The Future of Information Systems Audit & Control," IS Audit & Control Journal, 1994, Vol. IV, pp. 62-67.

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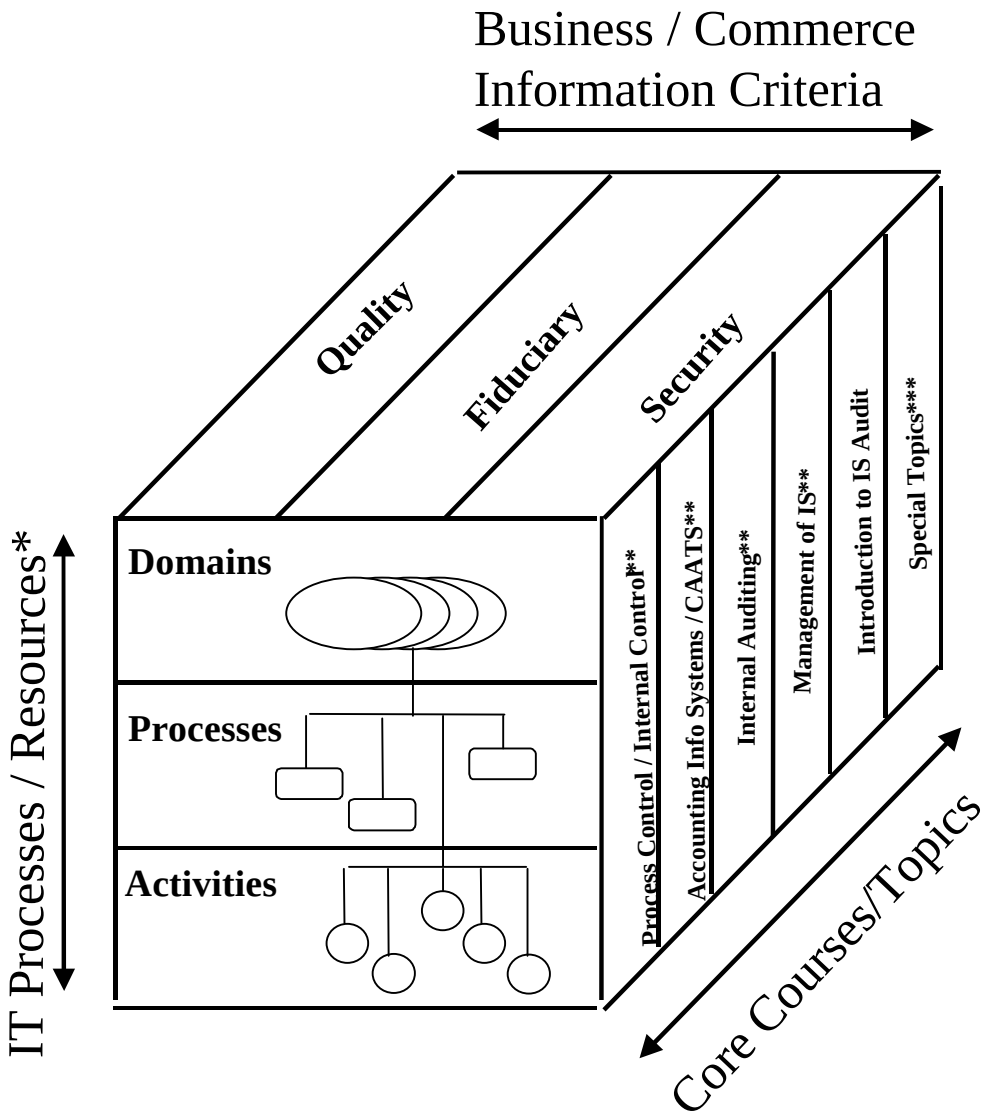
Stachtchenko, Patrick. "New CISA Exam Domains Emphasize IS Link to Business Objectives," *Global Communiqué,* 1995, Vol. V, pp. 2-3.

Weber, Ron. EDP Auditing Conceptual Foundations and Practice, New York: McGraw-Hill, Inc., 1988.

Illustration I:

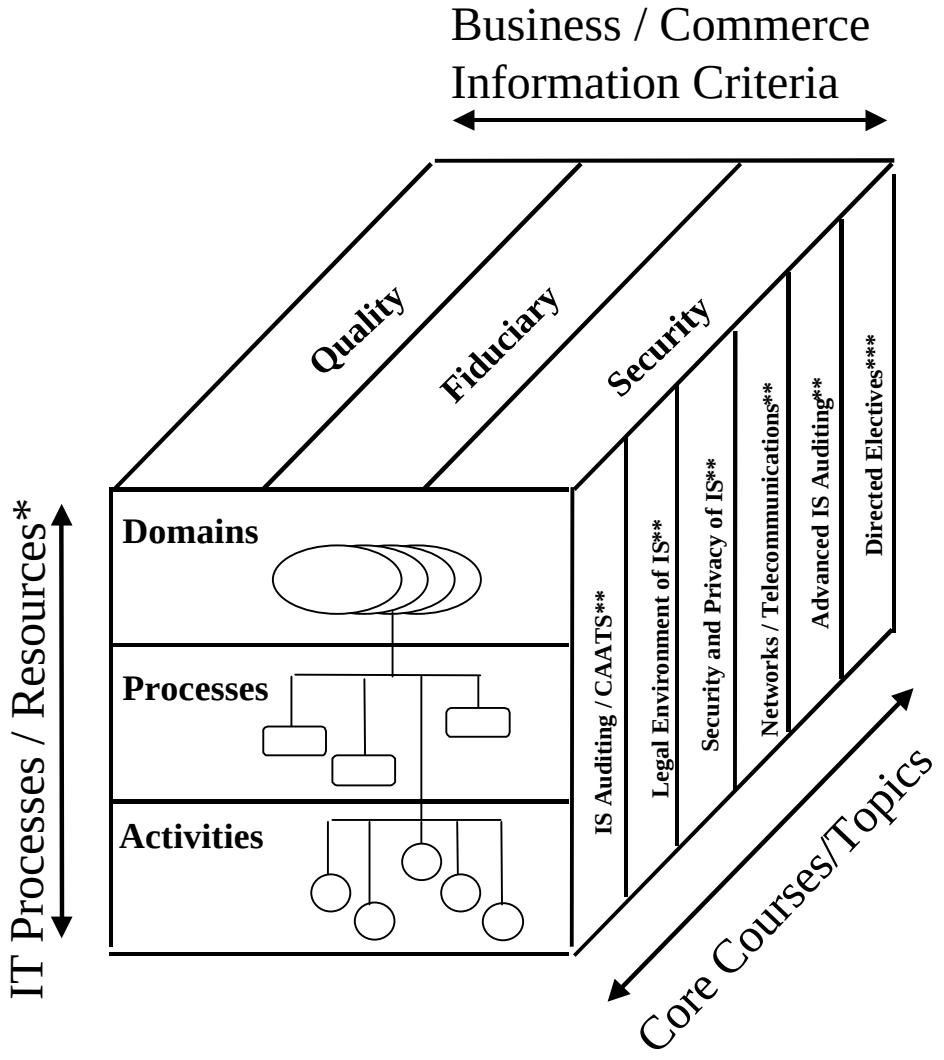
Relevance of Undergraduate IS Audit Model Curriculum to COBIT Conceptual Framework



* IT Resources involve people, application systems, technology, facilities, and data
** Courses offered within most universities may have different names or course titles
*** See Exhibit V

Illustration II:

Relevance of Graduate IS Audit Model Curriculum to COBIT Conceptual Framework



* IT Resources involve people, application systems, technology, facilities, and data
** See Exhibit IV
*** See Exhibit V

Illustration III:

