IS'97

Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems 7

Association for Computing Machinery (ACM) Association for Information Systems (AIS) Association of Information Technology Professionals (AITP) (formerly DPMA) 11 **Gordon B. Davis, ACM Co-Chair John T. Gorgone, ACM Co-Chair J. Daniel Couger, AIS Co-Chair David L. Feinstein, AITP (DPMA) Co-Chair Herbert E. Longenecker, Jr., AITP (DPMA) Co-Chair**

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IS '97 Foreward

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The IS'97 report is the latest output from model curriculum work for information systems that began in the early 1970s and has matured over a twenty year period. This report represents the combined effort of numerous individuals and reflects the interests of thousands of faculty. It is grounded in the expected requirements of industry and represents the views of organizations employing the graduates.

219
This model curriculum is the first collaborative curriculum effort of the ACM, AIS and AITP (formerly DPMA) societies and is supported by other interested organizations. The draft was reviewed at eleven national and international meetings involving over 1,000 individuals from industry and academia.

222
All aspects of the computing field have had rapid, continuous change. As a result, university-level Information Systems (IS) curricula need frequent updating to remain effective. Since most academic units have mechanisms to maintain currency of curricula, why have professional society curriculum committees? If an IS academic unit were providing graduates solely to local business and government, the input on program contents could be derived from representatives of local organizations that hire the graduates. However, local employment is not the sole objective for undergraduate majors in Information Systems. Students from IS programs accept jobs in widely dispersed geographic areas. Therefore, availability of curriculum models enables local academic units to maintain academic programs that are consistent both with employment needs across the country and with the common body of knowledge of the IS field. The first IS curriculum models were introduced in the early 1970s. This early work was followed by model curricula developed by ACM and DPMA. Details of this history are reviewed in Appendix 2.

233
Professional society curriculum reports serve several other objectives. One important use is to provide a local academic unit with rationale to obtain proper resources to support its program. Often, administration at the local institution is not aware of the resources, course offerings, computing hardware, software, and laboratory resources needed for a viable program. Administration may be unaware of the specialized classroom technology, library resources, or laboratory assistants essential for proper education of IS undergraduates. Finally,

administration might not recognize the rapid turnover of knowledge in the field and the need for resources to support constant retooling of faculty. Curriculum reports provide recommendations in these resource areas as well as content for the necessary body of knowledge. They provide important information for local IS academic units to use in securing from their institution the necessary levels of support.

243
The importance of the curriculum effort is based on continuing strong demand for graduates. A strong demand for IS professionals is forecast by the U.S. Bureau of Labor Statistics to continue through the year 2005 (Occupational Outlook Quarterly 1993). For example, the forecast increase in demand for system analysts is 110 percent for the period 1992-2005, averaging over 8 percent annually. Of all occupations analyzed, the systems analyst position is projected to have one of the highest demands.

248
The IS field also remains attractive in regard to compensation. In 1993, raises in IS were second highest of all professions, only slightly below engineering (Sullivan-Trainor 1994). These growth and pay level factors indicate undergraduate degrees in IS will continue to be in strong demand over the next decade.

251
In a time of restricted academic budgets, some IS academic departments have been under downsizing pressure from other academic disciplines in their own institutions, citing a decline in employment in central IS organizations. However, there is no lessening in demand for IS knowledge and ability in organizations; to the contrary, the demand is expanding as the functional areas of the organization gain more capability in IS. Many areas of the organization are now hiring IS majors for departmental computing activities. There is also strong demand for the IS minor by students in other disciplines who need IS expertise in order to be effective in their work and to assist in developing applications in their functional area. A third reason that the demand for IS courses will continue to increase is that students in related disciplines want to acquire basic and intermediate IS skills. Every discipline is experiencing growth in computer use, and students who enrich their IS knowledge are at a career advantage.

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The editors of IS'97 thank those who have helped in this project. We hope this will be the beginning of a cooperative effort for continuous curriculum development. We are interested in your input and encourage you to let us know

how you are using these materials and how they might be improved.

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ABSTRACT

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IS'97 is a model curriculum for undergraduate degree programs in Information Systems. Information Systems, as an academic field, encompasses two broad areas: (1) acquisition, deployment, and management of information technology resources and services (the information systems function) and (2) development and evolution of technology infrastructures and systems for use in organization processes (system development). The model curriculum provides guidelines, a set of courses, source materials, curriculum design objectives, and knowledge elements. It provides advice to a number of intended users of the report who have a stake in the achievement of quality IS degree programs.

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The model curriculum is based on common structures and degree programs in the United States and Canada. Assumptions about student backgrounds and degree programs may not be applicable in other countries. However, the model is grounded in a fundamental body of computing and information systems knowledge. It can, therefore, be employed as a reference model for international use.

316

The curriculum assumes that students have prerequisite skills in software packages commonly used in organizational work or that these skills will be provided by remedial modules. The information systems coursework available to students can be organized programmatically in three levels:

319

- 1. General courses in information systems. This level includes a survey course on fundamentals of information systems and a course on personal productivity with information technology suitable for all students regardless of their majors or minors. An information systems theory and practice course is provided for students who intend to major or minor in information systems as well as students who wish to increase their depth of general knowledge in information systems.

324

- 2. Specialized information technology and application design courses for both majors and minors in information systems. These courses cover information technology, structures for information systems applications, and the analysis and logical design of applications.

327

- 3. Specialized application development, deployment, and project management courses for majors in information systems. These courses cover physical design and implementation of applications in both database and programming environments plus management of information systems projects.

330

The IS curriculum is designed to produce graduates equipped to function in entry level

information systems positions with a basis for continued career growth. The curriculum reflects input from both industry and universities. It responds to industry requests for both increased emphasis in technical orientation and improved skill in individual and group interactions. The exit characteristics of information systems graduates are defined in the report. The characteristics are elaborated by lists of abilities required to achieve them and knowledge that is applied. The curriculum has formal information systems courses but also assumes use of prerequisite or corequisite courses in communications, mathematics and statistics, and business functions. The communications prerequisite courses should provide students with listening skills and the knowledge to be effective in written and oral communication. The mathematics and statistics prerequisites should provide basic quantitative and qualitative techniques. The business courses should cover common business functions, economics, and international considerations.

341

The architecture of the information systems curriculum at the highest level consists of five curriculum presentation areas: IS fundamentals; information systems theory and practice; information technology; information systems development; and information systems deployment and management processes. The five presentation areas consist of ten courses. The courses are based on 127 learning units. The learning units are derived from elements in a body of information systems knowledge.

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<table>
<tr><th>Levels</th><th>Presentation Areas</th><th>Courses</th></tr>
<tr><td rowspan="2">1 - General</td><td>IS Fundamentals</td><td>Fundamentals of IS

Personal Productivity with IS Technology</td></tr>
<tr><td>Information Systems Theory and Practice</td><td>Information Systems Theory and Practice</td></tr>
<tr><td rowspan="2">2 -

Major and

Minor</td><td>Information Technology</td><td>Information Technology Hardware and Software

Programming, Data, File, and Object Structures

Networks and Telecommunications</td></tr>
<tr><td rowspan="2">Information Systems Development</td><td>Analysis and Logical Design</td></tr>
<tr><td rowspan="2">3 -

Major</td><td>Physical Design and Implementation with a DBMS

Physical Design and Implementation with a Programming Environment</td></tr>
<tr><td>Information System Deployment and Management Processes</td><td>Project Management and Practice</td></tr>
</table>

355
The curriculum gives course descriptions and resource recommendations for the IS degree program. The details in the appendices provide the basis for customizing courses while maintaining the coverage defined by the curriculum. The learning units and detailed IS body of knowledge provide the basis for examining the logic associated with the design and content of each course. They also provide the means for ongoing adaptation and updating of the curriculum.

USE OF THE IS'97 CURRICULUM REPORT

361
The model Information Systems undergraduate curriculum report has several intended classes of users who have a stake in the achievement of quality IS degree programs:

- academic executives to whom the information systems program reports
- academic heads of units where information systems programs are housed
- information systems faculty
- other faculty in the school or college where the information systems program resides
- information systems practitioners
- information systems students

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In this section, the uses of the report by these intended stakeholders are described and its value explained.

Academic Executives to Whom the Information Systems Program Reports

371
The IS discipline is an essential part of business and government organizations. Information systems are complex systems requiring both technical and organizational expertise for design, development, and management. They affect not only operations but also competitive strategy.

374
The nature of this rapidly changing field requires a unique set of resources. The minimal level of resources required to provide a viable undergraduate degree program in Information Systems is outlined below. Specifics of the resource requirements are detailed on pages 21-24. Additional resources are necessary to support the service courses provided by the IS faculty to other academic units of the university.

378
1. Faculty Resource Recommendations

379

- The number of faculty will depend upon the number of students majoring in Information Systems. However, a critical mass of faculty is needed to provide the degree of specialization essential for proper coverage of the curriculum. The rapid increase and change in knowledge in the Information Systems field require that faculty continuously upgrade their skills. A significant part of each faculty member's workload needs to be spent in receiving training and acquiring new knowledge and skills. The changes in the field place heavy demands on IS faculty relative to tailoring the curriculum to local conditions, developing up-to-date instructional cases, and managing student projects and internships. Beyond normal teaching, research and service activities, IS faculty need to participate in these additional activities:

388

- a. Technology assessment for maintaining currency of hardware and software in computer labs used in the program.

390

- b. Serving as a high-level faculty resource about computing for other faculty in the college/university.

391

- c. Seeking, obtaining and nurturing partnerships with hardware/software suppliers and users to keep computer labs current.

393

- d. High level of participation in academic and professional societies in order to develop the field. A high level is necessary because there are fewer numbers of faculty in this discipline compared to other university disciplines.

396

- e. Representing the academic unit on committees dealing with university information systems.

397

2. Computing Facilities Recommendations

398

- Students must have access to computing facilities equivalent to those they will use in industry. The rate of change in technology suggests a maximum three year upgrading cycle. University laboratories must be maintained with these requirements in mind.

401

- a. While some of the hardware/communications equipment available in the central campus computing facility may meet the needs of Information Systems, special equipment is necessary. This includes client server architectures, networks, graphics, and multimedia.

404

- b. The IS students should have access to large databases and development systems used in large organizations such as computer-assisted system engineering and development tools. These systems typically require powerful computing capabilities.

407
3. Physical Space Recommendations
408

- Because of the need for computer lab support, physical space requirements for the Information Systems program are more like that of the engineering and the biological and physical sciences than the professional programs in business administration and the social sciences. Laboratory facilities should include:

412

- a. Laboratories equipped with computer work stations.

413

- b. Laboratories to provide experience in designing, installing, and running networks.

414

- c. Project team laboratories to accommodate team projects essential to the IS program.

415
4. Laboratory Support

- In addition to facilities and physical space, IS laboratories require ongoing support for personnel, maintenance, and supplies.

Academic Heads of Units Where Information Systems Program are Housed

419
The report provides the rationale for adopting the curriculum recommendations for an undergraduate degree program in Information Systems. The curriculum recommendations are based on an assessment of industry expectations for entry level professional employees in the Information Systems field. Industry has expressed a need for both increased emphasis in technical orientation and improved skill in individual and group interactions. Graduates need to be able to interact more effectively with clients and to work effectively in teams. Students must have good written and oral communication skills. This report gives the specific recommendations necessary to successfully implement and maintain a program in Information Systems meeting both technical and behavioral emphases. A summary of the resource requirements necessary to support a viable Information Systems program is outlined above (and detailed on pages 21-24).

Information Systems Faculty

429
The curriculum recommendations are described with different levels of detail. Courses are defined at a high level with course descriptions. These include course title, catalog description,

scope, and topic list. A detailed description of each course is given in Appendix 8. Each course is described in terms of learning units for the course. Each learning unit is explained by a goal, objectives, and elements from an IS body of knowledge that fit the objectives. The IS body of knowledge was derived from industry and university survey responses. Each IS body of knowledge element for a course has a competency or depth of knowledge level for achievement in the course. This defines the depth of coverage for the topic in the course.

436
The learning goal, objectives, and body of knowledge elements with competency levels provide faculty members with details of the rationale supporting each course. They provide a basis for curriculum tailoring and curriculum experimentation. Each course represents a prescriptive grouping of learning units. However, this grouping is only one of several that may be appropriate. Given local conditions, faculty members may wish to modify the courses. With a modified set of courses, the set of learning units assists in evaluating completeness of topic coverage.

Other Faculty in the School or College Where the Information Systems Program Resides

443
The use of information technology is pervasive in society. The ability of the workforce to utilize this technology is increasing. Users of information technology are now expected to take personal responsibility for much of what has been handled in the past by a centralized computing services unit. While many organizations provide some user training in information technology, graduates who are capable users may have a comparative advantage in their employment. A strong, capable Information Systems program can benefit all students in a school and provide special benefits to non-majors who desire more competence in information technology and its application to their areas of interest.

450
IS'97 identifies prerequisite skills needed by all students in basic knowledge work software. Students in all majors should have a working knowledge of how to utilize software for word processing, Internet access and electronic mail, spreadsheet processing, database management, presentation graphics, statistical analysis, and external database retrieval. Although these skills are prerequisite and not part of the exclusive domain of Information Systems, the Information Systems faculty can provide useful competence for managing the self-study modules, course modules, and testing-out examinations for the prerequisites.

456
The IS'97 curriculum specifies some general courses to provide understanding and skill in information technology suitable for all students. There is a fundamentals of information systems course and a course on personal productivity with information technology. For students who desire more depth, a course on information systems theory and practice is also offered. These courses establish a foundation for specialized courses related to functional area information systems. Such courses may be taught by functional area faculty, by Information Systems faculty, or by cooperative arrangements.

462
Students in functional areas may wish to have a minor in Information Systems. The IS'97 curriculum defines a set of courses suitable for a minor. The courses include fundamental technologies for information systems and a systems analysis and logical design course.

Information Systems Practitioners

466
The report provides a basis for practitioner interaction with IS academic units in three respects:

467
1. To understand levels of competency the curriculum expects to achieve with graduates who will be prospective IS employees.

469
2. To compare the competency levels needed by their organization with the curriculum recommendations. This comparison can be used by practitioners to assist faculty in identifying knowledge and skills needing improvement.

472
3. To understand how to become involved in IS education. For example, IS practitioners may serve on industrial advisory boards at local colleges and universities or help provide industrial experience for IS students and faculty. Advanced levels of IS undergraduate education require participative learning. Practitioners can play a supportive role in these activities by providing case studies on which a student can work as well as serving as outside evaluators for student projects.

Information Systems Students

478
When a student is considering which academic field of study to select, this report can help explain the IS field and the nature of IS programs. The subjects covered and the knowledge levels required for various program alternatives can be examined. Characteristics of the field, job titles, and the types of jobs for a graduate from such programs as well as possible career paths can be reviewed.

482
When students are enrolled in an IS program, this report can add to their understanding of the consequences of choices among various track options or elective courses. Students can examine the breadth and depth of the IS field and the career opportunities that specific programs offer them. Information in this report can prepare students for discussions with academic advisors as to options and choices in the program and strategies for entering the job market. This report can help the student in assessing job opportunities when they are near graduation.

INFORMATION SYSTEMS AS A FIELD OF ACADEMIC STUDY

489
Computer-based information systems have become a critical part of the products, services, and management of organizations. The effective and efficient use of information technology is an important element in achieving competitive advantage for business organizations and excellence in service for government and non-profit organizations. The information technology/information system strategy is an integral part of an organization strategy. The management support role for information systems extends to operational, tactical, and management processes. Information systems are vital to problem identification, analysis, and decision making at all levels of management. The importance of information technology and information systems to organizations and the need for well-educated professionals in the field is the basis for a strong link between educational programs and the professional community of IS practitioners (Mawhinney, Morrell and Morris1994; Trauth, Frawell and Lee 1993).

499
Information Systems as a field of academic study began in the 1960s, a few years after the first use of computers for information processing by organizations. As organizations extended the use of information technology to operational processes, decision support, and competitive strategy, the academic field also grew in scope and depth. An IS organization function emerged to manage information technology. In the same way that universities have degree programs reflecting important organizational functions, such as financial resource management, marketing resource management, and human resource management, a degree program emerged for management of information technology resources. During this 30 year period of growth and change, different names have been used and the definition of the field has been enlarged. The simple term information systems (IS) has become the most commonly accepted, generic term to describe the discipline.

Differing Names for the Academic Field of Information Systems

509
Information systems as a field of academic study exists under a variety of different names. The multiplicity of labels reflects historical development of the field, different ideas about how to characterize it, and different emphases when programs were begun. The following terms represent a sampling of names associated with the academic discipline of Information Systems:

513

- Information Systems
- Management Information Systems
- Computer Information Systems
- Information Management
- Business Information Systems
- Informatics
- Information Resources Management
- Information Technology Systems
- Information Technology Resources Management
- Accounting Information Systems
- Information Science

Information and Quantitative Science

The Scope of Information Systems

526
Information Systems, as an academic field, encompasses two broad areas: (1) acquisition, deployment, and management of information technology resources and services (the information systems function) and (2) development and evolution of infrastructure and systems for use in organization processes (system development).

530
The information systems function has a broad responsibility to develop, implement, and manage an infrastructure of information technology (computers and communications), data (both internal and external), and organization-wide systems. It has the responsibility to track new information technology and assist in incorporating it into the organization's strategy, planning, and practices. The function also supports departmental and individual information technology systems.

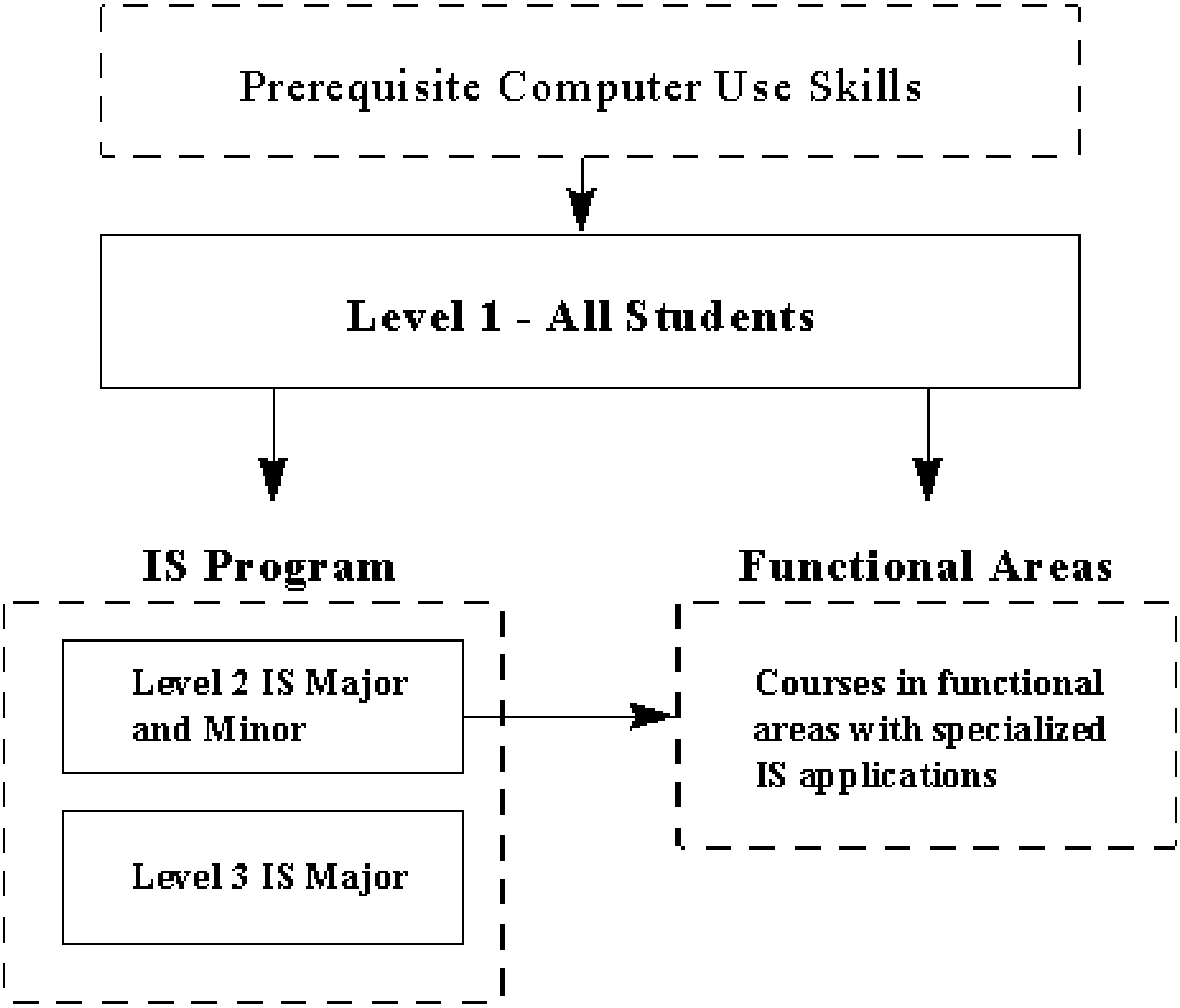
535
The activity of developing systems for organization and inter-organization processes involves creative use of information technology for data acquisition, communication, coordination, analysis, and decision support. There are methods, techniques, technology, and methodologies for this activity. Creating systems in organizations includes issues of innovation, quality, human-machine systems, human-machine interfaces, sociotechnical design, and change management.

540
Information technology is pervasive in all organization functions. It is used by accounting, finance, marketing, production, and so forth. This pervasive use increases the need for information systems professionals with system management and system development expertise. Professionals with such expertise support innovation, planning and management of information infrastructures and coordination of information resources. System development by IS staff involves not only organization-wide integrated systems, but also support for individual and departmental application development.

546
There is a close relationship between Information Systems and Computer Science. In some schools, students in both areas may take common courses. However, Information Systems is unique in that its context is an organization and its information systems. This leads to important differences with Computer Science in the context of the work to be performed, the types of problems to be solved, the types of systems to be designed and managed, and the way the technology is employed. Information Systems concentrates on the organizational mission and objectives and the application of information technology to further these goals. Information Systems and Computer Science are distinct areas of study, but they both require a common subset of technical knowledge.

INFORMATION SYSTEMS WITHIN DEGREE PROGRAMS OF A SCHOOL

556
There are three levels of IS curriculum responsibility. The three level model consists of general IS courses for all students, courses for IS majors and minors, and courses for IS majors. There is a progression through the three levels. Courses in level 1 are required for level 2; courses in level 2 are required for level 3. (See Figure 1.) The three levels deliver increasing levels of competency in significant topics within IS. This concept is illustrated for twenty IS topics in Table 1, developed by the IS'97 Curriculum Task Force. The topics represent subareas of presentation. For example, all students may need recognition knowledge of systems software, students doing a minor may need to be literate in the topic, and majors may need to be effective users.



564 **Figure 1. Educational Levels for IS Education** 565

Significant Subareas in IS Curriculum	Depth of Knowledge/Competency Levels for		
	All Students	IS Minor	IS Major

Literacy in computers and information systems	3	3	4
Knowledge work software packages	4	4	4
Systems theory and quality	2	3	4
Decision making	1	2	3
IS planning	1	2	3
IT and organizational systems	1	2	4
Computer systems hardware	1	2	3
Computer systems software	1	2	3
Networking and telecommunications	2	3	4
Programming: languages and implementation	1	2	3
Algorithmic design and data, object and file structures	1	2	3
Software development	1	2	3
Database: modeling, construction, tools	1	2	4
Information systems analysis, design, implementation	1	3	4
Teams, personal, and interpersonal skills	2	2	4
Project management	1	2	3
IS support services	1	2	2
Systems integration	1	2	3
Management of IS function	1	1	2
Information resource management	1	1	2

Table 1. Knowledge/Competency Levels for Significant IS Curriculum Sub Areas of Study (Levels: 0- no knowledge; 1 - recognition; 2 - literacy; 3 - usage; 4 - application)

589

Prerequisite Computer Use Skills: The prerequisite skills level provides a personal capability for student use of information technology. Six types of applications useful to students and graduates are covered: Internet and electronic mail, spreadsheet processing, database management, presentation graphics, statistical analysis, and external database retrieval. Word processing is also included in this toolkit but is typically acquired prior to formal courses. Students obtain a competency base in each of these six foundation applications. Some institutions provide the prerequisite IS skills level via a course required of all students. Other institutions enable students to acquire this competency through laboratories with computer-based tutorial modules. Competency tests may be used to ensure adequacy of prior knowledge. The Information Systems faculty may also have major responsibilities for remedial work relative to the prerequisite skills.

598

Level 1. All Students: This level of IS education provides an understanding of the use and role of information systems in organizations. It also provides the necessary competencies for ensuring personal productivity for end-users of IS systems. Students proficient at this level obtain advanced instruction and competency in the six information technology foundation applications and a refined set of Internet skills.

602

The focus is on features and concepts for productivity through information technology. Students receive instruction in development of small systems, effective use of information systems, and quality concepts for systems. Level 1 courses also include a survey of information systems theory and practice. A related level of competence may be provided by courses tailored to functional areas. Majors in these areas may gain additional IS skills and practice through use of application packages in their major fields of study, such as accounting, finance or marketing. Team approaches are utilized. Knowledge at this level is necessary for courses at level 2.

609

Level 2. IS Majors and Minors: Courses in level 2 are taken by both IS majors and students in functional areas who desire an IS specialist competency equivalent to a minor. Minoring students take a subset of the curriculum focusing on information systems technology plus the first course in information systems analysis and design. Individuals with a minor in IS often serve as peer experts within their work unit and as user representatives on teams to develop and enhance major functional applications.

614

A minor (level 2) may be tailored to the unique requirements of a functional area, such as marketing or accounting, or a second field, such as health sciences. The following excerpt from *Education Requirements for Entry into the Accounting Profession* (1988) illustrates the demand for a specialized minor:

617

- The widespread use of computer and telecommunications technology makes an understanding of the technologies and their application and limitations essential. Students should be familiar with the functions and interrelationships of hardware components, and with the capabilities and applications of software. File structures, data storage and retrieval, networking and telecommunications are relevant concepts. The internal controls that ensure accuracy, integrity and confidentiality of information should be examined. Most importantly, the CPA should know how and if the system provides information to management that is relevant, reliable, timely, and readily accessible. This requires that students be aware of the management processes and the importance of information to effective management.

629

Level 3. IS Majors: The courses in level 2 are prerequisites for the courses in level 3 required of all majors. Students proficient at this level are preparing for a career in the IS field. Topics at this level include IS development, implementation, and project management. Exercises and problems include project management in a team environment, designing and implementing information systems using both DBMS facilities and a programming environment, and integrating solutions into functioning organizational systems.

EXIT CHARACTERISTICS OF INFORMATION SYSTEMS GRADUATES

636

The graduate of an IS program should be equipped to function in an entry level position and should have a basis for continued career growth (Lee, Trauth and Farwell 1995). In Table 2, the exit characteristics are related to objectives of the curriculum in terms of "ability to" and "using the knowledge of." Overarching objectives for IS professionals are to support organizational needs and have a customer service orientation.

PREREQUISITES TO INFORMATION SYSTEMS DEGREE PROGRAM

642

There are general academic requirements that should be met prior to formal information systems courses (prerequisites) or concurrent with IS courses (corequisites). Students are expected, as a prerequisite, to have basic proficiency in the fundamental tools of personal computing such as Internet and e-mail, spreadsheets, word processing, databases, presentation graphics, statistical analysis, and external database retrieval. As a basis for lifetime learning, it is also recommended that students have an introduction to the behavioral, social and natural sciences.

648

All Information Systems students should be able to communicate effectively both orally and in writing. They should be able to apply both quantitative and qualitative techniques. IS students should have acquired interpersonal skills. They should have a basic understanding of the functions of an organization and should have been exposed to concepts of international business. Some of the topics should be prerequisite but others may be interleaved with information system courses.

653

Prerequisite or interleaved topics directly applicable to the IS curriculum therefore include:

654

Communications. This should cover general and technical writing, oral communications, and listening skills.

656

Quantitative and qualitative analysis. This includes such topics as discrete mathematics, introduction to calculus, and statistics.

658

Organization functions. Students should be exposed to economics and organization functions such as accounting, distribution, finance, human resources, marketing, and production. They should also be introduced to international aspects of business.

661

Characteristic	With the ability to...	Using the knowledge of...
Communication	accurately observe, note, and explain observations of events actively listen and express complex ideas in simple terminology organize and make presentations write memos, reports, and documentation	listening, observing and documenting interviewing and speaking negotiating and facilitation presentation and interpretation of data multimedia development and utilization computer and video conferencing techniques
Computer Applications Systems	apply IS solutions to functional, inter-organizational, operational, managerial, and executive problems and opportunities describe characteristics of various information systems	organizational theory, structure, and functions characteristics and capabilities of systems and technologies
Information Technology and Tools	describe the functions and components of computers and networks select and apply software tools for organizational solutions install and integrate purchased solutions develop and manage distributed systems with high-level tools and methodologies	computer and networking concepts distributed systems database implementation and management programming languages and environments security and privacy management

Interpersonal Relationships	effectively work with people of diverse backgrounds effectively work with people at all corporate levels lead and facilitate teams in a collaborative environment develop win-win approaches empathetically listen and seek synergistic solutions	leadership, management, and organizations small group communications and motivation organization, team and individual goal setting shared vision and responsibility cultural diversity
Management	establish project goals consistent with organizational goals specify, gather, deploy, monitor, and direct resources and activities observe the need for paradigm shifts apply concepts of continuous quality improvement	mission, planning, goal setting and tracking project and steering team operation planning and resource management leadership, motivation, and team building measurement and benchmarking
Problem Solving	recognize the need for the application of analytic methods devise questions that will identify problems apply systems concepts to definition and solution of problems formulate creative solutions to simple and complex problems	technical observation and writing problem solving models life cycle stages creativity techniques methods to collect, summarize, and interpret data statistical and mathematical methods

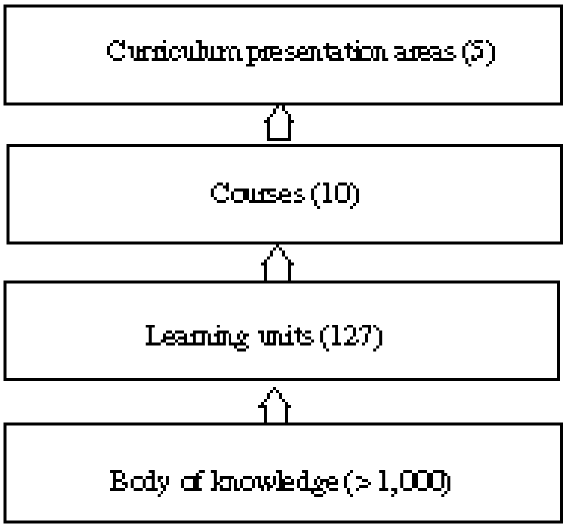
Systems Development Methodologies	select and utilize appropriate methodologies use tools and techniques to analyze, design, and construct an information system assess feasibility and risk assessment for projects apply design methodologies compatible with organizational settings	systems development life cycle prototyping, purchasing, and outsourcing feasibility and risk analysis standards
Systems Theory and Concepts	apply systems representations and life cycle concepts represent organizational processes and data using formal methods identify interfaces, boundaries, and components of problems apply solution checking and reality testing mechanisms	general systems theory control systems concepts quality, effectiveness and efficiency concepts business process modeling and re-engineering business process data, logic, and event modeling
Professionalism	apply personal goal setting and time management concepts apply personal decision making skills articulate a personal position and respect the opinions of others adhere to ethical standards assess organizational and societal impacts of an IS actively seek and employ current practice standards	codes of conduct ethical theory legal and regulatory standards generally accepted practice standards record keeping and reporting international standards, culture, and practices stakeholder needs

Table 2. Representative Capabilities and Knowledge Expected for IS Program Graduates

ARCHITECTURE OF THE INFORMATION SYSTEMS CURRICULUM

681

The IS'97 curriculum is organized at the highest level as a set of curriculum presentation areas. Each of these areas has one or more courses. Each course is built from IS learning units (also termed knowledge units in other curriculum reports). The learning units are derived from the ISbody of knowledge.



684

Each of the elements will be explained in this section starting with the curriculum presentation areas.

Curriculum Presentation Areas

686

A view of the curriculum depicting the IS curriculum presentation areas is given in Figure 2. The dotted box indicates that part of the program taught by faculty in other functional areas or other academic units. The other five boxes show the part of the program generally taught by the IS faculty. The figure also depicts the general sequence in which the material is acquired by students in the IS program. A description of the content for the five areas is presented in Table 3.

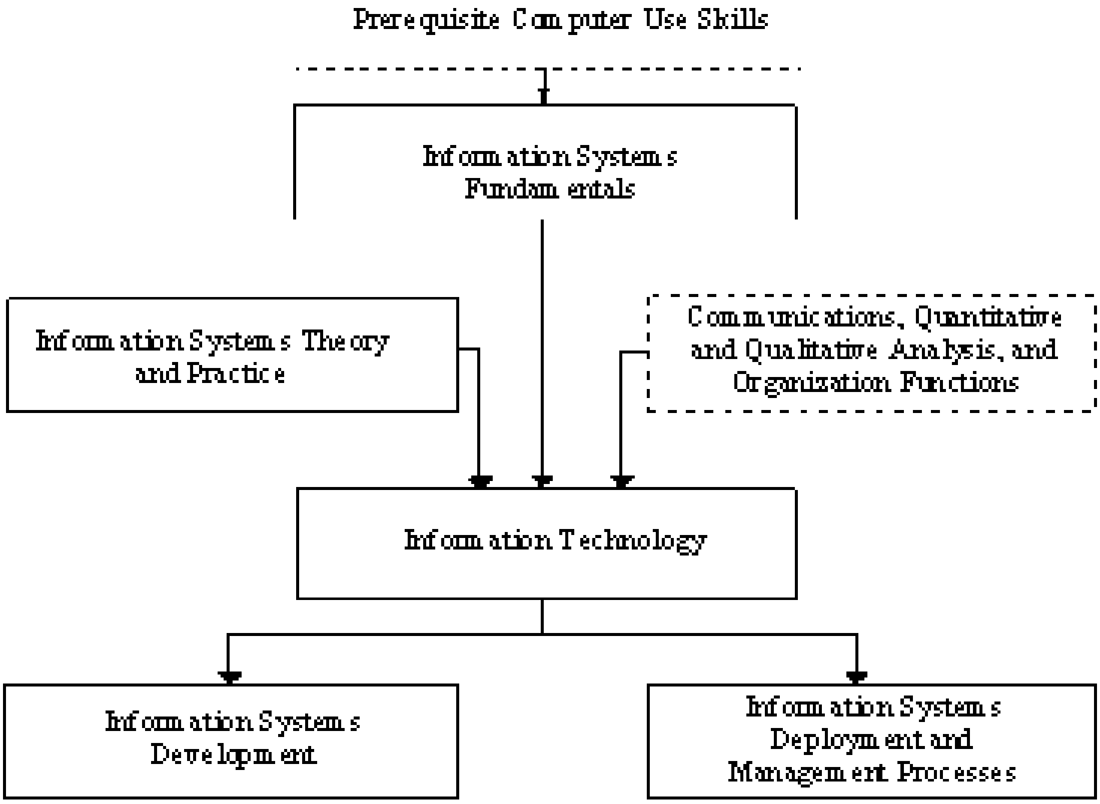


Figure 2. Curriculum Presentation Areas for IS Curriculum

692

Curriculum Presentation Area	Description
Prerequisite Computer Skills	Basic skill in use of a personal computer and introductory skills in a set of PC software packages commonly used in organizations.
Information Systems Fundamentals	Information systems fundamentals include a broad introduction to the field of information systems and information technology plus instruction designed to improve personal productivity through effective and efficient use of information technology. Students are introduced to the use of information systems and information technology in organizations. The way these add value to organizations as part of new and enhanced products and services, in support of decision making, and as elements in organization processes are explained. Information technology is surveyed. The processes and methods employed by the information systems function are presented. Fundamentals in information systems include both theory and practice in applying information technology to knowledge work of the type most graduates will perform. Students will learn how to analyze personal

	requirements, define an information system to support their work, use productivity features of personal computer software, and develop custom solutions to enhance individual performance. The emphasis is on doing systems in the small but relating them to processes for large systems to be studied later in the curriculum.
Information Systems Theory and Practice	After obtaining broad survey knowledge of information systems and information technology and having experienced requirements analysis and system development for small productivity-oriented personal systems, students will be introduced to concepts and theories that explain or motivate methods and practices in the development and use of information systems. The concepts and theories will include systems, management and organization, information, quality, and decision making. The relationship of information systems to corporate planning and strategy and concepts relating information technology to comparative advantage and productivity are explained. The concepts and practices underlying the use of information technology and systems in improving organizational performance are presented.
Information Technology	This curriculum area provides students an opportunity to gain breadth and depth in the technical aspects of the discipline. Computing system architectures, operating systems software, and interconnection of information resources through telecommunications are major components of presentation and discussion. Students will be expected to develop significant skills by participating in installation, configuration, and operation of the technologies.
Information Systems	Students will work in teams to learn to analyze problems and design and implement information systems. Systems analysis provides experience determining system requirements and developing a logical design. It includes process re-engineering.
Development	Instruction in physical design of information systems will ensure that the students can use a logical design to implement information systems. Two approaches will be used. One involves design and implementation using development tools; the other applies DBMS tools.
Information System Development and Management	Students engage in a significant project. Management of the information systems function, systems integration, and project management to ensure project quality are integral components of this curriculum area.

Table 3. Content for Five IS Curriculum Presentation Areas

Courses

708

Courses (see Figure 3) in IS'97 are the building blocks that implement the broad curriculum presentation areas diagramed in Figure 2. The courses are labeled IS'97.P0 through IS'97.10. IS'97.P0 is considered to be a prerequisite to the program. Courses are described later in the report with course title, scope and topics. They are further defined by a catalog description, outcome expectations, and a set of learning units in Appendix 8. Courses are based on a semester calendar of 16 weeks with 48 lecture hours.

713

The set of courses represents a complete model that includes all of the learning units. As a model, they are presented to provide guidance. Institutions may develop their own courses based on learning units to accommodate unique individual missions. The set of courses can be mapped to the IS curriculum requirements for all students, IS minors, and IS majors (Figure 4) and to the IS curriculum presentation areas (Figure 5).

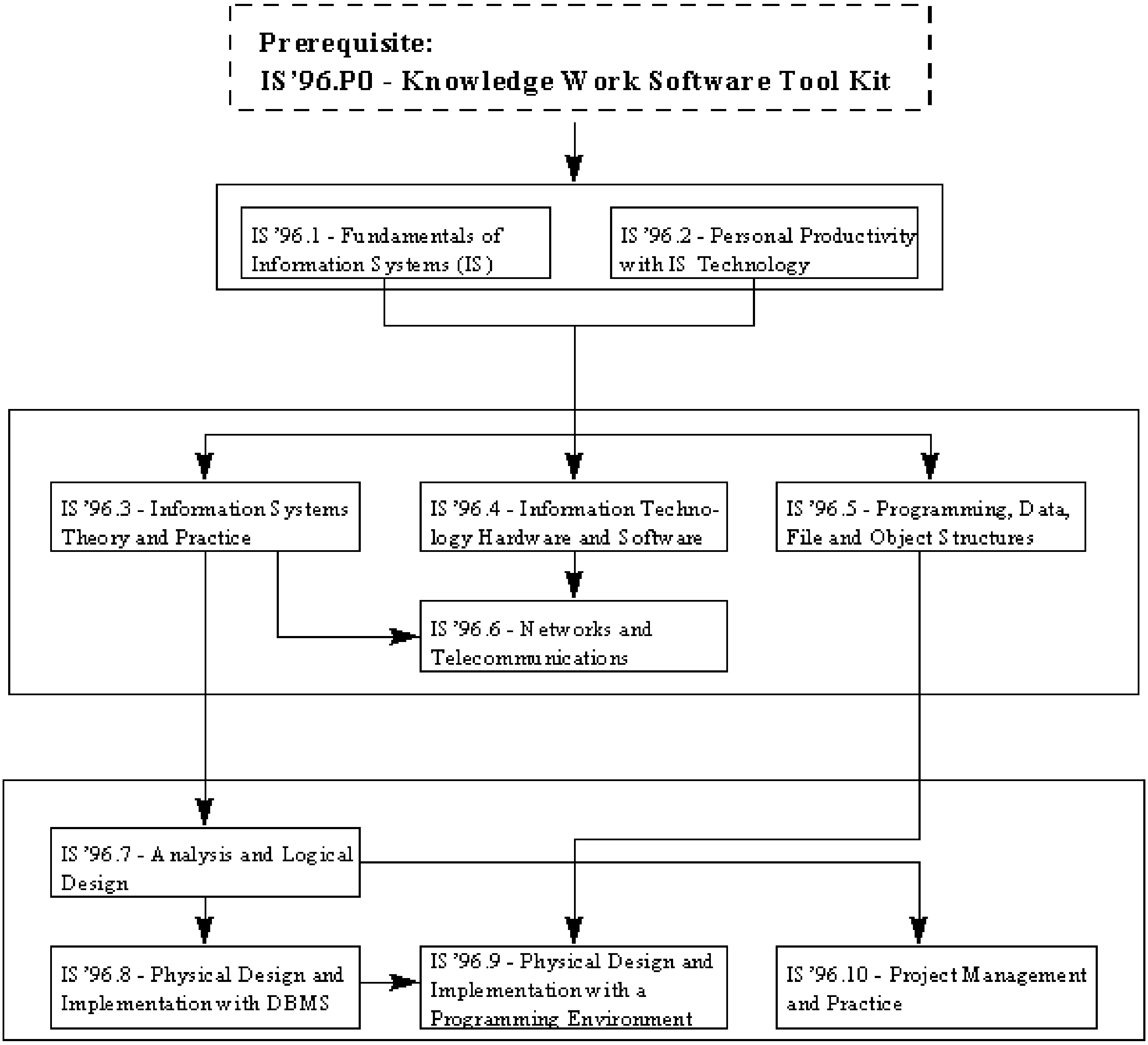


Figure 3. IS'97 Course Sequence.

Student Groups	Notes	Curriculum Model

All Students	1	IS'97.P0 Knowledge Work Software Tool Kit IS'97.1 Fundamentals of IS IS'97.2 Personal Productivity with IS Technology IS'97.3 Information Systems Theory and Practice	Communications, Quantitative and Qualitative Analysis, and Organization Functions	Writing, speaking and listening skills. Mathematics and statistics. Organization functions such as marketing, finance, accounting, production, distribution and human resources; micro and macro economics; the internationalization of business
IS Majors and **Minors**	2	IS'97.5 Programming, Data Files and IS'97.4 Information Technology Hardware Object Structures and Software IS'97.7 Analysis and Logical Design IS'97.6 Networks and Telecommunications		
IS Majors	3	IS'97.8 Physical Design and Implementation with a DBMS IS'97.9 Physical Design and Implementation with a Programming Environment IS'97.10 Project Management and Practice		

Notes:

725

1. It is assumed that most students have completed IS'97.P0 in high school. If this is not true, courses which synthesize the objectives for IS'97.P0 and IS'97.1 may be combined into a one year sequence with IS'97.2. Some programs may combine IS'97.3 with IS'97.1 and IS'97.2 into a one year sequence including laboratory components. Other programs may rearrange the learning units of IS'97.3 into IS'97.2 and IS'97.7. Programs building alternate course sequences can map the learning units defined in Appendix 8 into their own sequences.

729

2. Many IS programs work closely with Computer Science units. Programs wishing to produce graduates with

more in-depth programming skills may require CS1 and CS2 (two courses in the model Computer Science curriculum) as prerequisites to IS'97.5. Another alternative is to extend IS'97.5 to a one year sequence.

732

3. IS'97.8 and IS'97.9 form a one year sequence. The project course can be considered as the lab component of IS'97.8 and IS'97.9; many programs may have a project as an additional course of at least one semester.

Figure 4. IS'97 Courses and Corequirements for All Students, IS Minors, and IS Majors

Learning Units

736

A learning unit (also termed a knowledge unit; Bruner 1966) describes a set of material to be learned by students. A course is a group of learning units. The material to be covered by a learning unit consists of a set of topics or elements from the IS body of knowledge with competency specified for each element. The learning units are stated in terms of a goal, objectives, and elements of the IS body of knowledge along with competency or depth of knowledge levels.

741

Each learning unit is specified by a goal statement that explains the purpose of the learning unit. For example, a learning unit goal might be "to present top-down implementation strategies."

743

The learning unit goal statement is elaborated by one or more learning unit objectives. These are stated as behavioral objectives defining what a student should be able to do after learning the material in the unit. The student should be able to explain, discuss, use, apply, and demonstrate central concepts. For example, a behavioral objective for a learning unit might be "apply system software functions to analyze resource use and performance characteristics for an application." The learning objectives can be used by faculty to assess student achievement relative to the learning unit or by students in evaluating their knowledge.

IS'97 Curriculum Areas and Courses

P. Prerequisite
- IS'97.P0 Knowledge Work Software Tool Kit (a prerequisite to the program)

A. Information Systems Fundamentals
- IS'97.1 Fundamentals of IS
- IS'97.2 Personal Productivity with IS Technology

B. Information Systems Theory and Practice
- IS'97.3 Information Systems Theory and Practice

C. Information Technology
- IS'97.4 Information Technology Hardware and Software
- IS'97.5 Programming, Data and Object Structures
- IS'97.6 Networks and Telecommunications

D. Information Systems Development
- IS'97.7 Analysis and Logical Design of an IS
- IS'97.8 Physical Design and Implementation with DBMS
- IS'97.9 Physical Design and Implementation with a Programming Environment

E. Information Systems Deployment and Management Processes
- IS'97.10 Project Management and Practice

Figure 5. IS'97 Curriculum Presentation Areas and Course Relationships.

749

Each learning unit has a set of topics that define the coverage for the unit. These topics consist of elements from the IS body of knowledge. The depth of coverage for each topic in a learning unit is specified by a depth of knowledge level ranging from 1 to 5 (with 4 being the highest competency level specified for an undergraduate program). A topic may be covered at a low depth of knowledge level as part of an introductory course and in more depth (higher competency) in a subsequent course. The sequencing of learning units is based on instructional design methodology derived from Gagne, Briggs and Wager (1988).

755

The learning units provide the basis for detailed course design. The objective is to present elements of the IS body of knowledge to willing learners through pedagogical techniques associated with desired levels of learning. The pedagogy differs for desired depth of knowledge levels. A low level of competency may be achieved with lectures and exercises; the highest level of knowledge is achieved by active learning techniques such as projects.

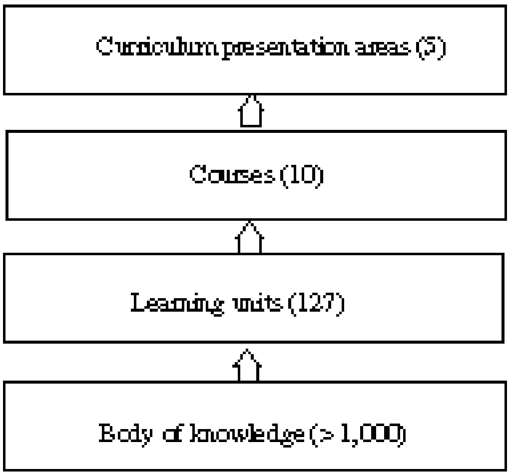
Body of Knowledge

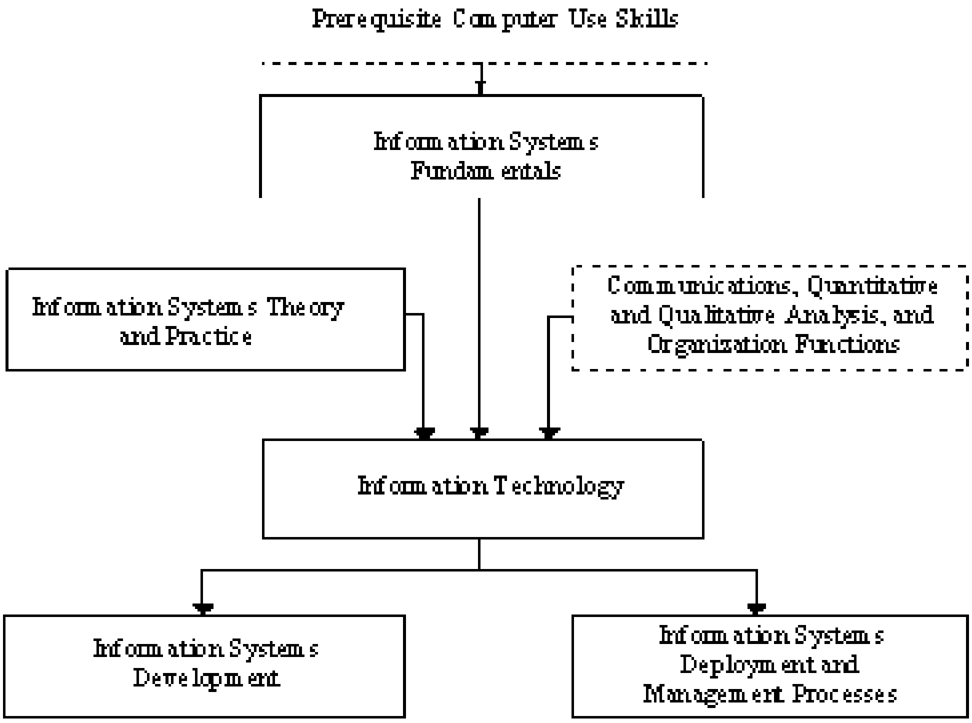
761

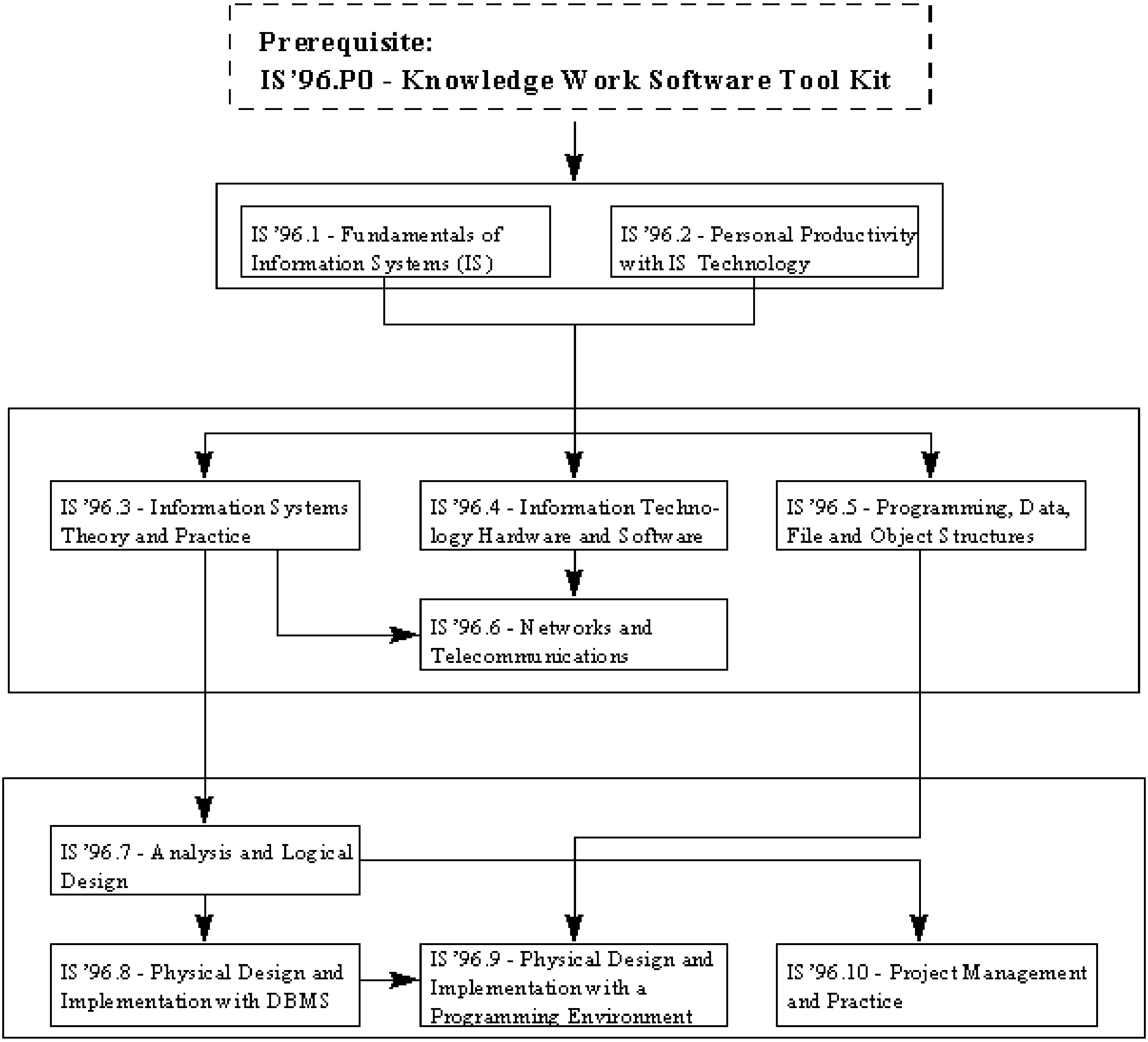
The IS body of knowledge consists of the topics to be taught at some level of competency in an IS curriculum. The IS'97 body of knowledge is a reorganization and extension of an earlier DPMA sponsored IS'90 body of knowledge. The body of knowledge was derived from surveys of practitioners and academics and mapping of relevant topics from curricula for Computer Science and other computer related disciplines.

765

The elements or topics in the IS body of knowledge form the lowest level building blocks for the curriculum. The elements, with desired competency levels, are grouped under learning units and learning units are grouped into courses.


Curriculum presentation areas (5)
Courses (10)
Learning units (127)
Body of knowledge (> 1,000)


Prerequisite Computer Use Skills
Information Systems Fundamentals
Information Systems Theory and Practice
Communications, Quantitative and Qualitative Analysis, and Organization Functions
Information Technology
Information Systems Development
Information Systems Deployment and Management Processes


Prerequisite:
IS'96.P0 - Knowledge Work Software Tool Kit
IS'96.1 - Fundamentals of Information Systems (IS)
IS'96.2 - Personal Productivity with IS Technology
IS'96.3 - Information Systems Theory and Practice
IS'96.4 - Information Technology Hardware and Software
IS'96.5 - Programming, Data, File and Object Structures
IS'96.6 - Networks and Telecommunications
IS'96.7 - Analysis and Logical Design
IS'96.8 - Physical Design and Implementation with DBMS
IS'96.9 - Physical Design and Implementation with a Programming Environment
IS'96.10 - Project Management and Practice

IS'97 Curriculum Areas and Courses

P. Prerequisite

IS'97.P0 Knowledge Work Software Tool Kit (a prerequisite to the program)

A. Information Systems Fundamentals

IS'97.1 Fundamentals of IS
IS'97.2 Personal Productivity with IS Technology

B. Information Systems Theory and Practice

IS'97.3 Information Systems Theory and Practice

C. Information Technology

IS'97.4 Information Technology Hardware and Software
IS'97.5 Programming, Data and Object Structures
IS'97.6 Networks and Telecommunications

D. Information Systems Development

IS'97.7 Analysis and Logical Design of an IS
IS'97.8 Physical Design and Implementation with DBMS
IS'97.9 Physical Design and Implementation with a Programming Environment

E. Information Systems Deployment and Management Processes

IS'97.10 Project Management and Practice

Figure 5. IS'97 Curriculum Presentation Areas and Course Relationships.

INFORMATION SYSTEMS COURSE DESCRIPTIONS

769

The prerequisite software tool kit course plus the ten IS courses are described by a title, scope statement, and topic list. The ten courses represent the IS'97 suggestions for packaging the 127 learning units (Appendix 8) into courses. There may be factors contingent upon local conditions to cause a faculty to package the learning units in other ways.

IS'97.P0 - Knowledge Work Software Tool Kit

774

SCOPE IS'97 assumes as a prerequisite elementary exposure to a suite of software tools useful for knowledge workers (spreadsheets, databases, presentation graphics, database retrieval, statistics, word processing, and Internet and electronic mail). Although identified as a course, this material can be delivered as self study modules, as modules associated with other courses using the software, or as a full course.

779

TOPICS Word processing, E-mail, Internet tools, spreadsheets, databases, presentation graphics, external database retrieval, introduction to statistical software.

IS'97.1 - Fundamentals of Information Systems (Prerequisite: IS'97.P0)

782

SCOPE This course provides an introduction to systems and development concepts, information technology, and application software. It explains how information is used in organizations and how IT enables improvement in quality, timeliness, and competitive advantage.

785

TOPICS Systems concepts; system components and relationships; cost/value and quality of information; competitive advantage and information; specification, design and re-engineering of information systems; application versus system software; package software solutions; procedural versus non-procedural programming languages; object oriented design; database features, functions, and architecture; networks and telecommunication systems and applications; characteristics of IS professionals and IS career paths.

IS'97.2 - Personal Productivity with IS Technology (Prerequisite: IS'97.P0)

792

SCOPE This course enables students to improve their skills as knowledge workers through effective and efficient use of packaged software. It covers both individual and group work. The emphasis is on productivity concepts and how to achieve them through functions and features in computer software. Design and development of solutions focus on small systems.

796

TOPICS End user systems versus organization systems; analysis of knowledge work and its requirements; knowledge work productivity concepts; software functionality to support personal and group productivity; organization and management of software and data; accessing organization data, accessing external data; selecting a computer solution; developing a macro program by doing; designing and implementing a user interface; developing a solution using database software; refining and extending individual and group information management activities.

IS'97.3 - Information Systems Theory and Practice (Prerequisite: IS'97.2)

803

SCOPE This course provides an understanding of organizational systems, planning, and decision process, and how information is used for decision support in organizations. It covers quality and decision theory, information theory, and practice essential for providing viable information to the organization. It outlines the concepts of IS for competitive advantage, data as a resource, IS and IT planning and implementation, TQM and reengineering, project management and development of systems, and end-user computing.

809

TOPICS Systems theory and concepts; information systems and organizational systems; decision theory and how it is implemented by IT; quality, TQM and reengineering; level of systems: strategic, tactical and operational; system components and relationships; information system strategies; roles of information and information technology; roles of people using, developing and managing systems; IS planning; human-computer interface; network and telecommunications systems management; electronic commerce; implementation and evaluation of system performance; societal and ethical issues related to information systems design and use.

IS'97.4 - Information Technology Hardware and Software (Prerequisite: IS'97.2)

817

SCOPE This course provides the hardware/software technology background to enable systems development personnel to understand tradeoffs in computer architecture for effective use in a business environment. System architecture for single user, central, and networked computing systems; single and multiuser operating systems.

821

TOPICS Hardware: CPU architecture, memory, registers, addressing modes, busses, instruction sets, multi processors versus single processors; peripheral devices: hard disks, CDs, video display monitors, device controllers, input/output; operating systems functions and types; operating system modules: processes, process management, memory and file system management; examples of hardware architectures; examples of operating systems; basic network components, switches, multiplexers and media; installation and configuration of multiuser operating systems.

IS'97.5 - Programming, Data, File and Object Structures (Prerequisite: IS'97.2)

828

SCOPE This course provides an understanding of algorithm development, programming, computer concepts and the design and application of data and file structures. It includes an understanding of the logical and physical structures of both programs and data.

831

TOPICS Data structures and representation: characters, records, files, multimedia; precision of data; information representation, organization and storage; algorithm development; object representation compared to conventional data flow notation; programming control structures; program correctness, verification, and validation; file structures and representation.

IS'97.6 - Networks and Telecommunication (Prerequisites: IS'97.3, IS'97.4)

836

SCOPE This course provides an in-depth knowledge of data communications and networking requirements including networking and telecommunications technologies, hardware, and software. Emphasis is upon the analysis and design of networking applications in organizations. Management of telecommunications networks, cost-benefit analysis, and evaluation of connectivity options are also covered. Students learn to evaluate, select, and implement different communication options within an organization.

842

TOPICS Telecommunication devices, media, systems; network hardware and software; network configuration; network applications; coding of data; cost/benefit analysis; distributed versus centralized systems; architectures, topologies and protocols; installation and operation of bridges, routers and gateways; network performance analysis; privacy, security, reliability;

installation and configuration of LAN and WAN networks; monitoring of networks; management of telecommunications, and communications standards.

IS'97.7 - Analysis and Logical Design (Prerequisite: IS'97.3)

849

SCOPE This course provides an understanding of the system development and modification process. It enables students to evaluate and choose a system development methodology. It emphasizes the factors for effective communication and integration with users and user systems. It encourages interpersonal skill development with clients, users, team members, and others associated with development, operation and maintenance of the system. Object oriented analysis and design. Use of data modeling tools. Development and adherence to life cycle standards.

855

TOPICS Life cycle phases: requirements determination, logical design, physical design, test planning, implementation planning, and performance evaluation; communication, interpersonal skills, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group-based approaches: project management, joint application development (JAD), structured walkthroughs; object oriented design; software production and reviews; prototyping; database design; software quality metrics; application categories; software package evaluation and acquisition; professional code of ethics.

IS'97.8 - Physical Design and Implementation with DBMS (Prerequisite: IS'97.7)

863

SCOPE This course covers information systems design and implementation within a database management system environment. Students will demonstrate their mastery of the design process acquired in earlier courses by designing and constructing a physical system using database software to implement the logical design.

867

TOPICS Data models and modeling tools/techniques; structured and object design approaches; models for databases: relational, hierarchical, networked and object oriented designs; CASE tools; data dictionaries, repositories, warehouses; implementation: Windows/GUI coding and/or implementation, code/application generation; client-server planning, testing, and installation; system conversion, end user training/integration and post implementation review.

IS'97.9 - Physical Design and Implementation with a Programming Environment

(Prerequisites: IS'97.5, IS'97.7, and IS'97.8)

874

SCOPE This course covers physical design, programming, testing and implementation of the system. Implementations of object-oriented, client-server designs using a programming environment.

876

TOPICS Selection of client-server programming language environment; software construction: structured, event driven and object oriented application design; testing; software quality assurance; system implementation; user training; system delivery; post implementation review; configuration management; maintenance; reverse engineering and re-engineering.

IS'97.10 - Project Management and Practice (Prerequisite: IS'97.7; Corequisites: IS'97.8, IS'97.9)

881

SCOPE This course covers the factors necessary for successful management of system development or enhancement projects. Both technical and behavioral aspects of project management are discussed. The focus is on management of development for enterprise-level systems.

884

TOPICS Managing the system life cycle: requirements determination, logical design, physical design, testing, implementation; system and database integration issues; network and client-server management; metrics for project management and system performance evaluation; managing expectations: superiors, users, team members and others related to the project; determining skill requirements and staffing the project; cost-effectiveness analysis; reporting and presentation techniques; effective management of both behavioral and technical aspects of the project; change management.

RESOURCES FOR IS DEGREE PROGRAMS

892

A capable faculty is the first required resource. In addition, computing, laboratory, classroom and library resources are essential elements for a successful academic program in Information Systems (Gorgone and McGregor 1989). In a rapidly changing technical environment, students should be exposed to a variety of up-to-date hardware and software systems that adequately represent the professional setting in which they will be employed.

Faculty

898

Faculty members are vital to the strength of an information systems program. Its faculty need both academic training and practical experience. There must be enough faculty to provide course offerings that allow the students to complete a degree in a timely manner. The interests and qualifications of the faculty must be sufficient not only to teach the courses but also to plan and modify the courses and curriculum.

902

Faculty members must remain current in the discipline. Professional development and scholarly activities are a joint obligation of the institution and the individual faculty member. The school should support continuing faculty development. Given the rapidly changing technology, it is particularly critical that faculty members have sufficient time for professional development and scholarly activities. Resources should be provided for faculty to regularly attend conferences, workshops and seminars, and to participate in academic and professional organizations. The program is enhanced significantly when faculty acquire practical experience in the profession through activities such as consulting, sabbatical leaves, and industry exchange programs. Faculty must also be equipped to develop teaching materials for their students. Faculty must have available technology at least equivalent to and compatible with that available to students so that they may prepare educational materials for use by students. In addition, faculty must be networked so they have access both to students and to the larger academic and professional world available on the Internet.

913

The number of full-time faculty needed by the program is influenced by such factors as the number of students in the program, the number of required courses, the number of service and elective courses offered, and the teaching load of the faculty. Typically, a program should have a minimum of four full-time faculty with primary commitment to the information systems program in order to meet the teaching needs of the program and to provide depth and breadth of faculty expertise. The professional competence of the faculty should span a range of interests in information systems including computer systems concepts, information systems concepts, data management, telecommunications and networks, systems design and development, systems integration, information systems management, and IS policy. Additional faculty will be needed to teach the service courses which provide foundation-level knowledge across the campus.

Computing

923

Adequate computing facilities are essential for effective delivery of the IS program. These resources normally involve a blend of computer facilities of varying capabilities and complexity. They should include:

- graphical user interface (GUI) environment
- desk top systems with CD-ROMs
- local area networks
- mainframes

929

Students at different levels in the curriculum have different needs. Substantial resources must be provided to support the level 1 service courses. More sophisticated resources are necessary for IS minors and majors who are developing skills in computing and IS fundamentals. Specialized laboratories are needed for advanced students where group and individual projects are developed.

933

Hardware and software are rapidly changing and improving. It is critical that faculty and students have access to facilities reflecting environments that graduates will be expected to use professionally. Therefore, laboratory equipment and software should be kept current. In order to accomplish this, a plan should exist to upgrade and/or replace software and equipment in a timely manner. An appropriate rule of thumb is to replace hardware/software in a three year cycle.

938

Software development tools should be available to create GUI client/server based applications. Among the categories of tools that should be included are:

- visual (graphic) programming languages
- graphic database systems
- graphical design tools
- multimedia equipment and tools

944

Experience with at least one development language with graphical and object oriented capabilities is a fundamental requirement. Experience with integrated computer-aided systems engineering (ICASE) development tools is also essential.

947

Systems should be networked with convenient access to the Internet and Internet tools. In order to extend the educational experience beyond the classroom, faculty and students should be encouraged to develop dialogues through a variety of Internet tools.

Laboratories

951

Programs in information systems require hardware and software for structured, open/public, and specialized laboratories. Students must have an opportunity to use learning materials in both structured and unstructured laboratories.

954

Students should be provided opportunities to work together on team-oriented projects. The group skills developed in this mode are critical to the successful IS professional. Technological support, such as groupware, is expected for group and team activities.

957

All laboratories must have adequate technical support in terms of professional staff to provide for installation and maintenance of the equipment. The staff should be proficient in both the hardware and software applications. Complete documentation must also be available.

960

Four types of laboratory activities should be supported:

1. Structured Laboratories

962

A structured laboratory is a closed, scheduled, supervised experience in which students complete specified exercises. Supervision is provided by an instructor who is qualified to provide necessary support and feedback to the students. Exercises are designed to reinforce and complement the lecture material.

2. Open/Public Laboratories

966

Laboratories open to unscheduled use. It is also important that students have ample time to complete exercises that are not part of the structured assignments. It is not necessary to have separate facilities for structured and open laboratories, but adequate unscheduled open time must be available in the labs.

3. Specialized Laboratories

970

Specialized laboratory facilities are necessary to support an up-to-date IS program. Special facilities include the following:

972

a. Systems Development-- Facilities to provide access to and evaluation of the latest systems development tools and platforms. Examples include CASE tools, higher level languages, and database management and client-server systems. These facilities may be used for advanced project and design assignments.

976

b. Data Communication -- Facilities to provide hands-on experimentation and evaluation of local and wide area network hardware, software, and applications. Examples include LAN network software and hardware, access to servers and mainframe communication facilities, cross-platform linkage capability, and access to communication-based applications such as the Internet.

980

c. Advanced Technology -- This should provide hands-on experimentation with and evaluation of applications requiring special hardware and software. Examples include group and executive support systems, document handling and imaging systems, and multimedia systems.

4. Network and Remote Access

984

Both students and faculty should have access to campus resources through remote computers and networks. This has the advantage of reducing capital expenditure for the program and providing more convenient access.

Classrooms

988

Suitable classroom facilities, equipped with information technology teaching resources, should be provided. A computing system with multimedia facilities is necessary for demonstrating the development, implementation, and application of information technology as well as conducting walkthroughs and making presentations. Classrooms should also have access to networks.

Library

993

Library support is an important part of an academic program. It is especially important for disciplines with rapid development of knowledge such as the IS field. Libraries should include access to journals, proceedings, monographs and reference books. Access to online reference databases is also important. Fundamental to these holdings are the publications of professional societies including, for example, ACM, AIS, and AITP (formerly DPMA). Online access to library systems should be available through a campus network for both students and faculty.

SHARED COURSES BY COMPUTER SCIENCE AND INFORMATION SYSTEMS

1001

As explained earlier in the report, there is a close relationship between the academic fields of Information Systems and Computer Science, and there are also very significant differences. The context for Information Systems is an organization and its systems. The corresponding context for Computer Science is algorithmic processes for information processing and associated technical and technology issues. There are complementary strengths for these academic units in preparing graduates for information systems work in organizations.

1006

An Information Systems academic unit is typically strong in preparing students for the organizational environment. This advantage is especially strong when the IS program is within or closely tied to organization or business studies. The challenge for an IS unit may be in maintaining adequate depth of instruction in some technology subjects.

1010

A Computer Science program sometimes reverses the comparative position of an IS unit. It is typically strong in teaching technology and related algorithmic processes. On the other hand, organization functions and organization systems may not be an area of emphasis.

1013

Of course, there is so much variety in the actual organization of academic units that these remarks cannot be taken too literally. Even in the case of a single academic unit which covers both IS and CS curricula, one often sees these complementary strengths between the two curricula.

1016

This high level perspective of complementary strengths suggests that there may be opportunities for courses taught by Computer Science that also meet the needs of IS majors and similarly for courses taught by IS for Computer Science students desiring more IS knowledge. It is possible to conceptualize a common core course sequence for Computer Science and Information Systems, and in fact, such sequences are taught at a number of institutions. This report has not attempted a formal definition of such a course sequence because there is no fixed organizational model of the relationship between the two programs to which such a definition could be addressed. Instead, we believe the correct approach is for individual institutions to take the core requirements for IS as described in this report and those for CS as expressed in CS'91 and then, considering their own local situation in terms of organization of academic units and distribution of strengths of faculty and laboratory resources, to design a common core sequence, if this makes sense in their own circumstances. This is possible because both CS'91 and IS'97 describe the core requirements in terms of knowledge units rather than courses. Specific courses in each report are for the purpose of showing possible organizations of the material rather than a prescription for how it is to be taught. Needless to say, the finished product should satisfy both curricula. Close examination of CS'91 shows that opportunities for shared courses are particularly good in the curriculum area of information technology (see Figure 5 on page 17).

1032

The overall level of commonalty that might be achieved between a CS and an IS program are very dependent upon local conditions; for example, the Sample Curriculum G (Software Engineering Emphasis) of CS'91 has many knowledge elements in common with IS'97, whereas other CS'91 Sample Curricula have a smaller intersection.

UPDATING OF THE INFORMATION SYSTEMS CURRICULUM

1037

The curriculum updating cycle has been too slow to meet the needs of academia and industry. Both the committee processes and the process for publication of results have been inefficient and time consuming. The IS'97 task force recommends a new updating procedure and publication approach, using standard Internet resources such as e-mail and document transfer facilities. Proposals are currently being prepared to support the development of this system.

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Appendix 1 -- Introduction to Appendix Material

1265

Information Systems '97 (IS'97), is a model curriculum for a bachelor's degree in Information Systems (IS). It is the result of the collaborative work of a Joint Task Force of the Association for Computing Machinery (ACM), the Association for Information Systems (AIS), and the Association of Information Technology Professionals (AITP -- formerly the Data Processing Management Association, DPMA). The appendix material presents detailed materials from the work of the task force. The materials are designed for faculty who need significant detail to organize and design courses and write course materials.

1271

Appendix	Title	Overview
2	Background of IS Curricula and Related Disciplines	Computing curricula were first developed in the late 1960s. The initial curricula were in Computer Science (CS). The need for Information Systems (IS) curricula was identified (Ashenhurst 1972; Couger 1973). Curricula were developed over the next decade. Since the late 1970s, both the ACM and DPMA have supported the development of model curricula for information systems. This appendix provides a chronology of significant events in these developments and the relationship between IS and other disciplines.
3	Details of the Development of IS'97	A systems development philosophy is described for the development of courses and learning units. The group techniques that were used are explained as are the procedures for working with the knowledge structures.
4	Depth of Knowledge Metric and Related Pedagogy	A cognitive behavioral metric is presented for specifying and evaluating depth of knowledge. The specification includes a numeric depth indicator and appropriate language to describe presentation goals and resultant behavior expected of students completing specific parts of the curriculum.

5	IS Body of Knowledge	An overview of the IS body of knowledge is presented. The full Body of Knowledge is in the form of a four level outline hierarchy. This appendix discusses the first two levels. It is based on previous efforts of DPMA and ACM (Longenecker and Feinstein 1991a, 1991b, 1991c; Ashenhurst 1972; Couger 1973; Nunamaker, Couger and Davis 1982; ACM 1983; DPMA 1981, 1986). The IS'97 body of knowledge contains the Computer Science and Engineering body of knowledge (Turner and Tucker 1991).
6	Learning Units	A modular concept of learning units is defined and utilized in specifying proposed courses. Elements from the body of knowledge are combined in a logical top-down manner to form Learning Units (LU). Each LU contains a goal statement, behavioral objectives and associated elements from the body of knowledge. The language of the goals and objectives is consistent with the depth of knowledge description. The appropriate depth of knowledge is specified for the associated body of knowledge elements. Methods for mapping the learning units to alternate course sequence plans are discussed.
7	Detailed Body of Information Systems Knowledge	The complete four level hierarchy of the IS body of knowledge is presented. Depth of knowledge appropriate for each element is shown mapped to one or more of the 127 learning units. This allows a cross reference from the body of knowledge to learning units. This demonstrates the internal consistency and completeness of the model.
8	IS'97 Course Specifications and Learning Units	Catalog overview, scope, course topics and expectations are shown for each of the courses of IS'97. In addition, the complete goals, objectives and set of body of knowledge elements are shown for each of the learning units. The set of learning units completely describes the IS'97 content.

Appendix 2 -- Background of IS Curricula and Related Disciplines

Computer Science Curricula

1281

A curriculum for Computer Science (CS) was first outlined in 1968 (see list in Figure A2.1; ACM 1968) and revised a decade later (ACM 1979). These curricula helped define the field of Computer Science. A joint task force of the IEEE-CS and ACM revised the curriculum in 1991 (Turner and Tucker 1991).

Information Systems Curricula

1285

Curriculum development for Information Systems (IS) began in the early 1970s (Ashenhurst 1972; Couger 1973); both the ACM and DPMA published versions of IS model curricula in the 1980s (DPMA 1981, 1986; Nunamaker, Couger and Davis 1982). Key events are listed in Figure A2.1.

May, 1972	ACM Graduate Professional Programs in Information Systems (Ashenhurst 1972)
December, 1973	ACM Undergraduate Programs in Information Systems (Couger 1973)
March, 1981	ACM Educational Programs and Information Systems (Nunamaker, Couger and Davis 1982)
1981	DPMA Curriculum for Undergraduate Information Systems Education (DPMA 1981)
1983	ACM Information Systems Curriculum Recommendations for the 80s, Undergraduate and Graduate Programs (ACM 1983; Nunamaker, Couger and Davis 1982)
October, 1984	DPMA Secondary Curriculum on Information Technology and Computer Information Systems
October, 1985	DPMA Associate-Level Model Curriculum in Computer Information Systems
October, 1985	DPMA Model Curriculum for Undergraduate Computer Information Systems
May, 1990	ACM/IEEE Computing Curriculum for Computer Science for Undergraduates
October, 1990	DPMA IS'90 draft document (Longenecker and Feinstein 1991c)
June, 1991	DPMA IS'90 Curriculum for Undergraduate Programs in Information Systems
July, 1991	ACM CS Curriculum (Turner and Tucker 1991)
January, 1994	DPMA IS'94 Curriculum for Two Year Programs in Information Systems (Longenecker, Feinstein et al. 1994)
January, 1994	ACM Curriculum for Two Year Programs in Computer Information Systems
December, 1994	First Draft of IS'95 from the Joint ACM, AIS, DPMA Task Force (Gorgone et al. 1994; Longenecker et al. 1995; Couger 1996)
February, 1996	First Draft of IS'97 from the Joint ACM, AIS, DPMA Task Force

Figure A2.1 – Key Chronology of IS Curriculum Events

1288

The DPMA IS'90 model was begun in November 1988 and completed by July of 1991 (Longenecker and Feinstein 1991b, 1991c). This model was based on a survey of information systems programs in approximately 1,000 colleges and universities in North America (Longenecker and Feinstein 1991a). Participants in the effort, the Curriculum Task Force (CTF 90), were drawn from an international community of industry, business and academia including both two and four year institutions. The work was supported by the DPMA but participants were also active in other organizations. Material from the unpublished work of the ACM-IS curriculum committee which met in the late 1980s was incorporated into the model.

1295

The draft version "Information Systems - The DPMA Model Curriculum for a Four Year Undergraduate Degree (IS'90)," was released in October 1990. This draft was presented at ISECON (Information Systems Educational Conference) in Chicago, at the DSI (Decision Sciences Institute) meeting in San Diego, and at ICIS (International Conference for Information Systems) in Copenhagen. A final document was released in June 1991. IS'90 prompted considerable dialogue. A partial list of papers that discuss various aspects of IS education is found in the bibliography (Aggarwal and Rollier 1994; Burn et al. 1994; Cale 1994; Chow, Dick and Edmundson 1994; Daigle and Kemp 1993, 1994; Daniels et al. 1992; Denison 1993; Doran, Longenecker and Pardu 1994; Cohen 1993, 1994; Granger and Schroeder 1994; Haney 1994; Klein, Stephens and Bohannon 1994; Lim 1993; Longenecker, Feinstein and Gorgone 1994; Longenecker et al. 1996; Longenecker et al. 1997; Lorents and Neal 1993; Mawhinney, Morrell and Morris 1994; McKinney, Agarwal and Sanati 1994; Pick and Schenk 1993; Pick, Baty and Phoenix 1994; Sanati, McKinney and Agarwal 1994; Smith 1994; Waugespack 1994).

1306

Currently, most information systems programs use either the DPMA or ACM model or some combination of the two (Glass 1992; Pierson 1994).

Characteristics of IS'97 Development

1309

In February 1994 the initial meeting of a Joint Task Force for ACM, AIS, and DPMA collaboration on a model IS curriculum was held. At the meeting, the IS'90 body of IS knowledge was reviewed and updated. During subsequent meetings, curriculum presentation areas were described. Courses were also developed based on specific goals and objectives. Statements specifying the characteristics of graduates were reviewed and extended. Preliminary versions of the curriculum were presented in 1994 and 1995 at ISECON (Information Systems Educational Conference, Louisville), DSI (Decision Science Institute, Honolulu), IAIM (International Academy for Information Management, Las Vegas), ICIS (International Conference on Information Systems, Vancouver), and SIGCSE (Special Interest Group for Computer Science Education, Nashville).

1317

The IS'97 materials were presented for review to 900 faculty, chairs, and distinguished IS professionals during the summer of 1995. The critique from the review process was used by the co-chairs in developing the edited version now called IS'97. The ACM Education Board members and DPMA management submitted significant suggestions for revision of IS'95. The upgraded materials were presented in 1995 at IACIS (International Association for Computer Information Systems), ISECON, DSI, and IAIM, and in 1996 at SIGCSE in Philadelphia.

1322

IS'97 and its predecessor IS'90 differ from other approaches in several fundamental ways.

1323

1. Development was based on a systems based methodology which can be replicated as the knowledge base evolves.

1324

2. Course content is determined in a functional manner rather than topically. For example, an

integrated course in systems development replaces the necessity for separate courses in database, analysis, and design. These topics have always been strongly coupled and, therefore, should be taught together.

1327

3. The depth of coverage of elements of the body of knowledge within the objectives is progressive. This allows all related topics to be covered in an integrated fashion with repetition and increasing depth until the required exit competence is achieved.

1330

4. Measurable educational outcome objectives are identified and used uniformly throughout the methodology. Depth of knowledge is defined in a manner consistent with Bloom (1956). This allows for learning of the body of knowledge to a specified competence as well as continuous assessment and feedback (Argyris 1976, 1977) . Topics are revisited several times within the context of given goals of instruction (Gagne, Briggs and Wager 1988).

1335

5. The learning units provide small units for curriculum design. They support tailoring of courses and are not as prescriptive as courses used in previous models. This allows flexibility by individual academic units, yet with the ability to remain focused on overall objectives of the curriculum. This approach will help ensure the quality of graduates (Denning 1992; Bemowski 1991a, 1991b; Cherkasky 1992).

May, 1972	ACM Graduate Professional Programs in Information Systems (Ashenhurst 1972)
December, 1973	ACM Undergraduate Programs in Information Systems (Couger 1973)
March, 1981	ACM Educational Programs and Information Systems (Nunamaker, Couger and Davis 1982)
1981	DPMA Curriculum for Undergraduate Information Systems Education (DPMA 1981)
1983	ACM Information Systems Curriculum Recommendations for the 80s, Undergraduate and Graduate Programs (ACM 1983; Nunamaker, Couger and Davis 1982)
October, 1984	DPMA Secondary Curriculum on Information Technology and Computer Information Systems
October, 1985	DPMA Associate-Level Model Curriculum in Computer Information Systems
October, 1985	DPMA Model Curriculum for Undergraduate Computer Information Systems
May, 1990	ACM/IEEE Computing Curriculum for Computer Science for Undergraduates
October, 1990	DPMA IS'90 draft document (Longenecker and Feinstein 1991c)
June, 1991	DPMA IS'90 Curriculum for Undergraduate Programs in Information Systems
July, 1991	ACM CS Curriculum (Turner and Tucker 1991)
January, 1994	DPMA IS'94 Curriculum for Two Year Programs in Information Systems (Longenecker, Feinstein et al. 1994)
January, 1994	ACM Curriculum for Two Year Programs in Computer Information Systems
December, 1994	First Draft of IS'95 from the Joint ACM, AIS, DPMA Task Force (Gorgone et al. 1994; Longenecker et al. 1995; Couger 1996)
February, 1996	First Draft of IS'97 from the Joint ACM, AIS, DPMA Task Force

Figure A2.1 – Key Chronology of IS Curriculum Events

Appendix 3 -- Details of the Development of IS'97

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This appendix explains the development process for IS'97. A few key principles guided the effort:

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1. The documents produced and the thinking involved should represent a consensus from IS faculty, chairs, and industry leaders.

1343

2. The documents should be designed to help IS faculty produce competent and confident entry level graduates well suited to work-place responsibilities.

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3. The documents should not be prescriptive, but should allow faculty to see clearly the depth of understanding and behaviors expected of graduates, and to build their own courses within the guidelines of the documents.

1347

4. The documents should be based on sound educational methodology and make appropriate recommendations for consideration by IS faculty.

1349

5. The model should be flexible and adaptable to most IS programs. It should be useful for IS programs in different parts of the university. Survey data indicated almost 50% of IS programs occur in schools of business, while the rest occur in a number of other areas.

The Development Process

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There were meetings of the entire task force, of the co-chairs, and of the IS community at formal panels, keynotes, and other presentations at the annual meetings of IACIS, ISECON, DSI, IAIM, ICIS, and SIGCSE. Agenda items (Clawson and Bostrom 1991) and group methods were considered in detail, and methods were selected to take maximum advantage of the various assembled groups.

1357

In meetings, facilitated discussion was frequently used. As the group talked through agenda items, an almost verbatim transcript was produced and projected on a screen for all to view. This written record prevented any blocking behavior and provided a mechanism for developing shared vision, a major goal at every meeting.

Group systems tools were used for several electronic meetings in which information was collected from group members.

1361

1. A group meeting tool (GROUP_OUTLINER) was used for an electronic discussion forum and idea generation. The tool allowed developing an organized list/outline (with directions) for electronic discussion by the participants. Printouts were given to the group frequently during such meetings. This allowed for group and individual learning and sharing of ideas.

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2. A group meeting software function (VOTE) was used to test opinions and to determine the relative strength of ideas. The tool was not used as a means to divide or eliminate discussion. The tool was not used to develop or enforce a consensus.

1368

3. A group meeting software function (GROUP-MATRIX) was used by the task force for level setting with lengthy multi-column lists. Significant variances in opinions were explored through face-to-face discussion during the sessions. The tool was used to encourage consensus.

1371

Idea development was usually initiated in large groups with collection of data. Small teams or individuals sifted through the ideas to extract the central meanings and present abstractions for review by the group. Idea initiators were asked to bring reference material to ensure completeness.

1374

Abstractions were reviewed and evaluated. Surveys were developed to involve a larger group in reviewing the developing ideas and concepts. The surveys were considered useful forward-looking input because:

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1. Faculty completing the surveys knew that their answers would be used to reflect the future.

1377

2. Consistency in importance of survey items over time identifies items having long-term value. For example, the importance of systems theory was in all surveys going back to 1988. Such a constant

observation leads to the recommendation to include systems theory within the IS'97 curriculum.

1380

3. Important unmet needs emerge. Where a significant percent of the community accepts or rejects an idea, the recommendations reflect such concerns. For example, a very high percent of surveyed participants suggested that the curriculum should present options involving cooperation with Computer Science units.

1383

In using the survey data, questions were posed that tested many of the ideas the task group felt were important. The results were shared with the IS community to test the suggestions. Such data are an explicit part of IS'97.

1385

The co-chairs and task force members are well known IS faculty and/or professionals. ACM Education Board, AIS, DPMA top management, DSI, IAIM, ISECON, and IACIS management have provided critical review and the opportunity for refinement of these materials. Reviewers have completed surveys and provided commentary to ensure the validity and accuracy of this document.

1389

In identifying participants for the survey, the *MISRC/McGraw-Hill Directory of Management Information Systems Faculty* was used for tracking IS departments, IS faculty, and IS chairs. We feel this collection represents about 40% of the IS community. Other lists from meeting participants, the DPMA, and Peterson Guide were used. Overall, several thousand IS programs within the United States, Canada and from other parts of the world were contacted.

Exit Objectives for Graduates

1394

In a systems approach to the IS curriculum, the definition of exit objectives identifies the output of the system. The input is assumed to be high school graduates capable of entering college.

1396

The basic idea is that graduates of IS programs should have competencies, skills and attitudes that are necessary for success in the workplace and life-long learning as an IS professional or provide the basis for graduate programs. Surveys of the task force and of others have identified and prioritized these characteristics. Many of these competencies are shared within the computing professions, as indicated by this data.

1400

Given these exit characteristics, there exists a sequence of learning units that produce graduates with the desired competencies. The task force described these learning units and their sequencing. This was accomplished in a top down manner by describing broad curriculum areas, formulating courses to implement these areas, and specifying learning units to implement the courses.

Depth of Knowledge Metrics

1405

The depth of knowledge metrics of IS'90 were adopted by the IS'97 task force. There are five levels of depth of knowledge competencies explained in Appendix 4. The IS'97 group extended the IS'90 observations by reviewing the appropriate pedagogy, particularly the issues regarding the successful application of cooperative learning mechanisms. These are particularly important in team environments. The competency levels were used to differentiate introductory explanation of topics from later depth coverage. A backtracking process was used to assure that correct sequencing of material was achieved and appropriate prerequisite material had been defined.

Body of Information Systems Knowledge

1412

The body of computing knowledge represents a synthesis of the IS'90 body of knowledge updated by the IS'97 task force. Also incorporated were elements of the ACM-Computer Science knowledge elements from CS'91 and other curriculum proposals as well as all of the knowledge elements from the Software Engineering Institute documents (see Appendix 7 for detail). In addition, the document has been modified to reflect the work of the NSF sponsored task force describing a tenth area for CS'91.