Relevance of IS Audit Undergraduate Curriculum to 1996 CISA Examination Domains

Domain	Title and Description	Process Control/ Internal Control	Accounting Info Systems/ CAATs	Internal Audit	Mgmt of IS	Intro to IS Audit
10	Information Systems Audit Standards and Practice and Information Systems Security and Control Practices adheres to generally accepted information systems audit standards, statements and practices and information systems security and control practices.			X		X
20	Information Systems Organization and Management Analyses and evaluates the information systems (IS) strategy, policies and procedures, management practices and organization structures.	X	X		X	X
30	Information Systems Process Analyses and evaluates the information systems (IS) process, including hardware and software platforms, network and telecommunications infrastructure, operational practices, utilization of IS resources and business processes.	X	X		X	X
40	Information Systems Integrity, Confidentiality and Availability Analyses and evaluates logical, physical, environmental data validation, processing and balancing controls and the business continuity planning and testing process.	X	X	X	X	X
50	Information Systems Integrity, Confidentiality and Availability Analyses and evaluates logical, physical, environmental data validation, processing and balancing controls and the business continuity planning and testing process.	X	X		X	X

Source: Stachchenko, Patrick. "New CISA Exam Domains Emphasize IS Link to Business Objectives," *Global Communiqué*, 1995, Vol. V.

Illustration IV:

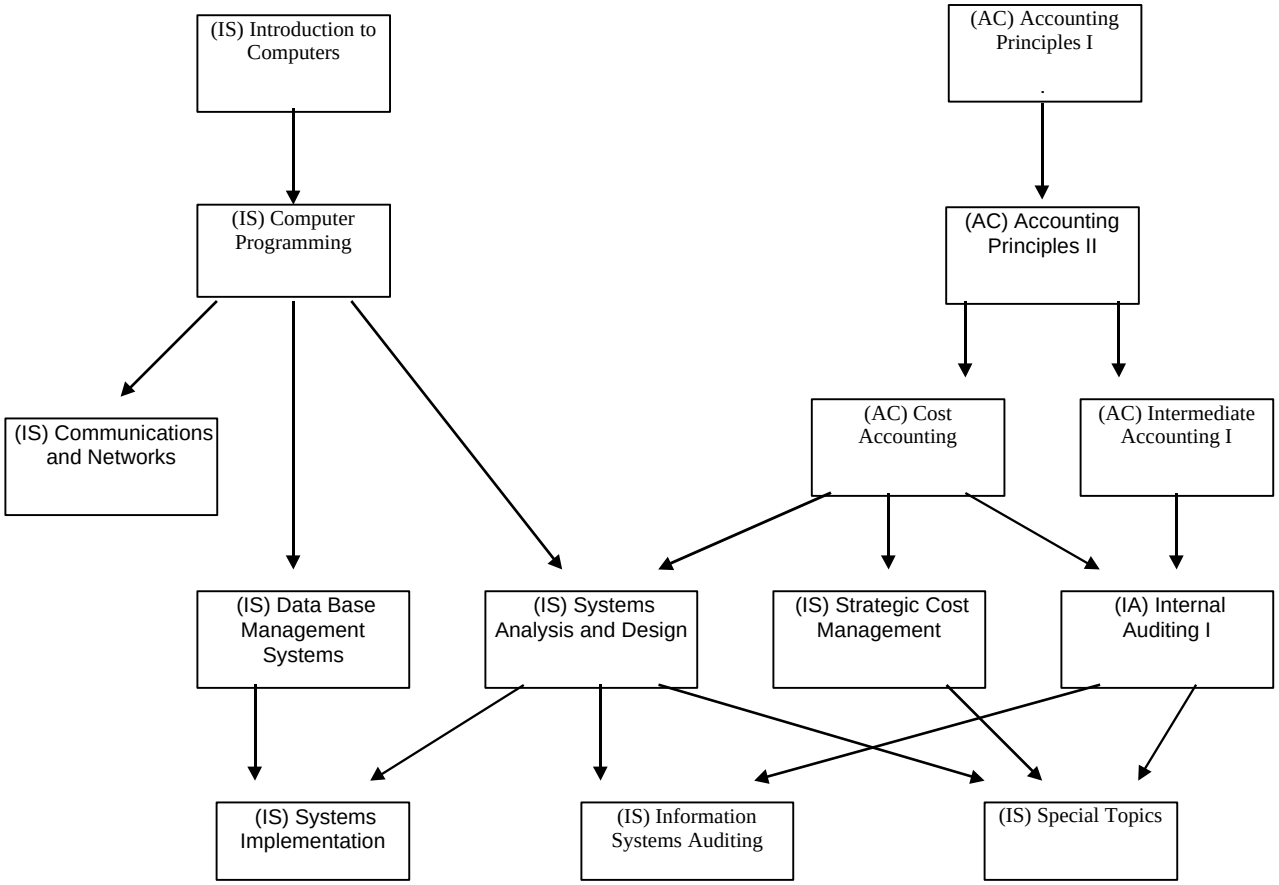
Relevance of IS Audit Graduate Curriculum to 1996 CISA Examination Domains

Domain	Title and Description	IS Audit/ CAATs	Legal Environment of IS	Security & Privacy of IS	Networks/ Telecom-munications	Advanced IS Audit
10	Information Systems Audit Standards and Practice and Information Systems Security and Control Practices Adheres to generally accepted information systems audit standards, statements, and practices and information systems security and control practices.	X	X	X	X	X
20	Information Systems Organization and Management Analyses and evaluates the information systems (IS) strategy, policies and procedures, management practices and organization structures.	X	X	X	X	X
30	Information Systems Process Analyses and evaluates the information systems (IS) process, including hardware and software platforms, network and telecommunications infrastructure, operational practices, utilization of IS resources and business processes.	X	X	X	X	X
40	Information Systems Integrity, Confidentiality and Availability Analyses and evaluates logical, physical, environmental data validation, processing and balancing controls and the business continuity planning and testing process	X	X	X	X	X
50	Information Systems Development, Acquisition and Maintenance. Analyses and evaluates the information systems (IS) development, acquisition and maintenance.	X	X	X	X	X

Source: Stachchenko, Patrick. "New CISA Exam Domains Emphasize IS Link to Business Objectives," *Global Communiqué*, 1995, Vol. V.

Exhibit I:

Structure of the Model Curriculum for an Undergraduate Program in Information Systems Auditing



Key
IS – Information Systems
AC – Accounting
IA – Internal Auditing

Exhibit II:

Sample Syllabi for Undergraduate Level IS Auditing Core Courses

Disclaimer: Syllabi provided only as an example of type of courses offered by universities to meet the level of training required

California State Polytechnic University, Pomona
CIS 433 - Introduction to Information Systems Auditing
Spring 1997 Syllabus

Professor: Daniel Manson
Office: CLA 98-C3-14

SECTION A

I. Catalog Description:

Fundamentals of EDP auditing. Understanding EDP controls, types of EDP Audits, risk assessment and concepts, and CAATs techniques used in EDP audits. Prerequisite: ACC 419 or CIS 406 or permission of instructor.

II. Required Background or Experience:

II.A. Prerequisites: ACC 419 or CIS 406 or permission of instructor.

II.B. Prerequisites Justification:

Problems and projects in the course require understanding of programming, systems analysis and design and auditing concepts.

II.C. General Education Contribution:

The student is expected to have the ability to express himself/herself both orally and in writing (ENG 104). The student also is expected to use basic analytical skills to develop relevant relationships among data. This capability would be enhanced through mathematics and statistics courses (STA 120 and MAT 125).

III. Expected Outcomes:

The student should be able to (1) understand the role of the EDP [IS] audit function, (2) the purpose of controls in a computer environment, and (3) skills required to perform EDP [IS] Audits.

IV. Text and References: [Textbook Decision: By Dan Manson]

*Current selection(s). Weber, Ron, EDP Auditing, Conceptual Foundations and Practice, McGraw-Hill, 1988.