1417

In order to match and include the ACM and other knowledge elements, all competency statements were removed, leaving just the knowledge element. The IS body of knowledge is essentially a three level hierarchy of broad subject areas. Most of the CS and SE elements are added as the fourth level to further elaborate the detailed topics. They add a considerable richness to the hierarchy and, in fact, define a computing body of knowledge. The ethics components from an NSF task force for a tenth area of CS'91 were added as elements at the fourth level and required renaming several third level elements for completeness.

1423

The mapping process was done one element at a time, searching to see where the element belonged. The process was repeated for each element. Some elements matched an existing third level element.

Development of Courses

1426

Selecting the names and number of courses was one of the most controversial issues for the task force. Although there was a final concession to agree to adopt ten courses and one prerequisite, it is doubtful there was a true consensus on the validity of the entire course set. For example, in AACSB accredited schools, a maximum of eight courses is permitted. The task force therefore used the courses as a vehicle to determine the goals and objectives that all graduates needed to learn rather than a unified prescription.

1431

Curriculum areas were a source of discussion but there was good agreement on these areas. The task force used Group Systems to collect potential course names within each curriculum area. These lists were organized and the number of courses that could be taught within each area were identified. Once the number of courses was fixed, the group selected course titles. Reasonable consensus was reached through face to face discussion of the lists and the course titles presented in this document were adopted.

Development of Learning Units

1437

The systems approach of Gagne, Briggs and Wager (1988) based on a strategic sequencing of learning objectives requiring performance at increasing levels of Bloom's (1956) competencies was chosen. A modification of Bloom levels was used with four levels of competency. Learning units were developed to encapsulate goals and objectives for transferring elements of the IS body of computing knowledge. IS'90 (Longenecker and Feinstein 1991c) developed a language for specification of goals and objective statements.

1442

Once course titles were fixed, the task force again used group meeting software to collect goal and objective statements for each course. Task force members had previous curriculum documents, access to texts, the body of knowledge, and a variety of recent publications in addition to their own expertise.

1445

Several thousand goal and objective statement were collected. These were organized into groups manually and rewritten giving a list of 127 goal statements and 250 uncorrelated objective statements. Both lists were entered into a database. Each goal and objective was classified with keywords. The keywords were used to partially order the two lists. One or more objective statement was matched to a goal statement. Some goal statements had no corresponding objectives and goals were written for these. Each goal and set of objectives was then reviewed for completeness, given a name and a depth level based on the language of the goal and objectives.

1451

Using the keywords for each goal and objective, the body of knowledge was searched manually for appropriate elements. The search was done by looking primarily for third level knowledge statements. For each third level element, at least one, and preferably more than one, goal-objectives set, or "learning unit," was isolated for each depth of knowledge level. The mapping of the body of knowledge to learning units is shown both in Appendices 8 and 9. In Appendix 7, the learning units are shown. In Appendix 8, the goal and objective sets are shown, along with the relevant body of knowledge elements.

Appendix 4 - Depth of Knowledge Metrics and Related Pedagogy

1458

A key ingredient in IS'97 is a competency or depth of knowledge metric with five levels (with four levels specified in the curriculum). This metric is based on but not identical to the work of Bloom (1956), which describes a six level metric. The metric makes it possible to communicate specifications and expectations.

Depth of Knowledge Metric

1462

Table A4.1 is a summary of the depth of knowledge metric. Note that there are conceptually five levels for depth of knowledge in IS'97 but only the first four are used for an undergraduate program. The IS'97 levels differ from Bloom levels in that Bloom's level 1 is divided into IS'97 levels 1 and 2 and Bloom levels 4, 5, and 6 are mapped to IS'97 level 5.

1466

The characteristics of the metric include

- the definition of the levels of knowledge,

- the behavior to be demonstrated by those completing learning units of the curriculum,

- how goals and objectives are developed compatible with each knowledge level,

- how to determine the level of knowledge from previously defined goal and objective statements (reverse engineer knowledge levels from existing documentation),

- how material at a given level can be delivered to students, and

- how learning at given level can be assessed.

1474

The Joint IS'97 Curriculum Task Force used the taxonomy of knowledge description adopted by IS'90 (Longenecker and Feinstein 1991c; Longenecker, Clark et al. 1994) summarized above. The IS'97 task force used the template shown in column 3 for use in writing behavioral objective and goal statements; these statements allow authors and faculty to be more precise in communicating expectations for both students and teachers.

Identifying Expectations

1479

The statements of characteristics of graduates contain "keywords" that can be detected using the template of the metric. For example, if the expectation is to "apply problem solving techniques in configuring a local area network," this is the equivalent of a level 4 objective. The knowledge levels specified within IS'97 are compatible with the definitions of Table A4.1. The exit objectives of the goals and objectives have been checked and verified to assure consistency with the expectations of industry and academics.

Content Analysis of Statements of Expectation

1485

The knowledge levels of IS'97 are designed to give guidance to educators in planning as well as in the analysis of outcomes. Column 3 of Table A4.1 describes a template for writing objectives. This template was originally defined in IS'90 and has been expanded in the present context. The language used in writing a behavioral objectives was derived from the Bloom taxonomy. The template may be used prescriptively in writing presentation goals and student performance objectives to ensure that the implied level of difficulty is presented. Likewise, given the objective, the student's behavior can be observed and compared with the objective statement to ensure that the students achieve the desired results of the presentation goal statements.

Learning Techniques for Different Levels

1493

Learning techniques often differ for different levels. Level 1 knowledge in IS'97 (awareness) is knowledge that is immediately apparent. Given a visual stimulus, it is knowledge that is recalled. IS'97 level 2 knowledge (literacy) requires not only recognition, but recognition of the context of the knowledge; that is, the knowledge element and its parents and descendants should be familiar to the learner. Classroom activity or participative learning strategies are sufficient in transferring this level of knowledge, although level 2 activity is enhanced in the lab. Although knowledge at levels 1 and 2 is relatively low, these levels should be mastered before higher levels can be achieved. It is the "revisiting" of previously presented and learned knowledge that is implied in the organization of learning units.

1500

The more complex IS'97 level 3 (usage/comprehension) requires considerable practice and creative repetition. Level 4 (application) requires unsupervised practice. Team work, project work, and other participative learning facilitate achieving these levels. Proper sequencing is an important factor in achieving student success. Project laboratories are ideal for this level of student activity. In fact, these laboratories are beneficial at all levels of instruction (Doran, Longenecker and Pardu 1994; Dutt 1994). Some institutions have been successful with total participatory project environments (Holland College 1993).

1506

The cooperative paradigm (Litchfield 1996; Johnson, Johnson and Houlubec 1993) offers many advantages to learners, although it requires considerable change on the part of faculty. The cooperative paradigm greatly increases student motivation and better simulates the work environment in which graduates are expected to perform. The cooperative paradigm supports well the development of application level competencies.

IS'90,'94,'95 Depth of Knowledge	Bloom Levels of Knowledge	Template for Writing Behavioral Objectives Students completing ... will be able to	Meaning of Depth of Knowledge Level and Activities Associated with Attaining that Level
1513 1 Awareness	1 Knowledge Recognition	Define ... List characteristics of ... Name components of ... Diagram ... List advantages/disadvantages of ...	Introductory Recall and Recognition Class presentations, discussion groups, reading, watching videos, structured laboratories. Involves only recognition, but with little ability to differentiate. Does not involve use.
1514 2 Literacy	1 Differentiation	Compare and contrast ... Explain ... Write/execute simple ... Define functional capabilities that are ... Describe interrelations of ... to related objects	Knowledge of Framework and Contents, Differential Knowledge Continued lecture and participative discussion, reading, team work and projects, structured labs. Requires recognition knowledge as a prerequisite. Requires practice. Does not involve use.

1515 3 Concept/Use	2 Comprehension Translation/ Extrapolation Use of Knowledge	Use ... Communicate the idea of ... Form and relate the abstraction of ... as ... Given a set of ..., interpolate/extrapolate to ... List concepts/major steps in ...	Comprehension and Ability to Use Knowledge *when Asked* Requires continued lab and project participation, presentation involving giving explanations and demonstrations, accepting criticism; may require developing skills in directed labs.
1516 4 Detailed Understanding Application	3 Application Knowledge	Search for correct solution to ... and apply it to ... Design and implement a ... for ... Write syntactically correct ... and/or debug ... Apply the principles of ... to ... Implement a ... and maintain it	Selection of the Right Thing and Using It *without Hints* Semi-structured team-oriented labs where students generate their own solutions, make their own decisions, commit to and complete assignments, and present and explain solutions.
1519 5 Skilled Use	4 Analysis 5 Synthesis 6 Evaluation	Develop/originate/institute ... Construct/adapt ... Generate novel solutions to ... Come up with new knowledge regarding ... Evaluate/judge the relative value of ... with respect to ...	Identification, Use and Evaluation of New Knowledge An advanced level of knowledge for those very capable of applying existing knowledge in which *denovo* solutions are found and utilized in solving and evaluating the proposed new knowledge.

Table A4.1 -- Knowledge Levels, Templates for Objective Writing, and Meaning of the Depth Levels with Associated Learning Activities

Appendix 5 -- IS Body of Knowledge

1522
A specific discipline may be defined by its associated body of knowledge. The information systems body of knowledge consists of three major subject areas:

1.0 Information Technology

2.0 Organizational and Management Concepts

3.0 Theory and Development of Systems

1527
Each subject area contains major topics and each major topic contains subtopics which are the lowest level curriculum elements of the body of knowledge. A fourth level with more detail for third level elements is useful in describing curriculum content.

Sources Used in Defining the Body of Knowledge

1531
Each of these subject areas represents specific domains of knowledge. The entire body of knowledge consists of 506 elements in a four level hierarchy (Nunamaker, Couger and Davis 1982; DPMA 1981,1986; Longenecker and Feinstein 1991c; Longenecker, Feinstein et al. 1994). The fourth level makes it possible to include the 106 element CS knowledge body of Turner and Tucker (1991) and the 120 elements from the software engineering body of knowledge. Elements of the software engineering body of knowledge were explicitly derived from analysis of curriculum content contained in reports on software engineering education developed by the Software Engineering Institute (Ford 1990, 1991), and were based on the observations of Glass (1992), other reports from the SEI (Berry 1992; Ford, Gibbs, and Tomayko 1987; Ford and Ardis 1989; Ford 1994; Gibbs and Ford 1986; Shaw 1986, 1990; SEI 1991; Tomayko and Shaw 1991), and other efforts (BCS 1989; Ford and Gibbs 1989; Freeman 1987; Gibbs 1989; Leventhal and Mynatt 1987; NSF 1993; Parnas 1990; Wasserman 1976).

Two Level View of the Body of Knowledge

1543
Table A5.1 shows a two level hierarchy of the body of knowledge. The three major subject areas are broken into subareas. While Table A5.1 shows only two levels, the complete body of knowledge (see Appendix 7) contains the expansion to four levels.

Industry/Academic Survey of Required Depth of Knowledge

1547
Table A5.2 shows a two level description of each of the subject areas of the body of knowledge in column 1. Columns 2 through 4 show data derived by surveying academicians on the importance of the various items to different categories of students (IS majors, IS minors and end users). Column 5 represents data derived from a survey of industry

expectations for new hires (Mawhinney, Morrell and Morris 1994). By inspection of columns 4 and 5, it is evident that there is substantial agreement between industry expectations and the depth standard set by IS academics. Table A5.2 shows that graduates of an IS program require comprehensive usage level of information technology. Graduates should be able to accept direction and complete tasks assigned (Denning 1992) and also be able to apply their knowledge without direction. This information has been used for setting depth expectations within IS'97.

1557

Body of Information Systems Knowledge

1.0 Information Technology

1.1 Computer Architectures
1.2 Algorithms and Data Structures
1.3 Programming Languages
1.4 Operating Systems
1.5 Telecommunications
1.6 Database
1.7 Artificial Intelligence

2.0 Organizational and Management Concepts

2.1 General Organization Theory
2.2 Information Systems Managemen
2.3 Decision Theory
2.4 Organizational Behavior
2.7 Managing the Process of Change
2.8 Legal and Ethical Aspects of IS
2.9 Professionalism
2.10 Interpersonal Skills

3.0 Theory and Development of Systems

3.1 Systems and Information Concepts
3.2 Approaches to Systems Development
3.3 Systems Development Concepts and Methodologies
3.4 Systems Development Tools and Techniques
3.5 Application Planning
3.6 Risk Management
3.7 Project Management
3.8 Information and Business Analysis
3.9 Information Systems Design
3.10 Systems Implementation and Testing Strategies
3.11 Systems Operation and Maintenance
3.12 Systems Development for Specific Types of Information Systems

Table A5.1 -- IS'97 Body of Knowledge Presented as a Two Level Hierarchy.
(See Appendix 7 for the complete structure.)

1590

Body of Information Systems Knowledge Elements	Expected Knowledge Levels of Information Systems Professionals				
	Survey of IS Academics				IS Industry 1994
	DPMA 12/93 Survey			IS'97 8/95 Review	
	End User	IS Minor	IS Major	IS Major	Entry Level
1.1 Computer Architectures	1.4	2.2	3.1	2.9	3.4
1.2 Algorithms and Data Structures	1.3	2.3	3.4	3.2	3.2
1.3 Programming Languages	1.5	2.6	3.7	3.5	3.2
1.4 Operating Systems	1.4	2.4	3.2	2.7	3.1
1.5 Telecommunications	1.5	2.5	3.2	3.0	3.0
1.6 Database	1.8	2.8	3.7	3.5	3.5
1.7 Artificial Intelligence	1.4	2.0	2.6	2.2	1.9
2.1 General Organizational Theory	1.8	2.3	2.8	3.2	2.6
2.2 Information Systems Management	1.6	2.6	3.2	2.9	2.5
2.3 Decision Theory	1.7	2.2	2.7	2.9	2.4
2.4 Organizational Behavior	2.7	2.7	2.8	3.0	2.4
2.7 Managing the Process of Change	1.9	2.3	2.8	2.9	2.8
2.8 Legal and Ethical Aspects of IS	1.5	2.6	3.0	2.8	3.5
2.9 Professionalism	1.9	2.6	3.0	3.1	3.5
2.10 Interpersonal Skills/Communications	2.5	2.8	3.9	3.6	4.0*
3.1 Systems and Information Concepts	2.5	2.8	3.1	3.2	3.3
3.2 Approaches to Systems Development	1.5	2.3	3.2	3.3	3.4
3.3 Systems Development Concepts and Methodologies	1.5	2.3	3.2	3.4	3.3
3.4 Systems Development Tools and Techniques	1.4	2.6	3.5	2.9	2.5
3.5 Applications Planning	1.7	2.8	3.6	3.2	3.0
3.7 Project Management	1.6	2.6	3.3	2.9	3.0
3.8 Information and Business Analysis	1.7	2.7	3.4	3.4	3.4
3.9 Information System Design	1.6	2.7	3.6	3.2	3.1
3.10 Systems Implementation and Testing Strategies	1.5	2.7	3.5	3.0	3.6
3.11 Systems Operation and Maintenance	1.5	2.7	3.5	2.7	--

3.12 Systems Development for Specific Types of Information Systems	1.7	2.7	3.2	3.1	--

The data from IS academics was obtained in a DPMA sponsored national survey of IS program heads conducted by the IS'97 Curriculum Task Force in December 1993, and from a survey of 161 department heads and IS faculty conducted during the review of IS'97. The industry survey information was taken from Table 1, with 2.10 estimated from Figure 3, of Mawhinney, Morrell and Morris (1994). The knowledge levels are means of survey responses and represent the average depth of learning expected by the sample group where each respondent selected an integer knowledge level (where 1=Awareness, 2=Literacy, 3=Ability to Use and 4=Ability to Apply the indicated knowledge).

Table A5.2 -- Academic versus Industry Expected Competencies

Appendix 6 - Learning Units

1626

Once the general architecture of the curriculum and course names were determined, goal and objective statements for each of the courses were developed. The goal and objective statements were developed to achieve a synthesis consistent with underlying principles and characteristics of IS graduates, general curriculum areas, an updated body of knowledge, and the concept of spiral learning.

1631

The goal and objective statements were developed using the template definitions of Appendix 4. The levels of learning are explicit in all of the statements. The use of the template structure ensured consistent and uniform language. The language used in writing goals and objectives help faculty devise examinations to measure the performance required for completion of each of the units. Overall, 127 goals were identified. Approximately 250 objectives were developed and matched to the goal statements.

1636

Exit levels of competency were developed for all third and fourth level elements of the body of knowledge. The exit level of knowledge is the depth or level of understanding students are expected to attain for each knowledge unit by the completion of the program. Items from the body of knowledge were assigned to the appropriate objectives at the level of competency required to satisfy the objective. Knowledge units may appear in more than one objective. For each occurrence of a knowledge unit, an exit level of competency was assigned. This repetition of the knowledge units formed a progression of increasing competency.

1642

Each goal and its associated objectives comprise a Learning Unit. Each goal/objective set was assigned a Learning Unit name. The level of knowledge was extracted from the "template" text of the learning unit, since precise language indicating level had been used. Learning units were grouped within each curriculum presentation sub-area. Figure A6.1 shows the relation of learning units to the curriculum sub-areas. Figure A6.2 show the learning units associated with each course. Appendix 8 shows the details of each course and also shows the details of each of the learning units. In summary,

1648

IS'97 consists of

> **Curriculum Areas** which are broad areas of knowledge which can be expressed by
>
> > **IS Courses** which are implemented through a sequence of
> >
> > > **IS'97 Learning Units** each defined by a specific
> > >
> > > > **Learning Unit Goal** which describes presentation of
> > > >
> > > > **Body of Knowledge Elements** whose effective presentation can be assessed by
> > > >
> > > > **Learning Objectives** which describe the expected level of knowledge outcome performance by students.

1655

Many institutions are developing integrated courses that span multiple academic units. For example, a business school may wish to develop an entirely integrated core curriculum and ensure that appropriate end-user computing is a component of such a program. An alternate example might involve development of a hybrid CS-IS core curriculum. It is the intention that learning units can be moved intact into these integrated courses and programs.

With incorporation of the learning units, the integrity of the IS learning experience can be preserved in the integrated program.

Figure A6.1 -- Learning Units in IS'97 (organized by Curriculum Area and Sub Area)

1661

- **CURRICULUM PRESENTATION AREA**
  - **CURRICULUM SUB-AREA**
    - **LEVEL OF KNOWLEDGE**
      - **COURSE NUMBER**
        - **LEARNING UNIT NUMBER AND NAME**

A. FUNDAMENTALS OF CIS

1667

A.1 IS LITERACY

- LEVEL COURSE LU-# LEARNING UNIT NAME----------------

1 00 0004 IT AND SOCIETY
1 00 0001 SYSTEMS AND IT CONCEPTS
1 01 0012 ETHICS AND THE IS PROFESSIONAL

1672

A.2 END-USER COMPUTING

1 00 0003 PROBLEM SOLVING, SMALL IS
1 02 13.01 WORK AND ACTIVITY CONCEPTS
1 02 13.02 SUPPORT: INDIVIDUALS VS GROUPS

2 02 13.05 ORGANIZING PERSONAL DATA RESOURCES

2 02 13.07 ACCESSING/RETRIEVING/STORING DATA

3 00 0002 KNOWLEDGE WORK SOFTWARE

3 02 13.09 CONFIGURE AND CUSTOMIZE A PACKAGE

3 02 13.16 IMPLEMENTING A PERSONAL IS APPLICATION

B. IS THEORY AND PRACTICE

1682

B.1 SYSTEMS/QUALITY

1 01 0006 INFORMATION AND QUALITY

1 01 0005 SYSTEMS AND QUALITY

2 03 0016 IS THEORY

2 03 0022 SYSTEMS AND QUALITY, AND IS

2 08 0099 IS REQUIREMENTS/WORK-FLOW PLANNING

3 05 0042 INFORMATION MEASUREMENTS/DATA/EVENTS

1689

B.2 DECISION MAKING

1 01 0010 CHARACTERISTICS OF AN IS PROFESSIONAL

2 03 0021 DECISION MAKING, SIMON MODEL

2 03 0020 PERSONAL GOALS AND DECISIONS

2 03 0019 PERSONAL, COGNITIVE PROCESS

1694

B.3 IS PLANNING

2 03 0018 IS DEVELOPMENT AND MANAGEMENT

2 03 0123 IS MANAGEMENT OF IS FUNCTION

2 03 0026 IS PLANNING

1698

B.4 IT AND ORG SYSTEMS

2 01 0009 IT AND ATTAINING OBJECTIVES

2 03 0031 IS SOCIETY AND ETHICS

2 03 0017 IS STRATEGIC COMPONENT

2 03 0027 IS TYPES

2 03 0025 MODELS, ORG; RELATION TO IS

2 03 0023 SYSTEMS, ROLE OF MGMT, USERS, DESIGNERS

2 03 0024 SYSTEMS, WORK-FLOW, ORG SYSTEMS

2 07 0085 IS PROFESSIONAL CODE OF ETHICS

3 03 0119 ETHICS AND LEGAL ISSUES

C. INFORMATION TECHNOLOGY

1709

C.1 COMPUTER HARDWARE

1 01 0007 IT HARDWARE AND SOFTWARE

1 06 0064 IT HARDWARE ARCHITECTURES

2 06 0063 IT PERIPHERAL DEVICES

1713

C.2 SYSTEM SOFTWARE

1 06 0065 IT SYSTEMS SOFTWARE COMPONENTS/INTERACT

1 06 0068 OS ENVIRONMENTS AND RESOURCES

2 06 0067 OS FUNCTIONS

1717

C.3 TELECOMMUNICATIONS

2 04 0124 IS MANAGING EMERGING TECHNOLOGIES

2 04 0037 TELECOM, ARCH., TOPOLOGIES, PROTOCOLS

2 04 0036 TELECOM, CENTRAL/DISTRIBUTED SYSTEMS

2 04 0032 TELECOM, DEVICES, MEDIA, SYSTEMS

2 04 0034 TELECOM, ECONOMICS, DESIGN ISSUES

2 04 0038 TELECOM, HARDWARE AND SOFTWARE

2 04 0033 TELECOM, ORG SUPPORT BY

2 04 0039 TELECOM, SERVICES, RELIAB., SECURITY...

2 04 0035 TELECOM, STANDARDS, STD ORGS

2 06 0062 TELECOM, SYSTEMS VIEW HW/SW

1728

C.4 PROGRAMMING

2 02 13.10 PROCEDURAL/EVENT DRIVEN PROGRAMMING

2 05 0052 PROBLEM SOLVING, ENVIRONMENTS/TOOLS

2 05 0056 PROBLEM SOLVING, IS APPL, SUBSTRUCTURES

2 05 0050 PROBLEM SOLVING, MODULES/COHESION/ COUPLING

2 05 0049 PROBLEM SOLVING, OBJECT IMPLEMENTATION

2 05 0051 PROBLEM SOLVING, V&V--SYSTEMS VIEW

2 05 0061 PROGRAMMING: LANGUAGE COMPARISON

2 07 0083 IS SOFTWARE QUALITY METRICS

2 07 0082 PROBLEM SOLVING, COMPLEXITY METRICS

2 09 0104 IS APPLICATIONS, PROGRAMMING ENVIRONMENT

2 09 0101 IS IMPLEMENTATION WITH OBJECTS/EVENT DR

3 05 0060 PROBLEM SOLVING, DESIGN, TEST, DEBUG

3 05 0059 PROBLEM SOLVING, FILE/DB EDITORS/RPTS

3 05 0048 PROBLEM SOLVING, TOP DOWN IMPLEMENTATION

3 05 0058 PROBLEM SOLVING, WITH FILES/DATABASE

3 09 0100 IS APPLICATION WITH PROGRAMMING LANG

1745

C.5 ALGORITHMIC DESIGN

2 02 13.11 IMPLEMENTING SIMPLE ALGORITHMS

2 05 0044 ADT'S, CLASSES, OBJECTS

2 05 0053 ADT'S: DATA AND FILE STRUCTURES

2 05 0043 DATA: CHARACTERS, RECORDS, FILES, MMEDIA

2 05 0046 OBJECT REPRESENTATION OF A SYSTEM

2 05 0045 PROBLEM SOLVING, FORMAL PROBLEMS AND IS

2 08 0089 ADT'S: DATABASE MODELS AND FUNCTIONS

3 05 0054 ADT'S: ARRAYS, LISTS, TREES, RECORDS

3 05 0055 ADT'S: INDEXED FILES, KEYS

3 05 0047 PROBLEM SOLVING, ALGORITHM DEVELOPMENT

3 05 0057 PROBLEM SOLVING, DATA/FILE APPLICATIONS

D. SYSTEMS DEVELOPMENT

1758

D.1 SOFTWARE DEVELOPMENT

2 02 13.08 IS LIFE CYCLE: DEVELOPING WITH PACKAGES

2 02 13.13 IMPLEMENTING AND EVENT DRIVEN APPLICATIONS

3 08 0093 IS APPLICATION DEVELOPMENT/CODE GENERATE

3 08 0090 IS DATABASE AND IS IMPLEMENTATION

3 08 0092 IS DATABASE APPLICATION IMPLEMENTATION

3 08 0091 IS DATABASE APPLICATION STRUCTURING

3 09 0103 IS DEVELOPMENT TESTING

4 10 0110 IS APPLICATIONS, PRODUCTION SYSTEMS

1767

D.2 DATABASE

2 02 13.06 DATABASE TERMINOLOGY AND CONCEPTS

2 02 13.12 IMPLEMENTING A SIMPLE DATABASE DESIGN

3 07 0081 IS DATABASE APPLICATIONS DEVELOPMENT

3 08 0088 IS DATA MODELING

3 08 0095 IS DATABASE CONCEPTUAL/LOGICAL MODELS

1773

D.3 SYS ANALYSIS/DESIGN

1 02 13.03 INFO ANALYSIS: INDIVIDUAL VS GROUP

2 02 13.04 INFO ANALYSIS: FINDING IS/IT REQUIREMENTS

2 03 0028 IS DEVELOPMENT STANDARDS

2 07 0077 IS DEVELOPMENT RISKS/FEASIBILITY

2 08 0097 IS CONVERSION PLANNING

3 01 0008 IT SYSTEMS SPECIFICATION

3 02 0014 PROBLEM SOLVING, WITH PACKAGES

3 07 0072 IS ANALYSIS AND DESIGN TASKS

3 07 0078 IS CONTINUOUS IMPROVEMENT AND IS

3 07 0075 IS DESIGN AND IMPLEMENTATION

3 07 0076 IS RAPID PROTOTYPING

3 07 0074 IS REQUIREMENTS AND SPECIFICATIONS

3 07 0084 SYSTEMS AND QUALITY METRICS/ASSESSMENT

3 08 0098 IS DEVELOPMENT AND CONVERSION

3 08 0096 IS FUNCTIONAL SPECIFICATIONS

4 10 0111 IS REQUIREMENTS AND DATABASE

1790

D.4 TEAMS/INTERPERSONAL

2 08 0086 INTERPERSONAL, SYNERGISTIC SOLUTIONS

3 07 0079 INTERPERSONAL, CONSENSUS DEVELOPMENT

3 07 0080 INTERPERSONAL, GROUP DYNAMICS

3 08 0087 INTERPERSONAL, AGREEMENTS/COMMITMENT

3 10 0126 PERSONAL, TIME/RELATIONSHIP MANAGEMENT

4 08 0117 PERSONAL, PRESENTATION

4 10 0113 INTERPERSONAL, EMPATHETIC LISTENING

4 10 0114 INTERPERSONAL, GOAL/MISSION ALIGNMENT

4 10 0112 PERSONAL, PROACTIVITY/PRINCIPLED ACTION

1800

D.5 PROJECT MANAGEMENT

2 10 0109 IS DEVELOPMENT PROJECT CLOSE DOWN

3 08 0094 IS DEVELOPMENT AND PROJECT MANAGEMENT

3 08 0127 QUALITY AND PERFORMANCE MANAGEMENT

3 10 0105 IS DEVELOPMENT PROJECT PLANNING

4 10 0106 IS DEVELOPMENT PROJECT MANAGEMENT

4 10 0107 IS DEVELOPMENT PROJECT MANAGEMENT

4 10 0108 IS DEVELOPMENT PROJECT MANAGEMENT TOOLS

4 10 0116 IS LIFE CYCLES AND PROJECTS

E. IS DEPLOYMENT AND MANAGEMENT

1810

E.1 SUPPORT SERVICES

4 10 0118 PERSONAL, LIFE-LONG LEARNING

1812

E.2 SYSTEMS INTEGRATION

2 04 0040 TELECOM, INSTALLATION, IMPLEMENTATION

2 04 0041 TELECOM, LAN, INSTALL, CONFIGURE

2 06 0069 OS, INSTALL MULTI-MEDIA

2 06 0070 OS, INTEROPERABILITY AND SYS INTEGRATION

3 06 0071 OS, INSTALL MULTI-USER SYSTEM

3 07 0073 IS COMMERCIAL IMPLEMENTATIONS

1819

E.3 MANAGEMENT OF IS THE FUNCTION

1 01 0011 IS CAREERS

1 03 0030 PERSONAL, PERFORMANCE EVALUATION

2 03 0029 IS IMPLEMENTATION, OUTSOURCING

2 10 0122 IS POLICIES AND STANDARDS

3 10 0120 IS MANAGEMENT AND DEPT ORGANIZATION

3 10 0115 IS RESPONSIBILITY TO SELL DESIGNS TO MGT

3 10 0121 PERSONAL, LEADERSHIP AND IS

1827

E.4 INFORMATION RESOURCE MANAGEMENT

2 10 0125 IS IMPLEMENTATION AND OUTSOURCING

3 02 0015 INFORMATION USE STRATEGIES

Figure A6.2 -- Learning Units in IS'97 Courses

1831

This figure show the distribution of learning units in the IS'97 courses. The learning units are organized according to the curriculum presentation areas and subareas. The learning unit numbers correspond to the numbers used in Appendix 7 which gives a complete definition of the individual learning units. The level of knowledge associated with each learning unit corresponds to the IS'97 knowledge units defined in Appendix 8.

1836

COURSE

CURRICULUM PRESENTATION AREA

CURRICULUM SUB-AREA

LU-# LEVEL LEARNING UNIT NAME--------------

1840

IS'97.P0 KNOWLEDGE WORK SOFTWARE TOOL KIT

1.0 FUNDAMENTALS OF CIS

1.1 IS LITERACY

0001 1 SYSTEMS AND IT CONCEPTS

0004 1 IT AND SOCIETY

1.2 END-USER COMPUTING

0002 3 KNOWLEDGE WORK SOFTWARE

0003 1 PROBLEM SOLVING, SMALL IS

1848

IS'97.1 FUNDAMENTALS OF INFORMATION SYSTEMS

1.0 FUNDAMENTALS OF CIS

1.1 IS LITERACY

0012 1 ETHICS AND THE IS PROFESSIONAL

2.0 IS THEORY

2.1 SYSTEMS/QUALITY

0005 1 SYSTEMS AND QUALITY

0006 1 INFORMATION AND QUALITY

2.2 DECISION MAKING

0010 1 CHARACTERISTICS OF AN IS PROFESSIONAL

2.4 IT AND ORGANIZATIONAL SYSTEMS

0009 2 IT AND ATTAINING OBJECTIVES

3.0 INFORMATION TECHNOLOGY

3.1 COMPUTER HARDWARE

0007 1 IT HARDWARE AND SOFTWARE

4.0 SYSTEMS DEVELOPMENT

4.3 SYSTEMS ANALYSIS AND DESIGN

0008 3 IT SYSTEMS SPECIFICATION

5.0 IS DEPLOYMENT AND MANAGEMENT

5.3 MANAGEMENT OF IS FUNCTION

0011 1 IS CAREERS

1869

IS'97.2 PERSONAL PRODUCTIVITY WITH IS TECHNOLOGY

1.0 FUNDAMENTALS OF CIS

1.1 LITERACY

13.15 1 EMERGING INFORMATION TECHNOLOGIES

1.2 END-USER COMPUTING

13.01 1 KNOWLEDGE WORK AND ACTIVITY CONCEPTS

13.02 1 IT/IS SUPPORT: INDIVIDUALS VS GROUPS

13.05 2 ORGANIZING PERSONAL DATA RESOURCES

13.07 2 ACCESSING/RETRIEVING/STORING DATA

13.09 3 CONFIGURE AND CUSTOMIZE A PACKAGE

13.16 3 IMPLEMENTING A PERSONAL IS APPLICATION

3.0 INFORMATION TECHNOLOGY

3.4 PROGRAMMING

13.10 2 PROCEDURAL/EVENT DRIVEN PROGRAMMING

3.5 ALGORITHMIC DESIGN

13.11 2 IMPLEMENTING SIMPLE ALGORITHMS

4.0 SYSTEMS DEVELOPMENT

4.1 SOFTWARE DEVELOPMENT

13.08 2 IS LIFE CYCLE: DEVELOPING WITH PACKAGES

13.13 2 IMPLEMENTING AN EVENT DRIVEN APPLICATION

4.2 DATABASE

13.06 2 DATABASE TERMINOLOGY AND CONCEPTS

13.12 2 IMPLEMENTING A SIMPLE DATABASE DESIGN

4.3 SYSTEMS ANALYSIS/DESIGN

13.03 1 INFO ANALYSIS: INDIVIDUAL VS GROUP CONSIDERATIONS

13.04 2 INFO ANALYSIS: FINDING IS/IT REQUIREMENTS

5.0 IS DEPLOYMENT/MANAGEMENT

5.4 INFO RESOURCE MANAGEMENT

0015 3 INFORMATION USE STRATEGIES

1898

IS'93.3 INFORMATION SYSTEMS THEORY AND PRACTICE

2.0 IS THEORY

2.1 SYSTEMS/QUALITY

0016 2 IS THEORY

0022 2 SYSTEMS AND QUALITY, AND IS

2.2 DECISION MAKING

0019 2 PERSONAL, COGNITIVE PROCESS

0020 2 PERSONAL, GOALS AND DECISIONS

0021 2 DECISION MAKING, SIMON MODEL

2.3 IS PLANNING

0018 2 IS DEVELOPMENT AND MANAGEMENT

0026 2 IS PLANNING

0123 2 IS MANAGEMENT OF IS FUNCTION

2.4 IT AND ORGANIZATIONAL SYSTEMS

0017 2 IS AS A STRATEGIC COMPONENT

0023 2 SYSTEMS, ROLE OF MANAGEMENT, USERS, DESIGNERS

0024 2 SYSTEMS, WORK-FLOW, ORGANIZATIONAL SYSTEMS

0025 2 MODELS, ORGANIZATIONAL RELATIONSHIP TO IS

0027 2 IS TYPES

0031 2 IS SOCIETY AND ETHICS

0119 3 ETHICS AND LEGAL ISSUES

4.0 SYSTEMS DEVELOPMENT

4.3 SYSTEMS ANALYSIS AND DESIGN

0028 2 IS DEVELOPMENT STANDARDS

5.0 IS DEPLOYMENT/MANAGEMENT

5.3 MANAGEMENT OF THE IS FUNCTION

0029 2 IS IMPLEMENTATION, OUTSOURCING

0030 1 PERSONAL, PERFORMANCE EVALUATION

1926

IS'97.4 INFORMATION TECHNOLOGY HARDWARE AND SOFTWARE

3.0 INFORMATION TECHNOLOGY

3.1 COMPUTER HARDWARE

0063 2 IT PERIPHERAL DEVICES

0064 1 IT HARDWARE ARCHITECTURES

3.2 SYSTEM SOFTWARE

0065 1 IT SYSTEMS SOFTWARE COMPONENTS, INTERACTIONS

0067 2 OS FUNCTIONS

0068 1 OS ENVIRONMENTS AND RESOURCES

3.3 TELECOMMUNICATIONS

0062 3 TELECOM, SYSTEMS VIEW HW/SW

5.0 IS DEPLOYMENT AND MANAGEMENT

5.2 SYSTEMS INTEGRATION

0069 2 OS, INSTALLATION, CONFIGURATION FOR MULTI-MEDIA

0070 2 OS, INTEROPERABILITY AND SYSTEMS INTEGRATION

0071 3 OS, INSTALLATION, CONFIGURATION OF MULTI-USER SYSTEMS

1942

IS'97.5 PROGRAMMING, DATA, FILE AND OBJECT STRUCTURES

2.0 IS THEORY

2.1 SYSTEMS AND QUALITY

0042 3 INFORMATION MEASUREMENTS/DATA/EVENTS

3.0 INFORMATION TECHNOLOGY

3.4 PROGRAMMING

0048 3 PROBLEM SOLVING, TOP DOWN IMPLEMENTATION

0049 2 PROBLEM SOLVING, OBJECT IMPLEMENTATION

0050 2 PROBLEM SOLVING, MODULES/COHESION/COUPLING

0051 2 VERIFICATION AND VALIDATION-A SYSTEMS VIEW

0052 2 PROBLEM SOLVING, ENVIRONMENTS AND TOOLS

0056 2 PROBLEM SOLVING, IS APPLICATIONS, SUB-STRUCTURES

0058 3 PROBLEM SOLVING, WITH FILES AND DATABASE

0059 3 PROBLEM SOLVING, FILE/DB EDITORS/REPORTS

0060 3 PROBLEM SOLVING, DESIGN, TEST, DEBUG

0061 2 PROGRAMMING: LANGUAGE COMPARISON

3.5 ALGORITHMIC DESIGN

0043 2 DATA: CHARACTERS, RECORDS, FILES, MULTI-MEDIA

0044 2 ADT'S, CLASSES, OBJECTS

0045 2 PROBLEM SOLVING, FORMAL PROBLEMS AND IS

0046 2 OBJECT REPRESENTATION OF A SYSTEM

0047 3 PROBLEM SOLVING, ALGORITHM DEVELOPMENT

0053 2 ADT'S: DATA AND FILE STRUCTURES

0054 3 ADT'S: ARRAYS, LISTS, TREES, RECORDS

0055 3 ADT'S: INDEXED FILES, KEYS

0057 3 PROBLEM SOLVING, DATA AND FILE APPLICATIONS

1968

IS'97.6 TELECOMMUNICATIONS

3.0 INFORMATION TECHNOLOGY

3.3 TELECOMMUNICATIONS

0032 2 TELECOM, DEVICES, MEDIA, SYSTEMS

0033 2 TELECOM, ORGANIZATIONAL SUPPORT BY

0034 2 TELECOM, ECONOMICS, DESIGN ISSUES

0035 2 TELECOM, STANDARDS, STANDARD ORGANIZATIONS

0036 2 TELECOM, CENTRAL/DISTRIBUTED SYSTEMS

0037 2 TELECOM, ARCHITECTURES.,TOPOLOGIES, PROTOCOLS

0038 2 TELECOM, HARDWARE AND SOFTWARE

0039 2 TELECOM, SERVICES, RELIABILITY., SECURITY...