V. Special or Unique Student Materials:

Access to microcomputer and/or mainframe audit software.

VI. Special or Unique University Facilities:

Access to microcomputer, VAX and/or IBM mainframe computer facilities.

VII. Expanded Description of the Course and Instructional Methods:

VII.A. Expanded Description of the Course:

The course focuses on the need for control and audit of computers involving the following areas:

- Organizational costs of data loss
- Incorrect decision making
- Computer abuse
- Value of computer hardware, software, and personnel
- High costs of computer error
- Privacy
- Controlled evolution of computer use

VII.B. Instructional Methods:

The delivery system throughout the course will be a combination of class discussions, computer audit assignments, and written and oral presentations. A limited amount of time will be devoted to lectures (i.e., transfer of knowledge).

VIII. Methods of Evaluating Outcomes:

Evaluation Tools: (The percentages reflect an approximation of the balance.)

- Research paper - 100 points - 25%
- Audit project - 100 points - 25%
- Midterm Examination - 100 points - 25%
- Final Exam - 100 points - 25%

Learning Domains (including primary features):

- Cognitive Domain: Knowledge, comprehension, application, analysis, synthesis, and evaluation.
- Affective Domain: Receiving, responding, and valuing

SECTION B

Preface: (Optional)

Module

Title/Theme of Meetings and Time Allotted:

1. Overview of EDP Auditing

Course introduction	15
Why computer systems need to be controlled and audited	15
The nature of EDP auditing and its objectives	15
How the use of computers impacts the system of internal controls within organizations	15
The effects of computers on the evidence collection and evidence evaluation tasks performed by auditors	15
How other disciplines have affected the theory and practice of EDP auditing	

2. Conducting an EDP Audit

Assignment of team audit project	15
How to break an EDP Audit up into parts in order to make each task manageable	15
The major steps to be undertaken during the conduct of an EDP Audit	15
The nature of management controls and application controls	15
The relationship between controls and expected losses	15
Some of the major decisions to be made during the conduct of an EDP Audit	15

3. Top Management and EDP Management

The roles that top management and EDP management play in achieving the objectives of asset safeguarding, maintaining data integrity, and ensuring system effectiveness and system efficiency	15
Why EDP Auditors evaluate top management and EDP Management during the conduct of an EDP Audit	15
The nature of the major functions performed by top management and EDP Management	15
Identifying the important controls exercised by top management and EDP Management and the exposures over which the controls reduce expected losses	15
How evidence can be collected on the reliability of the controls exercised by top management and EDP Management	15
Performing an overall evaluation on the reliability of the controls exercised by top management and EDP Management	

Title/Theme of Meetings and Time Allotted:

4. Systems Development

Ways in which the auditor may carry out an evaluation of the system development process	15
Why the auditor needs a normative model of the system development process	15
Why different normative models of the system development process may be appropriate at different times	15
The major phases in the system development process and the impact on each phase on the auditor's evaluation decision	15
The differences between an internal auditor's evaluation and external auditor's evaluation of the system development process	15
The impact that end-user system development has on the system development process and the implications of end-user system development for the conduct of the audit	

5. Program Management

Major phases in the program life cycle	15
Major exposures that exist in each phase, and controls that reduce expected losses from these exposures to an acceptable level	15
Issues involved in choosing an organizational structure for the programming team	15
Control problems when managing a system programming group and control measures that might be implemented	15
Software development aids and their importance from an audit viewpoint	15
Impact of high-level programming languages on the program life cycle and appropriate control and audit procedures	15

6. Data Resources Management

Data and database administration roles	15
Functions the data and database administration roles should perform	15
Distinguishing between data and database administration roles and functions	15
Where data and database administration roles should be placed within the organizational hierarchy	15
Use of a data dictionary/directory system in a database environment	15
Database administration control weaknesses and possible remedial measure	15

Title/Theme of Meetings and Time Allotted

7. Security Administration/Operation Management

Security administrator role and placement	15
Physical security threats and controls	15
Disaster recovery plan components	15
Major functions of operations management	15
Exposures in operations management	15
Controls in operations management	15

8. Boundary Controls

Functions performed by the boundary subsystem	15
Functions of an access control mechanism	15
Access control mechanism implementation	15
Cryptography and encryption	15
Digital signatures and authentication	15
Boundary control audit trail and existence controls	15

9. Input Controls: Validation and Error Control

Levels and types of input validation	15
Design and implementation of a data input validation program	15
Controls for submission and resubmission of data	15
Elements of a generalized data input validation system	15
Types of validation checks applied to instruction input	15
Preview of Midterm Examination	15

10. EDP Audit Management and Control Issues

Midterm Examination	100

11. Communication Controls

Threats and exposures in the communication subsystem	15
Component failure in the communication subsystem	15
Controls to reduce expected losses from component failure	15
Passive and active subversive threats	15
Controls to reduce expected losses form passive and active subversive threats	15
Audit trail and existence controls in the communication subsystem	15

Title/Theme of Meetings and Time Allotted

12. Processing Controls

Controls used to protect processing integrity	15
Controls used to protect processing data	15
Operating system security	15
Operating system integrity threats	15
Processing validation checks	15
Audit trail and existence controls in the processing subsystem	15

13. Database Controls

Database security policies and access control mechanisms used to implement policies	15
Application update and report protocols	15
Concurrency and deadlock problems and strategies	15
Use of cryptographic controls in the database subsystem	15
File handling controls	15
Audit trail and existence controls in the database subsystem	15

14. Output Controls

Motivations for inference controls in the output subsystem	20
Presentation controls	20
Production and distribution controls	20
Audit trail and existence controls in the output subsystem	30

15. Generalized Audit Software/ Other Audit Software

Capabilities and limitations of generalized audit software	15
Steps in managing generalized audit software	15
Problems in using generalized audit software	15
Capabilities and limitations of industry-specific audit software	15
Use of systems software and specialized audit software	15
Control and integrity issues in specialized audit software	15

16. Code Review, Test Data, Code Comparison and Concurrent Auditing Techniques

Program quality factors	15
Program source code review	15
Test data objectives and methodology	15
Code comparison objectives and methodology	15
Concurrent audit techniques	15
Advantages and disadvantages of concurrent auditing	15

Title/Theme of Meetings and Time Allotted:

17. Interviews, Questionnaires, Control Flowcharts and Performance Monitoring Tools

Preparing, conducting and analyzing and interview	15
Designing and using questionnaires	15
Constructing and using control flowcharts	15
Computer system object measurement	15
Characteristics of performance monitors	15
Strengths and weaknesses of performance monitors	15

18. Evaluating Asset Safeguarding and Data Integrity

Asset safeguarding and data integrity evaluation measures	20
Asset safeguarding and data integrity qualitative approaches	20
Asset safeguarding and data integrity quantitative approaches	20
Cost-effectiveness of asset safeguarding and data integrity evaluation	30

19. Information system goals

Information systems goals	15
Information system evidence collection	15
Global evaluation judgment on system effectiveness	15
System efficiency evaluation steps	15
System efficiency performance indices	15
System efficiency workload and system models	15

20. Organization and Management of the EDP Audit Function

Types of EDP Audit functions and number of EDP auditors required	15
Training requirements for EDP Auditors	15
Career paths for EDP Auditors	15
Changes in EDP Audit group objectives and tasks through group maturity	15
EDP Audit management software support	15
Review for final examination	

Exhibit III: Structure of the Model Curriculum for A Graduate Program in Information Systems Auditing

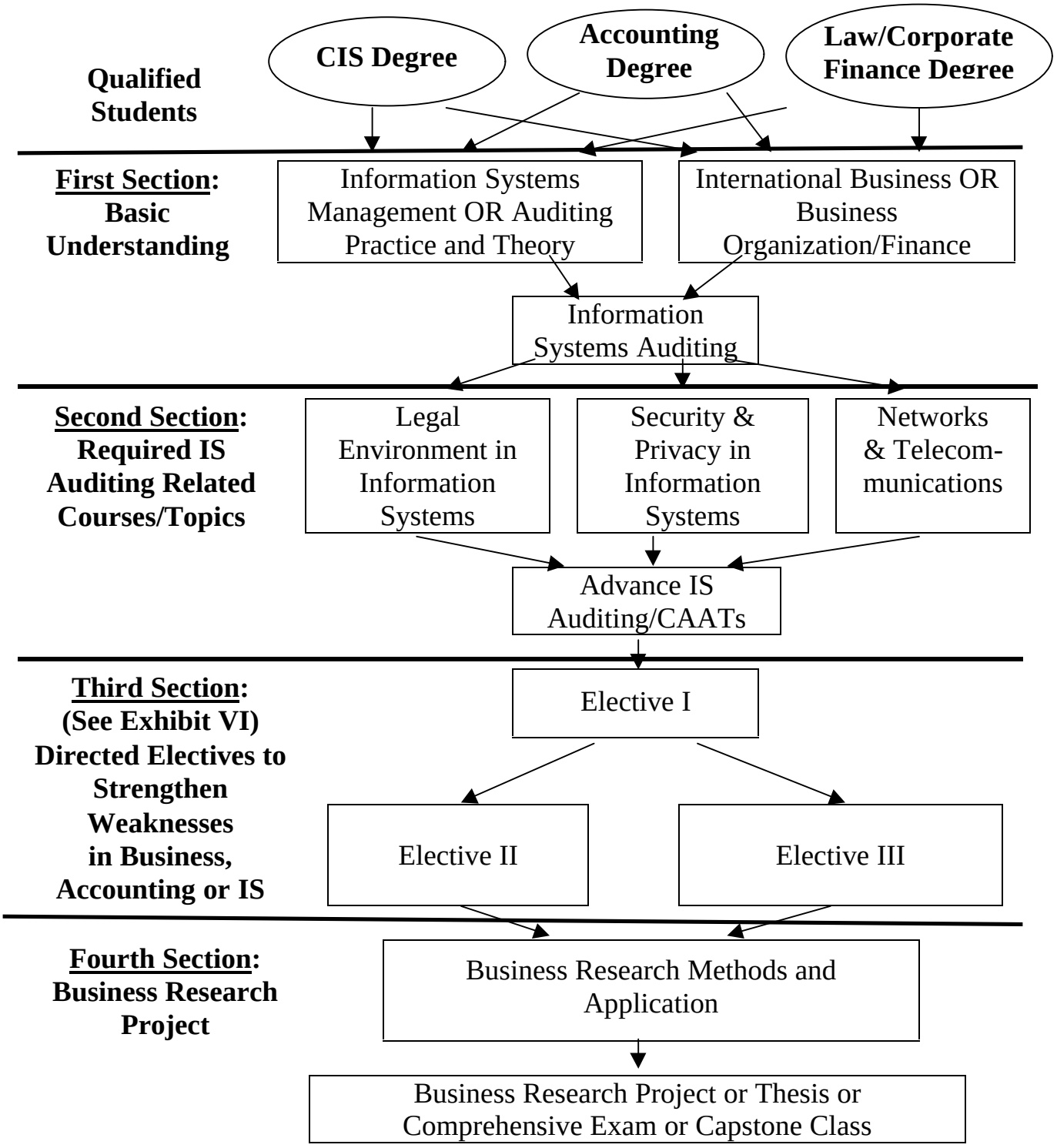


Exhibit IV:

Sample Syllabi For Graduate Level IS Auditing Core Courses

- IS Auditing
- Advanced IS Auditing
- Legal Environment
- Security and Privacy
- Communications and Networks

Disclaimer: Course Syllabi are provided only as examples of the type and structure academic courses given by universities to support training in this field

University of Arizona
ACC 591 - Computer Assisted Audit Techniques
Fall 1997 Syllabus

Professor: Dan C. Kneer, Former Director of Research, EDP Auditors Association

Classes: Acc 533 6:05-8:35 TBA 341 Acc 591 6:05-8:55 MBA 457
Texts: Reading Packet (required)
ACL for Windows (Version 3.4), User Guide for Windows, Workbook, Pocket Reference (all required), KPL (Kneer Personal Library, optional)

Course Objectives:

(1) To gain an awareness of various CAATs techniques
(2) To determine appropriate CAAT usage and opportunities
(3) To utilize specific CAATs software
(4) To explore future CAATs development

Assumed Knowledge:

As mature graduate students, it is assumed that you possess exposure to but not necessarily a working knowledge in the following accounting/computer areas:

Auditing	Data Processing	Microcomputers	Teleprocessing
Computer Networks	Database Management	Technical	Network Architectures
Ethics/Law	Systems	Writing (Turabin)	Current Technology

Prerequisite Class: ACC 481/450 (B or better) and/or ACC 533 (B or better)

Grade Allocation:			**Due Dates**:
	Class Participation, Discussion Leader	200	Various
	Midterm: CAATs Presentations (Cooperative learning: team projects [teams of 2]) (Case #1 = 100, Case #2 = 200, Case #3 = 100)	400	Various
	Final Exam: Case Application	150	October 18
	Term Project (Oral & Written) (Cooperative learning: team projects (3-4 people)	350	December 6
	TOTAL	1100	

Capped Enrollment:

Enrollment in this class has been capped to provide a seminar environment. Thus, much is expected of the student regarding class participation. You are expected to contribute to each and every class discussion, and come to class fully prepared. Be ready also to share your professional experience and exchange ideas. You will be a discussion leader for both cases and readings.

My Expectations Of Your Work:

You are graduate students. Therefore I expect you to be able to clearly analyze CAAT opportunities and the inappropriate mismatching of CAATs to audit objectives. You must be able to conceptualize future CAATs development.

Withdrawing From Class:

Withdrawing from the course will be in accordance with the *ASU Bulletin*. A "passing grade" in this course is an average of 60% or better on all exams and assignments to the withdrawal date.

Class Presentations:

You will make multiple computerized class presentations. Your grade on the efforts is primarily base upon the "cleverness" of your idea, how well developed it is, and you bridge to theoretical underpinnings of this course. We'll let the professor and the class vote on how "clever" you are.

Readings Leader:

Quite often one or more of you will be the discussion leader of a few reading or textbook cases. Please don't just rehash the paper or case; be analytical! Your duty is to 1) quickly explain the contents, and then to 2) relate the findings to our class. Do you agree with the author? Try starting your discussion with "What I found most intriguing about this article was."

Term Project:

The term project is the highlight of the course. Your term project may be (1) a major extension of a presentation from earlier in the year, (2) a new topic selected from the list below or (3) your own original idea. Regardless of its source, you must provide a brief written proposal prior to commencing your term project research.

1. Conduct a "benchmarking" of two similar CAATs (say FOCUS vs. ACL). Why do performance characteristics differ?

2. Review some of the newer packages (Crypto Boxes, Sniffers, Loggers, Hand Shakers, etc.).

3. The ACL developers acknowledge that it needs a more robust on-line tutorial. Since the ACL folks are friendly to ASU, critique their tutorial and develop a universally generic tutorial.

4. Write a case for the National Leagues' next team, the Phoenix Pharos. What issues should challenge an ACC 330 student as regards to state of the art technology and internal controls. Scannable (bar-coded) hot dogs! It could happen. Check out the Sky Dome. Assume management is a bunch of old baseball players!

5. Make a movie. That is, War Games, Sneakers, Jurassic Park and Demolition Man all had security as a main theme or in key snippets.