0124 2 IS MANAGEMENT OF EMERGING TECHNOLOGIES

5.0 IS DEPLOYMENT/MANAGEMENT

5.2 SYSTEMS INTEGRATION

0040 2 TELECOM, INSTALLATION, IMPLEMENTATION

0041 2 TELECOM, LAN, INSTALLATION, CONFIGURATION

1984

IS'97.7 ANALYSIS AND LOGICAL DESIGN OF INFORMATION SYSTEMS

2.0 IS THEORY

2.4 IT AND ORGANIZATIONAL SYSTEMS

0085 2 IS PROFESSIONAL CODE OF ETHICS

3.0 INFORMATION TECHNOLOGY

3.4 PROGRAMMING

0082 2 PROBLEM SOLVING, COMPLEXITY METRICS

0083 2 IS SOFTWARE QUALITY METRICS

4.0 SYSTEMS DEVELOPMENT

4.2 DATABASE

0081 3 IS DATABASE APPLICATIONS DEVELOPMENT

4.3 SYSTEMS ANALYSIS/DESIGN

0072 3 IS ANALYSIS AND DESIGN TASKS

0074 3 IS REQUIREMENTS AND SPECIFICATIONS

0075 3 IS DESIGN AND IMPLEMENTATION

0076 3 IS RAPID PROTOTYPING

0077 2 IS DEVELOPMENT RISKS/FEASIBILITY

0078 3 IS CONTINUOUS IMPROVEMENT AND IS

0084 3 SYSTEMS AND QUALITY METRICS/ASSESSMENT

4.4 TEAMS/INTERPERSONAL

0079 3 INTERPERSONAL, CONSENSUS DEVELOPMENT

0080 3 INTERPERSONAL, GROUP DYNAMICS

5.0 IS DEPLOYMENT AND MANAGEMENT

5.2 SYSTEMS INTEGRATION

0073 3 IS COMMERCIAL IMPLEMENTATIONS

2009

IS'97.8 PHYSICAL DESIGN AND IMPLEMENTATION OF IS WITH DBMS

2.0 IS THEORY

2.1 SYSTEMS AND QUALITY

0099 2 IS REQUIREMENTS/WORK-FLOW PLANNING

3.0 INFORMATION TECHNOLOGY

3.5 ALGORITHMIC DESIGN

0089 2 ADT'S: DATABASE MODELS AND FUNCTIONS

4.0 SYSTEMS DEVELOPMENT

4.1 SOFTWARE DEVELOPMENT

0090 3 IS DATABASE AND IS IMPLEMENTATION

0091 3 IS DATABASE APPLICATION STRUCTURING

0092 3 IS DATABASE APPLICATION IMPLEMENTATION

0093 3 IS APPLICATION DEVELOPMENT/CODE GENERATE

4.2 DATABASE

0088 3 IS DATA MODELING

0095 3 IS DATABASE CONCEPTUAL/LOGICAL MODELS

4.3 SYSTEMS ANALYSIS AND DESIGN

0096 3 IS FUNCTIONAL SPECIFICATIONS

0097 2 IS CONVERSION PLANNING

0098 3 IS DEVELOPMENT AND CONVERSION

4.4 TEAMS AND INTERPERSONAL COMMUNICATIONS

0086 2 INTERPERSONAL, SYNERGISTIC SOLUTIONS

0087 3 INTERPERSONAL, AGREEMENTS AND COMMITMENT

0117 4 PERSONAL, PRESENTATION

4.5 PROJECT MANAGEMENT

0094 3 IS DEVELOPMENT AND PROJECT MANAGEMENT

0127 3 QUALITY AND PERFORMANCE MANAGEMENT

2036

IS'97.9 PHYSICAL DESIGN AND IMPLEMENTATION OF AN IS WITH A PROGRAMMING ENVIRONMENT

3.0 INFORMATION TECHNOLOGY

3.4 PROGRAMMING

0100 3 IS APPLICATION WITH PROGRAMMING LANGUAGE

0101 2 IS IMPLEMENTATION WITH OBJECTS, EVENT DRIVEN

0104 2 IS APPLICATIONS, PROGRAMMING ENVIRONMENT

4.0 SYSTEMS DEVELOPMENT

4.1 SOFTWARE DEVELOPMENT

0103 3 IS DEVELOPMENT TESTING

2046

IS'97.10 PROJECT MANAGEMENT AND PRACTICE

4.0 SYSTEMS DEVELOPMENT

0110 4 IS APPLICATIONS, PRODUCTION SYSTEMS

4.3 SYSTEMS ANALYSIS/DESIGN

0111 4 IS REQUIREMENTS AND DATABASE

4.4 TEAMS/INTERPERSONAL

0112 4 PERSONAL, PROACTIVITY, PRINCIPLED ACTION

0113 4 INTERPERSONAL, EMPATHETIC LISTENING

0114 4 INTERPERSONAL, GOALS, MISSION , ALIGNMENT

0126 3 PERSONAL, TIME AND RELATIONSHIP MANAGEMENT

4.5 PROJECT MANAGEMENT

0105 3 IS DEVELOPMENT, PROJECT PLANNING

0106 4 IS DEVELOPMENT, PROJECT MANAGEMENT

0107 4 IS DEVELOPMENT , PROJECT MANAGEMENT

0108 4 IS DEVELOPMENT, PROJECT MANAGEMENT TOOLS

0109 2 IS DEVELOPMENT, PROJECT CLOSE DOWN

0116 4 IS LIFE CYCLES AND PROJECTS

5.0 IS DEPLOYMENT/MANAGEMENT

5.1 SUPPORT SERVICES

0118 4 PERSONAL, LIFE-LONG LEARNING

5.3 MANAGEMENT OF IS FUNCTION

0115 3 IS RESPONSIBILITY TO SELL DESIGNS TO MANAGEMENT

0120 3 IS MANAGEMENT AND IS DEPARTMENT ORGANIZATION

0121 3 PERSONAL, LEADERSHIP AND IS

0122 2 IS POLICIES AND STANDARDS

5.4 INFORMATION RESOURCE MANAGEMENT

0125 2 IS IMPLEMENTATION AND OUTSOURCING

2073

Depth of Knowledge Level	Year 1	Year 2	Year 3	Year 4
	IS'96.P0 Knowledge Work Software Tool Kit IS'96.1 Fundamentals of IS	IS'96.2 Personal Productivity IS IS'96.3 IS Theory/Practice IS'96.6 Networking and Telecommunications	IS'96.5 Programming IS'96.4 IT hardware/Software IS'96.7 Analysis/Logical Design IS'96.8 Physical Design with DB	IS'96.9 Physical Design/Prog IS'96.10 Proj Mgmt/Practice
4 Application Knowledge			0117 Personal Presentation Skills	0118 Life-long Learning Skills 0106 Project Management 0107 Project Management 0108 Project Management Tools 0111 IS Requirements/Database 0110 IS Applications 0113 Principled Action/Proactivity

				0114 Goals/Mission Alignment 0116 Life Cycles/Projects
3 Use / Comprehensive Knowledge	0002 Knowledge Work Software 0008 IT Systems Specification	0013 IS, Personal Level Systems 0015 Information Use Strategies 0014 Problem Solving/Packages 13.09 Configure/Customize a Package 13.16 Implement a Personal IS Application 0119 Ethics and Legal Issues	0054 ADT's: Array/List/Trees/Records 0055 ADT's: Indexed Files, Keys 0047 Problem Solving, Alg. Development 0048 " " Top Down Implementation 0057 " " Data/File Applications 0058 " " DB Applications 0059 " " File/DB Editors/Rpts 0060 " " Design/Code/Test/Debug 0084 System & Quality Metrics 0071 Telecomm, Systems View of HW/SW 0073 Install Multi-user OS 0094 IS Proj Mgmt Appl Development 0073 IS Commercial Implementations 0072 IS Analysis and Design Tasks 0074 IS Requirements & Specs 0096 IS Functional Specs 0088 IS Data Modeling 0095 IS DB Conceptual/Logical Models 0075 IS Design/Construction 0076 IS Rapid Prototyping	0100 IS Apps/Programming Lang 0103 IS Development Testing 0115 IS Responsibility to Mgmt 0120 IS Mgmt/Dept Organization 0121 Personal Leadership Skills 0105 Project Planning 0126 Time Management

			0090 IS DB and Implementations 0091 IS DB Application Structuring 0092 IS Application Devel/Code Gen 0081 IS DB Application Development 0098 IS Development and Conversion 0078 Continuous Improvement & IS 0079 Consensus Development 0080 Group Dynamics 0081 Agreements/Commitment 0127 Quality/Performance Management	
Literacy / Differential Knowledge	0029 IT and Attaining Objectives	13.05 Info Analysis Finding IS Requirements 13.06 Database Terminology and Concepts 13.07 Accessing/Retrieving/Storing Data 13.08 IS Life Cycle: Developing & Packages 13.10 Procedural/Event Drive Programming 13.11 Implementing Simple Algorithms 13.12 Implementing a Simple Database 13.13 Implementing and Event Driven Ap 13.14 Developing with Prototypes 0016 IS Theory	0043 Data: Records, Files, Multi-Media 0044 ADT's, Classes, Objects 0045 Formal Problems and IS 0046 Object Representation of a System 0049 Problem Solving Object Implement 0050 " " Modules/Cohesion/Coupling 0051 " " V & V--Systems View	

		0017 IS as Strategic Component 0018 IS Development/Mgmt 0019 Cognitive Process & IS 0020 Goals and Decisions 0021 Decisions/Simon Process 0022 Systems, Quality & IS 0023 Sys Role Mgmt, Designers, Users 0024 Work-flow, Org Systems 0025 Models, Relation to IS 0026 IS Planning 0027 IS Types 0031 IS, Society & Ethics 0123 Management of IS 0028 Development Standards 0032 Telecomm Devices,Media 0033 " Organization Support by 0034 " Economics, Design Issues 0035 " Standards, Std Orgs 0036 " Central/Distrib Systems 0037 " Arch., Topologies, Protocol 0038 " Hardware & Software 0039 " Services, Reliability, Security 0124 " Management of			

		Services 0040 " Installation/Implementation 0041 " Install/Configure LAN 0029 IS Implementation		
1 Awareness / Recognition Knowledge	0001 Systems and IT Concepts 0003 Problem Solving, Small IS 0004 IT and Society 0007 IT Hardware and Software 0006 Information and Quality 0010 Nature of an IS Professional 0012 Ethics and the IS Professional	13.01 Knowledge Work and Activity 13.02 IS/IT Support: Individuals vs Groups 13.03 Info Analysis: Individuals vs Groups 13.15 Emerging Information Technologies 0030 Performance Evaluation	0064 IT Hardware Architectures 0065 IT HW/SW Components / Interactions 0068 OS Environments	

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Figure A6.3 - Placement of Learning Units in Curriculum '97. Learning Units form the basis of implementation of the ***spiral*** concept of the curriculum. In general the further into the curriculum, the higher the level of expectation of learners. Depth of knowledge (see Table A4.1 for depth of knowledge defin'cnn.Open "Provider=MSDASQL.1;Password=isk2;Persist Security Info=True;User ID=admin;Data Source=IS2K;Initial Catalog=is2ka" itions) is shown in the vertical axis while years within the curriculum form the columns. The courses representing each column are show in the first row of the table. The number shown at the left of each tabled item is the Learning Unit id number which will facilitate your cross reference to Figure A6.1. Please note that Telecommunications is sequenced in the second year in this figure--this sequencing is similar to the sequencing in IS'94 (Longenecker, Reaugh, Fournier and Feinstein 1994) and enables hands on experience before learning the theory in IS'97.4.

Appendix 7 -- DETAILED BODY OF INFORMATION

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This appendix is a table that shows the complete IS Body of Knowledge elements with learning unit numbers in column one through column four. The column number corresponds to depth of knowledge. For example, knowledge element 1.1.1, Fundamental Data, is to be achieved in learning unit 3 up to depth of knowledge level 1 (awareness/recognition). The same unit is to be learned to level 4 (applications knowledge) in learning unit 44. Appendix 6 contains knowledge level definitions and explanations. Appendix 8 has detailed definitions of the learning units.

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Learning Unit Numbers at IS'97 Depth of Knowledge Levels				Body of Knowledge Source			**IS'97 Body of Knowledge Elements in Four Levels of Detail (subject area, subareas, topics and subtopics)**
Level 1	Level 2	Level 3	Level 4	CS	IS	SE	
3, 13.10	42	43	44	n n n n	1	1 1 1	1.0 Information technology 1.1 Computer architectures 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision) 1.1.1.1 Basic machine representation of numeric data 1.1.1.2 Basic machine representation of non-numeric data 1.1.1.3 Finite precision of integer and floating point number representation 1.1.1.4 Errors in computer arithmetic and related portability issues 1.1.1.5 Basic concepts of computer architecture

42, 13.10	62	43			1		1.1.2 Physical representation of digitized information: e.g., data, text, image, voice, video
1, 7	62, 64	62		n n n n n n	1	1 1	1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 1.1.3.1 Basic organization; von Neumann, block diagram, data paths, control path, functional units, instruction cycles 1.1.3.2 Instructions and addressing modes: instruction sets and types 1.1.3.3 Instructions and addressing modes: assembly-machine language 1.1.3.4 Addressing modes 1.1.3.5 Control unit; instruction fetch and execution, operand fetch 1.1.3.6 CISC, RISC 1.1.3.7 Computer organization 1.1.3.8 Memory systems
1	7, 38, 62, 64	36		n n n n n n n n	1	n 1	1.1.4 Computer system components: busses, controllers, storage systems, peripheral devices 1.1.4.1 Peripherals: I/O and interrupts 1.1.4.2 Peripherals: input/output control methods, interrupts 1.1.4.3 Peripherals: external storage, physical organization and drives 1.1.4.4 Auxiliary storage, tape, optical 1.1.4.5 Storage systems and technology 1.1.4.6 Space allocation, hierarchy

				n			1.1.4.7 Main memory organization, bus operations, cycle times for selection and addressing 1.1.4.8 Cache memory, read/write 1.1.4.9 Virtual memory 1.1.4.10 Interfaces between computers and other devices (sensors, effector, etc.)
	62			 n	1	 n	1.1.5 Multiprocessor architectures 1.1.5.1 Systems architectures (single multi-processing and distributed processing, stack, array, vector, multiprocessor and hypercube architectures, supercomputers) 1.1.5.2 Client server technologies
62	64			 n n n n n n n n n	1	1	1.1.6 Digital logic and systems 1.1.6.1 Logic elements and switching theory; minimization concepts and implementation of functions 1.1.6.2 Propagation delays and hazards 1.1.6.3 Demultiplexers, multiplexers, decoders, encoders, adders, subtractors, comparators, shift registers, counters 1.1.6.4 ROM, PROM, EPROM, EAPROM, RAM 1.1.6.5 Analysis and synthesis of synchronous circuits, asynchronous vs synchronous circuits 1.1.6.6 Register transfer notation, conditional and unconditional 1.1.6.7 Algorithmic state machines, steering networks, load transfer signals

							1.1.6.8 Tristates and bus structures 1.1.6.9 Block diagrams, timing diagrams, transfer language
1, 3, 13.1045	13.11, 46, 48	13.16, 47, 48, 50, 51, 54, 56, 57, 59, 60, 91, 98, 103	50, 51, 92, 100, 110	n n n n n n	1	n 1 1	1.2 Algorithms and data structures 1.2.1 Formal problems and problem solving 1.2.1.1 Problem solving strategies using greedy algorithms 1.2.1.2 Problem solving strategies using divide and conquer algorithms 1.2.1.3 Problem solving strategies using back-tracking algorithms 1.2.1.4 Software design process; from specification to implementation 1.2.1.5 Problem recognition statement and algorithmic determination; procedural abstraction; parameters 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual; management task) 1.2.1.7 Formal verification concepts 1.2.1.8 Formal models of computation
13.1, 13.10	56, 13.11	44, 50, 54, 57, 60		1	1	1	1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked-lists, stacks, queues, trees, graphs
1, 3	42, 50	43			1		1.2.3 Complex data structures: e.g., of data, text, voice, image, video, hypermedia

	53	43, 47, 49, 51, 52, 54, 56, 57, 58, 59, 60, 91, 94, 98, 103	50, 51, 92, 100, 110	n n n n n n	1		1.2.4 Abstract data types 1.2.4.1 Purpose and implementation of abstract data types 1.2.4.2 Informal specifications 1.2.4.3 Formal specifications, pre-conditions and post-conditions, algebraic specifications for abstract data types 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy charts 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants, elementary proofs of code and design reading, structured walkthroughs 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in problem solving
13.10	55	50, 53, 57, 58, 59, 98		n n n	1	1	1.2.5 File structures: sequential, direct access, hashing, indexed 1.2.5.1 Files (structure, access methods): file layouts; fundamental file concepts; sequential files; non-sequential files 1.2.5.2 Files (structure, access methods): directories contents and structure, naming, searching, access, backups 1.2.5.3 Files (structure, access methods): system security overview, security methods and devices, protection, access, authentication

3	14, 53, 57, 60			n n n	1	1	1.2.6 Sorting and searching data structures and algorithms 1.2.6.1 Sorting algorithms (shell sort, bucket sort, radix sort, quick sort), editing, reporting, updating 1.2.6.2 Searching algorithms (serial search, binary search, and binary search tree) 1.2.6.3 Searching, hashing, collision resolution
	83			n n n n n n n n	1	1 1	1.2.7 Algorithm efficiency, complexity and metrics 1.2.7.1 Asymptotic analysis at upper and average bounds; big "O", little 1.2.7.2 Time vs space trade-offs in algorithms 1.2.7.3 Complexity classes P, NP, P-space; tractable and intractable problems 1.2.7.4 Lower bound analysis (for sorting) 1.2.7.5 NP-completeness 1.2.7.6 O (n "squared") sorting algorithms 1.2.7.7 O (n log n) sorting algorithms 1.2.7.8 Backtracking, parsing, discrete simulations, etc. 1.2.7.9 Fundamentals of analysis of algorithms

61				n n	1	1	1.2.8 Recursive algorithms 1.2.8.1 Recursive algorithms connection with mathematical induction 1.2.8.2 Comparison of iterative and recursive algorithms
61					1		1.2.9 Neural networks and genetic algorithms
61				n n n n n n n n n	1	n	1.2.10 Advanced considerations 1.2.10.1 Computable functions: models of computable functions selected from Turing machines, RAM, (partial) recursive functions, lambda calculus, Church's thesis 1.2.10.2 Machines, e.g. Universal Turing Machine 1.2.10.3 Decision problems: recursive and recursively enumerable problems; undecidable problems 1.2.10.4 Models of parallel architectures 1.2.10.5 Algorithms for parallel architectures 1.2.10.6 Mathematical problems: well-conditioned and ill-conditioned problems 1.2.10.7 Mathematical problems: iterative approximation to mathematical problems; Newton's method; Gaussian elimination 1.2.10.8 Mathematical problems: error classification; computational, representational, and methodological distinctions 1.2.10.9 Mathematical problems: applications of iterative approximation methods in sciences and engineering 1.2.10.10 Bounds on computing:

							computability and algorithmic intractability
13.10	61, 104				1	1	1.3 Programming languages 1.3.1 Fundamental programming language structures; comparison of languages and applications
	61			1	1	1	1.3.2 Machine and assembly level languages
	13.11, 61	50		n n n	1		1.3.3 Procedural languages 1.3.3.1 Procedural programming advantages and disadvantages 1.3.3.2 Basic type declarations; arithmetic operators and assignment; conditional statements; loops and recursion 1.3.3.3 Procedures, functions, and parameters; arrays and records
13.10	61	103			1		1.3.4 Non-procedural languages: logic, functional, event driven
13.10	61	51	104		1		1.3.5 Fourth-generation languages
61	101	46	104		1		1.3.6 Object oriented extensions to languages
	38, 46, 61	46, 50, 71, 93, 104		n n n n n n n n n	1		1.3.7 Programming languages, design, implementation and comparison 1.3.7.1 History of early languages 1.3.7.2 Evolution of procedural languages 1.3.7.3 Evolution of non-procedural languages 1.3.7.4 Virtual computers 1.3.7.5 Elementary and structured data types 1.3.7.6 Creation and application of user defined data types 1.3.7.7 Expressions, order of evaluation, and side-effects

				n n n n n n n n n n n n n n n n n n n n		1 1 1	1.3.7.8 Subprograms and coroutines as abstractions of expressions and statements 1.3.7.9 Exception handling 1.3.7.10 Mechanisms for sharing and restricting access to data 1.3.7.11 Static vs dynamic scope, lifetimes, visibility 1.3.7.12 Parameter passing mechanisms; reference, value, name, result, etc. 1.3.7.13 Varieties of type checking disciplines and their mechanics 1.3.7.14 Stack-based application of storage 1.3.7.15 Heap-based application of storage 1.3.7.16 Finite state automata as restricted models of computation and acceptors of regular expressions 1.3.7.17 Application of regular expressions to programming language analysis 1.3.7.18 Use of context-free grammars as a formal description device for programming language syntax 1.3.7.19 Equivalence of context free grammar and pushdown automata 1.3.7.20 Use of pushdown automata in parsing programming languages 1.3.7.21 Language translation process, compilers to interpreters 1.3.7.22 Programming language semantics

				n n			1.3.7.23 Functional programming paradigms and languages 1.3.7.24 Parallel programming constructs 1.3.7.25 Procedural languages: implementation issues; performance improvement, debugging, anti-bugging 1.3.7.26 Compilers and translators 1.3.7.27 Very high level languages: SQL, 4th-GL 1.3.7.28 Object-oriented design, languages, and programming 1.3.7.29 Logic programming languages: LISP, PROLOG; logic oriented programming 1.3.7.30 Code generators 1.3.7.31 Expert system shells 1.3.7.32 Software design languages
1	7, 62	82		n	1	1	1.4 Operating systems 1.4.1 Architecture, goals and structure of an operating system; structuring methods, layered models, object-server model
1	7, 36, 62, 65, 67	71, 82			1		1.4.2 Interaction of operating system and hardware architecture

	62, 65, 67				1	1	1.4.3 Process management: concurrent processes, synchronization
				n		1	1.4.3.1 Tasks, processes, dispatching context switchers, role of interrupts
				n			1.4.3.2 Structures, ready list, process control blocks
				n			1.4.3.3 Concurrent process execution
				n			1.4.3.4 Sharing access, race conditions
				n			1.4.3.5 Deadlock; causes, conditions, prevention
				n			1.4.3.6 Models and mechanisms (e.g., busy waiting, spin locks, Deker's algorithm, semaphores, mutex locks, regions, monitors
				n			1.4.3.7 Preemptive and non-preemptive switching
				n			1.4.3.8 Schedulers and scheduling policies
	67				1	1	1.4.4 Memory management
				n			1.4.4.1 Physical memory and registers
				n			1.4.4.2 Overlays, swapping, partitions
				n			1.4.4.3 Pages and segments
				n			1.4.4.4 Placement and replacement policies
				n			1.4.4.5 Thrashing, working sets
				n			1.4.4.6 Free lists, layout; servers, interrupts; recovery from failures
				n			1.4.4.7 Memory protection; recovery management

62, 67	62	71		n n n n n n n	1	n 1	1.4.5 Resource allocation and scheduling 1.4.5.1 Protocol suites (communications and networking); streams and datagrams 1.4.5.2 Internetworking and routing; servers and services 1.4.5.3 Types of operating systems: single user, multi-user, network 1.4.5.4 Synchronization and timing in distributed and real time systems 1.4.5.5 Special concerns in real-time systems; failures, risks, and recovery 1.4.5.6 Operating system utilities 1.4.5.7 Hardware evolution; economic forces and constraints 1.4.5.8 Architecture of real-time and embedded systems 1.4.5.9 Special concerns in embedded real-time systems: hard-timing requirements; reliability, robustness, and fault tolerance; input and output considerations; awareness of issues pertaining to time; concurrency; complex interfaces of device/device and device/software; inadequacy of testing for real-time systems
	65, 67	71			1		1.4.6 Secondary storage management
	65, 67	71			1		1.4.7 File and directory systems
62	65, 67, 94	71			1		1.4.8 Protection and security
36	70				1		1.4.9 Distributed operating systems

	19, 61, 65, 68, 101	52, 69			1		1.4.10 OS support for human interaction: e.g., GUI, interactive video
62	37, 70				1		1.4.11 OS interoperability and compatibility: e.g., open systems
62		68			1		1.4.12 Operating system utilities, tools, commands and shell programming
62		68			1		1.4.13 System administration and management 1.4.13.1 System bootstrapping/initial program load 1.4.13.2 System generation 1.4.13.3 System configuration 1.4.13.4 Performance analysis, evaluation and monitoring 1.4.13.5 System optimization and tuning 1.4.13.6 System management functions: backup, security and protection, adding and deleting users
4, 13.7	7, 35, 37, 62, 64			n n	1	1 1	1.5 Telecommunications 1.5.1 International telecommunication standards, models, trends 1.5.1.1 Computer networks and control: topologies, common carriers, equipment configuration, error detection and correction, polling and contention protocols, security and encryption 1.5.1.2 Network design and management: network architectures (ISO, SNA, DNA), protocols (X.25, ISO, etc.)

4, 64	32, 62	40		n	1		1.5.2 Data transmission: media, signaling techniques, transmission impairments, encoding, error detection, compression 1.5.2.1 Communications system technology: transmission media, analog-digital, communications hardware and software
	37, 62	40			1		1.5.3 Line configuration: error control, flow control, multiplexing
4, 13.7, 64	38, 62, 63	32, 41, 94		n	1 1	1 1 1	1.5.4 Local area networks 1.5.4.1 Topologies, medium access control, multiplexing 1.5.4.2 Local area networks and WANs: topology, gateways, uses (functions and office automation), PBXs 1.5.4.3 Requirements determinations, performance monitoring and control, economics 1.5.4.4 Architecture of distributed systems 1.5.4.5 Hardware aspects of distributed systems
13.7	4, 35, 36, 38, 62	40, 64, 94			1		1.5.5 Wide area networks: switching techniques, broadcast techniques, routing
4	37, 38, 62, 64	32			1		1.5.6 Network architectures and protocols
	4				1		1.5.7 Internetworking
	33, 35, 37, 38, 39, 62	34, 41, 94			1		1.5.8 Network configuration, performance analysis and monitoring
	35, 37				1		1.5.9 Network security: encryption, digital signatures, authentication
62	37				1		1.5.10 High-speed networks: e.g., broadband ISDN, SMDS, ATM, FDDI

	37			1	1		1.5.11 Emerging networks: ATM, ISDN, satellite nets, optic nets, etc., integrated voice, data and video
62	33, 37, 64, 68	40			1		1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia, video conferencing, value-added networks 1.5.12.1 Methods of transmitting graphical and video information using telecom, data compression, client-server display techniques, e.g., AOL interface, XWindows
1, 4, 24, 42	2, 13.6, 58, 111	13.12, 81, 91, 92, 94, 98	92	n n n	1	1	1.6 Database 1.6.1 DBMS: features, functions, architecture 1.6.1.1 DBMS (features, functions, architecture); components of database system (data, dictionary, application programs, users, administration) 1.6.1.2 DBMS: overview of relational algebra 1.6.1.3 Logical design (DBMS independent design): ER, object oriented
13.6, 42	13.12, 58, 111	47, 81, 88, 89, 91, 92, 94, 98	92, 100, 110	n n	1		1.6.2 Data models: relational, hierarchical, network, object, semantic object 1.6.2.1 Relational data model terminology; mapping conceptual schema to a relational schema 1.6.2.2 Conceptual modeling (e.g., entity-relationship, object-oriented) 1.6.2.3 Model type interconversion (e.g. hierarchical to relational, etc.)
111		47, 81, 92, 98		1	1		1.6.3 Normalization

	13.12	81, 94, 95, 98	92, 110	n	1		1.6.4 Integrity (referential, data item, intra-relation): representing relationships; entity and referential integrity
13.6, 24	2, 13.12, 111	47, 81, 88, 89, 91, 94, 95, 98	92, 100	1	1		1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.)
1, 13.6, 13.10, 24	13.13, 47	47, 91, 103	92, 100	 n n n	1		1.6.6 Application interface 1.6.6.1 Function supported by typical database system; access methods, security, deadlock and concurrency problems, 4th generation environments 1.6.6.2 DML, query, QBE, SQL, etc.: database query language; data definition, query form, update sub-language, expressing constraints, referential integrity, embedding in a procedural language 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 1.6.6.4 Event driven screen objects (buttons, list boxes, etc.) 1.6.6.5 Physical transaction processing ; client-server considerations 1.6.6.6 Client and server distribution of processing considerations
24	2	81, 103	91		1		1.6.7 Intelligent query processors and query organization, OLAP tools
13.7, 24	36			1	1		1.6.8 Distributed databases, repositories and warehouses
1, 4	91	94		1	1		1.6.9 DBMS products: recent developments in database systems (e.g., hypertext, hypermedia, optical disks)
61				1	1		1.6.10 Database machines and servers

1, 13.5	13.7, 91, 98	94, 110		n n n	1	1	1.6.11 Data and database administration 1.6.11.1 Data administration 1.6.11.2 Database administration: social impact of database systems; security and privacy 1.6.11.3 Ownership and access controls for data and application systems 1.6.11.4 Role and capability based access models 1.6.11.5 Replication 1.6.11.6 System capacity planning 1.6.11.7 Redundancy, safety and backup planning and administration
	98, 111	81, 91		n	1		1.6.12 Data dictionary, encyclopedia, repository
1		13.7		1	1		1.6.13. Information retrieval: e.g. internet tools, image processing, hypermedia
	42, 88			n n n	1		1.7 Artificial intelligence 1.7.1 Knowledge representation 1.7.1.1 History, scope and limits of artificial intelligence; the Turing test 1.7.1.2 Social, ethical, legal, and philosophical aspects of artificial intelligence 1.7.1.3 Problems and state spaces
	42, 88			1	1		1.7.2 Knowledge engineering

	42, 88			 n n n n	1	1	1.7.3 Inference processing 1.7.3.1 Basic control strategies (e.g., depth-first, breadth-first) 1.7.3.2 Forward and backward reasoning 1.7.3.3 Heuristic search (e.g., generate & test, hill climb, breadth-first search, means-ends analysis, graph search, minimax search) 1.7.3.4 Expert systems and shells
42					1		1.7.4 Other techniques: fuzzy logic, CASE-based reasoning, natural language and speech recognition
	42			 n n n n n	1	1	1.7.5 Knowledge-based systems 1.7.5.1 Natural language, speech and vision 1.7.5.2 Pattern recognition 1.7.5.3 Machine learning 1.7.5.4 Robotics 1.7.5.5 Neural networks
13.12	17, 18, 95			1	1		2.0 Organizational and management concepts 2.1 General organization theory 2.1.1 Hierarchical and flow models of organizations
	17, 18, 33			1	1		2.1.2 Organizational work groups
13.3	18, 33			1	1		2.1.3 Organizational span: single user, work group, team, enterprise, global
4	17, 22, 26, 94				1		2.1.4 Role of IS within the enterprise: strategic, tactical and operations

4, 13.3	8, 17, 22, 25, 95, 116				1		2.1.5 Effect of IS on organizational structure; IS and continuous improvement
	18, 36, 95, 125				1		2.1.6 Organizational structure: centralized, decentralized, matrix
13.2	25				1	1	2.1.7 Organizational issues pertaining to use of software systems in organizations
13.2, 13.8, 25	9, 18, 26	94, 114, 121, 122, 124			 1 1 1 1 1		2.2 Information systems management 2.2.1 IS planning 2.2.1.1 Alignment of IS planning with enterprise planning 2.2.1.2 Strategic IS planning 2.2.1.3 Short-range IS planning 2.2.1.4 Re-engineering 2.2.1.5 Continuous improvement
	29, 65, 125	116			1		2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing
13.1	18, 120	87, 116, 127 91	118		1 1 1 1 1		2.2.3 Staffing and human resource management 2.2.3.1 Skills planning 2.2.3.2 Staff performance management 2.3.3.3 Empowerment/job ownership 2.2.3.4 Education and training 2.2.3.5 Competition, cooperation and reward structures

	18, 26, 125				1		2.2.4 IS functional structures -- internal vs outsourcing
3	13.15, 26, 62, 125	121, 122			1		2.2.5 Determining goals and objectives of the IS organization
	95, 116, 121, 122, 125	78, 94			1		2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS critical success factors
	18, 115	15			1		2.2.7 CIO and staff functions
62	29, 116, 121, 122, 125	94			1		2.2.8 IS as a service function: performance evaluation -- external/internal, marketing of services
	116, 121, 122, 125				1		

Appendix 8 -- IS'97 COURSE SPECIFICATIONS AND LEARNING UNITS

2230

Appendix 8 contains detailed descriptions of each of the IS'97 courses. Part of the details are a specification of the learning units. Each learning unit consists of a goal, learning objectives which describe behavioral expectations for a student completing a given learning unit. Elements of the IS Body of Knowledge are shown in the fourth column; for example, in learning unit 1, element 1.1.3, CPU Architectures, is to be learned to knowledge level 1, recognition level. With a few exceptions, depth of knowledge is specified only on three level elements.

IS'97.P0 - Knowledge Work Software Tool Kit

2236

CATALOG Students with minimal skills will learn to enhance their personal productivity and problem solving skills using knowledge work tools expected of end-users.

2338

SCOPE This curriculum assumes as prerequisites a suite of software tools useful for knowledge workers, such as spreadsheets, databases, presentation graphics, database retrieval, statistics, word processing, and Internet and electronic mail. Although identified as a course, this material can be delivered as self study modules, modules associated with other courses using the software, or as a full course.

2242

TOPICS E-mail, Internet tools, spreadsheets, databases, presentation graphics, external database retrieval, introduction to statistical analysis.

EXPLANATION AND EXPECTATIONS

2245

To prepare novice students to have the expected levels of personal productivity needed in business and industry will require hands-on experience and knowledge of problem solving involving the effective use of knowledge work software. Identifying classes of problems that can be solved while developing a framework in formal problem statement and solution.

2249

The framework should be coupled to problem solving and implementing explicit example applications employing word processing, spreadsheet, database, statistics and data management tools within the context of a standard computing environment involving a graphical user interface (GUI).

2252

Developing and making short presentations using presentation graphics software, e.g. a "slide show" enables developing communication as well as software skills.

Students completing this course will have mastered the following learning units:

2254

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
1	to introduce systems and information technology definitions and concepts to novice users	describe and explain in systems terms the hardware and software components of a computer system (LO-0001) describe, explain and use an operating system and user interface to install and operate programs, define and protect data files, and perform operating system utility functions (LO-0002) define, explain and use the concepts of knowledge work software (LO-0003)	1 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 1 1.1.4 Computer system components: busses, controllers, storage systems, peripheral... 1 1.2.1.4 Software design process; from specification to implementation 1 1.2.3 Complex data structures: e.g. of data, text, voice, image, video, hypermedia 1 1.4.1 Architecture, goals and structure of an operating system; structuring methods... 1 1.4.2 Interaction of operating system and hardware architecture 1 1.6.1 DBMS: features, functions, architecture 1 1.6.6.2 DML, query, QBE, SQL, etc.: database query language; data definition... 1 1.6.9 DBMS products: recent developments in database systems (e.g., hypertext... 1 1.6.11.3 Ownership of data and application systems 1 1.6.13 Information retrieval: e.g., image processing, hypermedia 1 2.2.11 End user computing support, role and functions 2 2.2.16 Security and control, viruses and systems integrity

			2 2.3.3 Cost/value of information, competitive value of IS 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 3 3.1.4 System components and relationships 1 3.1.5 Systems control: standards control theory, feedback, loops, measurement...
2	to develop skill to effectively use standard knowledge work software packages (operating system and user interface, word processing, spreadsheet, database, statistics and data management, presentation graphics, and communications)	design, develop and use a simple database; import a spread sheet into the database; export a database table (or spread- sheet) to a word processing package for use in a report (LO-0022) implement a "slide show" presentation in a presentation graphics package to communicate a problem and its solution, and a hand-out for an attending audience (LO-0026)	2 1.6.1 DBMS: features, functions, architecture 2 1.6.5 Data definition languages 2 1.6.7 Intelligent query processors and query organization 2 2.2.11 End user computing support, role and functions 2 3.2.1 Systems development models: e.g., SDLC, prototyping 2 3.2.2 Package acquisition and implementation 3 3.2.3 Integrating software components 3 3.7.8 Systems documentation 3 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line... 2 3.9.1 Design: logical, physical 2 3.9.3 Design objectives: e.g., usability, performance 3 3.10.1 Systems construction 2 3.10.5 Systems integration and system testing: verification and validation, test plan... 2 3.10.6 Training: e.g., user, management,

			operation, systems, training materials
3	to introduce the concepts of problem solving within the context of information systems of limited complexity using standard knowledge work software packages	describe, explain and use a systems approach definition and implementation of PC based solutions using knowledge work software (word processing, spreadsheet, database, statistics and data management, presentation graphics, and communications) to improve personal productivity and increase knowledge work capabilities (LO-0004) identify, state, and implement solutions involving knowledge work software to simple organizational and personal tasks (LO-0005) select and configure appropriate macros, tools and packages for implementation of personal systems (LO-0020)	1 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors... 1 1.2.1 Formal problems and problem solving 1 1.2.1.4 Software design process; from specification to implementation 1 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 1 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 1 1.2.3 Complex data structures: e.g., of data, text, voice, image, video, hypermedia 1 1.2.6 Sorting and searching data structures and algorithms 1 2.2.5 Determining goals and objectives of the IS organization 1 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 2 2.2.11 End user computing support, role and functions 1 2.2.16 Security and control, viruses and systems integrity 1 2.10.6 Proactive attitude and approach 1 2.10.7 Personal goal setting, decision making, and time management 1 2.10.8 Principle centered leadership 2 3.1.1 General systems theory 1 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives

			3 3.2.4 User developed systems 1 3.5.2 Planning the IS architecture 1 3.7.1 Project planning and selection of appropriate process model; project scheduling... 2 3.8.3 Requirements determination and specification 1 3.9.4 Techniques to enhance the creative design process 3 3.10.2 Software systems construction: e.g., programming, unit testing, load module... 1 3.10.7 Software project management: scoping, scheduling, configuration manage... 2 3.12.6 Office systems
4	to introduce the relevance and application of information technology in society	describe and explain the relevance and impact of information technology on society (LO-0006) explain the role of information systems within a company versus a global environment (LO-0039)	1 1.5.1 International telecommunication standards, models, trends 1 1.5.2 Data transmission: media, signaling techniques, transmission impairments... 1 1.5.4 Local area networks 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 1 1.5.6 Network architectures and protocols 2 1.5.7 Internet working 1 1.6.1 DBMS: features, functions, architecture 1 1.6.9 DBMS products: recent developments in database systems 1 2.1.4 Role of IS within the enterprise: strategic, tactical and operations

			1 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 2 2.4.2 Cultural diversity 1 2.9.7 Historical and social context of computing 1 3.1.3 Properties of open systems 1 3.1.6 Properties of information systems 1 3.12.1 Transaction processing systems 1 3.12.2 Management information systems 1 3.12.3 Group support systems 1 3.12.8 Work-flow systems 2 3.12.9 Functional support systems: e.g., process control , marketing 1 3.12.10 Interorganizational systems

IS'97.1 Fundamentals of Information Systems

2263

CATALOG Systems theory, quality, decision making and the organizational role of information systems are introduced. Information technology including computing and telecommunications systems are stressed. Concepts of organization and information system growth and re-engineering are introduced.

2266

SCOPE This course provides an introduction to systems concepts, information technology and application software. It also introduces students to how information is used in organizations and how IT enables improvement in quality and timeliness of information.

2269

TOPICS Systems concepts; system components and relationships; cost/value and quality of information; specification, design and engineering or re-engineering of information systems; application versus system software; procedural versus non-procedural programming languages; database features, functions, architecture; telecommunications applications; characteristics of IS professionals and IS career paths.

EXPLANATION AND EXPECTATIONS

2274

Students with practical end-user knowledge will study systems theory and quality concepts as an introduction to information technology concepts and information systems development. Structure and functions of computers and telecommunications systems will be examined. Standard systems purpose and organization will be introduced.

2278

The concept that information is of significance in stating and attaining organizational goals will be used as the basis for exploring the development of databases to store the information. Information systems will be introduced to process and communicate the information. The dynamic nature of organizations and the necessity for growth and re-engineering of the organization as well as its information systems will be presented and used as the motivator for understanding IS development methodologies.

2283

The development path for entry level to senior information systems professionals will be explained. Professional ethical expectations and obligations will be reviewed. The necessity for personal and interpersonal communications skills will be discussed.

Students completing this course will have mastered the following learning units:

2287

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
5	to introduce systems and quality concepts	explain systems theory and quality concepts (LO-0008)	2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 2 3.1.1 General systems theory 1 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 2 3.1.3 Properties of open systems 2 3.1.4 System components and relationships 2 3.1.5 Systems control: standards, control theory, feedback, loops, measurement...
6	to provide an introduction to the organizational uses of information to improve overall quality	explain methodologies to facilitate measurements to achievement of ISO 9000, Baldridge, National Performance Review and other quality standards (LO-0046)	1 2.3.1 Measurement and modeling 1 2.3.2 Decisions under certainty, uncertainty, risk 3 2.3.3 Cost/Value of information, competitive value of IS

7	to present hardware, software and related information technology concepts	explain the elements and functional relationships of major hardware, software, and communications elements of information systems consisting of single PCs, LANs and/or WANs (LO-0014)	1 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 2 1.1.4 Computer system components: busses, controllers, storage systems, peripheral... 2 1.4.1 Architecture, goals and structure of an operating system; structuring methods... 2 1.4.2 Interaction of operating system and hardware architecture 2 1.5.1 International telecommunication standards, models, trends 2 3.1.6 Properties of information systems
8	to provide concepts and skills for the specification and design or the re-engineering of organizationally related systems of limited scope using information technology	explain the concepts of implementing IS coupled to re-engineering and continuous improvement (LO-0058)	2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 2 2.4.4 Teamwork, leadership and empowerment 2 2.4.8 Consensus building 2 2.10.2 Interviewing, questioning and listening 2 2.10.10 Fostering creativity and opportunity finding 2 3.1.4 System components and relationships 2 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 2 3.2.1 Systems development models: e.g., SDLC, prototyping 2 3.3.1 Organizational and software process modeling

			2 3.3.4 Process oriented methodologies 2 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code... 2 3.8.1 Problem opportunity identification: e.g., service requests, from planning process 2 3.8.3 Requirements determination and specification 2 3.9.4 Techniques to enhance the creative design process 2 3.12.8 Work-flow systems
9	to show how information technology can be used to design, facilitate and communicate organizational goals and objectives	explain the relevance of IS management aligning itself with strategic organizational processes (LO-0047)	2 2.2.1 IS planning 3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering...
10	to explain the concepts of individual decision making, goal setting, trustworthiness and empowerment	discuss and explain the concepts of goal setting and individual decision making and achievement; explain the requirement of goal setting and personal decision making in empowerment in a work setting (LO-0197)	1 2.10.6 Proactive attitude and approach 1 2.10.7 Personal goal setting, decision making, and time management 1 2.10.8 Principle centered leadership

11	to show career paths in Information Systems	identify and explain telecommunications careers and career paths (LO-0077)	2 2.9.2 Certification issues 2 2.9.3 Professional organizations: e.g., DPMA, ACM, TIMS, ASM, DSI, ACE, IEEE... 2 2.9.4 Professional conferences 2 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team...
12	to present and discuss the professional and ethical responsibilities of the IS practitioner	use professional code of ethics to evaluate specific IS actions (LO-0117) describe ethical and legal issues; discuss and explain ethical considerations of software usage, sales, distribution, operation and maintenance (LO-0157)	2 2.8.1 Software sales, licensing and agency 2 2.8.2 Contract fundamentals 3 2.8.5 Protection of intellectual property rights 3 2.8.6 Ethics: plagiarism, honesty, codes of ethics 3 2.8.7 Risks, losses and liability in computing applications 1 2.8.8 Warranties 3 2.9.3 Professional organizations: e.g., DPMA, ACM, TIMS, ASM, DSI, ACE, IEEE... 2 2.10.4 Consulting Skills 3 2.10.7 Personal goal setting, decision making, and time management 2 2.10.10 Fostering creativity and opportunity finding 2 3.7.5 Project control: planning, cost estimation, resource allocation, software tech... 3 3.7.7 Management concerns; stress and time management

IS'97.2 - Personal Productivity with IS Technology

2299

CATALOG Students will extend ability to be efficient and effective in knowledge work by applying information technologies to problem situations and by design and use of small information systems for individuals and groups. (Prerequisite: IS'97.P0)

2302

SCOPE This course enables students to improve their skills as knowledge workers through effective and efficient use of packaged software. It covers both individual and group work. The emphasis is on productivity concepts and how to achieve them through functions and features in computer software. Design and development of solutions focus on small systems.

2306

TOPICS End user systems versus organization systems; analysis of knowledge work and its requirements; knowledge work productivity concepts; software functionality to support personal and group productivity; organization and management of software and data; accessing organization data, accessing external data; selecting a computer solution; developing a macro program by doing; designing and implementing a user interface; developing a solution using database software; refining and extending individual and group information management activities.

EXPLANATION AND EXPECTATIONS

2313

Students who have prerequisite end-user knowledge work skills will have an opportunity to extend their basic problem solving skills by undertaking, completing and using a sequence of more extensive "personal systems." The course has both a theoretical problem solving component and an equivalent component of structured supervised laboratory experience. The knowledge work tool set as well as local and wide area network telecommunications are the context for the problem domain.