6. Build either a prototype test data generator or the world's most robust test data.

7. Nurture the trusted systems concept and develop a prototype A-1 rated access package.

8. Assume the psychological tests Keirsey Temperament Questionnaire and Myers & Briggs research are inadequate for determining computer cops and criminals. Develop your own questionnaire. What theory(ies) is it based upon?

9. Develop encryption software using your own algorithm. Can it be cracked easily?

10. Are relational databases "securable" if logical deductions remain? Can you develop a model which decomposes a database into securable chunk?.

11. The ultimate CAAT would be a "reverse compiler". A package exists (called, I think, REVERSE IT). Obtain and critique this package. Does it work?

12. Obtain Rodney Kidders "EDP audit templates". Do they have academic usage?

13. Is PC-SAS friendly enough? As opposed to the old days when we wrote JCL. What would be your GUI?

14. Develop the ultimate readings list for this course. Why are your readings better than mine? What are your objectives?

15. 15. Assist in the analysis of various statistical sampling packages (FOC-AUDIT, F-DOT, TVA, etc.) Note, you must have a very strong knowledge of statistical theory. For instance, you could test multiple packages against multiple distributions and view "n".

16. Assist in the development/review of several regression packages. (FOCUS, PC-SAS, EXCEL, BURDICK).

17. Design a vehicle for an "electronic readings list" for grad courses.

18. Design a electronic vehicle for unobtrusively voting "clever" on student presentations in this course.

19. You locate, acquire and demo software potentially useful for auditors. Be open minded. SMF, Code Compare and DCDIII weren't developed for auditors! Hint: Look at the ads in BYTE, PC Week, etc.

20. Obtain three microcomputer-based access security packages. Evaluate these three. What are your criteria?

21. Utilizing stepwise regression, or discriminate analysis (dummy variable is failed/non-failed audits) develop an audit risk model.

22. The Los Angeles Police Department, and others in criminal investigations, are really concerned with the evidentiary issues (and potential peripheral danger) of search and seizure of computerized records. Develop an audit program, extremely detailed in procedures, for search and seizure in say, a hacker billboard or in.....

23. As the accounting procedure become almost totally computerized, a mathematical technique called topological sorting may be extremely relevant as a control analysis tool. Re-visit this technique. Could it assist you as a CAATs tool? Also see Willingham and Parks (CPA Journal) re "boundaried."

24. Has DB2, RACF or anything adequately handled the deductive security issues raised in the Thuraisingham or Wiseman readings?

25. Program maintenance is one of the two biggest security threats of all time. For an MVS5ype operating environment (only) obtain Change Action and demo it to the class.

Article Synopsis:

During the semester you will be spending a significant amount of time in Hayden and Nobel Libraries. You may extract (full text) and synopsize up to three great papers that you read this semester (not in your reading packets). This effort will assist all future CAATs classes. You may turn them in one at a time, or preferably, all at once, for 30 total points of extra credit. Please turn in full copy of article.

> You will present your term project in class during the last two weeks of the semester. Your presentation should last 28 minutes (I will bring an alarm clock to class.) Please only speak for 20 minutes. Reserve 4 minutes for Dr. Dan's questions and 4 minutes for class questions. See me before class if you need overheads made. Also plan to turn in a very professional written report. Your report is due December 6.
>
> Your term project grade is based upon 1)the report's content and writing style (67%) and 2) the in-class presentation (33%). Additionally, your term project grade received a "degree of difficulty" multiplier from the old professor. That is, you are rewarded for tackling mentally tough projects, and conversely..(I am very unimpressed by prior effort at the graduate level). Please provide a detailed table of contents.

Hint:

- Try to "see your presentation" as you plan your project. What are the hypothesis, tables and conclusions.
- Most students in Acc 533 used PowerPoint or toolbook for their presentation.
- If your presentation uses multiple speakers, budget your time extremely well.

Limit: the page limit, on the textual portion of your term paper, is 22 pages.

Date	Topic(s)	Software(s)	Reading(s)	LCD Panel	Bring Lap-top
Aug 22	Introduction to course, Presentation Graphics Software, Metric Building, Mini-Max, CAATs: Regression Analysis	E-Mail, Compel, Tool Book, Power Point, Excel, Vision Quest, PC-SAS, Ethernet	Wallace, Mercer	X	
Aug 29	CAATs: Risk Analysis Software	Boeing, IIA	Neim and Teed, Reding and DiGriolamo	X	
Sep 5	Labor Day		Rent "Sneakers", "War Games", "True Lies"		
Sep 12	Student Presentations (#1) of Clever Regression and Risk Applications	Excel, PC-SAS	n/a	X	X
Sep 19	CAATs: Generalized Audit Software	ACL, FOCUS	n/a	X	
Sep 26	CAATs: Data Retrieval, Data Manipulation	ACL, FOCUS	n/a	X	X
Oct 3	CAATs: Advanced Techniques (Programming), Multi-File Applications	Test Data, Embedded Modules	n/a	X	X

Oct 10	Student Presentations (#2) of Clever GAS Applications (Test Data, Embedded Modules)	ACL, FOCUS, PC-SAS	n/a	X	X
Oct 17	CAATs: Program Documentation and Maintenance	Reverse-it, DCDIII, PC Compare, PC Tools, Flowcharter	Wadwha, Gilhooley	X	
Oct 24	CAATs: Access Control, LAN "Sniffers", Let's Play Offenders and Defenders	Encryption, Watch Dog, Keystroke Logger	Evans, Wiseman,	X	
Oct 31	CAATs: Field Trip to SRP	SMF, RACF, CA Compare, PanValet DB2	Al-Saffar	n/a	
Nov 7	CAATs: Technology and Audibility Issues; Information Highway: Issues and Opportunities (Encryption and Data Mining) and DB2	Test Data thru PC-Mainframe, Mosaic	Kaliski, Begley and Liu, Bulkeley, Thuraisingham	n/a	X
Nov 14	Team Meetings and Consultation Re: Term Project	n/a	n/a	n/a	
Nov 21	The Computer Auditor and the Psychology of Computer Criminals, Actual Taking of Psy Test, Student Presentations (#3) of DB2. Logical Inference Issues and Information Robustness	Psychological Testing	Myers-Briggs Test	X	
Nov 28	CAATs Round Table, Laws and Criminals: Don Staggs, FBI, Gail Thackery, Cyberpunks	Virus Footprint(s) and Detection Software	Elmer-Dewitt,	n/a	
Dec 5	Student Presentations of Term Projects	Who Knows!	n/a	X	
Dec 12	FINAL EXAM	n/a	n/a	n/a	

California State Polytechnic University, Pomona
GBA 560 - Legal Environment of Information Systems
Winter 1997 Syllabus

Professor: Frederick Gallegos
Office: CLA 98-C4-23

SECTION A

I. Catalog Description:

Fundamentals and intermediate knowledge of the legal environment concerning Information Systems. Typical legal problems arising from the acquisition, use and control of Information Systems. 4 lecture-discussions. Prerequisites: CIS 433 and GBA 530.

II. Required Background or Experience:

II.A. Prerequisites: CIS 433, IS Auditing and GBA 530, Legal Environment of Business.

II.B. Prerequisites Justification:

This course is a required core course for Graduate Students in the MSBA - IS Audit option. Students are expected to have an undergraduate level business law class (GBA 530) and base level knowledge of auditing computer information systems (CIS 433).

II.C. General Education Contribution:

This is a graduate level course designed to provide the MSBA - IS Audit graduate an understanding of current legal issues impacting the information systems environment.

III. Expected Outcome:

This course is intended to provide the student with a fundamental working knowledge of a number of legal areas of the computer industry. The course will stress the area of contract contents and interpretation, tort liability including negligence and misrepresentation in the computer industry and intellectual property rights analysis, including a survey of the areas of copyright, patent and trade secrets and trade mark law.

It is hoped that the student would obtain a fundamental knowledge of the legal concepts involved such that as problems arise, the student will be able to recognize, in a working environment. that legal issues must be addressed.

IV. Text and References: [Textbook Decision: By Department Committee]

- Computer Law (Cases-Comments-Questions), Maggs, Peter B., Soma, John T. and Sprowl, James A. West Publishing, 1992.
- Protecting Your Proprietary Rights, Marzouk, Toby B., Computer Society Press, Wash, DC, 1988.

V. Special or Unique Student Materials:

Access to electronic mail and computer facilities and resources.

VI. Special or Unique University Facilities:

Computer facilities with Access to the Internet, use of support tools such as Mosaic and Netscape highly recommended

VII. Expanded Description of the Course and Instructional Methods:

VII.A. Expanded Description of the Course:

This course is a required course for Graduate students in the Masters of Science in Business Administration (Option - IS Audit) and one of the four key areas of testing and evaluation for the Comprehensive Graduate Examination. This course covers the comprehensive area of legal issues impacting computer information systems and those who use such systems.

This course covers in content, current issues in contracting for computer goods and services, including hardware, software and information system services. Legal issues in Trade Secret, Copyright and Patent protection is examined in the form of case studies from current and recent cases. In addition, legal issues in Employment contracts for computer information systems services are studied.

Under current events, protection of the computer industry through recent marketing protection laws and regulations is explored, as well as issues surrounding Import, Export and Taxation laws and rulings. Also, covered in this course are special issues involving information transfer and recent legislation impacting computer information security and privacy.

Computer crime and ethics is also explored in depth through case studies and examination of past and recent laws and court rulings on this issue.

VII.B. Instructional Methods:

The delivery system throughout the course will be a combination of class lecture, written and oral presentations, and class discussion.

VIII. Methods of Evaluating Outcomes:

Evaluation Tools:

- Examinations (midterm and final) [50%],
- Writing Assignments on approved topic (Term Paper) [25%],
- Quizzes/Computer Research assignments/Cases [25%].

Learning Domains (including primary features):

- Cognitive Domain: Knowledge, comprehension, application, analysis, synthesis, and evaluation.
- Affective Domain: Receiving, responding and valuing.

SECTION B

Title/Theme of Meetings and Time Allotted:

1. Orientation/Introduction & CIS Contract Issues

Course Organization and Requirements	100
Contracts In CIS	30
Contract Issues - Hardware	50
Case Study - Hardware Contract	20

2. CIS Contracts Issues (Cont.)

Contract Issues in Software	50
Contract Issues in Contracting for Services	50
Case Study - Software	30
Case Study - CIS Services	30
Contracting Issues in Firmware	40

3. CIS Contracts Issues (Cont.)

Case Study - Firmware	20
Contract Issues in Government Contracts	50
Technical Data - Governments Rights	30
Case Study - Federal Government Contract	30
Legal and Audit Issues with regard to contracts	30
The Regulatory Process	40

Title/Theme of Meetings and Time Allotted:

4. Trade Secret Protection & Copyright Protection

Recent Legislation - Trade Secret & Copyrights	30
CIS Issues regarding Trade Secrets	20
CIS Issues regarding Copyrights	50
The Trade Secret Process	30
Recent Case Law - Trade Secrets/CIS	20
The Copyright Process	30
Recent Case law - Copyrights/CIS	20

5. Review of CIS Contract Issues, Copyrights, Trade Secrets and Marketing Protection

Midterm Examination (excluding Marketing Protection)	100
Legal Issues concerning Marketing Protection	30
Hardware and Firmware Issues	30
Software Issues	40

6. Import/Export/Taxation Issues

CIS Hardware, Software & Firmware Import Issues	30
CIS Hardware, Software & Firmware Export Issues	30
Case Studies - Import & Export Issues	40
CIS Taxation Issues (Hardware, Software, Servers)	40
Case Studies- CIS Taxation Issues	40
Current Laws Impacting Import/Export/Taxation	20

7. Legal Issues Impacting CIS Security

Overview of Recent Federal Laws Regarding Computer Security	35
Role of CIS Security: Private, Public & International Institutions	25
Legal Issues Involving CIS Security Requirements over Hardware, Software,	50
Firmware, Services and Information	40
Case Study - Computer Security	50
International Laws regarding Computer Security	

Title/Theme of Meetings and Time Allotted:

8. Legal Issues Impacting CIS Privacy

Overview of Recent Federal & International Laws Regarding Information Privacy	50
Role of CIS Privacy: Public, Private & International Concerns	30
Legal Issues Involving Information Privacy Requirements over Services & Information	30
Case study - CIS Privacy	30
Discussion of Today's Information Highway Structure and Risks to Users	30
Case Study - Internet	

9. Computer Crime

Overview of Recent Federal and Int'l Laws Passed	50
Regarding Computer Crime	30
Types of Computer Crimes	30
Case Study - Computer Crime/Hardware	30
Case Study - Computer Crime/Software	30
Case Study - Computer Crime/Information	30
Case Study - Computer Crime/Services	

10. Computer Crime (Continued) and Course Overview

Recent Case Law and Actions - Computer Crime	30
Current Legislation Pending	20
Computer Ethics, professional Ethics as a Deterrent to Computer Crime	50 100
Course Overview - Discussion and Analysis	

California State Polytechnic University, Pomona
GBA 578 - Information Security and Privacy
Winter 1997

Professor: Daniel Manson
Office: CLA 98-C3-14

SECTION A

I. Catalog Description:

Concepts of information security and privacy. Understanding information protection, physical and logical security of information systems

II. Required Background or Experience:

II.A. Prerequisites: CIS 433 IS Auditing and GBA 578 Advanced IS Auditing or permission of instructor.

II.B. Prerequisites Justification:

This course is a required core course for Graduate Students in the MSBA - IS Audit option. The students are expected to have a base level knowledge of auditing computer information systems (CIS 433) and knowledge of advanced concepts in IS Audit (GBA 577)

II.C. General Education Contribution:

This is a graduate level course designed to provide the MSBA - IS Audit graduate an understanding of security and privacy issues impacting the information systems environment.

III. Expected Outcome:

The purpose of the course is to introduce students to security and privacy issues at two levels. The textbook provides a view of information protection issues from a management viewpoint. The audit project will give students an opportunity to translate information protection requirements from management theory to a practical level by reviewing access controls in an actual computer system.

IV. Text and References: [Textbook Decision: By Dan Manson]

- Current selection(s): DeMaio, Harry B., *Information Protection and Other Unnatural Acts*, AMACON, 1992.

V. Special or Unique Student Materials:

Kocot, Rodney, *Audit and Control of VAX/VMS Systems*, 1992.

VI. Special or Unique University Facilities:

Computer Accounts on the Campus Academic VAX System

VII. Expanded Description of the Course and Instructional Methods:

VII.A. Expanded Description of the Course:

This course is a required course for Graduate students in the Masters of Science in Business Administration (Option - IS Audit) and one of the four key areas of testing and evaluation for the Comprehensive Graduate Examination.

This course covers concepts of information security and privacy. Understanding information protection, physical and logical security of information systems.

Each student is assigned a chapter of the textbook to present in class. The student leads a class discussion on the chapter assigned. A written report on the chapter and discussion is also required.

Students gain hands-on audit experience through an access controls review of a Cal Poly computer system. This is a team project with each team consisting of three to four members.

Each team conducts the audit phases of preliminary review, audit program development, audit fieldwork, preparation and presentation of an audit report to the auditee.

VII.B. Instructional Methods:

The delivery system throughout the course will be a combination of class discussion, class lecture, and written and oral presentations. A limited amount of time will be devoted to lectures (i.e., transfer of knowledge).

VIII. Methods of Evaluating Outcomes:

Evaluation Tools:

1. Examinations (midterm and final 50%)
2. Individual Writing Assignments and Class Presentation (25%)
3. Audit Project (25%).