Students completing this course will have mastered the following learning units:

2319

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
13.1	to describe the concept of knowledge work and the need for personal information technology to support it	define and explain the concept of knowledge work compare and contrast data, information and knowledge describe knowledge work activity; identify and explain methods for achieving productivity in knowledge work	1 1.2.2 Basic data structures 1 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering, IS and quality, IS global impact and international considerations 2 2.2.11 Knowledge work, end user computing: support, role, productivity, activities 1 2.3.3.3 Empowerment/job ownership 1 2.2.3.4 Education and training 1 3.1.1 General systems theory 1 3.1.4 System components and relationships 1 3.1.6 Properties of information systems
13.2	to relate individual vs organizational information system requirements	compare and contrast application planning, development, and risk management for personal vs organizational information systems explain potential problems of user developed systems	1 2.1.7 Organizational issues pertaining to use of software systems in organizations 1 2.2.1 IS planning 2.2.1.1 Alignment of IS planning with enterprise planning 1 2.8.7 Risks, losses and liability in computing applications 1 2.10.10 Fostering creativity and opportunity finding 1 3.2.1.3 Developing with packages

			2 3.2.4 End User developed systems 1 3.6.2 Risk management principles
13.3	to introduce concepts of individual vs collaborative knowledge work and relate them to information needs analysis and technology	describe and explain individual vs group technology; explain the additional processing and other issues and needs necessitated by working in a group describe and explain group support technology for common knowledge requirements describe and explain the process of information analysis and application of information technology solutions	1 2.1.3 Organizational span: single user, work group, team, enterprise, global 1 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 1 2.8.5 Ethics and Protection of intellectual property rights 2.8.5.1 Protection of intellectual property 2.8.5.2 Forms of intellectual property, means for protecting it, and penalties for violating it 2.8.5.3 Ethics (plagiarism, honesty, privacy, hackers): uses, misuses, and limits of computer technology 1 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code reviews 2 3.7.1 Project planning and selection of appropriate process model; project scheduling and milestones 1 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line documentation) 1 3.8.1 Problem opportunity identification: e.g., service requests, from planning process 1 3.12.3 Group support systems 1 3.12.6 Office systems 1 3.12.7 Collaborative systems

13.4	to describe and explain the goals and process of analysis, and documentation of knowledge work, information technology, and information requirements for individuals and work groups	describe and explain characteristics and attributes of knowledge work for individuals and groups discuss and explain knowledge building and maintaining tasks use questions to elicit systematically and identify data requirements from individuals and groups analyze individual and group tasks to determine information requirements identify related information technology requirements	1 2.4.3 Group dynamics 1 2.4.4 Teamwork, leadership and empowerment 1 2.4.8 Consensus building 1 2.10.2 Interviewing, questioning and listening 1 3.8.1 Problem opportunity identification: e.g., service requests, from planning process 1 3.8.2 Relating the application to the enterprise model 1 3.8.3 Requirements determination and specification
13.5	to define concepts, principles and practical approaches to management of individual software and data	given knowledge work tasks and activities, design and implement an approach to directory organization and file naming that will support retention and access to data list principles that apply to software acquisition and upgrades	1 1.6.11 Data and database administration 1 2.2.13 Backup, disaster planning and recovery 1 2.2.15.4 Data administration 1 2.2.15.5 Ownership of data and application systems 1 3.10.4 Systems conversion: approaches, planning, implementation

		describe approaches for transferring data among applications including OLE, importing/exporting, conversion, and alternate methods	
13.6	to explain organizational database concepts, components, structures, access, security and management considerations	describe and explain the terminology and use of relational databases describe and explain concepts necessary to access organizational databases use a database access facility to query data from an organizational repository	2 1.6.1 DBMS: features, functions, architecture 1 1.6.2 Data models: relational, hierarchical, network, object, semantic object 1 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 1 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL)
13.7	to define the content, availability and strategies to access information external to the organization	define and discuss external information resources; identify source, content, cost and timeliness locate and access external information resources using available internet tools: browsers, search, ftp create and maintain an individual directory of external information resources	1 1.5.1 International telecommunication standards, models, trends 1 1.5.4 Local area networks 1.5.4.1 Topologies, medium access control, multiplexing 1.5.4.2 Local area networks and WANs: topology, gateways, uses (functions and office automation), PBXs 1.5.4.4 Architecture of distributed systems 1.5.4.5 Hardware aspects of distributed systems 1 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing

			1 1.6.8 Distributed databases 2 1.6.11 Data and database administration 3 1.6.13 Information retrieval: e.g. internet tools, image processing, hypermedia
13.8	to present and explain the life cycle of development of an information system including the concepts of software acquisition vs development	discuss the concept an information systems life cycle identify and explain criteria to decide between acquisition of software packages vs custom development of software	1 2.2.1 IS planning 2 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 2 3.1.4 System components and relationships 2 3.2.1 Systems development models: e.g., SDLC, prototyping 2 3.2.2 Package acquisition and implementation
13.9	To introduce and explore the use of general purpose and application software	install and customize a general purpose software package to provide specific functionality beyond the default settings add capability to a software system by recording and storing a macro in the library of the given software package access technical information provided in the form of software "help" facilities; observe and use a "help" facility	3 3.2.2 Package acquisition and implementation 2 3.4.3 Software implementation concepts and tools: e.g., data dictionary, repository, application generator, reuse, program generators, software implementation languages

13.10	to introduce and explore software development approaches, then explain the goals and strategies of procedural, event driven, and object oriented programming paradigms	discuss and explain the concepts of data and procedural representation, programming languages, compilers and interpreters, development environments, and event-driven graphical user interfaces compare, relate, and explain concepts of structured, event-driven, and object oriented approaches to program design and with examples of each approach	1 1.2.1 Formal problems and problem solving 1 1.2.2 Basic data structures 1 1.2.5 File structures: sequential, direct access, hashing, indexed 1 1.3.1 Fundamental programming language structures; comparison of languages and applications 1 1.3.3 Procedural languages 1 1.3.4 Non-procedural languages: logic, functional, event driven 1 1.3.5 Fourth-generation languages 1 1.6.6 Application interface
13.11	To introduce and develop the process of algorithm and structured code development	state a simple problem identifying desired outputs for given inputs; give an overview of the problem describe fundamental data types and their operation design program logic using both graphical and pseudocode techniques which utilize standard control structure: sequence, iteration and selection.	2 1.2.1 Formal problems and problem solving 2 1.2.2 Basic data structures: lists, arrays, strings, records 2 1.3.3 Procedural languages 1.3.3.1 Procedural programming advantages and disadvantages 1.3.3.2 Basic type declarations; arithmetic operators and assignment; conditional statements; loops and recursion

		translate data structures and program design into code in a programming language; verify the translation, and ensure the correctness of the result; test the code with sample data sets	
13.12	To introduce the purpose and develop ability to use a relational database software package	describe and explain tables, relations, referential integrity, and the concepts of normal forms from a workflow drawing or other requirements documents, derive a simple multi-table database design using a relational database software package, implement and populate the tables; develop several simple queries to look at the data	2 1.6.1 DBMS: features, functions, architecture 1.6.1.1 DBMS (features, functions, architecture); components of database system (data, dictionary, application programs, users, administration) 1.6.1.3 Logical design (DBMS independent design): ER, object oriented 2 1.6.2 Data models: relational, hierarchical, network, object, semantic object 1.6.2.1 Relational data model terminology; mapping conceptual schema to a relational schema 1.6.2.2 Conceptual modeling (e.g., entity-relationship, object-oriented) 2 1.6.4 Integrity (referential, data item, intra-relation): representing relationships; entity and referential integrity 2 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 1 2.1.1 Hierarchical and flow models of organizations

13.13	To introduce and develop ability to design and implement a graphical user interface facility	apply a GUI event-driven solution in a development environment build a simple application form with several objects (e.g. label, field edit box, list box, radio button, command button)	2 1.6.6 Application interface 1.6.6.2 DML, query, QBE, SQL, etc.: database query language; data definition, query form, update sub-language, expressing constraints, referential integrity, embedding in a procedural language 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 1.6.6.4 Event driven screen objects (buttons, list boxes, etc.)
13.14	to present the prototype process, and to introduce and apply the concepts of evaluation and evolutionary refinement to personal application prototypes	compare capabilities of an application with the requirements it is intended to meet identify alternative outcomes of the process of application verification evaluate and define the results and probabilities of errors in prototyped application software modify inputs, outputs and processing to refine a prototype	2 3.2.1 Systems development models: e.g., SDLC, prototyping 3.2.1.1 Systems development life cycle: software life-cycle models (iterative enhancement, phased development, spiral, waterfall) 3.2.1.2 Developing with prototyping 1 3.10.5 Systems integration and system testing: verification and validation, test plan generation, testing (acceptance testing, unit testing, integration testing, regression testing)

13.15	to present foundation technologies and define importance in future information technology capabilities	list and explain technologies and their relevance to individual information technology given a technology, explain its importance to future developments and to future knowledge worker productivity identify drivers and inhibitors of change in information technology	1 2.2.14 Management of emerging technologies 1 2.2.5 Determining goals and objectives of the IS organization
13.16	to identify, investigate, analyze, design, and develop with packages (and/or high level languages) a single personal level information system applications to enhance individual productivity	analyze, design, develop and use packages and/or high level database languages to implement workable solutions that solve an information systems problem associated with knowledge work activities assess the increased productivity realized by implementation of personal systems	3 1.2.1 Formal problems and problem solving 2 2.2.11 End user computing support, role and functions 3 3.2.3 Integrating software components 3 3.2.4 User developed systems 2 3.6.1 Feasibility assessment 3 3.9.3 Design objectives: e.g., usability, performance

15	to define concepts of an individual information management infrastructure, and to apply strategies and tools for implementing, accessing and using information resources	explain data administration and access to personal, corporate and alternate information resources identify needed information technology to support given sets of tasks and activities for individuals, workgroups and the organizational intelligently discuss the requirements for managing personal vs corporate IS&T, IRM, systems development, systems maintenance, systems operations; relate individual information technology infrastructure to the requirements of the workgroup, department, and organization	2 1.5.5 Wide area networks ... 2 1.5.9 Network security ... 2 1.5.12 Telecommunications applications ... 2 1.6.11 Data and database administration 3 2.2.7 CIO and staff functions 2 2.2.15.1 Telecommunications management 2 2.2.15.4 Data administration 2 2.2.15.5 Ownership of data and application systems 2 2.8.3 Privacy law

IS'97.3 - Information Systems Theory and Practice

2340

CATALOG Students who have constructed personal information systems will be exposed to the theory of the IS discipline. Application of these theories to the success of organizations and to the roles of management, users and IS professionals are presented. (Prerequisite: IS'97.2)

2343

SCOPE This course provides an understanding of the decision process and how information is used for decision support in organizations. It covers decision theory, information theory, and practice essential for providing viable information to the organization.

2346

TOPICS Systems theory and concepts; how information systems relate to organizational systems; decision theory and how it is implemented by IT; level of systems: strategic, tactical and operational; system components and relationships; information system strategies; roles of information technology and roles of people using, developing and managing systems; IS planning; human-computer interface; implementation and evaluation of system performance; societal and ethical issues related to information systems design and use.

EXPLANATION AND EXPECTATIONS

2353

Students who have end-user skills who have implemented personal productivity systems using knowledge work tools will be prepared to use the information systems theory presented in this course

2355

The course presents the basic concepts for use in subsequent courses; the systems point of view, the organization and development of a system, information flows, the nature of information systems, and basic techniques for representing systems structure.

2358

Learning, goal setting and achieving, decision making and other characteristics of individuals, groups and teams are explored. Organizational models and planning are presented. Quality concepts are explained. IS planning and development activities are explored in the organizational context of management and users. Cross-functional management and user teams are discussed.

Students completing this course will have mastered the following learning units:

2363

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
16	to introduce, discuss and describe fundamental concepts of IS theory and it's importance to practitioners	identify and explain underlying concepts of IS discipline (LO-0029)	2 2.9.7 Historical and social context of computing 2 3.1.6 Properties of information systems
17	to show how an information system is a strategic and integral component of an organization	describe the historic development of the information systems discipline (LO-0007) explain the strategic role of information systems in organizations (LO-0011) explain strategic relationship of IS activities to enhancing competitive position (LO-0033) explain the differences between strategic, tactical and operational level applications (LO-0038)	2 2.1.1 Hierarchical and flow models of organizations 2 2.1.2 Organizational work groups 2 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 2 2.3.1 Measurement and modeling 2 2.9.7 Historical and social context of computing 2 3.1.6 Properties of information systems 2 3.12.8 Work-flow systems 2 2.2.3.6 Ensuring positive climate for creativity

18	to discuss how an information system is developed and managed within an organization	explain information systems development and organizational process redesign; explain groups of individuals and their responsibilities in this process (LO-0016) explain the roles of professional IS personnel within an IS organization; explain functions of IS management, CIO, project manager, information analyst, and explain career paths (LO-0041)	2 2.1.1 Hierarchical and flow models of organizations 2 2.1.2 Organizational work groups 2 2.1.3 Organizational span: single user, work group, team, enterprise, global 2 2.1.6 Organizational structure: centralized, decentralized, matrix 2 2.2.1 IS planning 2 2.2.3 Staffing and human resource management 2 2.2.4 IS functional structures -- internal vs outsourcing 2 2.2.7 CIO and staff functions 2 2.2.15 Management of sub-functions 2 2.2.15.1 Telecommunications management 2 2.2.17 Computer operations management: e.g., tape/DASD management... 2 2.4.1 Job design theory 2 2.4.2 Cultural diversity 2 3.6.3 Contingency planning 2 3.7.3 Work breakdown structures and scheduling 2 3.12.1 Transaction processing systems 2 3.12.2 Management information systems

			2 3.12.3 Group support systems 2 3.12.6 Office systems 2 3.12.9 Functional support systems: e.g., process control, marketing
19	to present and discuss the relevance of the cognitive process and human interactions in information system design and implementation	explain cognitive process and other human oriented considerations in information systems design and implementation (LO-0048)	2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 2 2.10.10 Fostering creativity and opportunity finding 3 3.9.5 Information presentation alternatives; cognitive styles 2 3.9.6 Human-computer interaction (e.g., ergonomics, graphical-user interfaces...
20	to discuss how individuals make decisions and set and achieve goals	discuss and explain how individuals make decisions, set and achieve goals; explain what is meant by mission directed personal action (LO-0049)	2 2.10.7 Personal goal setting, decision making, and time management
21	to discuss the Simon Model of organizational decision making and its support by IS	discuss and explain decision theory and the decision process (LO-0035) explain IS support for decision making; explain the use of expert systems in support of heuristic decision making (LO-0036) explain and give	2 2.3.2 Decisions under certainty, uncertainty, risk 2 2.3.4 Decision models and IS: optimizing, satisficing 2 2.3.5 Group decision process 3 3.12.4 Decision support systems/expert systems 2 3.12.5 Executive support systems 3 3.12.7 Collaborative systems

		an illustration of the Simon organizational decision model (LO-0037)	
22	to introduce systems theory, quality, and organizational modeling and demonstrate their relevance to information systems	explain the use of information and information systems in documentation, decision making and control of organizational activity (LO-0010) discuss and explain systems goals, client expectation, and quality concepts (LO-0030) discuss and explain systems components and relationships (flows) (LO-0031) apply system concepts to define and explain the role of information systems (LO-0032)	2 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 2 2.3.3 Cost/Value of information, competitive value of IS 2 3.1.1 General systems theory 2 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 3 3.1.3 Properties of open systems 3 3.1.4 System components and relationships 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 2 3.1.6 Properties of information systems

23	to discuss a systems based role for management, users and designers	identify the generic responsibilities of users, designers and management in terms described in the Churchman "trinity"; discuss in systems terms detailed obligations of each in order to ensure quality; relate these observations to the quality improvement models for organizational development; identify the IS function in these terms (LO-0214)	2 3.1.1 General systems theory
24	to explain physical systems and work flow and how information systems relate to organizational systems	explain the relation of database modeling to organizational physical activity (LO-0018)	1 1.6.1 DBMS: features, functions, architecture 1 1.6.5 Data definition languages 1 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 1 1.6.7 Intelligent query processors and query organization 1 1.6.8 Distributed databases 1 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 1 3.3.1 Organizational and software process modeling 1 3.3.3 Data oriented methodologies

			1 3.3.4 Process oriented methodologies 1 3.9.1 Design: logical, physical
25	to present other organizational models and their relevance to IS	describe the role of information technology (IT) and the roles of people using, designing and managing IT in organizations (LO-0013) discuss how general systems theory is applicable to the analysis and development of an information system (LO-0034)	2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.1.7 Organizational issues pertaining to use of software systems in organizations 1 2.2.1 IS planning 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 2 2.3.1 Measurement and modeling 2 2.4.4 Teamwork, leadership and empowerment 2 2.9.6 IS industry: manufacturers, OEMs, system integrators, software developers 2 2.10.8 Principle centered leadership 2 3.1.4 System components and relationships 2 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 2 3.8.1 Problem opportunity identification: e.g., service requests, from planning...

26	to discuss the relationship of IS planning to organizational planning	explain IS planning goals and processes (LO-0053) explain the importance of corporate and strategic planning and of aligning the project to the information systems plan (LO-0126)	2 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 2 2.2.1 IS planning 2 2.2.4 IS functional structures -- internal vs outsourcing 2 2.2.5 Determining goals and objectives of the IS organization 2 2.4.1 Job design theory 2 3.5.2 Planning the IS architecture 3 3.8.2 Relating the application to the enterprise model 3 3.10.7 Software project management: scoping, scheduling, configuration manage...
27	to demonstrate specific classes of application systems including TPS and DSS	describe the classifications of information systems, e.g., TPS, DSS, ESS, WFS (LO-0012) explain relevant organizational IS: TPS, DSS, EIS, ES, Work Flow Systems (LO-0040)	2 3.12.1 Transaction processing systems 2 3.12.2 Management information systems 2 3.12.3 Group support systems 1 3.12.6 Office systems 1 3.12.8 Work-flow systems

28	to discuss and examine the process, standards and policies for development of information systems: development methodologies, life cycle, workflow, OOA, prototyping, spiral, end-user and other approaches	discuss and explain the concept of an IS development methodology; explain life cycle, workflow, OOA, prototyping, risk-based models, spiral and other restricting models; show how this can be proactively furnished (LO-0192)	2 3.5.5 Planning for IS security, privacy and control 2 3.6.2 Risk management principles 2 3.9.2 Design methodologies: e.g., real time, object oriented, structured
29	to discuss outsourcing and alternate implementations of the IS function	explain the advantages and disadvantages of outsourcing some or most of the IS function; state IS personnel requirements with and without outsourcing (LO-0180)	2 2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing 2 2.2.8 IS as a service function: performance evaluation -- external/internal, market...
30	to discuss performance evaluation consistent with quality management and continuous improvement	describe, explain and apply the responsibilities of the project leader; manage a small systems development project (LO-0151) discuss, explain and implement a methodology for tracking customer satisfaction within all phases of the life cycle (LO-	3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 3 2.3.4 Decision models and IS: optimizing, satisficing 3 2.3.5 Group decision process

		0152) explain methodologies to facilitate measurements to achievement of ISO 9000, Baldridge, National Performance Review and other quality standards (LO-0179)	
31	to introduce the societal implications of IS and related ethical issues to introduce and explore ethical concepts and issues relating to personal and professional behavior to introduce, compare and contrast ethical models and approaches to explore ethical and social analysis skills to consider the nature and	discuss and explain ethics and principled behavior and the concept of ethical practice in IS (LO-0045) discuss ethical major ethical models and discuss the reasons for being ethical explain the use of professional codes of ethics; explain the burden of professionalism resulting from trust associated with computing knowledge and skills discuss and explain the basis and nature of	2 2.8.6 Ethics: Personal and professional responsibility 2 2.8.7 Risks, losses and liability in computing applications 2 2.10.6 Proactive attitude and approach

	existence of power	questionable ethical approaches discuss and explain the ethical and social analysis of IS development discuss and explain the issues of power and its social impact in the development life cycle	
119	to discuss and explain ethical and legal principles and issues; to discuss and explain ethical considerations of information systems development, planning, implementation, usage, sales, distribution, operation and maintenance	list and explain ethical and legal issues in development, ownership, sales, acquisition, use and maintenance of computer systems and software (LO-0215) explain the utilization of ethical models, e.g. principle centered leadership to IS life cycle stages give examples of the effects of social context on technology development	2 2.8.1 Software sales, licensing and agency 2 2.8.3 Privacy law 2 2.8.5 Protection of intellectual property rights 2 2.8.6 Ethics: Personal and professional responsibility; ethical models 2 2.8.7 Risks, losses and liability in computing applications 2 2.8.8 Warranties

123	to investigate issues relative to managing the information systems function	explain security and privacy issues (LO-0128) explain the basis for a legal contract to develop systems (LO-0129)	2 2.8.1 Software sales, licensing and agency 2 2.8.2 Contract fundamentals 2 2.8.3 Privacy law 2 2.8.5 Protection of intellectual property rights 2 3.5.5 Planning for IS security, privacy and control

IS'97.4 - Networking and Telecommunications

2385

CATALOG Students will gain in-depth experience of telecommunications fundamentals, including voice-video-data for LAN, MANN and WAN including the switched network systems. Data communication and telecommunication models and standards, concepts, and standard organizations will be studied. Installation, configuration, systems integration and management of the technologies will be practiced.

2389

SCOPE The course provides an in-depth knowledge of telecommunications technologies, hardware and software. Emphasis is upon the analysis and design of networking applications in business. Management of telecommunications networks, cost-benefit analysis and evaluation of connectivity options is also covered. Students learn to evaluate, select and implement different communication options within a business.

2393

TOPICS Telecommunication devices and standards, media, systems; modems, multiplexers, bridges, routers, gateways and other network hardware and software; network configuration; network applications; coding of data; cost-benefit analysis; distributed versus centralized systems; architectures, topologies and protocols; network performance analysis; privacy, security, reliability; installation of networks; monitoring of networks; management of telecommunications.

EXPLANATION AND EXPECTATIONS

2399

Students who have used LANs, MANNs, and WANs to complete assignments in previous courses and who are knowledgeable of the significance of information technology in facilitating information systems will be given an opportunity in this course to gain considerable depth in telecommunications, both theoretically and through practical experience.

2403

Students will learn some of the significant telecommunications standards and about the organizations that have developed the standards. The ISO seven layered model will be presented. The CCITT and IEEE standards will be reviewed.

2406

The technology supporting telephone companies, satellite communications, as well as local and metropolitan systems will be explored. Devices including switches, media, modems, multiplexers, computer interfaces, bridges, routers and gateways will be studied.

2409

Acquisition, installation, configuration and other details of management of the various technologies will be studied.

Students completing this course will have mastered the following learning units:

2412

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
32	to develop awareness and associated terminology of the different objects, media and devices necessary for telecommunications, including local (LAN) and wide area (WAN) networks	identify the characteristics of telecommunication transmission media to LAN, MAN and WAN environments (LO-0065) access a remote information system for file transfer in both LAN and WAN environments (LO-0066) discuss and explain the telecommunications industry and the concepts of standards and regulationq	2 1.5.2 Data transmission: media, signaling techniques, transmission impairments... 3 1.5.4 Local area networks 3 1.5.6 Network architectures and protocols

33	to develop an awareness of how telecommunication systems are used to support organization communication infrastructure including information systems, teleconferencing, and telecomputer conferencing	explain the use of information systems to support "work flow"; discuss the concepts of teleconferencing and telecomputer conferencing in enabling communications and decision making; discuss and explain the infrastructure involving telecommunication systems (LO-0209)	2 1.5.8 Network configuration, performance analysis and monitoring 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia... 2 2.1.2 Organizational work groups 2 2.1.3 Organizational span: single user, work group, team, enterprise, global 2 2.2.15.1 Telecommunications management 3 2.3.4 Decision models and IS: optimizing, satisficing 3 2.3.5 Group decision process
34	to explore the issues related to the economics, design and management of computer networks	explain the steps in analyzing and configuring a telecommunication system, including specific hardware and software components (LO-0070) explain the purpose of modems, bridges, gateways, hubs, and routers in interconnecting systems	3 1.5.8 Network configuration, performance analysis and monitoring 2 2.2.15.1 Telecommunications management

35	to familiarize the student with the telecommunication standards and with regulatory organizations and their standards	identify the role of standards and of regulatory organizations and their standards as a facilitator in achieving local through global telecommunications (LO-0062) explain digital coding of data relevant to telecommunications (LO-0067)	2 1.5.1 International telecommunication standards, models, trends 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 1.5.8 Network configuration, performance analysis and monitoring 2 1.5.9 Network security: encryption, digital signatures, authentication
36	to discuss and explain underlying principles and issues of distributed versus centralized computer systems	explain, diagram and discuss structures and principles involved in distributing computing resources and data; identify hardware and software requirements and approximate costs of centralized and distributed systems; discuss and explain risks, security and privacy in alternate system configurations (LO-0211)	3 1.1.4 Computer system components: busses, controllers, storage systems, peripherals 2 1.4.2 Interaction of operating system and hardware architecture 1 1.4.9 Distributed operating systems 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 1.6.8 Distributed databases 2 2.1.6 Organizational structure: centralized, decentralized, matrix 2 3.8.3 Requirements determination and specification

37	to present architectures, topologies, and protocols of telecommunications	identify and explain the function of each of the layers of the ISO model (LO-0063) explain the concept of "virtual" communications between communicating machines at each layer of the ISO model identify and explain common topologies and implementation methods and issues for telecommunication systems (LO-0064) identify and describe the organization and operation of bit and byte protocols (LO-0068) discuss telecommunication services and analyze a specific implementation of the ISO model (LO-0069)	2 1.4.11 OS interoperability and compatibility: e.g., open systems 2 1.5.1 International telecommunication standards, models, trends 2 1.5.3 Line configuration: error control, flow control, multiplexing 2 1.5.6 Network architectures and protocols 2 1.5.8 Network configuration, performance analysis and monitoring 2 1.5.9 Network security: encryption, digital signatures, authentication 2 1.5.10 High-speed networks: e.g. broadband ISDN, SMDS, ATM, FDDI 2 1.5.11 Emerging networks: ATM, ISDN, satellite nets, etc.; optic nets; integrated... 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia...

38	to present the hardware and software components of telecommunications systems and how they are organized to provide required services	describe, diagram, discuss and explain hardware and software components of telecommunications systems; describe integration of phone, fax, LAN and WAN systems; diagram and discuss various organizations of hardware, identifying and describing each type of required device (LO-0210) explain the use of routers and hubs in designing interconnected systems explain telecommunication requirements of voice, audio, data, still images, motion video and multimedia explain fast packet technologies and applications explain issues of telecommunications network design	2 1.1.4 Computer system components: busses, controllers, storage systems, peripheral... 2 1.3.7.26 Compilers and translators 2 1.5.4 Local area networks 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 1.5.6 Network architectures and protocols 2 1.5.8 Network configuration, performance analysis and monitoring 2 3.1.4 System components and relationships

		give examples of business applications of telecommunications and explain the devi es and their utilization in the described system	
39	to provide awareness of the responsibilities inherent in providing telecommunication services, including security, privacy, reliability and performance	explain telecommunications systems performance measures and ensure adequate performance and reliability (LO-0076)	2 1.5.8 Network configuration, performance analysis and monitoring 2 2.8.4 Agencies and regulatory bodies
40	to explain how to install equipment necessary to implement a telecommunication system, e.g. cable, modems, Ethernet connections, gateways, routers	explain, install and test modems, multiplexers and Ethernet components (LO-0071) explain, install and test bridges and routers on appropriate hardware install and operate terminal emulation software on a PC (LO-0073) explain and construct organizational plans for the use of EDI (LO-0162)	3 1.5.2 Data transmission: media, signaling techniques, transmission impairments 3 1.5.3 Line configuration: error control, flow control, multiplexing 3 1.5.5 Wide area networks: switching techniques , broadcast techniques, routing 3 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia... 3 2.2.15.1 Telecommunications management 2 2.8.3 Privacy law

41	to explain how to design, install, configure and manage a LAN	design, install and manage a LAN (LO-0072) explain and implement security appropriate for an end-user environment involving access to an enterprise level IS	3 1.5.4 Local area networks 3 1.5.8 Network configuration, performance analysis and monitoring 3 2.2.15.1 Telecommunications management
124	to discuss issues pertinent to the management and transfer of emerging technologies	explain and detail methods for environment scanning and selecting effective hardware and software (LO-0163) explain management of emerging technologies (LO-0168)	3 2.2.1 IS planning 2 2.2.14 Management of emerging technologies

IS'97.5 - Programming, Data and Object Structures

2427

CATALOG This course presents object oriented and procedural software engineering methodologies in data definition and measurement, abstract data type construction and use in developing screen editors, reports and other IS applications using data structures including indexed files.

2430

SCOPE This course provides an understanding of classes and objects as well as algorithm development, programming, computer concepts and the design and application of data and file structures. The increasing complexity of applications requires an understanding of the logical and physical structures of both programs and data.

2434

TOPICS Data structures and representation: characters, records, files, multimedia; precision of data; information representation, organization and storage; algorithm development; classes, ADTs and objects; event driven representations; data flow notation; programming control structures; program correctness, verification and validation; file and database structures, definition, representation, and access; screen and report structures.

EXPLANATION AND EXPECTATIONS

2440

Students will gain in-depth understanding of defining and measuring events which produce data, both simple and complex, and principles, concepts and practices of successful software development.

2442

Formal problem solving strategies will be presented. Program design methods and strategies including top down implementation will be discussed and implemented. Graphic programming environments will be explored. Capabilities of a number of programming languages will be presented. Skill will be developed in at least one language supporting an indexed file system.

2446

Software engineering principals will be practiced in a systems view. Students will learn to recognize objects and abstract data types, concepts of event driven and data flows, module identification, modularity including parameters, module naming, cohesion, coupling desired and erroneous practices, and testing. Correctness, verification and validation methods will be presented and practiced in generation of small modules and larger programs.

2451

Specific data structures including arrays, records, stacks, queues, and trees will be incorporated into ADTs and used in creating IS applications including menus, screen record editors -- list boxes, dialog boxes, buttons, and menu structures, file and database definition and access modules, transaction posting mechanisms, and simple and control break reports.

Students completing this course will have mastered the following learning units:

2456

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
2	to present the concept that data is a representation and measurement of real-world events	explain the concept of measurement and information, information representation, organization, storage and processing (LO-0009) describe the concept that data is a representation and measurement of real-world events and the process of capturing it in machine readable forms (LO-0079)	2 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors... 1 1.1.2 Physical representation of digitized information: e.g., data, text, image, voice... 2 1.2.3 Complex data structures: e.g. of data, text, voice, image, video, hypermedia 1 1.6.1 DBMS: features, functions, architecture 1 1.6.2 Data models: relational, hierarchical, network, object, semantic object 2 1.7.1 Knowledge representation 2 1.7.2 Knowledge engineering 2 1.7.3 Inference processing 1 1.7.4 Other techniques: fuzzy logic, CASE-based reasoning, natural language and... 2 1.7.5 Knowledge-based systems 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 2 2.3.1 Measurement and modeling

43	to show and explain the logical and physical structure of data to represent characters, records, files, and multimedia objects	identify, explain and discuss the data hierarchy and identify all primary operations associated with each level of the hierarchy (LO-0078)	3 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors... 3 1.1.2 Physical representation of digitized information: e.g., data, text, image, voice... 3 1.2.3 Complex data structures: e.g. of data, text, voice, image, video, hypermedia 3 1.2.4 Abstract data types
44	to explain the concepts of classes, abstract data types (ADT), and objects	discuss classes which involve elements of the "hierarchy of data" (bit, byte, fields, records, files, database), and use these definitions as a basis for the solutions to problems; describe program structures and their usage relating to each data structure (LO-0086)	4 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors... 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks...
45	to explain and illustrate with IS examples of formal synthetic and analytic problem solving	explain and give examples of the concept of writing computer programs and using software development languages and application development facilities to solve problems (LO-0015)	1 1.2.1.4 Software design process; from specification to implementation 1 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 1 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 2 2.3.1 Measurement and modeling 1 3.9.7 Software development 3 3.10.3 Software integration: e.g., packages

46	to present a systems view of object representations and compare with data flow models	discuss and explain a systems view of an object representation; explain the similarity of an object representation to conventional data flow notation (LO-0200)	2 1.2.1 Formal problems and problem solving 3 1.3.6 Object oriented extensions to languages 2 1.3.7 Programming languages, design, implementation and comparison 3 1.3.7.28 Object-oriented design, languages, and programming 3 3.1.4 System components and relationships 2 3.3.5 Behavior oriented (event modeling) methodologies 2 3.3.6 Object oriented methodologies
47	to develop skills in developing an algorithmic solution to a problem and be able to represent it with appropriate program and data objects	design algorithms and translate them into working solutions in a programming language for many component problems involved in complete information system applications (LO-0199)	3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.3 Normalization 3 1.6.5 Data definition languages 2 1.6.6.1 Function supported by typical database system; access methods, security... 2 1.6.6.2 DML, query, QBE, SQL, etc.: database query language; data definition... 3 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 3 3.9.1 Design: logical, physical

48	to present top-down implementation strategies	design and implement programs in a top-down manner, building first the top levels, stubbing the lower levels; successively complete lower levels in the same manner; identify the concept of continued success in this method (LO-0205)	2 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 3.2.5 Selecting a systems development approach 3 3.9.1 Design: logical, physical
49	to present object implementation concepts	explain and implement modular structures; show the relation of data flow and object representations to the produced code (LO-0090)	3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy...
50	to present modular design, cohesion, and coupling concepts	develop and translate a data flow representation of a problem solution to a hierarchical and/or object representation (LO-0081) use algorithmic and modular design in the solution of a problem and implement the solution with a procedural language (LO-0087) use parameter passing in implementing a modular solution to a problem; explain the	4 1.2.1 Formal problems and problem solving 4 1.2.1.4 Software design process; from specification to implementation 4 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 4 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 2 1.2.3 Complex data structures: e.g. of data, text, voice, image, video, hypermedia 4 1.2.4 Abstract data types 4 1.2.4.3 Formal specifications, preconditions and post-conditions, algebraic...

		importance of high cohesion and low coupling (LO-0089) apply concepts of modular design to define cohesive modules of appropriate size (LO-0143) apply programming control structures and verify correctness (LO-0144) demonstrate ability to test and validate the solution (LO-0146)	4 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy... 4 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 4 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in... 3 1.2.5.1 Files (structure, access methods): file layouts; fundamental file concepts... 3 1.3.3.3 Procedures, functions, and parameters; arrays and records 3 1.3.7.12 Parameter passing mechanisms; reference, value, name, result, etc. 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 3 3.1.4 System components and relationships 3 3.9.1 Design: logical, physical 3 3.9.7 Software development 3 3.10.1 Systems construction 3 3.10.2 Software systems construction: e.g., programming, unit testing, load module...
51	to present a systems view of verification and validation	explain the verification and validation process; verify code by manual re-engineering to both procedural and/or object representations (LO-0091) develop data flow designs and translate	4 1.2.1 Formal problems and problem solving 4 1.2.1.4 The software design process; from specification to implementation 4 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 1.2.4 Abstract data types

		these designs to pseudocode or fourth GLs (LO-0141)	3 1.2.4.1 Purpose and implementation of abstract data types 4 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.3.5 Fourth-generation languages 4 3.9.7 Software development
52	to present and expose students to a variety of programming environments, development tools and graphics development environments	demonstrate ability to evaluate and use existing GUI components in construction of an effective user interface for an application (LO-0145)	3 1.2.4 Abstract data types 3 1.4.10 OS support for human interaction: e.g., GUI, interactive video 3 3.9.6 Human-computer interaction (e.g., ergonomics, graphical-user interfaces...
53	to introduce the concepts and techniques used to represent and operate on data and file structures, with simple examples	explain the ADTs necessary to access records in an indexed data file; show examples of each type of operation required (LO-0203)	2 1.2.4 Abstract data types 3 1.2.5 File structures: sequential, direct access, hashing, indexed 2 1.2.6 Sorting and searching data structures and algorithms
54	to explain how to develop structures using abstract data types representing arrays, lists, trees, records and files, and demonstrate how they are applied as components of programs and	use array representations to simulate accessing an indexed file, and use the representations in designing an abstract data type for insert, delete-current, find, next, and previous operations (LO-0085)	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 3 1.2.4.3 Formal specifications, pre-conditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to...

	applications		3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in...
55	to present and use index file structures, including key organizations	discuss and explain the concept of indexed files; describe key construction and compare data management requirements involved in selecting optimal keys; explain the functions that are necessary to implement and access indexed records; explain the similarity of arrays and indexed files in terms of similarities of functions in ADTs (LO-0202)	2 1.2.5 File structures: sequential, direct access, hashing, indexed
56	to explain a variety of fundamental structures that are building blocks for the development of programs and IS applications	apply application software to solve small scale problems (LO-0084) develop user and system documentation for a program solution to a problem of moderate complexity (LO-0088)	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 2 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 3 1.2.4 Abstract data types 3 2.2.16 Security and control, viruses and systems integrity

			2 2.10.2 Interviewing, questioning and listening 3 2.10.5 Writing skills 3 3.2.2 Package acquisition and implementation 2 3.7.8 Systems documentation 2 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line...
57	to provide the foundations for applications of data structures and file processing techniques	use abstract data types involved in common IS applications to implement solutions to problems involving indexed file processing techniques. (LO-0198)	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 3 1.2.4 Abstract data types 3 1.2.4.1 Purpose and implementation of abstract data types 3 1.2.4.2 Informal specifications 3 1.2.4.3 Formal specifications, pre-conditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions; invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in...

			3 1.2.5 File structures: sequential, direct access, hashing, indexed 3 1.2.5.1 Files (structure, access methods): file layouts; fundamental file concepts... 3 1.2.5.2 Files (structure, access methods): directories, contents and structure, naming... 2 1.2.6 Sorting and searching data structures and algorithms 2 1.2.6.1 Sorting algorithms (shell sort, bucket sort, radix sort, quick sort), editing...
58	to present and ensure problem solving involving files and database representations	use indexed files and ADTs to solve simple problems involving files used as elements of a database solution. (LO-0204)	3 1.2.4 Abstract data types 3 1.2.4.3 Formal specifications, pre-conditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in... 3 1.2.5 File structures: sequential, direct access, hashing, indexed 2 1.6.1 DBMS: features, functions, architecture 2 1.6.2 Data models: relational, hierarchical, network, object, semantic object 2 2.3.1 Measurement and modeling 2 3.3.2 Data modeling: e.g., entity-relationship diagrams, normalization

59	to present and develop useful structured file (database) editors, posting mechanisms, and reports (simple, control break)	build and document several applications using indexed files, screen editors, and reports (LO-0093)	3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.2.5 File structures: sequential, direct access, hashing, indexed 3 3.7.8 Systems documentation 2 3.9.6 Human-computer interaction (e.g., ergonomics, graphical-user interfaces, voice...
60	to continue the development of programming techniques, particularly in the design, testing and debugging of IS related programs of some complexity	define, explain and present the process of stating and solving formal analytic problems (LO-0080)	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 3 1.2.4 Abstract data types 3 1.2.4.3 Formal specifications, pre-conditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in... 2 1.2.6.1 Sorting algorithms (shell sort, bucket sort, radix sort, quick sort), editing, report... 2 1.2.6.2 Searching algorithms (serial search, binary search, and binary search tree)

			2 1.2.6.3 Searching, hashing, collision resolution 3 3.1.3 Properties of open systems 3 3.9.1 Design: logical, physical 3 3.9.7 Software development 3 3.10.2 Software systems construction: e.g., programming, unit testing, load module...
61	to develop an awareness of the relative capabilities and limitations of most common programming languages	explain the capabilities and differences for programming environments and language (LO-0094)	1 1.2.8 Recursive algorithms 1 1.2.9 Neural networks and genetic algorithms 1 1.2.10 Advanced considerations 2 1.3.1 Fundamental programming language structures; comparison of languages and... 2 1.3.2 Machine and assembly level languages 2 1.3.3 Procedural languages 2 1.3.4 Non-procedural languages: logic, functional 2 1.3.5 Fourth-generation languages 1 1.3.6 Object oriented extensions to languages 2 1.3.7 Programming languages, design, implementation and comparison 2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 1 1.6.10 Database machines

IS'97.6 - Information Technology Hardware and Software

2480

CATALOG Principles and application of telecommunication and computer systems hardware and software will be presented through lecture, installation, configuration and operations experiences. (Prerequisite: IS'97.2)

2482

SCOPE The course provides the hardware-software technology background to enable systems development personnel to understand tradeoffs in computer architecture for effective use in the business environment.

2484

TOPICS Hardware: CPU architecture, memory, registers, addressing modes, busses, instruction sets, multi processors versus single processors; peripheral devices: hard disks, CDs, video display monitors, device controllers, input/output; operating systems functions and types; operating system modules: processes, process management, memory and file system management; examples of hardware architectures; examples of operating systems.

EXPLANATION AND EXPECTATIONS

2490

Students who are knowledgeable of and have developed personal information systems will gain an in-depth exposure to information technology hardware and software components and their interaction.

2492

A systems view of computer systems will be utilized in identification of computer and telecommunication system components. Peripheral devices will be identified and principles of operation will be studied and learned. The operating system software, including I/O drivers, and telecommunication applications and extensions to the operating system will be examined, learned and utilized.

2496

Organization of the operating system will be studied to understand how concurrent processes, scheduling, memory management, and I/O are accomplished. The flow of information in the operating system in relation to the computer and to the application software will be considered.

2499

Telecommunication devices will be identified and system integration considerations will be presented. Switches, multiplexers, and media -- wire, glass fiber and radio -- will be explored as basic components of telephone, LAN and WAN systems.

2502

Standards, standard organizations and resulting hardware and software consequences will be identified and studied. General principles will be expressed.

2504

Students will gain practical experience with cabling, installing, configuring and multi-user operating systems and LANs.

Students completing this course will have mastered the following learning units:

2506

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
62	to explain in systems terms the fundamental characteristics and components of computer and telecommunications hardware, and system software, and demonstrate how these components interact	use the systems approach to explain the hardware and software components of a telecommunications system, and to diagram and discuss the nature of the interactions of the components; explain in systems terms the purpose, expectations and the quality of a telecommunications system, and show how the components work purposefully together (LO-0230)	2 1.1.2 Physical representation of digitized information: e.g., data, text, voice, video 3 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 2 1.1.3.1 Basic organization; von Neumann, block diagram, data paths, control path... 2 1.1.4.1 Peripherals: I/O and interrupts 2 1.1.4.2 Peripherals: input/output control methods, interrupts 2 1.1.4.3 Peripherals: external storage, physical organization and drives 2 1.1.5 Multiprocessor architectures 1 1.1.6 Digital logic and systems

			1 1.1.6.3 Demultiplexers, multiplexers, decoders, encoders, adders, subtractors... 1 1.1.6.8 Tristates and bus structures 2 1.4.1 Architecture, goals and structure of an operating system; structuring methods... 2 1.4.2 Interaction of operating system and hardware architecture 2 1.4.3 Process management: concurrent processes, synchronization 2 1.4.3.1 Tasks, processes, dispatching context switchers, role of interrupts 2 1.4.5 Resource allocation and scheduling 1 1.4.5.1 Protocol suites (communications and networking); streams and datagrams 1 1.4.5.2 Internetworking and routing; servers and services 1 1.4.5.3 Types of operating systems: single user, multi-user, network 1 1.4.5.6 Operating system utilities 1 1.4.8 Protection and security 1 1.4.11 OS interoperability and compatibility: e.g., open systems 1 1.4.12 Operating system utilities, tools, commands and shell programming 1 1.4.13 System administration and management 2 1.5.1.2 Network design and management: network architectures (ISO, SNA, DNA)...

			2 1.5.2 Data transmission: media, signaling techniques, transmission impairments... 2 1.5.2.1 Communications system technology: transmission media, analog-digital... 2 1.5.3 Line configuration: error control, flow control, multiplexing 2 1.5.4 Local area networks 2 1.5.4.2 Local area networks and WANs: topology, gateways, uses (functions and... 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 1.5.6 Network architectures and protocols 2 1.5.8 Network configuration, performance analysis and monitoring 1 1.5.10 High-speed networks: e.g., broadband ISDN, SMDS, ATM, FDDI 1 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia... 2 2.2.5 Determining goals and objectives of the IS organization 1 2.2.8 IS as a service function: performance evaluation -- external/internal market... 1 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 1 2.2.13 Backup, disaster planning and recovery 1 2.2.15.1 Telecommunications management 1 2.2.15.7 Quality management: e.g. reliability and quality engineering; QC teams

			1 2.2.16 Security and control, viruses and systems integrity 3 3.1.1 General systems theory 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 2 3.1.3 Properties of open systems
63	to provide an overview of peripheral devices and their function	identify major classes of peripheral devices and explain the principles of operation and software requirements and functions provided for each type of device; give specific examples of each device identified, and discuss the installation requirements for the hardware and required software (LO-0213)	2 1.5.4 Local area networks
64	to introduce the concepts of computer hardware architectures	define data and communication requirements to access local (the hard-disk, or server) and remote data (e.g., via internet) to solve individual problems (LO-0024) describe and explain the major hardware and software components of a computing system and how they	2 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 2 1.1.4 Computer system components: busses, controllers, storage systems, peripheral... 2 1.1.6 Digital logic and systems 2 1.5.1 International telecommunication standards, models, trends 1 1.5.2 Data transmission: media, signaling techniques, transmission impairments... 1 1.5.4 Local area networks 3 1.5.5 Wide area networks: switching

		interact (LO-0095)	techniques, broadcast techniques, routing 2 1.5.6 Network architectures and protocols 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia... 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement...
65	to introduce the concepts of system software components and interactions	describe and explain the major components of an operating system and how they interact (LO-0096) explain the control of input/output functions; install and configure drivers (LO-0101)	2 1.4.2 Interaction of operating system and hardware architecture 2 1.4.3 Process management: concurrent processes, synchronization 2 1.4.6 Secondary storage management 2 1.4.7 File and directory systems 2 1.4.8 Protection and security 2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 2 2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 2 3.9.3 Design objectives: e.g., usability, performance 2 3.10.2 Software systems construction: e.g., programming, unit testing, load module...

67	to introduce the major concepts in operating systems, including process definition, concurrent processing, memory management, scheduling, interrupt processing, security, and file systems	explain the concept of tasks and processes (LO-0097) explain the concept of concurrency and multi- tasking (LO-0098) explain routine behavior of task schedulers, priority queues, interrupt processing, memory management and file system (LO-0099)	2 1.4.2 Interaction of operating system and hardware architecture 2 1.4.3 Process management: concurrent processes, synchronization 2 1.4.4 Memory management 1 1.4.5 Resource allocation and scheduling 2 1.4.6 Secondary storage management 2 1.4.7 File and directory systems 2 1.4.8 Protection and security 3 3.1.4 System components and relationships
68	to introduce a variety of operating environments (traditional, GUI, multimedia) and resource requirements	describe and discuss several computer system operating environments including traditional, graphical user interface, and multi-media; estimate the hardware and software items and approximate cost for each environment; discuss relative advantages for each environment (LO-0212)	2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 3 1.4.12 Operating system utilities, tools, commands and shell programming 3 1.4.13 System administration and management 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia...

69	to discuss, explain and install multimedia facilities	discuss and explain the hardware and software requirements necessary to support multimedia (LO-0181) explain development software tools which support multimedia environments; discuss the advantages and shortcomings of various development tools and environments (LO-0182) install multimedia sound and video hardware and software components; install development environments and demonstrate use of the installed software systems (LO-0183)	3 1.4.10 OS support for human interaction: e.g., GUI, interactive video
70	to introduce the requirements for interoperability and systems integration	explain concepts of interoperability and systems integration in relation to policies and practices (LO-0177) explain components of hardware and software to connect and implement networked solutions	2 1.4.9 Distributed operating systems 2 1.4.11 OS interoperability and compatibility: e.g., open systems 2 3.10.5 Systems integration and system testing: verification and validation, test plan...

		for PC networks and more advanced LAN and WAN environments. explain installation and configuration of a distributed system explain OS considerations to enable a client server environment	
71	to install, configure and operate a multi-user operating system	build system software command structures (e.g. JCL) for both mainframe and microcomputer systems involving the macro facilities of the operating system (LO-0100) install, configure and operate a multi-user operating system (LO-0103)	3 1.3.7.28 Object-oriented design, languages, and programming 3 1.4.2 Interaction of operating system and hardware architecture 3 1.4.5 Resource allocation and scheduling 3 1.4.6 Secondary storage management 3 1.4.7 File and directory systems 3 1.4.8 Protection and security

IS'97.7 - Analysis and Logical Design

2520

CATALOG Students with information technology skills will learn to analyze and design information systems. Students will practice project management during team oriented analysis and design of a departmental level system. (Prerequisites: IS'97.4, IS'97.5, and IS'97.6)

2523

SCOPE This course provides an understanding of the system development and modification process. It enables students to evaluate and choose a system development methodology. It emphasizes the factors for effective communication with users and team members and all those associated with development and maintenance of the system.

2527

TOPICS Life cycle phases: requirements determination, logical design, physical design, test planning, implementation planning and performance evaluation; communication, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group based approaches: JAD, structured walkthroughs, design and code reviews; prototyping; database design; software quality metrics; application categories; software package evaluation and acquisition; professional code of ethics.

EXPLANATION AND EXPECTATIONS

2533

Students with the basic skills of information technology will learn to gather information in order to identify problems to be solved. They will determine system requirements and a logical design for an information system, while participating as team members in a project beginning in this course and continuing over a coordinated four course project sequence (IS'97.7, IS87.8, IS/97.9 and IS'97.10).

2537

Students will investigate alternative solutions, and will determine feasibility of solutions. They will identify value added by the completion of the system.

2539

Students will be exposed to case or other tools which have the same functionality. Tools which facilitate each stage of the life cycle should be used. While CASE tools are not a substitute for understanding of the processes involved, they may be used to ensure that a particular methodology is used rigorously. If manual methods are used, it is important to define the methodology thoroughly.

2543

Project management will be taught and used to control the team project. Team concepts including personal and interpersonal skills will be discussed and monitored. Empowerment concepts will be used and measured. Scheduling and completing individual and group actions will be used to ensure project milestone completion.

2547

A departmental information system will be designed during this course. The instructor, in addition to lecturing, may wish to adopt a role within the project phase: CIO, project manager, consultant, or client are all possible roles.

Students completing this course will have mastered the following learning units:

2551

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Levels and Body of Knowledge Elements in Learning Units
72	to present necessary concepts to provide the skills necessary to do the analysis, modeling, and definition of information systems problems	explain IS life cycle phases and concepts and alternatives (LO-0057) detect problem to solve, re-engineer physical flow (LO-0108)	3 2.10.10 Fostering creativity and opportunity finding 2 3.6.1 Feasibility assessment 2 3.6.2 Risk management principles 3 3.8.1 Problem opportunity identification: e.g., service requests, from planning process
73	to give students exposure to using commercial program products to implement information systems	demonstrate ability to analyze alternative approaches to applications including packages, tailoring or customizing packages, adding modules to packages, and building unique applications (LO-0110) explain the concepts of acquiring	2 2.8.1 Software sales, licensing, and agency 3 2.8.2 Contract fundamentals 3 2.8.3 Privacy law 2 2.8.4 Agencies and regulatory bodies 2 2.8.5 Protection of intellectual property rights 3 2.8.7 Risks, losses and liability in computing applications 3 3.7.11 Scoping and scope control

		computer hardware and software (LO-0167) explain the process of writing bids and contracts (LO-0174) explain all phases of contracts and write realistic examples for consultant relationships, software and hardware acquisition, or other relevant examples (LO-0175)	
74	to show how to collect and structure information in the development of requirements and specifications	conduct an information gathering interview with individuals and with a group (LO-0106) conduct a JAD session using a GDS tool (either manual or electronic) (LO-0111)	3 2.10.1 Communication skills 3 2.10.2 Interviewing, questioning and listening 3 2.10.5 Writing skills 3 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code...
75	to show how to develop a logical design, and develop and analyze alternatives involving implementation using packages, tailoring of packages, constructing software, or CASE tools	use CASE , I-CASE or other automated or non-automated tools (LO-0112) be able to use a commercial CASE tool to generate "upper case" documentation (LO-0113)	3 3.4.1 CASE

76	to develop a functional understanding of rapid prototyping and other similar alternative mechanisms for rapid development of information systems	use rapid prototyping and other similar alternative mechanisms for rapid development of information systems (LO-0114)	3 3.2.1 Systems development models: e.g., SDLC, prototyping 3 3.2.5 Selecting a systems development approach
77	to show how to assess risks and feasibility	identify IS requirements and specifications and tentative logical design alternatives; evaluate proposed competitive advantage, feasibility and risk (LO-0109)	2 3.5.1 Infrastructure planning: hardware, communications, database, site 3 3.6.1 Feasibility assessment 3 3.8.3 Requirements determination and specification 3 3.9.1 Design: logical, physical
78	to show students how to analyze organizational systems to determine how the systems might be improved	compare several proposed systems solutions, based on criteria for success (LO-0061) identify, explain and use development methodologies compatible with the concept of process of continuous improvement (LO-0107) apply systems, decision and quality theory and information systems development techniques and methodologies to initiate, specify and	3 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 3 2.3.1 Measurement and modeling 2 2.10.8 Principle centered leadership 2 2.10.10 Creative problem solving and opportunity identification 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 3 3.10.7 Software project management: scoping, scheduling, configuration manage...

		implement a relatively complex multi-user information system originating in a quality conscious organization involved in continuous improvement of its processes (LO-0149) at an enterprise or multi-department level, develop physical flows as well as a complete work flow design	
79	to develop skills for effective interpersonal communication to develop consensus using classical techniques as well as computer facilitated groupware	explain the concept of shared vision in developing effective solutions to organizational process (LO-0052) explain common forms of behavior that can lead to lack of communication	3 2.3.4 Decision models and IS: optimizing, satisficing 3 2.3.5 Group decision process 2 3.9.4 Techniques to enhance the creative design process
80	to demonstrate and analyze small group dynamics as related to working with users	explain group and team behavior in an IS context (LO-0051) explain how groups and teams should work together, empower co-workers, and apply team methods; measure and prove empowerment and effectiveness; participate effectively	3 2.3.4 Decision models and IS: optimizing, satisficing 3 2.3.5 Group decision process 4 2.4.3 Group dynamics 4 2.4.4 Teamwork, leadership and empowerment 2 2.4.5 Use of influence, power and politics 4 2.4.8 Consensus building

		in cooperative team work; and evaluate success of work (LO-0154)	
81	to develop application skills for implementing databases and applications by operating and testing these databases	design and implement an information system within a database environment (LO-0118) develop dataflow and/or an event driven models of the components of an information system, and design the implementation of the concepts develop the corresponding database and implement the schema with a DBMS package develop event driven screens corresponding with the database design; develop report designs for necessary documentation and reporting; resolve the database indexes and construct the appropriate application	3 1.6.1 DBMS: features, functions, architecture 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.3 Normalization 3 1.6.4 Integrity (referential, data item, intra-relation): representing relationships; entity... 3 1.6.5 Data definition languages 3 1.6.7 Intelligent query processors and query organization 3 1.6.12 Data dictionary, encyclopedia, repository 3 3.9.2 Design methodologies: e.g., real time, object oriented, structured 2 3.9.5 Information presentation alternatives; cognitive styles

82	to present and use complexity metrics to assess developed solutions	apply system software functions to analyze resource use and performance characteristics for an application (LO-0102)	3 1.4.1 Architecture, goals and structure of an operating system; structuring methods... 3 1.4.2 Interaction of operating system and hardware architecture 2 3.5.4 Metrics for size, function points, control of complexity 3 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line... 3 3.7.13 System development quality assurance 2 3.9.7 Software development
83	to develop quality metrics for assessment of software development and project control of software development	explain how written standards describing each phase of the life-cycle can evolve; explain the relevance of written standards, and the desirability of developing quality assurance procedures describe and explain the use of quality metrics in assessment of software development and in facilitating project control of the development activities (LO-0206)	2 1.2.7 Algorithm efficiency, complexity and metrics 3 2.2.15.7 Quality management: e.g. reliability and quality engineering; QC teams 2 3.5.4 Metrics for size, function points, control of complexity 2 3.7.10 System metrics 2 3.7.13 System development quality assurance 2 3.9.7 Software development
84	to develop quality metrics for assessment of customer satisfaction at all phases of the life cycle	use quality metrics and performance benchmarks to ensure customer satisfaction for each phase of the life cycle. Test the metrics during system development activities (LO-0115)	3 3.7.10 System metrics 3 3.7.13 System development quality assurance 2 3.9.3 Design objectives: e.g., usability, performance

85	to explain the use of a professional code of ethics to evaluate specific IS actions	identify and describe professional organizations (LO-0043) explain setting an ethical standard (LO-0044) explain and examine ethical issues and arguments and failed approaches as a function of power and social context identification of stakeholders in a given IS development context, and the effect of development on these individuals describe use of the codes of ethics and ensure that project actions are consistent with these prescriptions (LO-0127)	2 2.8.3 Privacy law 3 2.8.5 Protection of intellectual property rights 2 2.8.6 Ethics: Personal and professional responsibilities; ethical models, ... 2 2.9.1 Current literature periodicals, professional, academic journals 2 2.9.2 Certification issues 3 2.9.3 Professional organizations: e.g., DPMA, ACM, TIMS, ASM, DSI, ACE, IEEE... 2 2.9.4 Professional conferences 2 2.10.6 Proactive attitude and approach

IS'97.8 - Physical Design and Implementation with DBMS

2569

CATALOG Students completing the analysis and logical design course will continue in this course the detailed physical design and implementation of a departmental database requiring implementation. (Prerequisite: IS'97.7)

2572

SCOPE The course covers information systems design and implementation within a database management system environment. Students demonstrate their mastery of the design process acquired in earlier courses by designing and constructing a physical system to implement the logical design.

2575

TOPICS Data models and modeling techniques; structured and object design approaches; differing models for databases: relational, hierarchical, network and object oriented; CASE tools; dictionaries, repositories, warehouses; implementation: coding, testing, installation and post implementation review.

EXPLANATION AND EXPECTATIONS

2579

Students who have completed the information analysis and logical design course will engage in the physical design and implementation process for a departmental level information system, as part of the coordinated four course project sequence begun in IS'97.7.

2582

CASE tools or manual methods will be used within a team oriented project environment to design and implement a database requiring a departmental information system.

2584

A data model of a physical flow will be completed and the detailed database design will be used to construct a database.

A corresponding functional analysis of the problem will be completed. Program specifications will be developed and utilized in construction of the physical system. Testing, integration, and integration testing of the final system will be accomplished. Tools will be used to measure complexity of solutions; quality assurance measures implemented as project standards will be used to control project quality and risk.

2590

Code generators or libraries will be used to facilitate rapid development of the desired system. Existing project management software will be used to manage user expectation and completed work.

Students completing this course will have mastered the following learning units:

2593

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
86	to discuss the importance of finding synergistic solutions with team and clients	describe and explain interdependence habits of empathetic listening, synergy and consensus building (LO-0050) explain negotiation and interdependent activities (LO-0173)	4 2.3.5 Group decision process 3 2.4.3 Group dynamics 4 2.4.4 Teamwork, leadership and empowerment 3 2.4.5 Use of influence, power and politics 3 2.4.6 Cognitive styles 2 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building 3 2.10.1 Communication skills 3 2.10.6 Proactive attitude and approach 3 2.10.9 Principles of negotiation 3 2.10.10 Fostering creativity and opportunity finding

87	to show how to develop agreements describing work to be done, and to commit, rigorously complete and self- evaluate agreed work	perform work estimates, commit to the work, and rigorously complete, self-evaluate against standards, and account for the work (LO-0105)	3 2.2.3 Staffing and human resource management 3 2.10.6 Proactive attitude and approach 3 2.10.7 Personal goal setting, decision making, and time management 3 2.10.8 Principle centered leadership 3 3.7.7 Management concerns; stress and time management
88	to develop skill with data modeling of databases	use DBMS, data modeling, and data manipulation languages (LO-0124) use knowledge data models to differentiate model types; explain the different models for databases, e.g. relational, hierarchical, network and OO database; and explain how they are implemented in database management systems (LO-0130)	3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.5 Data definition languages 2 1.7.1 Knowledge representation 2 1.7.2 Knowledge engineering 2 1.7.3 Inference processing 3 3.3.2 Data modeling: e.g., entity-relationship diagrams, normalization 3 3.4.3 Software implementation concepts and tools: e.g., data dictionary, repository...

89	to develop awareness of the syntactical and theoretical differences between database models	identify the components of hierarchical, network, and relational database models; discuss the data definitions required for each model; explain the reasons for specific commands within the data manipulation facilities; discuss logical interconversion between the models (LO-0201)	3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.5 Data definition languages 2 3.8.2 Relating the application to the enterprise model
90	to develop skill in application of database systems development and retrieval facilities needed to facilitate creation of information system applications	apply life cycle implementation (LO-0122) explain database administration and maintenance (LO-0138)	2 2.8.3 Privacy law 3 2.10.10 Creative problem solving and opportunity identification 3 3.2.1 Systems development models: e.g., SDLC, prototyping 3 3.2.5 Selecting a systems development approach 3 3.4.1 CASE
91	to develop skills with application and structuring of database management systems	develop editors to facilitate data entry into the database (LO-0133) demonstrate design and implementation skills with both a graphical user interface and character based interface to implement list	3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.6.1 DBMS: features, functions, architecture 3 1.6.1.1 DBMS (features, functions, architecture); components of database system... 3 1.6.1.3 Logical design (DBMS independent design): ER, object oriented

		boxes, dialog boxes, buttons and menu structures design and implement simple reports to validate the performance of application systems (LO-0134) apply software development principles, methods and tools to implementation of an IS application (LO-0140)	3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.5 Data definition languages 3 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 4 1.6.7 Intelligent query processors and query organization 2 1.6.9 DBMS products: recent developments in database systems (.e.g., hypertext... 2 1.6.11 Data and database administration 3 1.6.12 Data dictionary, encyclopedia, repository 3 2.2.3.4 Education and training 3 2.2.15.7 Quality management: e.g., reliability and quality engineering; QC teams 3 2.3.1 Measurement and modeling 3 3.2.2 Package acquisition and implementation 3 3.2.3 Integrating software components 4 3.2.5 Selecting a systems development approach 3 3.5.1 Infrastructure planning: hardware, communications, database, site 3 3.9.7 Software development 4 3.10.1 Systems construction

			3 3.10.2 Software systems construction: e.g., programming, unit testing, load module
92	to develop skill with application and physical implementation of database systems, using a programming environment	apply database design techniques to implement a solution with calls from a program to the DBMS (LO-0139) explain and apply networking considerations in implementing distributed models develop client server applications and install and operate them in a multi-user environment.	4 1.2.1 Formal problems and problem solving 4 1.2.4 Abstract data types 4 1.6.1 DBMS: features, functions, architecture 3 1.6.1.2 DBMS: overview of relational algebra 4 1.6.1.3 Logical design (DBMS independent design): ER, object oriented 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.2.1 Relational data model terminology; mapping conceptual schema to a... 4 1.6.2.2 Conceptual modeling (e.g., entity-relationship, object-oriented) 3 1.6.3 Normalization 4 1.6.4 Integrity (referential, data item, intra-relation): representing relationships... 4 1.6.5 Data definition languages 4 1.6.6 Application interface 3 2.3.1 Measurement and modeling 4 2.10.6 Proactive attitude and approach 3 3.8.2 Relating the application to the

			enterprise model
93	to develop skills with use of a combination of code generators and language facilities to implement multi-user departmental or simple enterprise level systems	use code generators to implement an IS application and compare the results with hand-coded versions of the same application (LO-0196)	3 1.3.7.30 Code generators
94	to provide an opportunity to develop and use project management, project standards, and a system implementation plan, and to implement a documentation plan	create and present technical and end user telecommunication system documentation (LO-0074) identify security and privacy considerations and how they may be solved within the context of the telecommunications system (LO-0075) explain configuration controls (LO-0135) develop consistent with good practice a departmental level DBMS project, and develop systems development and	3 1.2.4 Abstract data types 2 1.4.8 Protection and security 3 1.5.4 Local area networks 3 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 3 1.5.8 Network configuration, performance analysis and monitoring 3 1.6.1 DBMS: features, functions, architecture 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.4 Integrity (referential, data item, intra-relation); representing relationships... 3 1.6.5 Data definition languages 3 1.6.9 DBMS products: recent developments in database systems (e.g., hypertext...

		user documentation (LO-0136) work in teams tracking individual and team results; develop assignments and performance rating measures to evaluate and ensure quality assurance in the development process (LO-0137) develop program level, system and user documentation (LO-0147) apply development concepts to a project of reasonable complexity in a team environment (LO-0148)	3 1.6.11 Data and database administration 2 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 3 2.2.1.1 Alignment of IS planning with enterprise planning 3 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 3 2.2.8 IS as a service function: performance evaluation -- external/internal, market... 3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 3 2.2.11 End user computing support, role and functions 2 2.2.13 Backup, disaster planning and recovery 2 2.2.15.3 Management of group decision support systems 2 2.2.15.4 Data administration 2 2.2.15.5 Ownership of data and application systems 3 2.2.15.6 Optimizing the climate for creativity 3 2.2.15.7 Quality management: e.g. reliability and quality engineering; QC teams 3 2.2.16 Security and control, viruses and systems integrity

			3 2.3.1 Measurement and modeling
			2 2.3.3 Cost/Value of information, competitive value of IS
			3 2.3.5 Group decision process
			2 2.4.1 Job design theory
			3 2.4.3 Group dynamics
			3 2.4.4 Teamwork, leadership and empowerment
			3 2.4.5 Use of influence, power and politics
			3 2.4.7 Negotiating and negotiating styles
			3 2.4.8 Consensus building
			2 2.10.3 Presentation skills
			2 2.10.4 Consulting skills
			3 3.1.4 System components and relationships
			2 3.7.1 Project planing and selection of appropriate process model; project scheduling...
			2 3.7.2 Project organization management, principles, concept and issues
			2 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team...
			2 3.7.5 Project control: planning, cost estimation, resource allocation, software tech...
			3 3.7.8 Systems documentation

			3 3.7.11 Scoping and scope control 2 3.7.12 Configuration management 2 3.7.14 Project tracking: e.g., PERT, Gantt 3 3.8.3 Requirements determination and specification 3 3.9.4 Techniques to enhance the creative design process 3 3.10.1 Systems construction 2 3.10.5 Systems integration and system testing: verification and validation, test plan... 3 3.12.1 Transaction processing systems
95	to show how to design a conceptual relational database model and logical database model, convert the logical database designs to physical designs, develop the physical database, and generate test data	explain a framework for evaluating an information system function and value of individual applications (LO-0055) explain the use of critical success factors (LO-0056) translate a logical system design into a physical design in a target environment, and, implement this specification into an operational system using DBMS technology (LO-0119)	3 1.6.4 Integrity (referential, data item, intra-relation): representing relationships... 3 1.6.5 Data definition languages 2 2.1.1 Hierarchical and flow models of organizations 2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.1.6 Organizational structure: centralized, decentralized, matrix 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 4 2.10.10 Creative problem solving and opportunity identification 3 3.9.1 Design: logical, physical

96	to provide opportunity to develop functional specifications for an information system, develop a detailed information system design, and develop information system application controls	use a methodology to specify and develop an information system of departmental level significance; ensure that data collection, verification, and control is accomplished; ensure that external audits will establish consistent goals and accomplishments (LO-0191)	3 2.4.5 Use of influence, power and politics 3 2.7.1 Reasons for resistance to change 3 2.7.2 Strategies for motivating change 3 2.7.3 Planning for change 3 2.7.4 Managing change 3 3.3.1 Organizational and software process modeling 2 3.3.3 Data oriented methodologies 3 3.3.4 Process oriented methodologies 3 3.3.5 Behavior oriented (event modeling) methodologies 3 3.7.13 System development quality assurance 4 3.9.5 Information presentation alternatives; cognitive styles
97	to show how to develop a conversion and installation plan, develop a hardware systems and environmental plan	develop a detailed training, conversion and installation plan for hardware and software involving a newly developed information system application (LO-0194) design networked solutions and install the DBMS on the server along with appropriate OS and telecommunications	4 2.4.6 Cognitive styles 3 2.7.1 Reasons for resistance to change 3 2.7.2 Strategies for motivating change 3 2.7.3 Planning for change 3 2.7.4 Managing change 3 3.9.7 Software development 3 3.10.4 Systems conversion: approaches, planing, implementation 3 3.10.6 Training: e.g., user, management, operation, systems, training materials

		hardware and software	
98	to show how to develop detailed program specifications, develop programs, set up system test parameters, install and test the new system, implement the conversion plan, employ configuration management	develop, test, install and operate a significant information system application program (LO-0193) develop, test, install and operate both client and server applications; ensure that all multi-user aspects of the application function as planned develop, test, install, and operate coupled application systems that have no pathological coupling mechanisms; describe and explain how other mechanisms might involve inappropriate coupling mechanisms, and illustrate consequences of such design errors; discuss and explain both off-line batch as well as on-line coupling mechanisms	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 1.2.4 Abstract data types 3 1.2.4.1 Purpose and implementation of abstract data types 3 1.2.4.3 Formal specifications, preconditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in... 3 1.2.5.1 Files (structure, access methods): file layouts; fundamental file concepts... 3 1.2.5.2 Files (structure, access methods): directories, contents and structure, naming... 3 1.6.1.3 Logical design (DBMS

			independent design): ER, object oriented 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.3 Normalization 3 1.6.4 Integrity (referential, data item, intra-relation): representing relationships... 3 1.6.5 Data definition languages 2 1.6.11 Data and database administration 2 1.6.12 Data dictionary, encyclopedia, repository 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.8 Consensus building 2 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code... 3 3.10.3 Software integration: e.g., packages 3 3.10.4 Systems conversion: approaches, planing, implementation 3 3.10.5 Systems integration and system testing: verification and validation, test plan... 3 3.10.7 Software project management: scoping, scheduling, configuration manage... 3 3.10.8 Systems installation

			2 3.10.9 Post implementation review 2 3.11.1 Service request and change control 2 3.11.3 Tuning and balancing 4 3.11.4 Systems and software maintenance concepts
99	to show how to develop a physical work-flow plan with a client	participate non-confrontationally in a team environment, and demonstrate empathetic listening skills to facilitate determination of alternate mechanisms for a horizontally integrated work group in improving its function through process redesign, including incorporation of information systems to ensure documentation and quality (LO-0216) design a workflow using graphical tools or image systems development software in the presence of a client convert the workflow to both an IDEF 0 and	3 2.3.5 Group decision process 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building 3 2.10.2 Interviewing, questioning and listening

		IDEF 3 type drawing; convert the IDEF3 drawing into an event driven model satisfactory for a graphical user interface	
117	to show how to present a system design, test plan, implementation plan, and evaluation, in written and oral form	present and explain solutions to a peer group for critique and improvement (LO-0028) apply oral and written communication skills to present proposed solutions and accomplishments (LO-0125)	3 2.10.1 Communication skills 3 2.10.2 Interviewing, questioning and listening 3 2.10.3 Presentation skills 4 2.10.5 Writing skills 3 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line...
127	to discuss performance evaluation consistent with quality management and continuous improvement	develop performance measures consistent with the concepts of valuing employees that facilitate team cooperation and discourage competitiveness among team members; discuss the reasons for such measures and explain the negative consequences of misunderstanding these issues (LO-0184)	3 2.2.3 Staffing and human resource management 3 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team...

IS'97.9 - Physical Design and Implementation with Programming Environments

2613

CATALOG Students who have completed the analysis and logical design course will extend their knowledge by implementing an information system using a programming language capable of calling functions in a DBMS. Teams will use project management to implement an information system. (Prerequisite: IS'97.7)

2616

SCOPE This course is designed to follow IS'97.7, Analysis and Logical Design, which addresses the early part of the system life cycle. This course addresses the latter part of the life cycle and is concerned with physical design, programming, testing and implementation of the system.

2619

TOPICS Selection of programming language environment which uses a database; software construction: structured, event driven and object oriented application design; testing; software quality assurance; system implementation; user training; system delivery; post implementation review; configuration management; maintenance; reverse engineering and re-engineering.

EXPLANATION AND EXPECTATIONS

2624

Students who have completed the information analysis and logical design course will continue participating in the coordinated four course project sequence begun in IS'97.7 by learning to develop information systems which are implemented using a third or fourth generation programming language capable of calling DBMS functions.

2628

If object-oriented programming has not been taught to the students earlier in the curriculum, then it should be used here. If only object-oriented methods have been used, some procedural facility should be employed.

2631

System representation (data flow) or object representation, modular design, use of control structures with proof of correctness, verification, testing and validation should be integral components of software quality assurance. Implementation standards should be developed by the students and used rigorously as project teams complete a significant system. A conversion and training plan should be developed and implemented involving both hardware, data, people, and software systems.

2636

Project management tools should be used to ensure timely completion of the project. Interdependence skills should be practiced and evaluated. Presentation of all life cycle events should be accomplished.

Students completing this course will have mastered the following learning units:

2639

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
100	to develop skill in analysis, design, and development of application software using a programming environment	design and implement information systems application software using a programming environment which utilizes database programming (Designs should include screen editors, data update mechanisms, audit and operations controls, and should contain appropriate printed reports.) (LO-0208) use productivity tools to develop conceptual data and functional models	4 1.2.1 Formal problems and problem solving 4 1.2.4 Abstract data types 4 1.6.2 Data models: relational, hierarchical, network, object, semantic object 4 1.6.5 Data definition languages 4 1.6.6 Application interface 4 1.6.6.2 DML, query, QBE, SQL, etc.: database query language; data definition... 4 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 4 2.3.1 Measurement and modeling 3 2.10.10 Fostering creativity and opportunity finding 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 4 3.3.2 Data modeling: e.g., entity-relationship diagrams, normalization 3 3.4.3 Software implementation concepts

			and tools: e.g., data dictionary, repository... 3 3.8.2 Relating the application to the enterprise model 4 3.9.7 Software development
101	to identify differences between a structured, event-driven, and object-oriented application design and explain the implications of these approaches to the design and development process	employ a programming environment to develop a simple event-driven application with a GUI interface (LO-0025)	2 1.3.6 Object oriented extensions to languages 2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 3 3.3.5 Behavior oriented (event modeling) methodologies 3 3.3.6 Object oriented methodologies 4 3.9.6 Human-computer interaction (e.g., ergonomics, graphical-user interfaces, voice...
103	to be able to develop program tests and system tests	construct effective queries using both structured and unstructured query tools (LO-0132) reverse engineer data flows from fourth GL applications to ensure verification (LO-0142)	3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.3.4 Non-procedural languages: logic, functional 3 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 3 1.6.7 Intelligent query processors and query organization

			3 3.8.3 Requirements determination and specification 3 3.9.7 Software development 3 3.10.2 Software systems construction: e.g., programming, unit testing, load module... 3 3.11.2 Reverse and re-engineering
104	to understand the different programming environments available for business application development	explain the characteristics, requirements and use of several programming environments including graphical and conventional environments; explain the concepts of software portability and the concepts of interoperability (LO-0207)	2 1.3.1 Fundamental programming language structures; comparison of languages and... 4 1.3.5 Fourth-generation languages 4 1.3.6 Object oriented extensions to languages 3 1.3.7 Programming languages, design, implementation and comparison
112	to develop a functional understanding of proactive principled behavior and time management	describe and explain character habits of proactive leadership and time management (LO-0042)	4 2.3.5 Group decision process 2 2.10.6 Proactive attitude and approach 2 2.10.8 Principle centered leadership 2 3.7.7 Management concerns; stress and time management

113	to ensure attitudes necessary to successful team behavior including empathetic listening, consensus negotiation, conflict resolution, and synergistic solution finding, and to apply the concept of commitment and rigorous completion	use and apply team work, empowerment methods, apply meetings concepts and methods, use group techniques, use empathetic listening skills, employ synergistic solution development (LO-0121) ensure that empathetic listening is practiced; ensure that individuals listen, commit and rigorously complete assignments; explain the relevance of such action in ensuring team effectiveness (LO-0156)	3 2.3.5 Group decision process 4 2.4.3 Group dynamics 3 2.4.4 Teamwork, leadership and empowerment 4 2.4.8 Consensus building 4 2.10.2 Interviewing, questioning and listening
114	to ensure goal setting and alignment of team activities with project obligations	discuss and explain the concepts of shared vision and mission directed activity in information system development (LO-0017) discuss and apply mission directed work by aligning team mission to project mission by tracking to ensure the results (LO-	3 2.2.1 IS planning 4 2.3.5 Group decision process 4 2.10.2 Interviewing, questioning and listening 4 2.10.8 Principle centered leadership 4 3.9.4 Techniques to enhance the creative design process 4 3.10.7 Software project management: scoping, scheduling, configuration manage...

		0155)	
115	to describe interactions with higher levels of management in selling project objectives and performing project management tasks	explain and prove the relationship of IS activities to enhancing competitive position (LO-0160) explain functions of IS management, CIO, project manager ... (LO-0164)	2 2.2.7 CIO and staff functions 3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 3 2.2.15 Management of sub-functions 3 2.3.2 Decisions under certainty, uncertainty, risk 3 2.3.3 Cost/Value of information, competitive value of IS 2 3.5.2 Planning the IS architecture 2 3.5.3 Planning for operations 3 3.6.1 Feasibility assessment 2 3.6.3 Contingency planning 3 3.10.9 Post implementation review
116	to describe and explain life cycle concepts, and apply them to the course project	explain and apply various life cycle concepts in engaging in and completing a project of a considerable size and scope, involving teams; tell how to ensure accepting and incorporating standards compatible with successful life cycles (LO-0185) explain the different responsibilities of	2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 3 2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing 3 2.2.3 Staffing and human resource management 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 2 2.2.8 IS as a service function: performance evaluation -- external/internal, market... 2 2.2.9 Financial administration of IS: e.g., funding and chargeout

		IS, CS and SE as they pertain to software and systems development activities; apply lessons learned to the course project (LO-0236) explain how formal software engineering techniques can contribute to the success of software and system development efforts; apply these techniques to the course project (quality assurance, verification and validation, correctness and reliability, testing, etc.) (LO-0237)	2 2.2.12 IS policy and operating procedures formulation and communication 3 2.2.13 Backup, disaster planning and recovery 3 2.3.1 Measurement and modeling 4 2.4.4 Teamwork, leadership and empowerment 4 2.4.8 Consensus building 4 3.1.3 Properties of open systems 4 3.1.4 System components and relationships 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 4 3.2.1 Systems development models: e.g., SDLC, prototyping 2 3.2.1.1 Systems development life cycle: software life-cycle models (iterative... 3 3.2.2 Package acquisition and implementation 4 3.2.5 Selecting a systems development approach 3 3.3.7 Software engineering process and products 3 3.7.1 Project planning and selection of appropriate process model; project scheduling... 3 3.7.2 Project organization management, principles, concept and issues

			3 3.7.6 Managing multiple projects 3 3.7.7 Management concerns; stress and time management 3 3.7.12 Configuration management 3 3.8.1 Problem opportunity identification: e.g., service requests, from planing process 4 3.9.7 Software development 4 3.10.2 Software systems construction: e.g., programming, unit testing, load module... 4 3.10.3 Software integration: e.g., packages 4 3.10.4 Systems conversion: approaches, planing, implementation 4 3.10.5 Systems integration and system testing: verification and validation, test plan... 4 3.10.8 Systems installation 4 3.11.4 Systems and software maintenance concepts
118	to discuss and apply the concept of life-long learning	discuss and apply the concept of learning to learn continuously (LO-0158)	4 2.2.3.4 Education and training

120	to present and explain the evolving leadership role of information management in organizations	describe and explain the composition of personnel needed to make up the team for a given project and use personnel management strategies (LO-0153) explain to a non-IS knowledge worker what they have to do to manage their information resources and requirements (LO-0178)	2 2.2.3 Staffing and human resource management 3 2.4.3 Group dynamics 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.5 Use of influence, power and politics 2 2.8.3 Privacy law 2 2.8.4 Agencies and regulatory bodies 3 2.10.3 Presentation skills 3 2.10.8 Principle centered leadership 3 3.4.1.2 Tools: CASE tools, code generators, CDSS 3 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team... 3 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line...

IS'97.10 - Project Management and Practice

2654

CATALOG Advanced IS majors operating as a high-performance team will engage in and complete the design and implementation of a significant information system. Project management, management of the IS function and systems integration will be components of the project experience. (Prerequisites: IS'97.8 and IS'97.9)

2658

SCOPE This course covers the factors necessary for successful management of system development or enhancement projects. Both technical and behavioral aspects of project management are discussed.

2660

TOPICS Managing the system life cycle: requirements determination, logical design, physical design, testing, implementation; system and database integration issues; metrics for project management and system performance evaluation; managing expectations: superiors, users, team members and others related to the project; determining skill requirements and staffing the project; cost-effectiveness analysis; reporting and presentation techniques; effective management of both behavioral and technical aspects of the project.

EXPLANATION AND EXPECTATIONS

2666

This is the capstone course for IS majors who have completed the systems analysis and design sequences. It focuses on engaging in and completing a major system development project, thereby completing the coordinated four course project sequence begun in IS'97.7.

2669

Within the project context management of IS, systems integration is an explicit requirement for students to address.

2671

The project is a team effort and allows a final opportunity to practice personal and interdependence skills to ensure team member empowerment and success. Project management tools will be employed by the team to ensure tracking of the project and communication of project goals and accomplishments to the client.

2675

CASE may or may not be used depending on resources. However, project standards will be developed for all life cycle and other actions. Software quality assurance methodologies will be employed to ensure a successful outcome for the project.

2678

On-going presentation of project planning, analysis, design, conversion plan, and other documentation will be done by the team. Each team member should play a significant role in some aspect of presentation.

Students completing this course will have mastered the following learning units:

2681

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
105	to ensure skills needed to design a project development and implementation plan	explain steering and other committee functions, and the rationale for horizontal teams in organizational development and re-engineering of IS (LO-0054)	3 2.10.10 Creative problem solving and opportunity finding 2 3.7.3 Work breakdown structures and scheduling
106	to further develop and practice essential project management skills	apply meeting design concepts to organizing and conducting effective team and client meetings which ensure shared vision, creativity and empowered actions (LO-0116)	3 2.2.3.6 Ensuring positive climate for creativity 3 2.3.5 Group decision process 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.8 Consensus building 3 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code...

107	to develop skill in use of project management tools and methods within the context of an information systems project	use and apply project management tools, techniques and software in definition, implementation and modification of project goals; produce timely management, individual, team and customer information progress reports to ensure quality software development, physical workflow system implementation, computer systems installation (LO-0150)	3 2.10.4 Consulting skills 4 2.10.7 Personal goal setting, decision making, and time management 4 3.7.1 Project planning and selection of appropriate process model; project... 4 3.7.5 Project control: planning, cost estimation, resource allocation, software tech... 4 3.7.14 Project tracking: e.g., PERT, Gantt
108	to select the proper project management tools and demonstrate their use	use project management concepts and tracking tools (PERT, GANTT) (LO-0104) use project management techniques e.g. tracking, PERT, GANTT (LO-0120) use CASE and other tools (LO-0123)	3 3.4.1 CASE 3 3.7.5 Project control: planning, cost estimation, resource allocation, software tech... 3 3.7.14 Project tracking: e.g., PERT, Gantt

109	to initiate, design, implement and discuss project close down	discuss and explain the concepts of terminating a project; explain and list the requirements for project close down (LO-0186)	3 3.7.15 Project close-down
110	to determine and analyze a significant problem using the systems approach to problem solving	develop and use detailed specifications to state and solve an information systems application problem including physical flows, database design, system functions, program requirements and design, as well as database and software implementation (LO-0195) design and implement a systems integration plan for an enterprise level system involving LAN and WAN techniques; implement systems connections, install and configure systems, and install, test and operate designed solutions	4 1.2.1 Formal problems and problem solving 4 1.2.4 Abstract data types 4 1.6.2 Data models: relational, hierarchical, network, object, semantic object 4 1.6.4 Integrity (referential, data item, intra-relation): representing relationships... 3 1.6.11 Data and database administration 4 3.2.3 Integrating software components 3 3.5.1 Infrastructure planning: hardware, communications, database, site 3 3.5.2 Planning the IS architecture 4 3.10.1 Systems construction

		integrate end user solutions and approaches into the enterprise model; develop and implement conversion and training plans develop and evolve written standards for all life cycle project activities; present and defend solutions; conform time management and accountability to the developed standards	
111	to develop requirements and specifications for a database requiring multi-user information system	identify physical flows and horizontal integration of organizational processes, and relate these flows to the relevant databases which describe the flows develop event driven functional models for the involved organizational process identify and specify the processes which	2 1.6.1 DBMS: features, functions, architecture 2 1.6.2 Data models: relational, hierarchical, network, object, semantic object 1 1.6.3 Normalization 2 1.6.5 Data definition languages 2 1.6.12 Data dictionary, encyclopedia, repository 3 3.3.2 Data modeling: e.g., entity-relationship diagrams, normalization 2 3.8.3 Requirements determination and specification

		solve the organizational problem and define the related database application (LO-0189)	
121	to present and explain the evolving leadership role of information management in organizations	explain setting an ethical standard (LO-0171) explain the relevance and use of a professional code of ethics explain and demonstrate successful application of ethical argument in identifying and evaluating alternatives based on social contextual analysis in client centered information systems development environment explain the alignment of IS with organizational mission; explain the relationship of departmental processes with the strategic success of the organization	3 2.2.1 IS Planning 3 2.2.5 Determining goals and objectives of the IS organization 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 2 2.2.8 IS as a service function: performance evaluation--external/internal, market... 2 2.2.9 Financial administration of IS: e.g., funding and chargeout 4 2.2.3.6 Ensuring positive climate for creativity 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.5 Use of influence, power and politics 3 2.4.6 Cognitive styles 3 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building 3 2.8.6 Ethics: plagiarism, honesty, codes of ethics 3 2.10.6 Proactive attitude and approach 3 2.10.7 Personal goal setting, decision

		explain budget planning and administration (LO-0172) explain and illustrate the application of ethical models, e.g. principle centered leadership, in project management standards and practice	making, and time management
122	to examine the process for development of information systems policies, procedures and standards in the organization	explain the relevance of IS management aligning itself with business process (LO-0159) explain and develop standards and policies which are involved in the development of information systems of organizational scope (LO-0190) explain the benefits of cross-functional teams in policy and procedure development explain the	3 2.2.1 IS planning 3 2.2.5 Determining goals and objectives of the IS organization 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 2 2.2.8 IS as a service function: performance evaluation -- external/internal, market... 2 2.2.9 Financial administration of IS: e.g., funding and chargeout 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.5 Use of influence, power and politics 3 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building 3 2.8.6 Ethics: plagiarism, honesty, codes

		benefits of team mission statement development, and of aligning team missions with organizational missions	of ethics 3 2.10.6 Proactive attitude and approach 3 2.10.7 Personal goal setting, decision making, and time management 3 3.3.3 Data oriented methodologies 3 3.10.7 Software project management: scoping, scheduling, configuration manage...
125	to discuss outsourcing and alternate implementations of the IS function	explain outsourcing as an alternative to an internal IS function (LO - 0231) define, explain, and compare from a cost-benefit perspective various outsourcing arrangements (LO-0232) manage the IS function in a small organization (LO-0233) explain outsourcing (LO-0234)	2 2.1.6 Organizational structure: centralized, decentralized, matrix 2 2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing 2 2.2.4 IS functional structures -- internal vs outsourcing 2 2.2.5 Determining goals and objectives of the IS organization 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 2 2.2.8 IS as a service function: performance evaluation -- external/internal, market... 2 2.2.9 Financial administration of IS: e.g., funding and charge out 2 2.2.12 IS policy and operating procedures formulation and communication 2 2.2.15.8 Management consulting relationships, outsourcing 2 2.3.3 Cost/Value of information, competitive value of IS

			1 2.8.7 Risks, losses and liability in computing applications 2 3.6.2 Risk management principles
126	to discuss management of time and interpersonal relations	explain four generations of time management concepts, and personal and interpersonal reasons for the success of each stage; use the mechanisms within a project environment (LO-0235)	4 3.7.7 Management concerns; stress and time management

IS'97 Learning Units

2696

Learning Unit 1: Fundamentals of CIS - IS Literacy - Systems and IT Concepts (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce systems and information technology definitions and concepts to novice users	describe and explain in systems terms the hardware and software components of a computer system (LO-0001) describe, explain and use an operating system and user interface to install and operate programs, define and protect data files, and perform operating system utility functions (LO-0002) define, explain and use the concepts of knowledge work software (LO-0003)	1 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 1 1.1.4 Computer system components: busses, controllers, storage systems, peripheral... 1 1.2.1.4 Software design process; from specification to implementation 1 1.2.3 Complex data structures: e.g. of data, text, voice, image, video, hyper media 1 1.4.1 Architecture, goals and structure of an operating system..Interaction of operating system and hardware architecture 1 1.6.1 DBMS: features, functions, architecture 1 1.6.6.2 DML, query, QBE, SQL, etc.: database query language; data definition... 1 1.6.9 DBMS products: recent developments in database systems (e.g., hypertext... 1 1.6.11.3 Ownership of data and application systems

		1 1.6.13 Information retrieval: e.g., image processing, hyper media 1 2.2.11 End user computing support, role and functions 2 2.2.16 Security and control, viruses and systems integrity 2 2.3.3 Cost/Value of information, competitive value of IS 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 3 3.1.4 System components and relationships 1 3.1.5 Systems control: standards control theory, feedback, loops, measurement...

2702

Learning Unit 2: Fundamentals of CIS - End-User Computing - Knowledge Work Software (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop skill to effectively use standard knowledge work software packages (operating system and user interface, word processing, spreadsheet, database, statistics and data management, presentation graphics, and communications)	design, develop and use a simple database; import a spread sheet into the database; export a database table (or spread-sheet) to a word processing package for use in a report (LO-0022)	2 1.6.1 DBMS: features, functions, architecture 2 1.6.5 Data definition languages 2 1.6.7 Intelligent query processors and query organization 2 2.2.11 End user computing support, role and functions

	implement a "slide show" presentation in a presentation graphics package to communicate a problem and its solution, and a hand-out for an attending audience (LO-0026)	2 3.2.1 Systems development models: e.g., SDLC, prototyping 2 3.2.2 Package acquisition and implementation 3 3.2.3 Integrating software components 3 3.7.8 Systems documentation 3 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line... 2 3.9.1 Design: logical, physical 2 3.9.3 Design objectives: e.g., usability, performance 3 3.10.1 Systems construction 2 3.10.5 Systems integration and system testing: verification and validation, test plan... 2 3.10.6 Training: e.g., user, management, operation, systems, training materials

2712

Learning Unit 3: Fundamentals of CIS - End-User Computing - Problem Solving, Small IS (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to introduce the concepts of problem solving within the context of information systems of limited complexity using standard knowledge work software packages	describe, explain and use a systems approach definition and implementation of PC based solutions using knowledge work software (word processing, spreadsheet, database, statistics and data management, presentation graphics, and communications) to improve personal productivity and increase knowledge work capabilities (LO-0004) identify, state, and implement solutions involving knowledge work software to simple organizational and personal tasks (LO-0005) select and configure appropriate macros, tools and packages for implementation of personal systems (LO-0020)	1 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors... 1 1.2.1 Formal problems and problem solving 1 1.2.1.4 Software design process; from specification to implementation 1 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 1 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 1 1.2.3 Complex data structures: e.g.., of data, text, voice, image, video, hyper media 1 1.2.6 Sorting and searching data structures and algorithms 1 2.2.5 Determining goals and objectives of the IS organization 1 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 2 2.2.11 End user computing support, role and functions 1 2.2.16 Security and control, viruses and systems integrity 1 2.10.6 Proactive attitude and approach 1 2.10.7 Personal goal setting, decision making, and time

		management 1 2.10.8 Principle centered leadership 2 3.1.1 General systems theory 1 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 3 3.2.4 User developed systems 1 3.5.2 Planning the IS architecture 1 3.7.1 Project planning and selection of appropriate process model; project scheduling... 2 3.8.3 Requirements determination and specification 1 3.9.4 Techniques to enhance the creative design process 3 3.10.2 Software systems construction: e.g., programming, unit testing, load module... 1 3.10.7 Software project management: scoping, scheduling, configuration manage... 2 3.12.6 Office systems

2718

Learning Unit 4: Fundamentals of CIS - IS Literacy - IT and Society (Level 1)

Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce the relevance and application of information technology in society	describe and explain the relevance and impact of information technology on society (LO-0006) explain the role of information systems within a company versus a global environment (LO-0039)	1 1.5.1 International telecommunication standards, models, trends 1 1.5.2 Data transmission: media, signaling techniques, transmission impairments... 1 1.5.4 Local area networks 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 1 1.5.6 Network architectures and protocols 2 1.5.7 Internetworking 1 1.6.1 DBMS: features, functions, architecture 1 1.6.9 DBMS products: recent developments in database systems 1 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 1 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 2 2.4.2 Cultural diversity 1 2.9.7 Historical and social context of computing

		1 3.1.3 Properties of open systems 1 3.1.6 Properties of information systems 1 3.12.1 Transaction processing systems 1 3.12.2 Management information systems 1 3.12.3 Group support systems 1 3.12.8 Work-flow systems 2 3.12.9 Functional support systems: e.g., process control , marketing 1 3.12.10 Interorganizational systems

2722

Learning Unit 5: IS Theory - Systems/Quality - Systems and Quality (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce systems and quality concepts	explain systems theory and quality concepts (LO-0008)	2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 2 3.1.1 General systems theory 1 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 2 3.1.3 Properties of open systems 2 3.1.4 System components and

		relationships 2 3.1.5 Systems control: standards, control theory, feedback, loops, measurement...