Learning Domains (including primary features):

1. Cognitive Domain: Knowledge, comprehension, application, analysis, synthesis and evaluation
2. Affective Domain: Receiving, responding and valuing

SECTION B

Title/Theme of Meetings and Time Allotted:

1. Orientation/What is Information Protection/Changes in Information Processing Technology

Orientation/Introduction	20
Chapter Descriptions/Assignments	30
Team Project Description/Assignments	30
What is Information Protection	60
Changes in Information Processing Technology	60

2. What are you protecting/Who and what are you protecting against? /Team Project Meetings

What are you protecting? – presentation	20
Who are you protecting against? – presentation	20
What are you protecting? – discussion	30
Who are you protecting against? – discussion	30
Team Project Meetings with Audit Manager (Instructor)	100

3. Who's Involved in Information Protection/Getting Support for Your Information Protection Program/Preliminary Survey Review

Who's Involved in Information Protection – presentation	20
Getting Support for Your Information Protection Program –presentation	20 30 30
Who's Involved in Information Protection – discussion Getting Support for Your Information Protection Program – discussion Team Project review of preliminary survey with Audit Manager (instructor)	100

Title/Theme of Meetings and Time Allotted:

4. Pre-Program Development Considerations/Planning, Developing, and Implementing a Protection Program/Midterm Assigned/Audit Program Review

Pre-Program Development Considerations-presentation	20
Planning, Developing, and Implementing a Protection Program - presentation	20 30
Pre-Program Development Considerations-discussion	30 20
Planning, Developing, and Implementing a Protection Program - discussion	80
Midterm Assigned	
Team Project Meetings with Audit Manager (Instructor)	

5. Elements of an Information Security Program/Elements of a Continuity Program/Team Project Meetings

Elements of an Information Security Program - presentation	20 20
Elements of a Continuity Program – presentation	30
Elements of an Information Security Program - discussion	30 100
Elements of a Continuity Program - discussion	
Audit Program Review with Audit Manager (Instructor)	

6. Managing an Ongoing Program/Minimizing Bureaucracy/Team Project Meetings

Managing an Ongoing Program – presentation	20
Minimizing Bureaucracy – presentation	20
Managing an Ongoing Program - discussion	30
Minimizing Bureaucracy - discussion	30
Team Project Meetings with Audit Manager (Instructor)	100

Title/Theme of Meetings and Time Allotted:

7. Using Architectures to Develop Well-Protected Information Security Systems/Information Ethics/Team Project Meetings

Using Architectures to Develop Well-Protected	20
Information Security Systems – presentation	20
Information Ethics – presentation	30
Using Architectures to Develop Well-Protected	30
Information Security Systems – discussion	100
Information Ethics – discussion	
Team Project Meetings with Audit Manager (Instructor)	

8. Awareness and Training/Dealing With Hackers, Viruses and Other Attacks/Team Project Meetings

Awareness and Training - presentation Dealing	20
With Hackers, Viruses and Other Attacks	20
Awareness and Training – discussion	30
Dealing With Hackers, Viruses and Other	30
Attacks- discussion	100
Team Project Meetings with Audit Manager (Instructor)	

9. Dealing With Computer Fraud, Disclosure, and Illegal Copies/Dealing With External Entities/Audit Project Presentations

Dealing With Computer Fraud, Disclosure, and	20
Illegal Copies - presentation	20
Dealing With External Entities – presentation	30
Dealing With Computer Fraud, Disclosure, and	30
Illegal Copies- discussion	100
Dealing With External Entities – discussion	
Audit Project Presentations	

10. Laws, Regulations, and Compliance/The Future of Information Protection/Review for Final

Laws, Regulations, and Compliance	20
The Future of Information Protection	20
Laws, Regulations, and Compliance - discussion	30
The Future of Information Protection –	30
discussion	100
Review for Final	

Georgia State University
Accounting 863 - IS Auditing
Winter 1997

Professor:	Dr. A. F. Borthick
Office:	BA 545
Office Hour:	3:45-5:15 pm Tu./Th., by appointment, by email
Class Meetings:	320 General Classroom Building 7:55-10:10 pm

Policies: Assignments, Activities, and Participation

The schedule following shows topics, readings and due dates. Readings for each day are listed separately. Study the readings and the accompanying questions in advance of the class for which they are assigned.

Course Objective:

To develop competence in information systems (IS) auditing (the audit and control of computer-based information systems) by focusing on the design and implementation of audit approaches in automated settings.

Prerequisites:

Ac 431 and Ac 461 or CIS 812; CSP; 1, 2, 3, 4, 5, 6. If you need more experience with a database system, GSU's Wells Computer Center is offering an Advanced Paradox class on January 17, 9am-4pm.

Text:

Articles and other materials as indicated below in the list by day.

Current reading:

- Daily:
- Weekly and monthly: Business, accounting and computing periodicals.

Participation:

Participate in class discussions, including commenting on other groups' assignments and projects.

Writing:

Your writing matters; its quality will affect your grade. Spelling and grammar checking features of word processing programs can help you identify possible weaknesses in your writing and improve it.

Grading: Graded work will be weighted as follows:

Exam 1	5%
Audit plan: Policy Churning	5%
Audit plan: Barings	5%
Exam 2	10%
Paper	20%
Project	20%
Exam 3	25%
Participation	10%
	100%

Audit Plan: Insurance Agent Policy Churning

Purpose*:* The purpose of the audit plan on insurance agent policy churning is to develop your skills in (1) recognizing applications that could (and should) be audited via IS auditing, (2) developing audit objectives for a specific purpose in a reasonably well-defined environment, (3) designing the audit plan to achieve the audit objectives, (4) working in a group toward a common goal, and (5) presenting the results of your efforts in oral and written form.

Required: Read the following article for background:
Scism, L. 1995. "Some agents 'churn' life insurance policies, hurt their customers." (1/3), A1, A4

In a group of students, document (only to the extent required to support your audit plan) a potential computer-based insurance policy information system, develop audit objectives for detecting insurance agent policy churning, design an audit plan to achieve the audit objectives, and present the results of your audit plan in class.

Grading: The project will be graded on its scope, comprehensiveness, suitability for the intended purpose, feasibility, and likelihood of accomplishing the audit objectives
Audit Plan: Barings PLC

Purpose*:* The purpose of the audit plan on Barings PLC is to develop your skills in (1) recognizing applications that could (and should) be audited via IS auditing, (2) developing audit objectives for a specific purpose in an ambiguous environment, (3) designing the audit plan to achieve the audit objectives, (4) working in a group toward a common goal, and (5) presenting the results of your efforts in oral and written form.

Required: Read the following articles for background:

1. Brauchli, M. W., Bray, N., and Sesit, M. R. 1995. "Barings PLC officials may have been aware of trader's position. (3/6), A1, A7.

2. Brauchli, M. W. 1995. "Many who knew Barings PLC suggest firm wasn't model corporate citizen" (3/8), A16.

3. Kolman, J. "Never trust a trader" *CFO*(May), 12.

4. "Barings backlash" 1995. *CFO*(May), 23.

5. Bray, N. 1995. "Barings failed to react to warning preceding collapse, evidence suggests."(7/7), B3A.

6. Seeger, C. M. 1995. "How to prevent future Nick Leesons" (8/8), A13.

7. Bray, N. 1995. "Leeson says losses at Barings started with bailout of errors by colleagues."(9/11), A16.

In a group of students, document (only to the extent required to support your audit plan) a potential computer-based trading system, develop audit objectives for detecting excessively risky trading, design an audit plan to achieve the audit objectives, and present the results of your audit plan in class.

Grading*:* The project will be graded on its scope, comprehensiveness, suitability for the intended purpose, feasibility, and likelihood of accomplishing the audit objectives.

Project: An IS Audit

Purpose: The purpose of the group project is to develop your skills in (1) recognizing applications that could (and should) be audited via IS auditing, (2) developing audit objectives for the audit. (3) designing the audit program to achieve the audit objectives. (4) implementing an IS audit program. (5) working in a group toward a common goal, and (5) presenting the results of your efforts in oral and written form.

Required: In a group of students, document (only to the extent required to support your audit program) a real or imaginary computer-based information system, develop audit objectives for the application, design an audit program for the application, implement the audit program with software available at GSU, and present the results of your project in class. Each group member must participate in the presentation.

Each group will present its project idea to the class (5 minutes or less) no later than February 15. The reason for this preliminary presentation is to help the group prepare a better project by having had comments from other class members and the instructor.

On the presentation date, submit the following written materials:

1. Executive summary of the conclusions of the audit
2. Statement of the overall audit purpose and the audit objectives that support it.
3. Documentation of the system being audited
4. Audit plan indicating how each objective is to be achieved
5. Listing of the computer code required to implement the audit plan
6. Sample results from having executed the audit plan
7. List of references

***Grading**:* The project will be graded on its scope, comprehensiveness, suitability for the intended application, feasibility, and likelihood of accomplishing the audit objectives.

Paper: Developing an IS Audit Idea

Purpose: The purpose of the paper is to develop your skills in (1) identifying IS audit issues important to people concerned about audit and control of information systems, (2) developing an IS audit idea into a manuscript, (3) working in a group toward a common goal, and (4) presenting the results of your efforts in oral and written form.

Writing for publication is important for business professionals because having one's work published establishes one's expertise in the subject and one's competence as a communicator. Writing for publication helps one develop the writing skills needed to write better audit reports that have clear and interesting presentation of technical material. Being recognized as an expert is crucial for career advancement.

***Required**:* In a group of students, identify a topic related to IS auditing that is important to people concerned about audit and control of information systems, develop the topic into a manuscript suitable for publication in a nationally distributed journal or magazine for a professional audience, and present the results of your efforts to the class. Each group member must participate in the presentation. The paper may be related to one of the audit plans or to your project.

Reading current business periodicals such as the *Wall Street Journal, Fortune, Forbes, Business Week, etc.* will help you identify topic that are interesting, relevant, and timely. Reading recent issues of publications such as *IS Audit & Control Journal* (formerly *EDP Auditor Journal*), *Computer Security Journal*, EDPACS, *Journal of Systems Management, Management Accounting, Journal of Accountancy, CPA Journal, Internal Auditor*, and *Journal of Cost Management* and *Computerworld* will help you decide which of the interesting topics have not been adequately covered in accounting/auditing publications.

The reason for selecting a magazine or journal is to help you focus on a specific topic for a specific audience. Each journal or magazine has its own set of author guideline, which you can request in writing from the editor of each journal/magazine you want to consider. If your magazine/journal has no page length specifications, write about 15 typed, double-spaced pages of text (appendices, figures, tables, and other materials do not count in the 15 pages.) Be sure to use headings and subheadings to organize the ideas for your readers.

Some general topic areas to consider are:

1. Improving business processes and business process controls

2. Using technology to improve audit quality and efficiency

3. Ensuring proper controls in a distributed computing environment

4. Improving the control and audit of client/server systems and telecommunications systems

5. Ensuring proper controls in systems involving new technology such as EDI, image processing, relational databases, communications technologies (e.g., ATM), LAN interoperability, and digital signatures for authorization of electronic payment.

6. Using quick response as a strategy for improving inventory movement with automatic identification of materials and products (e.g., through bar coding)

Each group will present its paper idea to the class (5 minutes or less) no later than February 15. The reason for this preliminary presentation is to help the group prepare a better paper by having had comments from other class members and the instructor.

On the presentation date, submit the following written materials:

1. A one-page (or less) summary of the manuscript

2. The manuscript

3. A copy of the author guidelines for the target publication

Grading: The paper will be graded on readability, originality, potential contribution to the auditing literature, and suitability for the intended publication.

Date	*Topic*	*Assignment Due*	*Day*
1/2	Introduction Internal control: Apex		1
1/4	Internal control: Apex Auditing of application processes Continuous auditing Relational databases		
1/9	Concurrent and continuous approaches		
1/11	Querying the database Examining and comparing code Non-current techniques Non-automated approaches		
1/16	Exam 1 Traditional development approaches		
1/18	Object-oriented approaches Reengineered systems Outsourced systems		
1/23	Maintaining data quality Liability arising from systems		
1/25	Present audit plan Hardware and operating systems Technology of database systems	Policy churning	
2/1	The keepers: IS personnel Access control		
2/6	Present audit plan Access control	Barings PLC	
2/8	Access control Security in open environments		
2/13	Exam 2 Privacy lapses/consequences		
2/15	Electrons same as cash		

Date	*Topic*	*Assignment Due*	*Day*
2/20	Evaluating internal control		
2/22	Evaluating internal control		16
2/27	Paper presentation	Paper	17
2/29	Disaster planning and recovery Environment for IS audit		
3/5	Project presentations	Project	19
3/9	Exam 3		20

Day *Topic and readings*

#2

1. The auditing of application processes

1. Stazyk, T. E., 1992. "Information systems auditing in the 1990s: A business approach" *Internal Auditing* (Summer), 3-8.

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Exhibit V:

Sample Undergraduate or Graduate Course Topics for Special Topics or Directed Electives

- Executive Information Systems
- Rapid Systems Development
- Information Systems Planning
- Advance Systems Analysis and Design
- Wide Area/Voice Networks
- Software Quality Assurance
- Business Systems Analysis
- Network Management
- Human Factors in Systems Design
- Business Economics
- Advance Office Systems/Directed Study
- Managerial Accounting for Decision Making
- Database Design and Processing
- Executive Development
- Professional Presentation Using Technology/Directed Study
- Management Science/Directed Study
- Advance Financial Management/Directed Study
- Accounting for Decisions and Control/Directed Study
- IS Integrity, Confidentiality and Availability

Exhibit VI:

Suggested Supplemental Skills for Information Systems Auditors

Managerial Communications and/or Public Speaking:

More effective communication skills, which are employed when discussing audit scope, findings and recommendations.

Interviewing Skills:

Effective gathering of information when interviewing business management and completing control questionnaires.

Negotiation Skills and/or Personal Selling:

Convince management to implement recommendations for positive change.

Business Writing:

Produce understandable and usable reports, and sundry written communications.

Industrial Psychology and/or Behavioral Science:

Understand, and effectively manage, human behavior throughout the audit process.

Project Management/Time Budgeting:

Effectively and efficiently manage time and tasks during audits, each of which are essentially projects. Auditors are frequently evaluated on meeting budgets.

Exhibit VII:

1996 CISA Examination Domains

Domain	Title and Description	Importance
10	Information Systems Audit Standards and Practice and Information Systems Security and Control Practices Adheres to generally accepted information systems audit standards, statements, and practices and information systems security and control practices.	8%
20	Information Systems Organization and Management Analyses and evaluates the information systems (IS) strategy, policies and procedures, management practices and organization structures.	15%
30	Information Systems Process Analyses and evaluates the information systems (IS) process, including hardware and software platforms, network and telecommunications infrastructure, operational practices, utilization of IS resources and business processes.	22%
40	Information Systems Integrity, Confidentiality and Availability Analyses and evaluates logical, physical, environmental data validation, processing and balancing controls and the business continuity planning and testing process.	29%
50	Information Systems Development, Acquisition and Maintenance. Analyses and evaluates the information systems (IS) development, acquisition and maintenance.	26%

Source: Stachchenko, Patrick. "New CISA Exam Domains Emphasize IS Link to Business Objectives," Global Communiqué (1995) Vol. 5.

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