2725

Learning Unit 6: IS Theory - Systems/Quality - Information and Quality (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to provide an introduction to the organizational uses of information to improve overall quality	explain methodologies to facilitate measurements to achievement of ISO 9000, Baldridge, National Performance Review and other quality standards (LO-0046)	1 2.3.1 Measurement and modeling 1 2.3.2 Decisions under certainty, uncertainty, risk 3 2.3.3 Cost/Value of information, competitive value of IS

2730

Learning Unit 7: Information Technology - Computer Hardware - IT Hardware and Software (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present hardware, software and related information technology concepts	explain the elements and functional relationships of major hardware, software, and communications elements of information systems consisting of single PCS, LANs and/or WANs (LO-0014)	1 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 2 1.1.4 Computer system components: busses, controllers, storage systems, peripheral... 2 1.4.1 Architecture, goals and structure of an operating system; structuring methods... 2 1.4.2 Interaction of operating system and hardware architecture 2 1.5.1 International telecommunication standards, models, trends 2 3.1.6 Properties of information systems

2734

Learning Unit 8: Systems Development - Systems Analysis and Design - IT Systems Specification (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to provide concepts and skills for the specification and design or the re-engineering of organizationally related systems of limited scope using information technology	explain the concepts of implementing IS coupled to re-engineering and continuous improvement (LO-0058)	2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 2 2.4.4 Teamwork, leadership and empowerment 2 2.4.8 Consensus building 2 2.10.2 Interviewing,

		questioning and listening 2 2.10.10 Fostering creativity and opportunity finding 2 3.1.4 System components and relationships 2 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 2 3.2.1 Systems development models: e.g., SDLC, prototyping 2 3.3.1 Organizational and software process modeling 2 3.3.4 Process oriented methodologies 2 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code... 2 3.8.1 Problem opportunity identification: e.g., service requests, from planning process 2 3.8.3 Requirements determination and specification 2 3.9.4 Techniques to enhance the creative design process 2 3.12.8 Work-flow systems

2740

Learning Unit 9: IS Theory - IT and Organizational Systems - IT and Attaining Objectives (Level 2)

Presentation Goals	Learning Unit Objectives	Body of Knowledge
to show how information technology can be used to design, facilitate and communicate organizational goals and objectives	explain the relevance of IS management aligning itself with strategic organizational processes (LO-0047)	2 2.2.1 IS planning 3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering...

2746

Learning Unit 10: IS Theory - Decision Making - Characteristics of an IS Professional (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to explain the concepts of individual decision making, goal setting, trustworthiness and empowerment	discuss and explain the concepts of goal setting and individual decision making and achievement; explain the requirement of goal setting and personal decision making in empowerment in a work setting (LO-0197)	1 2.10.6 Proactive attitude and approach 1 2.10.7 Personal goal setting, decision making, and time management 1 2.10.8 Principle centered leadership

2752

Learning Unit 11: IS Deployment and Management - Management of IS Function - IS Careers (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to show career paths in Information Systems	identify and explain telecommunications careers and career paths (LO-0077)	2 2.9.2 Certification issues 2 2.9.3 Professional organizations: e.g., DPMA, ACM, TIMS, ASM, DSI, ACE, IEEE... 2 2.9.4 Professional conferences 2 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team...

2756

Learning Unit 12: Fundamentals of CIS - IS Literacy - Ethics and the IS Professional (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present and discuss the professional and ethical responsibilities of the IS practitioner	use professional code of ethics to evaluate specific IS actions (LO-0117) describe ethical and legal issues; discuss and explain ethical considerations of software usage, sales, distribution, operation and maintenance (LO-0157)	2 2.8.1 Software sales, licensing and agency 2 2.8.2 Contract fundamentals 3 2.8.5 Protection of intellectual property rights 3 2.8.6 Ethics: plagiarism, honesty, codes of ethics 3 2.8.7 Risks, losses and liability in computing applications 1 2.8.8 Warranties 3 2.9.3 Professional organizations: e.g., DPMA, ACM, TIMS, ASM, DSI, ACE, IEEE... 2 2.10.4 Consulting Skills 3 2.10.7 Personal goal setting,

		decision making, and time management 2 2.10.10 Fostering creativity and opportunity finding 2 3.7.5 Project control: planning, cost estimation, resource allocation, software tech... 3 3.7.7 Management concerns; stress and time management

2760

Learning Unit 13: Fundamentals of CIS - End-User Computing - IS Personal Level Systems (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to identify, investigate, analyze, design, develop with either with packages (and/or high level languages) and use personal level information systems to enhance individual productivity	analyze, design, develop and use packages (e.g. a statistics and or high level data management package) and/or high level database requiring languages to implement workable solutions which solve an information systems problem associated with knowledge work activities (LO-0023) assess the increased productivity realized by implementation of personal systems (LO-0027)	1.2.1 Formal problems and problem solving 2 2.2.11 End user computing support, role and functions 3 3.2.3 Integrating software components 3 3.2.4 User developed systems 2 3.6.1 Feasibility assessment 3 3.9.3 Design objectives: e.g., usability, performance

2766

Learning Unit 13.1: Fundamentals of CIS - End-User Computing - Work and Activity Concepts (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to describe the concept of knowledge work and the need for personal information technology to support it	define and explain the concept of knowledge work compare and contrast data, information and knowledge describe knowledge work activity; identify and explain methods for achieving productivity in knowledge work	1 1.2.2 Basic data structures 1 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering, IS and quality, IS global impact and international considerations 2 2.2.1 Knowledge work, end user computing: support, role, productivity, activities 1 2.3.3.3 Empowerment/job ownership 1 2.2.3.4 Education and training 1 3.1.1 General systems theory 1 3.1.4 System components and relationships 1 3.1.6 Properties of information systems

2771

Learning Unit 13.2: Fundamentals of CIS - End-User Computing - Support: Individuals vs Groups (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to relate individual vs organizational information system requirements	compare and contrast application planning, development, and risk management for personal vs organizational information systems explain potential problems of user developed systems	1 2.1.7 Organizational issues pertaining to use of software systems in organizations 1 2.2.1 IS planning 2 2.1.1 Alignment of IS planning with enterprise planning 1 2.8.7 Risks, losses and liability in computing applications 1 2.10.10 Fostering creativity and opportunity finding 1 3.2.1.3 Developing with packages 2 3.2.4 End User developed systems 1 3.6.2 Risk management principles

2775

Learning Unit 13.3: Systems Development - Sys Analysis/Design - Info Analysiss: Individual vs Group (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce concepts of individual vs collaborative knowledge work and relate them to information needs analysis and technology	describe and explain individual vs group technology; explain the additional processing and other issues and needs necessitated by working in a group describe and explain group support technology for	1 2.1.3 Organizational span: single user, work group, team, enterprise, global 1 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 1 2.8.5 Ethics and Protection of intellectual property rights 2 8.5.1 Protection of intellectual

	common knowledge requirements describe and explain the process of information analysis and application of information technology solutions	property 2 8.5.2 Forms of intellectual property, means for protecting it, and penalties for violating it 2 8.5.3 Ethics (plagiarism, honesty, privacy, hackers): uses, misuses, and limits of computer technology 1 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code reviews 2 3.7.1 Project planning and selection of appropriate process model; project scheduling and milestones 1 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line documentation) 1 3.8.1 Problem opportunity identification: e.g., service requests, from planning process 1 3.12.3 Group support systems 1 3.12.6 Office systems 1 3.12.7 Collaborative systems

2780

Learning Unit 13.4: Systems Development - Sys Analysis/Design - Info Analysis: Finding IS/IT Requirements (Level 2)

Presentation Goals	Learning Unit Objectives	Body of Knowledge
to describe and explain the goals and process of analysis, and documentation of knowledge work, information technology, and information requirements for individuals and work groups	describe and explain characteristics and attributes of knowledge work for individuals and groups discuss and explain knowledge building and maintaining tasks use questions to elicit systematically and identify data requirements from individuals and groups analyze individual and group tasks to determine information requirements identify related information technology requirements	1 2.4.3 Group dynamics 1 2.4.4 Teamwork, leadership and empowerment 1 2.4.8 Consensus building 1 2.10.2 Interviewing, questioning and listening 1 3.8.1 Problem opportunity identification: e.g., service requests, from planning process 1 3.8.2 Relating the application to the enterprise model 1 3.8.3 Requirements determination and specification

2786

Learning Unit13.5: Fundamentals of CIS - End-User Computing - Organizing Personal Data Resources (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to define concepts, principles and practical approaches to management of individual software and data	given knowledge work tasks and activities, design and implement an approach to directory organization and file naming that will support retention and access to data list principles that apply to software acquisition and upgrades describe approaches for transferring data among applications including OLE, importing/exporting, conversion, and alternate methods	1 1.6.11 Data and database administration 1 2.2.13 Backup, disaster planning and recovery 1 2.2.15.4 Data administration 1 2.2.15.5 Ownership of data and application systems 1 3.10.4 Systems conversion: approaches, planning, implementation

2791

Learning Unit 13.6: Systems Development - Database - Databsse Terminology and Concepts (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to explain organizational database concepts, components, structures, access, security and management considerations	describe and explain the terminology and use of relational databases describe and explain concepts necessary to access organizational databases use a database access facility to query data from an organizational	2 1.6.1 DBMS: features, functions, architecture 1 1.6.2 Data models: relational, hierarchical, network, object, semantic object 1 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 1 1.6.6.3 Application and user interfaces (DML, query, QBE,

	repository	SQL)

2796

Learning Unit 13.7: Fundamentals of CIS - End-User Computing - Accessing/Retrieving/Storing Data (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to define the content, availability and strategies to access information external to the organization	define and discuss external information resources; identify source, content, cost and timeliness locate and access external information resources using available internet tools: browsers, search, ftp create and maintain an individual directory of external information resources	1 1.5.1 International telecommunication standards, models, trends 1 1.5.4 Local area networks 1 5.4.1 Topologies, medium access control, multiplexing 1 5.4.2 Local area networks and WANs: topology, gateways, uses (functions and office automation), PBXs 1 5.4.4 Architecture of distributed systems 1 5.4.5 Hardware aspects of distributed systems 1 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 1 1.6.8 Distributed databases 2 1.6.11 Data and database administration 3 1.6.13 Information retrieval: e.g. internet tools, image processing, hypermedia

2800

Learning Unit 13.8: Systems Development - Software Development - IS Life Cycle: Developing With Packages (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present and explain the life cycle of development of an information system including the concepts of software acquisition vs development	discuss the concept an information systems life cycle identify and explain criteria to decide between acquisition of software packages vs custom development of software	1 2.2.1 IS planning 2 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 2 3.1.4 System components and relationships 2 3.2.1 Systems development models: e.g., SDLC, prototyping 2 3.2.2 Package acquisition and implementation

2806

Learning Unit 13.9: Fundamentals of CIS - End-User Computing - Configure And Customize A Package (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce and explore the use of general purpose and application software	install and customize a general purpose software package to provide specific functionality beyond the default settings add capability to a software system by recording and storing a macro in the library of the given software package	3 3.2.2 Package acquisition and implementation 2 3.4.3 Software implementation concepts and tools: e.g., data dictionary, repository, application generator, reuse, program generators, software implementation languages

	access technical information provided in the form of software "help" facilities; observe and use a "help" facility	

2810

Learning Unit 13.10: Information Technology - Programming - Procedural/Event Driven Programming (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce and explore software development approaches, then explain the goals and strategies of procedural, event driven, and object oriented programming paradigms	discuss and explain the concepts of data and procedural representation, programming languages, compilers and interpreters, development environments, and event-driven graphical user interfaces compare, relate, and explain concepts of structured, event-driven, and object oriented approaches to program design and with examples of each approach	1 1.2.1 Formal problems and problem solving 1 1.2.2 Basic data structures 1 1.2.5 File structures: sequential, direct access, hashing, indexed 1 1.3.1 Fundamental programming language structures; comparison of languages and applications 1 1.3.3 Procedural languages 1 1.3.4 Non-procedural languages: logic, functional, event driven 1 1.3.5 Fourth-generation languages 1 1.6.6 Application interface

2816

Learning Unit 13.11: Information Technology - Algorithmic Design - Implementing Simple Algorithms (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce and develop the process of algorithm and structured code development	state a simple problem identifying desired outputs for given inputs; give an overview of the problem describe fundamental data types and their operation design program logic using both graphical and pseudocode techniques which utilize standard control structure: sequence, iteration and selection. translate data structures and program design into code in a programming language; verify the translation, and ensure the correctness of the result; test the code with sample data sets	2 1.2.1 Formal problems and problem solving 2 1.2.2 Basic data structures: lists, arrays, strings, records 2 1.3.3 Procedural languages 1 3.3.1 Procedural programming advantages and disadvantages 1 3.3.2 Basic type declarations; arithmetic operators and assignment; conditional statements; loops and recursion

2820

Learning Unit 13.12: Systems Development - Database - Implementing A Simple Database Design (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce the purpose and develop ability to use a relational database software package	describe and explain tables, relations, referential integrity, and the concepts of normal forms from a workflow drawing or other requirements documents, derive a simple multi-table database design using a relational database software package, implement and populate the tables; develop several simple queries to look at the data	2 1.6.1 DBMS: features, functions, architecture 1 6.1.1 DBMS (features, functions, architecture); components of database system (data, dictionary, application programs, users, administration) 1 6.1.3 Logical design (DBMS independent design): ER, object oriented 2 1.6.2 Data models: relational, hierarchical, network, object, semantic object 1 6.2.1 Relational data model terminology; mapping conceptual schema to a relational schema 1 6.2.2 Conceptual modeling (e.g., entity-relationship, object-oriented) 2 1.6.4 Integrity (referential, data item, intra-relation): representing relationships; entity and referential integrity 2 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 1 2.1.1 Hierarchical and flow models of organizations

2824

Learning Unit 13.13: Systems Development - Software Development - Implementing And Event Driven Applications (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce and develop ability to design and implement a graphical user interface facility	apply a GUI event-driven solution in a development environment build a simple application form with several objects (e.g. label, field edit box, list box, radio button, command button)	2 1.6.6 Application interface 1 6.6.2 DML, query, QBE, SQL, etc.: database query language; data definition, query form, update sub-language, expressing constraints, referential integrity, embedding in a procedural language 1 6.6.3 Application and user interfaces (DML, query, QBE, SQL) 1 6.6.4 Event driven screen objects (buttons, list boxes, etc.)

2829

Learning Unit 13.14:		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present the prototype process, and to introduce and apply the concepts of evaluation and evolutionary refinement to	compare capabilities of an application with the requirements it is intended to meet identify alternative outcomes of the process of application verification	2 3.2.1 Systems development models: e.g., SDLC, prototyping 3 2.1.1 Systems development life cycle: software life-cycle models (iterative enhancement, phased development, spiral, waterfall) 3 2.1.2 Developing with prototyping 1 3.10.5 Systems integration and

personal application prototypes	evaluate and define the results and probabilities of errors in prototyped application software modify inputs, outputs and processing to refine a prototype	system testing: verification and validation, test plan generation, testing (acceptance testing, unit testing, integration testing, regression testing)

2837

Learning Unit 13.15:		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present foundation technologies and define importance in future information technology capabilities	list and explain technologies and their relevance to individual information technology given a technology, explain its importance to future developments and to future knowledge worker productivity identify drivers and inhibitors of change in information technology	1 2.2.14 Management of emerging technologies 1 2.2.5 Determining goals and objectives of the IS organization

2842

Learning Unit 13.16: Fundamentals of CIS - End-User Computing - Implementing A Personal Application (Level 3)

Presentation Goals	Learning Unit Objectives	Body of Knowledge
to identify, investigate, analyze, design, and develop with packages (and/or high level languages) a single personal level information system applications to enhance individual productivity	analyze, design, develop and use packages and/or high level database languages to implement workable solutions that solve an information systems problem associated with knowledge work activities assess the increased productivity realized by implementation of personal systems	3 1.2.1 Formal problems and problem solving 2 2.2.11 End user computing support, role and functions 3 3.2.3 Integrating software components 3 3.2.4 User developed systems 2 3.6.1 Feasibility assessment 3 3.9.3 Design objectives: e.g., usability, performance

2849

Learning Unit 14: Systems Development - Systems Analysis/Design - Problem Solving, with Packages (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present and apply strategies, approaches and methods for using software packages as well as high level languages for development of solutions to "end user" implementable formal problems which are in alignment with organizational information systems	explain and use concepts of formal problems and software engineering as applied developing effective solutions which enhance personal productivity involving knowledge work activities, wherein solutions are compatible with the organizational information system (LO-0019)	2 1.2.1 Formal problems and problem solving 2 1.2.1.4 The software design process; from specification to implementation 2 1.2.1.5 Problem recognition statement, and algorithmic determination; procedural... 2 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 2 1.2.6 Sorting and searching

	develop, document, and maintain small systems for personal productivity using high level database utilizing application development tools or environments (LO-0021) use the concepts of stating and solving formal analytic problems in utilization of software packages; ensure that such solutions address the "real" information systems involved (LO-0188)	data structures and algorithms 2 2.2.5 Determining goals and objectives of the IS organization 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 3 2.2.11 End user computing support, role and functions 2 2.2.16 Security and control, viruses and systems integrity 2 2.3.3 Cost/Value of information, competitive value of IS 2 2.10.6 Proactive attitude and approach 2 2.10.7 Personal goal setting, decision making, and time management 1 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 2 3.1.4 System components and relationships 2 3.2.4 User developed systems 2 3.5.2 Planning the IS architecture 2 3.7.1 Project planning and selection of appropriate process model; project scheduling... 2 3.7.5 Project control: planning, cost estimation, resource allocation, software tech...

		3 3.8.3 Requirements determination and specification 3 3.9.4 Techniques to enhance the creative design process 3 3.10.1 Systems construction 2 3.10.3 Software integration: e.g., packages 1 3.10.7 Software project management: scoping, scheduling, configuration manage... 2 3.12.8 Work-flow systems

2857

Learning Unit 15: IS Deployment/Management - Info Resource Management - Information Use Strategies (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present and apply strategies for accessing and using information resources	explain data administration and access to corporate and alternate information resources (LO-0170) intelligently discuss the differences between managing IS&T, IRM, Systems Development, Systems Maintenance, Systems Operations (LO-0176)	2 1.5.5 Wide Area Networks ... 2 1.5.9 Network security ... 2 1.5.12 Telecommunications applications ... 2 1.6.11 Data and database administration 3 2.2.7 CIO and staff functions 2 2.2.15.1 Telecommunications management 2 2.2.15.4 Data administration

		2 2.2.15.5 Ownership of data and application systems 2 2.8.3 Privacy law

2861

Learning Unit 16: IS Theory - Systems/Quality - IS Theory (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce, discuss and describe fundamental concepts of IS theory and it's importance to practitioners	identify and explain underlying concepts of IS discipline (LO-0029)	2 2.9.7 Historical and social context of computing 2 3.1.6 Properties of information systems

2866

Learning Unit 17: IS Theory - IT and Organizational Systems - IS as a Strategic Component (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to show how an information system is a strategic and integral component of an organization	describe the historic development of the information systems discipline (LO-0007) explain the strategic role of information systems in organizations (LO-0011) explain strategic relationship of IS activities to enhancing competitive position (LO-0033)	2 2.1.1 Hierarchical and flow models of organizations 2 2.1.2 Organizational work groups 2 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer...

	explain the differences between strategic, tactical and operational level applications (LO-0038)	2 2.3.1 Measurement and modeling 2 2.9.7 Historical and social context of computing 2 3.1.6 Properties of information systems 2 3.12.8 Work-flow systems

2870

Learning Unit 18: IS Theory - IS Planning - IS Development and Management (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss how an information system is developed and managed within an organization	explain information systems development and organizational process redesign; explain groups of individuals and their responsibilities in this process (LO-0016) explain the roles of professional IS personnel within an IS organization; explain functions of IS management, CIO, project manager, information analyst, and explain career paths (LO-0041)	2 2.1.1 Hierarchical and flow models of organizations 2 2.1.2 Organizational work groups 2 2.1.3 Organizational span: single user, work group, team, enterprise, global 2 2.1.6 Organizational structure: centralized, decentralized, matrix 2 2.2.1 IS planning 2 2.2.3 Staffing and human resource management 2 2.2.4 IS functional structures -- internal vs outsourcing 2 2.2.7 CIO and staff functions 2 2.2.15 Management of sub-functions

		2 2.2.15.1 Telecommunications management 2 2.2.17 Computer operations management: e.g., tape/DASD management... 2 2.4.1 Job design theory 2 2.4.2 Cultural diversity 2 3.6.3 Contingency planning 2 3.7.3 Work breakdown structures and scheduling 2 3.12.1 Transaction processing systems 2 3.12.2 Management information systems 2 3.12.3 Group support systems 2 3.12.6 Office systems 2 3.12.9 Functional support systems: e.g., process control, marketing

2874

Learning Unit 19: IS Theory - Decision Making - Personal, Cognitive Process (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present and discuss the relevance of the cognitive process and human interactions in information system design and implementation	explain cognitive process and other human oriented considerations in information systems design and implementation (LO-0048)	2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 2 2.10.10 Fostering creativity and opportunity finding 3 3.9.5 Information presentation alternatives; cognitive styles 2 3.9.6 Human-computer interaction (e.g., ergonomics, graphical-user interfaces...

2879

Learning Unit 20: IS Theory - Decision Making - Personal, Goals and Decisions (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss how individuals make decisions and set and achieve goals	discuss and explain how individuals make decisions, set and achieve goals; explain what is meant by mission directed personal action (LO-0049)	2 2.10.7 Personal goal setting, decision making, and time management

IS'97 Learning Units

2883

Learning Unit 21: IS Theory - Decision Making - Decision Making, Simon Model (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss the Simon Model of organizational decision making and its support by IS	discuss and explain decision theory and the decision process (LO-0035) explain IS support for decision making; explain the use of expert systems in support of heuristic decision making (LO-0036) explain and give an illustration of the Simon organizational decision model (LO-0037)	2 2.3.2 Decisions under certainty, uncertainty, risk 2 2.3.4 Decision models and IS: optimizing, satisficing 2 2.3.5 Group decision process 3 3.12.4 Decision support systems/expert systems 2 3.12.5 Executive support systems 3 3.12.7 Collaborative systems

2887

Learning Unit 22: IS Theory - Systems/Quality - Systems and Quality, and IS (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to introduce systems theory, quality, and organizational modeling and demonstrate their relevance to information systems	explain the use of information and information systems in documentation, decision making and control of organizational activity (LO-0010) discuss and explain systems goals, client expectation, and quality concepts (LO-0030) discuss and explain systems components and relationships (flows) (LO-0031) apply system concepts to define and explain the role of information systems (LO-0032)	2 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 2 2.3.3 Cost/Value of information, competitive value of IS 2 3.1.1 General systems theory 2 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 3 3.1.3 Properties of open systems 3 3.1.4 System components and relationships 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 2 3.1.6 Properties of information systems

2892

Learning Unit 23: IS Theory - IT and Organizational Systems - Systems, Role of Management, Users, Designers (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to discuss a systems based role for management, users and designers	identify the generic responsibilities of users, designers and management in terms described in the Churchman "trinity"; discuss in systems terms detailed obligations of each in order to ensure quality; relate these observations to the quality improvement models for organizational development; identify the IS function in these terms (LO-0214)	2 3.1.1 General systems theory

2896

Learning Unit 24: IS Theory - IT and Organizational Systems - Systems, Work-Flow, Organizational Systems (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to explain physical systems and work flow and how information systems relate to organizational systems	explain the relation of database modeling to organizational physical activity (LO-0018)	1 1.6.1 DBMS: features, functions, architecture 1 1.6.5 Data definition languages 1 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 1 1.6.7 Intelligent query processors and query organization 1 1.6.8 Distributed databases 1 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 1 3.3.1 Organizational and software process modeling 1 3.3.3 Data oriented methodologies 1 3.3.4 Process oriented methodologies 1 3.9.1 Design: logical, physical

2901

Learning Unit 25: IS Theory - IT and Organizational Systems - Models, Organizational Relationship to IS (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present other organizational models and their relevance to IS	describe the role of information technology (IT) and the roles of people using, designing and managing IT in organizations (LO-0013) discuss how general systems theory is applicable to the analysis and development of an information system (LO-0034)	2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.1.7 Organizational issues pertaining to use of software systems in organizations 1 2.2.1 IS planning 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 2 2.3.1 Measurement and modeling 2 2.4.4 Teamwork, leadership and empowerment 2 2.9.6 IS industry: manufacturers, OEMs, system integrators, software developers 2 2.10.8 Principle centered leadership 2 3.1.4 System components and relationships 2 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 2 3.8.1 Problem opportunity identification: e.g., service requests, from planning...

2905

Learning Unit 26: IS Theory - IS Planning - IS Planning (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss the relationship of IS planning to organizational planning	explain IS planning goals and processes (LO-0053) explain the importance of corporate and strategic planning and of aligning the project to the information systems plan (LO-0126)	2 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 2 2.2.1 IS planning 2 2.2.4 IS functional structures -- internal vs outsourcing 2 2.2.5 Determining goals and objectives of the IS organization 2 2.4.1 Job design theory 2 3.5.2 Planning the IS architecture 3 3.8.2 Relating the application to the enterprise model 3 3.10.7 Software project management: scoping, scheduling, configuration manage...

2909

Learning Unit 27: IS Theory - IT and Organizational Systems - IS Types (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to demonstrate specific classes of application systems including TPS and DSS	describe the classifications of information systems, e.g., TPS, DSS, ESS, WFS (LO-0012) explain relevant organizational IS: TPS, DSS, EIS, ES, Work Flow Systems (LO-0040)	2 3.12.1 Transaction processing systems 2 3.12.2 Management information systems 2 3.12.3 Group support systems 1 3.12.6 Office systems 1 3.12.8 Work-flow systems

2913

Learning Unit 28: Systems Development - Systems Analysis and Design - IS Development Standards (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss and examine the process, standards and policies for development of information systems: development methodologies, life cycle, workflow, OOA, prototyping, spiral, end-user and other approaches	discuss and explain the concept of an IS development methodology; explain lifecycle, workflow, OOA, prototyping, risk-based models, spiral and other restricting models; show how this can be proactively furnished (LO-0192)	2 3.5.5 Planning for IS security, privacy and control 2 3.6.2 Risk management principles 2 3.9.2 Design methodologies: e.g., real time, object oriented, structured

2920

Learning Unit 29: IS Deployment/Management - Management of the IS Function - IS Implementation, Outsourcing (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss outsourcing and alternate implementations of the IS function	explain the advantages and disadvantages of outsourcing some or most of the IS function; state IS personnel requirements with and without outsourcing (LO-0180)	2 2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing 2 2.2.8 IS as a service function: performance evaluation -- external/internal, market...

2925

Learning Unit 30: IS Deployment/Management - Management of the IS Function - Personal, Performance Evaluation (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss performance evaluation consistent with quality management and continuous improvement	describe, explain and apply the responsibilities of the project leader; manage a small systems development project (LO-0151) discuss, explain and implement a methodology for tracking customer satisfaction within all phases of the life cycle (LO-0152)	3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 3 2.3.4 Decision models and IS: optimizing, satisficing 3 2.3.5 Group decision process

	explain methodologies to facilitate measurements to achievement of ISO 9000, Baldridge, National Performance Review and other quality standards (LO-0179)	

2931

Learning Unit 31: IS Theory - IT and Organizational Systems - IS Society and Ethics (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce the societal implications of IS and related ethical issues to introduce and explore ethical concepts and issues relating to personal and professional behavior to introduce, compare and contrast ethical models and approaches to explore ethical and social analysis skills	discuss and explain ethics and principled behavior and the concept of ethical practice in IS (LO-0045) discuss ethical major ethical models and discuss the reasons for being ethical explain the use of professional codes of ethics; explain the burden of professionalism resulting from trust associated with computing knowledge and	2 2.8.6 Ethics: Personal and professional responsibility 2 2.8.7 Risks, losses and liability in computing applications 2 2.10.6 Proactive attitude and approach

to consider the nature and existence of power	skills discuss and explain the basis and nature of questionable ethical approaches discuss and explain the ethical and social analysis of IS development discuss and explain the issues of power and its social impact in the development life cycle	

2960

Learning Unit 33: Information Technology - Telecommunications - Telecom, Organizational Support By (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop an awareness of how telecommunication systems are used to support organization communication infrastructure including information systems, teleconferencing, and telecomputer conferencing	explain the use of information systems to support "work flow"; discuss the concepts of teleconferencing and telecomputer conferencing in enabling communications and decision making; discuss and explain the infrastructure involving telecommunication	2 1.5.8 Network configuration, performance analysis and monitoring 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia... 2 2.1.2 Organizational work groups 2 2.1.3 Organizational span: single user, work group, team, enterprise, global

	systems (LO-0209)	2 2.2.15.1 Telecommunications management 3 2.3.4 Decision models and IS: optimizing, satisficing 3 2.3.5 Group decision process

2967

Learning Unit 34: Information Technology - Telecommunications - Telecom, Economics, Design Issues (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to explore the issues related to the economics, design and management of computer networks	explain the steps in analyzing and configuring a telecommunication system, including specific hardware and software components (LO-0070) explain the purpose of modems, bridges, gateways, hubs, and routers in interconnecting systems	3 1.5.8 Network configuration, performance analysis and monitoring 2 2.2.15.1 Telecommunications management

2971

Learning Unit 35: Information Technology - Telecommunications - Telecom, Standards, Standard Organizations (Level 2)

Presentation Goals	Learning Unit Objectives	Body of Knowledge
to familiarize the student with the telecommunication standards and with regulatory organizations and their standards	identify the role of standards and of regulatory organizations and their standards as a facilitator in achieving local through global telecommunications (LO-0062) explain digital coding of data relevant to telecommunications (LO-0067)	2 1.5.1 International telecommunication standards, models, trends 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 1.5.8 Network configuration, performance analysis and monitoring 2 1.5.9 Network security: encryption, digital signatures, authentication

2976

Learning Unit 36: Information Technology - Telecommunications - Telecom, Central/Distributed Systems (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss and explain underlying principles and issues of distributed versus centralized computer systems	explain, diagram and discuss structures and principles involved in distributing computing resources and data; identify hardware and software requirements and approximate costs of centralized and distributed systems; discuss and explain risks,	3 1.1.4 Computer system components: busses, controllers, storage systems, peripherals 2 1.4.2 Interaction of operating system and hardware architecture 1 1.4.9 Distributed operating systems 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing

	security and privacy in alternate system configurations (LO-0211)	2 1.6.8 Distributed databases 2 2.1.6 Organizational structure: centralized, decentralized, matrix 2 3.8.3 Requirements determination and specification

2981

Learning Unit 37: Information Technology - Telecommunications - Telecom, Architectures, Topologies, Protocols (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present architectures, topologies, and protocols of telecommunications	identify and explain the function of each of the layers of the ISO model (LO-0063) explain the concept of "virtual" communications between communicating machines at each layer of the ISO model identify and explain common topologies and implementation methods and issues for telecommunication systems (LO-0064)	2 1.4.11 OS interoperability and compatibility: e.g., open systems 2 1.5.1 International telecommunication standards, models, trends 2 1.5.3 Line configuration: error control, flow control, multiplexing 2 1.5.6 Network architectures and protocols 2 1.5.8 Network configuration, performance analysis and monitoring 2 1.5.9 Network security: encryption, digital signatures, authentication 2 1.5.10 High-speed networks: e.g. broadband ISDN, SMDS, ATM, FDDI

	identify and describe the organization and operation of bit and byte protocols (LO-0068) discuss telecommunication services and analyze a specific implementation of the ISO model (LO-0069)	2 1.5.11 Emerging networks: ATM, ISDN, satellite nets, etc.; optic nets; integrated... 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia...

2986

Learning Unit 38: Information Technology - Telecommunications - Telecom, Hardware and Software (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present the hardware and software components of telecommunications systems and how they are organized to provide required services	describe, diagram, discuss and explain hardware and software components of telecommunications systems; describe integration of phone, fax, LAN and WAN systems; diagram and discuss various organizations of hardware, identifying and describing each type of required device (LO-0210) explain the use of routers and hubs in	2 1.1.4 Computer system components: busses, controllers, storage systems, peripheral... 2 1.3.7.26 Compilers and translators 2 1.5.4 Local area networks 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 1.5.6 Network architectures and protocols 2 1.5.8 Network configuration, performance

	designing interconnectetd systems explain telecommunication requirements of voice, audio, data, still images, motion video and multimedia explain fast packet technologies and applications explain issues of telecommunications network design give examples of business applications of telecommunications and explain the dedi es and their utilization in the described system	analysis and monitoring 2 3.1.4 System components and relationships

2991

Learning Unit 39: Information Technology - Telecommunications - Telecom, Services, Reliability, Security... (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to provide awareness of the responsibilities inherent in providing telecommunication services, including security, privacy, reliability and performance	explain telecommunications systems performance measures and ensure adequate performance and reliability (LO-0076)	2 1.5.8 Network configuration, performance analysis and monitoring 2 2.8.4 Agencies and regulatory bodies

2997

Learning Unit 40: IS Deployment/Management - Systems Integration - Telecom, Installation, Implementation (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to explain how to install equipment necessary to implement a telecommunication system, e.g. cable, modems, ethernet connections, gateways, routers	explain, install and test modems, multiplexers and ethernet components (LO-0071) explain, install and test bridges and routers on appropriate hardware install and operate terminal emulation software on a PC (LO-0073) explain and construct organizational plans for the use of EDI (LO-0162)	3 1.5.2 Data transmission: media, signaling techniques, transmission impairments 3 1.5.3 Line configuration: error control, flow control, multiplexing 3 1.5.5 Wide area networks: switching techniques , broadcast techniques, routing 3 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia... 3 2.2.15.1 Telecommunications management 2 2.8.3 Privacy law

IS'97 Learning Units

3003

Learning Unit 41: IS Deployment/Management - Systems Integration - Telecom, LAN, Installation, Configuration (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to explain how to design, install, configure and manage a LAN	design, install and manage a LAN (LO-0072) explain and implement security appropriate for an end-user environment involving access to an enterprise level IS	3 1.5.4 Local area networks 3 1.5.8 Network configuration, performance analysis and monitoring 3 2.2.15.1 Telecommunications management

3012

Learning Unit 42: IS Theory - Systems and Quality - Information Measurements/Data/Events (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present the concept that data is a representation and measurement of real-world events	explain the concept of measurement and information, information representation, organization, storage and processing (LO-0009) describe the concept that data	2 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors... 1 1.1.2 Physical representation of digitized information: e.g., data, text, image, voice... 2 1.2.3 Complex data structures: e.g.. of data, text, voice, image, video, hyper

	is a representation and measurement of real-world events and the process of capturing it in machine readable forms (LO-0079)	media 1 1.6.1 DBMS: features, functions, architecture 1 1.6.2 Data models: relational, hierarchical, network, object, semantic object 2 1.7.1 Knowledge representation 2 1.7.2 Knowledge engineering 2 1.7.3 Inference processing 1 1.7.4 Other techniques: fuzzy logic, CASE-based reasoning, natural language and... 2 1.7.5 Knowledge-based systems 2 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 2 2.3.1 Measurement and modeling

3017

Learning Unit 43: Information Technology - Algorithmic Design - Data: Characters, Records, Files, Multi-Media (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to show and explain the logical and physical structure of data to represent characters, records, files, and multimedia objects	identify, explain and discuss the data hierarchy and identify all primary operations associated with each level of the hierarchy (LO-0078)	3 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors... 3 1.1.2 Physical representation of digitized information: e.g., data, text, image, voice... 3 1.2.3 Complex data structures: e.g.. of data, text, voice, image, video, hyper media 3 1.2.4 Abstract data types

3022

Learning Unit 44: Information Technology - Algorithmic Design - ADTs, Classes, Objects (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to explain the concepts of classes, abstract data types (ADT), and objects	discuss classes which involve elements of the "hierarchy of data" (bit, byte, fields, records, files, database), and use these definitions as a basis for the solutions to problems; describe program structures and their usage relating to each data structure (LO-0086)	4 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors... 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks...

3026

Learning Unit 45: Information Technology - Algorithmic Design - Problem Solving, Formal Problems and IS (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to explain and illustrate with IS examples of formal synthetic and analytic problem solving	explain and give examples of the concept of writing computer programs and using software development languages and application development facilities to solve problems (LO-0015)	1 1.2.1.4 Software design process; from specification to implementation 1 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 1 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 2 2.3.1 Measurement and modeling 1 3.9.7 Software development 3 3.10.3 Software integration: e.g., packages

3030

Learning Unit 46: Information Technology - Algorithmic Design - Object Representation of a System (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present a systems view of object representations and compare with data flow models	discuss and explain a systems view of an object representation; explain the similarity of an object representation to conventional data flow notation (LO-0200)	2 1.2.1 Formal problems and problem solving 3 1.3.6 Object oriented extensions to languages 2 1.3.7 Programming languages, design, implementation and comparison 3 1.3.7.28 Object-oriented design, languages, and programming 3 3.1.4 System components and relationships 2 3.3.5 Behavior oriented (event modeling) methodologies 2 3.3.6 Object oriented methodologies

3035

Learning Unit 47: Information Technology - Algorithmic Design - Problem Solving, Algorithm Development (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to develop skills in developing an algorithmic solution to a problem and be able to represent it with appropriate program and data objects	design algorithms and translate them into working solutions in a programming language for many component problems involved in complete information system applications (LO-0199)	3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.3 Normalization 3 1.6.5 Data definition languages 2 1.6.6.1 Function supported by typical database system; access methods, security... 2 1.6.6.2 DML, query, QBE, SQL, etc.: database query language; data definition... 3 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 3 3.9.1 Design: logical, physical

3040

Learning Unit 48: Information Technology - Programming - Problem Solving, Top Down Implementation (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present top-down implementation strategies	design and implement programs in a top-down manner, building first the top levels, stubbing the lower levels; successively complete lower levels in the same manner; identify the concept of continued success in this method (LO-0205)	2 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 3.2.5 Selecting a systems development approach 3 3.9.1 Design: logical, physical

3043

Learning Unit 49: Information Technology - Programming - Problem Solving, object Implementation (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present object implementation concepts	explain and implement modular structures; show the relation of data flow and object representations to the produced code (LO-0090)	3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy...

3046

Learning Unit 50: Information Technology - Programming - Problem Solving, Modules/Cohesion/Coupling (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present modular design, cohesion, and coupling concepts	develop and translate a data flow representation of a problem solution to a hierarchical and/or object representation (LO-0081) use algorithmic and modular design in the solution of a problem and implement the solution with a procedural language (LO-0087) use parameter passing in implementing a modular solution to a problem; explain the importance of high cohesion and low coupling (LO-0089) apply concepts of modular design to define cohesive modules of appropriate size (LO-0143) apply programming control structures	4 1.2.1 Formal problems and problem solving 4 1.2.1.4 Software design process; from specification to implementation 4 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 4 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 2 1.2.3 Complex data structures: e.g.. of data, text, voice, image, video, hyper media 4 1.2.4 Abstract data types 4 1.2.4.3 Formal specifications, preconditions and post-conditions, algebraic... 4 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy... 4 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants...

	and verify correctness (LO-0144) demonstrate ability to test and validate the solution (LO-0146)	4 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in... 3 1.2.5.1 Files (structure, access methods): file layouts; fundamental file concepts... 3 1.3.3.3 Procedures, functions, and parameters; arrays and records 3 1.3.7.12 Parameter passing mechanisms; reference, value, name, result, etc. 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 3 3.1.4 System components and relationships 3 3.9.1 Design: logical, physical 3 3.9.7 Software development 3 3.10.1 Systems construction 3 3.10.2 Software systems construction: e.g., programming, unit testing, load module...

3050

Learning Unit 51: Information Technology - Programming - Verification and Validation, A Systems View (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present a systems view of verification and validation	explain the verification and validation process; verify code by manual re-engineering to both procedural and/or object representations (LO-0091) develop data flow designs and translate these designs to pseudocode or fourth GLs (LO-0141)	4 1.2.1 Formal problems and problem solving 4 1.2.1.4 The software design process; from specification to implementation 4 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 1.2.4 Abstract data types 3 1.2.4.1 Purpose and implementation of abstract data types 4 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.3.5 Fourth-generation languages 4 3.9.7 Software development

3054

Learning Unit 52: Information Technology - Programming - Problem Solving, Environments and Tools (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present and expose students to a variety of programming environments, development tools and graphics development environments	demonstrate ability to evaluate and use existing GUI components in construction of an effective user interface for an application (LO-0145)	3 1.2.4 Abstract data types 3 1.4.10 OS support for human interaction: e.g., GUI, interactive video 3 3.9.6 Human-computer interaction (e.g., ergonomics, graphical-user interfaces...

3059

Learning Unit 53: Information Technology - Algorithmic Design - ADTs: Data and Files Structures (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce the concepts and techniques used to represent and operate on data and file structures, with simple examples	explain the ADTs necessary to access records in an indexed data file; show examples of each type of operation required (LO-0203)	2 1.2.4 Abstract data types 3 1.2.5 File structures: sequential, direct access, hashing, indexed 2 1.2.6 Sorting and searching data structures and algorithms

3064

Learning Unit 54: Information Technology - Algorithmic Design - ADTs: Arrays, Lists, Trees, Records (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to explain how to develop structures using abstract data types representing arrays, lists, trees, records and files, and demonstrate how they are applied as components of programs and applications	use array representations to simulate accessing an indexed file, and use the representations in designing an abstract data type for insert, delete-current, find, next, and previous operations (LO-0085)	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 3 1.2.4.3 Formal specifications, pre-conditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in...

3071

Learning Unit 55: Information Technology - Algorithmic Design - ADTs: Indexed Files, Keys (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present and use index file structures, including key organizations	discuss and explain the concept of indexed files; describe key construction and compare data management requirements involved in selecting optimal keys; explain the functions that are necessary to implement and access indexed records; explain the similarity of arrays and indexed files in terms of similarities of functions in ADTs (LO-0202)	2 1.2.5 File structures: sequential, direct access, hashing, indexed

3075

Learning Unit 56: Information Technology - Programming - Problem Solving, IS Applications, Sub-Structures (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to explain a variety of fundamental structures that are building blocks for the development of programs and IS applications	apply application software to solve small scale problems (LO-0084) develop user and system documentation for a program solution to a problem of moderate complexity (LO-0088)	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 2 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 3 1.2.4 Abstract data types 3 2.2.16 Security and control, viruses and systems integrity 2 2.10.2 Interviewing, questioning and listening 3 2.10.5 Writing skills 3 3.2.2 Package acquisition and implementation 2 3.7.8 Systems documentation 2 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line...

3080

Learning Unit 57: Information Technology - Algorithmic Design - Problem Solving, Data and File Applications (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to provide the foundations for applications of data structures and file processing techniques	use abstract data types involved in common IS applications to implement solutions to problems involving indexed file processing techniques. (LO-0198)	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual... 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 3 1.2.4 Abstract data types 3 1.2.4.1 Purpose and implementation of abstract data types 3 1.2.4.2 Informal specifications 3 1.2.4.3 Formal specifications, pre-conditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions;

		invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in... 3 1.2.5 File structures: sequential, direct access, hashing, indexed 3 1.2.5.1 Files (structure, access methods): file layouts; fundamental file concepts... 3 1.2.5.2 Files (structure, access methods): directories, contents and structure, naming... 2 1.2.6 Sorting and searching data structures and algorithms 2 1.2.6.1 Sorting algorithms (shell sort, bucket sort, radix sort, quick sort), editing...

3084

Learning Unit 58: Information Technology - Programming - Problem Solving, with Files and Database (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present and ensure problem solving involving files and database representations	use indexed files and ADTs to solve simple problems involving files used as elements of a database solution. (LO-0204)	3 1.2.4 Abstract data types 3 1.2.4.3 Formal specifications, pre-conditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in... 3 1.2.5 File structures: sequential, direct access, hashing, indexed 2 1.6.1 DBMS: features, functions, architecture 2 1.6.2 Data models: relational, hierarchical, network, object, semantic object 2 2.3.1 Measurement and modeling 2 3.3.2 Data modeling: e.g., entity-relationship diagrams, normalization

3088

Learning Unit 59: Information Technology - Programming - Problem Solving, File/DB Editors/Reports (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present and develop useful structured file (database) editors, posting mechanisms, and reports (simple, control break)	build and document several applications using indexed files, screen editors, and reports (LO-0093)	3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.2.5 File structures: sequential, direct access, hashing, indexed 3 3.7.8 Systems documentation 2 3.9.6 Human-computer interaction (e.g., ergonomics, graphical-user interfaces, voice...

3093

Learning Unit 60: Information Technology - Programming - Problem Solving, Design, Test, Debug (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to continue the development of programming techniques, particularly in the design, testing and debugging of IS related programs of some complexity	define, explain and present the process of stating and solving formal analytic problems (LO-0080)	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-up; teams vs individual...

		3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked lists, stacks... 3 1.2.4 Abstract data types 3 1.2.4.3 Formal specifications, pre-conditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to hierarchy... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in... 2 1.2.6.1 Sorting algorithms (shell sort, bucket sort, radix sort, quick sort), editing, report... 2 1.2.6.2 Searching algorithms (serial search, binary search, and binary search tree) 2 1.2.6.3 Searching, hashing, collision resolution 3 3.1.3 Properties of open systems 3 3.9.1 Design: logical, physical

		3 3.9.7 Software development 3 3.10.2 Software systems construction: e.g., programming, unit testing, load module...

IS'97 Learning Units

3099

Learning Unit 61: Information Technology - Programming - Programming: Language Comparison (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop an awareness of the relative capabilities and limitations of most common programming languages	explain the capabilities and differences for programming environments and language (LO-0094)	1 1.2.8 Recursive algorithms 1 1.2.9 Neural networks and genetic algorithms 1 1.2.10 Advanced considerations 2 1.3.1 Fundamental programming language structures; comparison of languages and... 2 1.3.2 Machine and assembly level languages 2 1.3.3 Procedural languages 2 1.3.4 Non-procedural languages: logic, functional 2 1.3.5 Fourth-generation languages 1 1.3.6 Object oriented extensions to languages 2 1.3.7 Programming languages, design, implementation and comparison 2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 1 1.6.10 Database machines

3104

Learning Unit 62: Information Technology - Telecommunications - Telecom, Systems View HW/SW (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to explain in systems terms the fundamental characteristics and components of computer and telecommunications hardware, and system software, and demonstrate how these components interact	use the systems approach to explain the hardware and software components of a telecommunications system, and to diagram and discuss the nature of the interactions of the components; explain in systems terms the purpose, expectations and the quality of a telecommunications system, and show how the components work purposefully together (LO-0230)	2 1.1.2 Physical representation of digitized information: e.g., data, text, voice, video 3 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 2 1.1.3.1 Basic organization; von Neumann, block diagram, data paths, control path... 2 1.1.4.1 Peripherals: I/O and interrupts 2 1.1.4.2 Peripherals: input/output control methods, interrupts 2 1.1.4.3 Peripherals: external storage, physical organization and drives 2 1.1.5 Multiprocessor architectures 1 1.1.6 Digital logic and systems 1 1.1.6.3 Demultiplexers, multiplexers, decoders, encoders, adders, subtractors... 1 1.1.6.8 Tristates and bus structures 2 1.4.1 Architecture, goals and structure of an operating system; structuring methods... 2 1.4.2 Interaction of operating system and hardware architecture

		2 1.4.3 Process management: concurrent processes, synchronization 2 1.4.3.1 Tasks, processes, dispatching context switchers, role of interrupts 2 1.4.5 Resource allocation and scheduling 1 1.4.5.1 Protocol suites (communications and networking); streams and datagrams 1 1.4.5.2 Internetworking and routing; servers and services 1 1.4.5.3 Types of operating systems: single user, multi-user, network 1 1.4.5.6 Operating system utilities 1 1.4.8 Protection and security 1 1.4.11 OS interoperability and compatibility: e.g., open systems 1 1.4.12 Operating system utilities, tools, commands and shell programming 1 1.4.13 System administration and management 2 1.5.1.2 Network design and management: network architectures (ISO, SNA, DNA)... 2 1.5.2 Data transmission: media, signaling techniques, transmission impairments... 2 1.5.2.1 Communications system technology: transmission media, analog-digital...

		2 1.5.3 Line configuration: error control, flow control, multiplexing 2 1.5.4 Local area networks 2 1.5.4.2 Local area networks and WANs: topology, gateways, uses (functions and... 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 1.5.6 Network architectures and protocols 2 1.5.8 Network configuration, performance analysis and monitoring 1 1.5.10 High-speed networks: e.g., broadband ISDN, SMDS,ATM, FDDI 1 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia... 2 2.2.5 Determining goals and objectives of the IS organization 1 2.2.8 IS as a service function: performance evaluation -- external/internal market... 1 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 1 2.2.13 Backup, disaster planning and recovery 1 2.2.15.1 Telecommunications management 1 2.2.15.7 Quality management: e.g. reliability and quality engineering; QC teams

		1 2.2.16 Security and control, viruses and systems integrity 3 3.1.1 General systems theory 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 2 3.1.3 Properties of open systems

3111

Learning Unit 63: Information Technology - Computer Hardware - IT Peripheral Devices (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to provide an overview of peripheral devices and their function	identify major classes of peripheral devices and explain the principles of operation and software requirements and functions provided for each type of device; give specific examples of each device identified, and discuss the installation requirements for the hardware and required software (LO-0213)	2 1.5.4 Local area networks

3115

Learning Unit 64: Information Technology - Computer Hardware - IT Hardware Architectures (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to introduce the concepts of computer hardware architectures	define data and communication requirements to access local (the hard-disk, or server) and remote data (e.g., via internet) to solve individual problems (LO-0024) describe and explain the major hardware and software components of a computing system and how they interact (LO-0095)	2 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 2 1.1.4 Computer system components: busses, controllers, storage systems, peripheral... 2 1.1.6 Digital logic and systems 2 1.5.1 International telecommunication standards, models, trends 1 1.5.2 Data transmission: media, signaling techniques, transmission impairments... 1 1.5.4 Local area networks 3 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 1.5.6 Network architectures and protocols 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia... 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement...

3119

Learning Unit 65: Information Technology - System Software - IT Systems Software Components, Interactions (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to introduce the concepts of system software components and interactions	describe and explain the major components of an operating system and how they interact (LO-0096) explain the control of input/output functions; install and configure drivers (LO-0101)	2 1.4.2 Interaction of operating system and hardware architecture 2 1.4.3 Process management: concurrent processes, synchronization 2 1.4.6 Secondary storage management 2 1.4.7 File and directory systems 2 1.4.8 Protection and security 2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 2 2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 2 3.9.3 Design objectives: e.g., usability, performance 2 3.10.2 Software systems construction: e.g., programming, unit testing, load module...

3123

Learning Unit 67: Information Technology - System Software - OS Functions (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to introduce the major concepts in operating systems, including process definition, concurrent processing, memory management, scheduling, interrupt processing, security, and file systems	explain the concept of tasks and processes (LO-0097) explain the concept of concurrency and multi-tasking (LO-0098) explain routine behavior of task schedulers, priority queues, interrupt processing, memory management and file system (LO-0099)	2 1.4.2 Interaction of operating system and hardware architecture 2 1.4.3 Process management: concurrent processes, synchronization 2 1.4.4 Memory management 1 1.4.5 Resource allocation and scheduling 2 1.4.6 Secondary storage management 2 1.4.7 File and directory systems 2 1.4.8 Protection and security 3 3.1.4 System components and relationships

3129

Learning Unit 68: Information Technology - System Software - OS Environments and Resources (Level 1)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to introduce a variety of operating environments (traditional, GUI, multimedia) and resource requirements	describe and discuss several computer system operating environments including traditional, graphical user interface, and multi-media; estimate the hardware and software items and approximate cost for each environment; discuss relative advantages for each environment (LO-0212)	2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 3 1.4.12 Operating system utilities, tools, commands and shell programming 3 1.4.13 System administration and management 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia...

3134

Learning Unit 69: IS Deployment and Management - Systems Integration - OS, Installation, Configuration for Multi-Media (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss, explain and install multimedia facilities	discuss and explain the hardware and software requirements necessary to support multimedia (LO-0181) explain development software tools which support multimedia environments; discuss the advantages and shortcomings of various development tools and environments (LO-0182) install multimedia sound and video hardware and software components; install development environments and demonstrate use of the installed software systems (LO-0183)	3 1.4.10 OS support for human interaction: e.g., GUI, interactive video

3139

Learning Unit 70: IS Deployment and Management - Systems Integration - OS, Interoperability and Systems Integration (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to introduce the requirements for interoperability and systems integration	explain concepts of interoperability and systems integration in relation to policies and practices (LO-0177) explain components of hardware and software to connect and implement networked solutions for PC networks and more advanced LAN and WAN environments. explain installation and configuration of a distributed system explain OS considerations to enable a client server environment	2 1.4.9 Distributed operating systems 2 1.4.11 OS interoperability and compatibility: e.g., open systems 2 3.10.5 Systems integration and system testing: verification and validation, test plan...

3144

Learning Unit 71: IS Deployment and Management - Systems Integration - OS, Installation, Configuration of Multi-User Systems (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to install, configure and operate a multi-user operating system	build system software command structures (e.g. JCL) for both mainframe and microcomputer systems involving the macro facilities of the operating system (LO-0100) install, configure and operate a multi-user operating system (LO-0103)	3 1.3.7.28 Object-oriented design, languages, and programming 3 1.4.2 Interaction of operating system and hardware architecture 3 1.4.5 Resource allocation and scheduling 3 1.4.6 Secondary storage management 3 1.4.7 File and directory systems 3 1.4.8 Protection and security

3149

Learning Unit 72: Systems Development - Systems Analysis/Design - IS Analysis and Design Tasks (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present necessary concepts to provide the skills necessary to do the analysis, modeling, and definition of information systems problems	explain IS life cycle phases and concepts and alternatives (LO-0057) detect problem to solve, re-engineer physical flow (LO-0108)	3 2.10.10 Fostering creativity and opportunity finding 2 3.6.1 Feasibility assessment 2 3.6.2 Risk management principles 3 3.8.1 Problem opportunity identification: e.g., service requests, from planning process

3154

Learning Unit 73: IS Deployment and Management - Systems Integration - IS Commercial Implementations (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to give students exposure to using commercial program products to implement information systems	demonstrate ability to analyze alternative approaches to applications including packages, tailoring or customizing packages, adding modules to packages, and building unique applications (LO-0110) explain the concepts of acquiring computer hardware and software (LO-0167) explain the process of writing bids and contracts (LO-0174)	2 2.8.1 Software sales, licensing, and agency 3 2.8.2 Contract fundamentals 3 2.8.3 Privacy law 2 2.8.4 Agencies and regulatory bodies 2 2.8.5 Protection of intellectual property rights 3 2.8.7 Risks, losses and liability in computing applications 3 3.7.11 Scoping and scope control

	explain all phases of contracts and write realistic examples for consultant relationships, software and hardware acquisition, or other relevant examples (LO-0175)	

3159

Learning Unit 74: Systems Development - Systems Analysis/Design - IS Requirements and Specifications (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to show how to collect and structure information in the development of requirements and specifications	conduct an information gathering interview with individuals and with a group (LO-0106) conduct a JAD session using a GDS tool (either manual or electronic) (LO-0111)	3 2.10.1 Communication skills 3 2.10.2 Interviewing, questioning and listening 3 2.10.5 Writing skills 3 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code...

3164

Learning Uni 75: Systems Development - Systems Analysis/Design - IS Design and Implementation (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to show how to develop a logical design, and develop and analyze alternatives involving implementation using packages, tailoring of packages, constructing software, or CASE tools	use CASE , I-CASE or other automated or non-automated tools (LO-0112) be able to use a commercial CASE tool to generate "upper case" documentation (LO-0113)	3 3.4.1 CASE

3170

Learning Unit 76: Systems Development - Systems Analysis/Design - IS Rapid Prototyping (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop a functional understanding of rapid prototyping and other similar alternative mechanisms for rapid development of information systems	use rapid prototyping and other similar alternative mechanisms for rapid development of information systems (LO-0114)	3 3.2.1 Systems development models: e.g., SDLC, prototyping 3 3.2.5 Selecting a systems development approach

3176

Learning Unit 77: Systems Development - Systems Analysis/Design - IS Development Risks/Feasibility (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to show how to assess risks and feasibility	identify IS requirements and specifications and tentative logical design alternatives; evaluate proposed competitive advantage, feasibility and risk (LO-0109)	2 3.5.1 Infrastructure planning: hardware, communications, database, site 3 3.6.1 Feasibility assessment 3 3.8.3 Requirements determination and specification 3 3.9.1 Design: logical, physical

3179

Learning Unit 78: Systems Development - Systems Analysis/Design - IS Continuous Improvement and IS (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to show students how to analyze organizational systems to determine how the systems might be improved	compare several proposed systems solutions, based on criteria for success (LO-0061) identify, explain and use development methodologies compatible with the concept of process of continuous improvement (LO-0107) apply systems, decision and quality theory and information systems development techniques and methodologies to initiate, specify and implement a relatively complex multi-user information system originating in a quality conscious organization involved in continuous improvement of its processes (LO-0149) at an enterprise or multi-department level, develop physical flows as well as a complete work flow design	3 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineering... 3 2.3.1 Measurement and modeling 2 2.10.8 Principle centered leadership 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 3 3.10.7 Software project management: scoping, scheduling, configuration manage...

3184

Learning Unit 79: Systems Development - Teams/Interpersonal - Interpersonal, Consensus Development (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop skills for effective interpersonal communication to develop consensus using classical techniques as well as computer facilitated groupware	explain the concept of shared vision in developing effective solutions to organizational process (LO-0052) explain common forms of behavior that can lead to lack of communication	3 2.3.4 Decision models and IS: optimizing, satisficing 3 2.3.5 Group decision process 2 3.9.4 Techniques to enhance the creative design process

3190

Learning Unit 80: Systems Development - Teams/Interpersonal - Interpersonal, Group Dynamics (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to demonstrate and analyze small group dynamics as related to working with users	explain group and team behavior in an IS context (LO-0051) explain how groups and teams should work together, empower co-workers, and apply team methods; measure and prove empowerment and effectiveness; participate effectively in cooperative team work; and evaluate success of work (LO-0154)	3 2.3.4 Decision models and IS: optimizing, satisficing 3 2.3.5 Group decision process 4 2.4.3 Group dynamics 4 2.4.4 Teamwork, leadership and empowerment 2 2.4.5 Use of influence, power and politics 4 2.4.8 Consensus building

IS'97 Learning Units

3194

Learning Unit 81: Systems Development - Database - IS Database Applications Development (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop application skills for implementing databases and applications by operating and testing these databases	design and implement an information system within a database environment (LO-0118) develop dataflow and/or an event driven models of the components of an information system, and design the implementation of the concepts develop the corresponding database and implement the schema with a DBMS package develop event driven screens corresponding with the database design; develop report designs for necessary documentation and reporting; resolve the database	3 1.6.1 DBMS: features, functions, architecture 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.3 Normalization 3 1.6.4 Integrity (referential, data item, intra-relation): representing relationships; entity... 3 1.6.5 Data definition languages 3 1.6.7 Intelligent query processors and query organization 3 1.6.12 Data dictionary, encyclopedia, repository 3 3.9.2 Design methodologies: e.g., real time, object oriented, structured 2 3.9.5 Information presentation alternatives; cognitive styles

	indexes and construct the appropriate application	

3199

Learning Unit 82: Information Technology - Programming - Problem Solving, Complexity Metrics (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present and use complexity metrics to assess developed solutions	apply system software functions to analyze resource use and performance characteristics for an application (LO-0102)	3 1.4.1 Architecture, goals and structure of an operating system; structuring methods... 3 1.4.2 Interaction of operating system and hardware architecture 2 3.5.4 Metrics for size, function points, control of complexity 3 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line... 3 3.7.13 System development quality assurance 2 3.9.7 Software development

3203

Learning Unit 83: Information Technology - Programming - IS Software Quality Metrics (Level 2)

Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop quality metrics for assessment of software development and project control of software development	explain how written standards describing each phase of the life-cycle can evolve; explain the relevance of written standards, and the desirability of developing quality assurance procedures describe and explain the use of quality metrics in assessment of software development and in facilitating project control of the development activities (LO-0206)	2 1.2.7 Algorithm efficiency, complexity and metrics 3 2.2.15.7 Quality management: e.g. reliability and quality engineering; QC teams 2 3.5.4 Metrics for size, function points, control of complexity 2 3.7.10 System metrics 2 3.7.13 System development quality assurance 2 3.9.7 Software development

3208

Learning Unit 84: Systems Development - Systems Analysis/Design - Systems and Quality Metrics/Assessment (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to develop quality metrics for assessment of customer satisfaction at all phases of the life cycle	use quality metrics and performance benchmarks to ensure customer satisfaction for each phase of the life cycle. Test the metrics during system development activities (LO-0115)	3 3.7.10 System metrics 3 3.7.13 System development quality assurance 2 3.9.3 Design objectives: e.g., usability, performance

3213

Learning Unit 85: IS Theory - IT and Organizational Systems - IS Professional Code of Ethics (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to explain the use of a professional code of ethics to evaluate specific IS actions	identify and describe professional organizations (LO-0043) explain setting an ethical standard (LO-0044) explain and examine ethical issues and arguments and failed approaches as a function of power and social context identification of stakeholders in a given IS	2 2.8.3 Privacy law 3 2.8.5 Protection of intellectual property rights 2 2.8.6 Ethics: Personal and professional responsibilities; ethical models, ... 2 2.9.1 Current literature periodicals, professional, academic journals 2 2.9.2 Certification issues 3 2.9.3 Professional organizations: e.g., DPMA, ACM, TIMS, ASM, DSI, ACE, IEEE... 2 2.9.4 Professional

	development context, and the effect of development on these individuals describe use of the codes of ethics and ensure that project actions are consistent with these prescriptions (LO-0127)	conferences 2 2.10.6 Proactive attitude and approach

3217

Learning Unit 86: Systems Development - Terms and Interpersonal Communications - Interpersonal, Synergistic Solutions (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss the importance of finding synergistic solutions with team and clients	describe and explain interdependence habits of empathetic listening, synergy and consensus building (LO-0050) explain negotiation and interdependent activities (LO-0173)	4 2.3.5 Group decision process 3 2.4.3 Group dynamics 4 2.4.4 Teamwork, leadership and empowerment 3 2.4.5 Use of influence, power and politics 3 2.4.6 Cognitive styles 2 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building 3 2.10.1 Communication skills 3 2.10.6 Proactive attitude and approach

		3 2.10.9 Principles of negotiation 3 2.10.10 Fostering creativity and opportunity finding

3222

Learning Unit 87: Systems Development - Teams and Interpersonal Communications - Interpersonal, Agreements and Commitment (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to show how to develop agreements describing work to be done, and to commit, rigorously complete and self-evaluate agreed work	perform work estimates, commit to the work, and rigorously complete, self-evaluate against standards, and account for the work (LO-0105)	3 2.2.3 Staffing and human resource management 3 2.10.6 Proactive attitude and approach 3 2.10.7 Personal goal setting, decision making, and time management 3 2.10.8 Principle centered leadership 3 3.7.7 Management concerns; stress and time management

3228

Learning Unit 88: Systems Development - Database - IS Data Modeling (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to develop skill with data modeling which describe databases	use DBMS, data modeling, and data manipulation languages (LO-0124) use knowledge data models to differentiate model types; explain the different models for databases, e.g. relational, hierarchical, network and OO database; and explain how they are implemented in database management systems (LO-0130)	3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.5 Data definition languages 2 1.7.1 Knowledge representation 2 1.7.2 Knowledge engineering 2 1.7.3 Inference processing 3 3.3.2 Data modeling: e.g., entity-relationship diagrams, normalization 3 3.4.3 Software implementation concepts and tools: e.g., data dictionary, repository...

3232

Learning Unit 89: Information Technology - Algorithmic Design - ADTs: Database Models and Functions (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to develop awareness of the syntactical and theoretical differences between database models	identify the components of hierarchical, network, and relational database models; discuss the data definitions required for each model; explain the reasons for specific commands within the data manipulation facilities; discuss logical interconversion between the models (LO-0201)	3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.5 Data definition languages 2 3.8.2 Relating the application to the enterprise model

3236

Learning Unit 90: Systems Development - Software Development - IS Database and IS Implementation (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop skill in application of database systems development and retrieval facilities needed to facilitate creation of information system applications	apply life cycle implementation (LO-0122) explain database administration and maintenance (LO-0138)	2 2.8.3 Privacy law 3 3.2.1 Systems development models: e.g., SDLC, prototyping 3 3.2.5 Selecting a systems development approach 3 3.4.1 CASE

3242

Learning Unit 91: Systems Development - Software Development - IS Database Application Structuring (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop skills with application and structuring of database management systems	develop editors to facilitate data entry into the database (LO-0133) demonstrate design and implementation skills with both a graphical user interface and character based interface to implement list boxes, dialog boxes, buttons and menu structures design and implement simple reports to validate the performance of application systems (LO-0134) apply software development principles, methods and tools to implementation of an IS application (LO-0140)	3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.6.1 DBMS: features, functions, architecture 3 1.6.1.1 DBMS (features, functions, architecture); components of database system... 3 1.6.1.3 Logical design (DBMS independent design): ER, object oriented 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.5 Data definition languages 3 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 4 1.6.7 Intelligent query processors and query organization 2 1.6.9 DBMS products: recent developments in database systems (.e.g., hypertext... 2 1.6.11 Data and database administration

		3 1.6.12 Data dictionary, encyclopedia, repository 3 2.2.3.4 Education and training 3 2.2.15.7 Quality management: e.g., reliability and quality engineering; QC teams 3 2.3.1 Measurement and modeling 3 3.2.2 Package acquisition and implementation 3 3.2.3 Integrating software components 4 3.2.5 Selecting a systems development approach 3 3.5.1 Infrastructure planning: hardware, communications, database, site 3 3.9.7 Software development 4 3.10.1 Systems construction 3 3.10.2 Software systems construction: e.g., programming, unit testing, load module

3246

Learning Unit 92: Systems Development - Software Development - IS Database Application Implementation (Level 3)

Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop skill with application and physical implementation of database systems, using a programming environment	apply database design techniques to implement a solution with calls from a program to the DBMS (LO-0139) explain and apply networking considerations in implementing distributed models develop client server applications and install and operate them in a multi-user environment	4 1.2.1 Formal problems and problem solving 4 1.2.4 Abstract data types 4 1.6.1 DBMS: features, functions, architecture 3 1.6.1.2 DBMS: overview of relational algebra 4 1.6.1.3 Logical design (DBMS independent design): ER, object oriented 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.2.1 Relational data model terminology; mapping conceptual schema to a... 4 1.6.2.2 Conceptual modeling (e.g., entity-relationship, object-oriented) 3 1.6.3 Normalization 4 1.6.4 Integrity (referential, data item, intra-relation): representing relationships... 4 1.6.5 Data definition languages 4 1.6.6 Application interface 3 2.3.1 Measurement and modeling

		4 2.10.6 Proactive attitude and approach 3 3.8.2 Relating the application to the enterprise model

3251

Learning Unit 93: Systems Development - Software Development - IS Application Development/Code Generation (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop skills with use of a combination of code generators and language facilities to implement multi-user departmental or simple enterprise level systems	use code generators to implement an IS application and compare the results with hand-coded versions of the same application (LO-0196)	3 1.3.7.30 Code generators

3258

Learning Unit 94: Systems Development - Project Management - IS Development and Project Management (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to provide an opportunity to develop and use project management, project standards, and a system implementation plan, and to implement a documentation plan	create and present technical and end user telecommunication system documentation (LO-0074) identify security and privacy considerations and how they may be solved within the context of the telecommunications system (LO-0075) explain configuration controls (LO-0135) develop consistent with good practice a departmental level DBMS project, and develop systems development and user documentation (LO-0136) work in teams tracking individual and team results; develop assignments and performance rating measures to evaluate and ensure quality assurance in the development process (LO-0137) develop program	3 1.2.4 Abstract data types 2 1.4.8 Protection and security 3 1.5.4 Local area networks 3 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 3 1.5.8 Network configuration, performance analysis and monitoring 3 1.6.1 DBMS: features, functions, architecture 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.4 Integrity (referential, data item, intra-relation); representing relationships... 3 1.6.5 Data definition languages 3 1.6.9 DBMS products: recent developments in database systems (e.g., hypertext... 3 1.6.11 Data and database administration 2 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 3 2.2.1.1 Alignment of IS planning with enterprise planning

	level, system and user documentation (LO-0147) apply development concepts to a project of reasonable complexity in a team environment (LO-0148)	3 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 3 2.2.8 IS as a service function: performance evaluation -- external/internal, market... 3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 3 2.2.11 End user computing support, role and functions 2 2.2.13 Backup, disaster planning and recovery 2 2.2.15.3 Management of group decision support systems 2 2.2.15.4 Data administration 2 2.2.15.5 Ownership of data and application systems 3 2.2.15.6 Optimizing the climate for creativity 3 2.2.15.7 Quality management: e.g. reliability and quality engineering; QC teams 3 2.2.16 Security and control, viruses and systems integrity 3 2.3.1 Measurement and modeling

		2 2.3.3 Cost/Value of information, competitive value of IS 3 2.3.5 Group decision process 2 2.4.1 Job design theory 3 2.4.3 Group dynamics 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.5 Use of influence, power and politics 3 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building 2 2.10.3 Presentation skills 2 2.10.4 Consulting skills 3 3.1.4 System components and relationships 2 3.7.1 Project planing and selection of appropriate process model; project scheduling... 2 3.7.2 Project organization management, principles, concept and issues 2 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team... 2 3.7.5 Project control:

		planning, cost estimation, resource allocation, software tech... 3 3.7.8 Systems documentation 3 3.7.11 Scoping and scope control 2 3.7.12 Configuration management 2 3.7.14 Project tracking: e.g., PERT, Gantt 3 3.8.3 Requirements determination and specification 3 3.9.4 Techniques to enhance the creative design process 3 3.10.1 Systems construction 2 3.10.5 Systems integration and system testing: verification and validation, test plan... 3 3.12.1 Transaction processing systems

3264

Learning Unit 95: Systems Development - Database - IS Database Conceptual/Logical Models (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to show how to design a conceptual relational database model and logical data base model, convert the logical database designs to physical designs, develop the physical database, and generate test data	explain a framework for evaluating an information system function and value of individual applications (LO-0055) explain the use of critical success factors (LO-0056) translate a logical system design into a physical design in a target environment, and, implement this specification into an operational system using DBMS technology (LO-0119)	3 1.6.4 Integrity (referential, data item, intra-relation): representing relationships... 3 1.6.5 Data definition languages 2 2.1.1 Hierarchical and flow models of organizations 2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.1.6 Organizational structure: centralized, decentralized, matrix 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 3 3.9.1 Design: logical, physical

3271

Learning Unit 96: Systems Development - Systems Analysis and Design - IS Functional Specifications (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to provide opportunity to develop functional specifications for an information system, develop a detailed information system design, and develop information system application controls	use a methodology to specify and develop an information system of departmental level significance; ensure that data collection, verification, and control is accomplished; ensure that external audits will establish consistent goals and accomplishments (LO-0191)	3 2.4.5 Use of influence, power and politics 3 2.7.1 Reasons for resistance to change 3 2.7.2 Strategies for motivating change 3 2.7.3 Planning for change 3 2.7.4 Managing change 3 3.3.1 Organizational and software process modeling 2 3.3.3 Data oriented methodologies 3 3.3.4 Process oriented methodologies 3 3.3.5 Behavior oriented (event modeling) methodologies 3 3.7.13 System development quality assurance 4 3.9.5 Information presentation alternatives; cognitive styles

3277

Learning Unit 97: Systems Development - Systems Analysis and Design - IS Conversion Planning (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to show how to develop a conversion and installation plan, develop a hardware systems and environmental plan	develop a detailed training, conversion and installation plan for hardware and software involving a newly developed information system application (LO-0194) design networked solutions and install the DBMS on the server along with appropriate OS and telecommunications hardware and software	4 2.4.6 Cognitive styles 3 2.7.1 Reasons for resistance to change 3 2.7.2 Strategies for motivating change 3 2.7.3 Planning for change 3 2.7.4 Managing change 3 3.9.7 Software development 3 3.10.4 Systems conversion: approaches, planing, implementation 3 3.10.6 Training: e.g., user, management, operation, systems, training materials

3282

Learning Unit 98: Systems Development - Systems Analysis and Design - IS Development and Conversion (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to show how to develop detailed program specifications, develop programs, set up system test parameters, install and test the new system, implement the conversion plan, employ configuration management	develop, test, install and operate a significant information system application program (LO-0193) develop, test, install and operate both client and server applications;	3 1.2.1 Formal problems and problem solving 3 1.2.1.4 Software design process; from specification to implementation 3 1.2.1.5 Problem recognition statement and algorithmic determination; procedural... 3 1.2.1.6 Implementation strategies (top-down, bottom-

	ensure that all multi-user aspects of the application function as planned develop, test, install, and operate coupled application systems that have no pathological coupling mechanisms; describe and explain how other mechanisms might involve inappropriate coupling mechanisms, and illustrate consequences of such design errors; discuss and explain both off-line batch as well as on-line coupling mechanisms	up; teams vs individual... 3 1.2.4 Abstract data types 3 1.2.4.1 Purpose and implementation of abstract data types 3 1.2.4.3 Formal specifications, preconditions and post-conditions, algebraic... 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.2.4.6 Control structures; selection, iteration, recursion; data types and their uses in... 3 1.2.5.1 Files (structure, access methods): file layouts; fundamental file concepts... 3 1.2.5.2 Files (structure, access methods): directories, contents and structure, naming... 3 1.6.1.3 Logical design (DBMS independent design): ER, object oriented 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.3 Normalization

		3 1.6.4 Integrity (referential, data item, intra-relation): representing relationships... 3 1.6.5 Data definition languages 2 1.6.11 Data and database administration 2 1.6.12 Data dictionary, encyclopedia, repository 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.8 Consensus building 2 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code... 3 3.10.3 Software integration: e.g., packages 3 3.10.4 Systems conversion: approaches, planing, implementation 3 3.10.5 Systems integration and system testing: verification and validation, test plan... 3 3.10.7 Software project management: scoping, scheduling, configuration manage... 3 3.10.8 Systems installation 2 3.10.9 Post implementation

		review 2 3.11.1 Service request and change control 2 3.11.3 Tuning and balancing 4 3.11.4 Systems and software maintenance concepts

3289

Learning Unit 99: IS Theory - Systems and Quality - IS Requirements/Work-Flow Planning (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to show how to develop a physical work-flow plan with a client	participate non-confrontationally in a team environment, and demonstrate empathetic listening skills to facilitate determination of alternate mechanisms for a horizontally integrated work group in improving its function through process redesign, including incorporation of information systems to ensure documentation and quality (LO-0216) design a workflow	3 2.3.5 Group decision process 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building 3 2.10.2 Interviewing, questioning and listening

	using graphical tools or image systems development software in the presence of a client convert the workflow to both an IDEF 0 and IDEF 3 type drawing; convert the IDEF3 drawing into an event driven model satisfactory for a graphical user interface	

3303

Learning Unit 100: Information Technology - Programming - IS Application with Programming Language (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop skill in analysis, design, and development of application software using a programming environment	design and implement information systems application software using a programming environment which utilizes database programming (Designs should include screen editors, data update mechanisms, audit and operations controls, and	4 1.2.1 Formal problems and problem solving 4 1.2.4 Abstract data types 4 1.6.2 Data models: relational, hierarchical, network, object, semantic object 4 1.6.5 Data definition languages 4 1.6.6 Application interface 4 1.6.6.2 DML, query, QBE,

	should contain appropriate printed reports.) (LO-0208) use productivity tools to develop conceptual data and functional models	SQL, etc.: database query language; data definition... 4 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 4 2.3.1 Measurement and modeling 3 2.10.10 Fostering creativity and opportunity finding 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 4 3.3.2 Data modeling: e.g., entity-relationship diagrams, normalization 3 3.4.3 Software implementation concepts and tools: e.g., data dictionary, repository... 3 3.8.2 Relating the application to the enterprise model 4 3.9.7 Software development

IS'97 Learning Units

3308

Learning Unit 101: Information Technology - Programming - IS Implementation with Objects, Event Driven (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to identify differences between a structured, event-driven, and object-oriented application design and explain the implications of these approaches to the design and development process	employ a programming environment to develop a simple event-driven application with a GUI interface (LO-0025)	2 1.3.6 Object oriented extensions to languages 2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 3 3.3.5 Behavior oriented (event modeling) methodologies 3 3.3.6 Object oriented methodologies 4 3.9.6 Human-computer interaction (e.g., ergonomics, graphical-user interfaces, voice...

3315

Learning Unit 103: Systems Development - Software Development - IS Development Testing (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to be able to develop program tests and system tests	construct effective queries using both structured and unstructured query tools (LO-0132) reverse engineer data flows from fourth GL applications to ensure verification (LO-0142)	3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.2.4.4 Modules, cohesion, coupling; data flow diagrams, and conversion to... 3 1.2.4.5 Correctness, verification and validation: pre- and post-conditions, invariants... 3 1.3.4 Non-procedural languages: logic, functional 3 1.6.6.3 Application and user interfaces (DML, query, QBE, SQL) 3 1.6.7 Intelligent query processors and query organization 3 3.8.3 Requirements determination and specification 3 3.9.7 Software development 3 3.10.2 Software systems construction: e.g., programming, unit testing, load module... 3 3.11.2 Reverse and re-engineering

3319

Learning Unit 104: Information Technology - Programming - IS Applications, Programming Environment (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to understand the different programming environments available for business application development	explain the characteristics, requirements and use of several programming environments including graphical and conventional environments; explain the concepts of software portability and the concepts of interoperability (LO-0207)	2 1.3.1 Fundamental programming language structures; comparison of languages and... 4 1.3.5 Fourth-generation languages 4 1.3.6 Object oriented extensions to languages 3 1.3.7 Programming languages, design, implementation and comparison

3360

Learning Unit 105: Systems Development - Project Management - IS Development, Project Planning (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to ensure skills needed to design a project development and implementation plan	explain steering and other committee functions, and the rationale for horizontal teams in organizational development and re-engineering of IS (LO-0054)	4 2.10.10 Fostering creativity and opportunity finding 2 3.7.3 Work breakdown structures and scheduling

3364

Learning Unit 106: Systems Development - Project Management - IS Development, Project Management (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to further develop and practice essential project management skills	apply meeting design concepts to organizing and conducting effective team and client meetings which ensure shared vision and empowered actions (LO-0116)	3 2.3.5 Group decision process 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.8 Consensus building 3 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code...

3368

Learning Unit 107: Systems Development - Project Management - IS Development, Project Management (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop skill in use of project management tools and methods within the context of an information systems project	use and apply project management tools, techniques and software in definition, implementation and modification of project goals; produce timely management, individual, team and customer information progress reports to ensure quality software development, physical workflow system implementation, computer systems installation (LO-0150)	3 2.10.4 Consulting skills 4 2.10.7 Personal goal setting, decision making, and time management 4 3.7.1 Project planning and selection of appropriate process model; project... 4 3.7.5 Project control: planning, cost estimation, resource allocation, software tech... 4 3.7.14 Project tracking: e.g., PERT, Gantt

3373

Learning Unit 108: Systems Development - Project Management - IS Development, Project Management Tools (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to select the proper project management tools and demonstrate their use	use project management concepts and tracking tools (PERT, GANTT) (LO-0104) use project management techniques e.g. tracking, PERT, GANTT (LO-0120) use CASE and other tools (LO-0123)	3 3.4.1 CASE 3 3.7.5 Project control: planning, cost estimation, resource allocation, software tech... 3 3.7.14 Project tracking: e.g., PERT, Gantt

3377

Learning Unit 109: Systems Development - Project Management - IS Development, Project Close Down (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to initiate, design, implement and discuss project close down	discuss and explain the concepts of terminating a project; explain and list the requirements for project close down (LO-0186)	3 3.7.15 Project close-down

3381

Learning Unit 110: Systems Development - ***** MISSING HEADING**** - IS Applications, Production Systems (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to determine and analyze a significant problem using the systems approach to problem solving	develop and use detailed specifications to state and solve an information systems application problem including physical flows, database design, system functions, program requirements and design, as well as database and software implementation (LO-0195) design and implement a systems integration plan for an enterprise level system involving LAN and WAN techniques; implement systems connections, install and configure systems, and install, test and operate designed solutions integrate end user solutions and approaches into the enterprise model; develop and implement conversion and training plans develop and evolve written standards for all life cycle project activities; present and defend solutions; conform time management and accountability to the developed standards	4 1.2.1 Formal problems and problem solving 4 1.2.4 Abstract data types 4 1.6.2 Data models: relational, hierarchical, network, object, semantic object 4 1.6.4 Integrity (referential, data item, intra-relation): representing relationships... 3 1.6.11 Data and database administration 4 3.2.3 Integrating software components 3 3.5.1 Infrastructure planning: hardware, communications, database, site 3 3.5.2 Planning the IS architecture 4 3.10.1 Systems construction

3386

Learning Unit 111: Systems Development - Systems Analysis/Design - IS Requirements and Database (Level 4)

Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop requirements and specifications for a database requiring multi-user information system	identify physical flows and horizontal integration of organizational processes, and relate these flows to the relevant databases which describe the flows; develop event driven functional models for the involved organizational process identify and specify the processes which solve the organizational problem and define the related database application (LO-0189)	2 1.6.1 DBMS: features, functions, architecture 2 1.6.2 Data models: relational, hierarchical, network, object, semantic object 1 1.6.3 Normalization 2 1.6.5 Data definition languages 2 1.6.12 Data dictionary, encyclopedia, repository 3 3.3.2 Data modeling: e.g., entity-relationship diagrams, normalization 2 3.8.3 Requirements determination and specification

3324

Learning Unit 112: Systems Development - Teams/Interpersonal - Personal, Proactivity, Principled Action (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to develop a functional understanding of proactive principled behavior and time management	describe and explain character habits of proactive leadership and time management (LO-0042)	4 2.3.5 Group decision process 2 2.10.6 Proactive attitude and approach 2 2.10.8 Principle centered leadership 2 3.7.7 Management concerns; stress and time management

3329

Learning Unit 113: Systems Development - Teams/Interpersonal - Interpersonal, Empathetic Listening (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to ensure attitudes necessary to successful team behavior including empathetic listening, consensus negotiation, conflict resolution, and synergistic solution finding, and to apply the concept of commitment and rigorous completion	use and apply team work, empowerment methods, apply meetings concepts and methods, use group techniques, use empathetic listening skills, employ synergistic solution development (LO-0121) ensure that empathetic listening is practiced; ensure that individuals listen, commit and rigorously complete assignments; explain the relevance of such action in ensuring team effectiveness (LO-0156)	3 2.3.5 Group decision process 4 2.4.3 Group dynamics 3 2.4.4 Teamwork, leadership and empowerment 4 2.4.8 Consensus building 4 2.10.2 Interviewing, questioning and listening

3336

Learning Unit 114: Systems Development - Teams/Interpersonal - Interpersonal, Goals, Mission, Alignment (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to ensure goal setting and alignment of team activities with project obligations	discuss and explain the concepts of shared vision and mission directed activity in information system development (LO-0017) discuss and apply mission directed work by aligning team mission to project mission by tracking to ensure the results (LO-0155)	3 2.2.1 IS planning 4 2.3.5 Group decision process 4 2.10.2 Interviewing, questioning and listening 4 2.10.8 Principle centered leadership 4 3.9.4 Techniques to enhance the creative design process 4 3.10.7 Software project management: scoping, scheduling, configuration manage...

3340

Learning Unit 115: IS Deployment/Management - Management of IS Function - IS Responsibility to Sell Designs to Management (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to describe interactions with higher levels of management in selling project objectives and performing project management tasks	explain and prove the relationship of IS activities to enhancing competitive position (LO-0160) explain functions of IS management, CIO, project manager ... (LO-0164)	2 2.2.7 CIO and staff functions 3 2.2.10 Strategic use of IS: e.g., competitive advantage and IS, process re-engineer... 3 2.2.15 Management of sub-functions 3 2.3.2 Decisions under certainty, uncertainty, risk 3 2.3.3 Cost/Value of information, competitive value of IS 2 3.5.2 Planning the IS architecture 2 3.5.3 Planning for operations 3 3.6.1 Feasibility assessment 2 3.6.3 Contingency planning

		3 3.10.9 Post implementation review

3346

Learning Unit 116: Systems Development - Project Management - IS Life Cycles and Projects (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to describe and explain life cycle concepts, and apply them to the course project	explain and apply various life cycle concepts in engaging in and completing a project of a considerable size and scope, involving teams; tell how to ensure accepting and incorporating standards compatible with successful life cycles (LO-0185) explain the different responsibilities of IS, CS and SE as they pertain to software and systems development activities; apply lessons learned to the course project (LO-0236) explain how formal software engineering techniques can contribute to the success of software and system development efforts; apply these techniques to the course project (quality assurance, verification and validation, correctness and reliability, testing, etc.) (LO-0237)	2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 3 2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing 3 2.2.3 Staffing and human resource management 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 2 2.2.8 IS as a service function: performance evaluation -- external/internal, market... 2 2.2.9 Financial administration of IS: e.g., funding and charge out 2 2.2.12 IS policy and operating procedures formulation and communication 3 2.2.13 Backup, disaster planning and recovery 3 2.3.1 Measurement and modeling 4 2.4.4 Teamwork, leadership and empowerment 4 2.4.8 Consensus building 4 3.1.3 Properties of open systems

		4 3.1.4 System components and relationships 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement... 4 3.2.1 Systems development models: e.g., SDLC, prototyping 2 3.2.1.1 Systems development life cycle: software life-cycle models (iterative... 3 3.2.2 Package acquisition and implementation 4 3.2.5 Selecting a systems development approach 3 3.3.7 Software engineering process and products 3 3.7.1 Project planning and selection of appropriate process model; project scheduling... 3 3.7.2 Project organization management, principles, concept and issues 3 3.7.6 Managing multiple projects 3 3.7.7 Management concerns; stress and time management 3 3.7.12 Configuration management 3 3.8.1 Problem opportunity identification: e.g., service requests, from planing process 4 3.9.7 Software development 4 3.10.2 Software systems construction: e.g., programming, unit testing, load module...

		4 3.10.3 Software integration: e.g., packages 4 3.10.4 Systems conversion: approaches, planing, implementation 4 3.10.5 Systems integration and system testing: verification and validation, test plan... 4 3.10.8 Systems installation 4 3.11.4 Systems and software maintenance concepts

3293

Learning Unit 117: Systems Development - Teams and Interpersonal Communications - Personal, Presentation (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to show how to present a system design, test plan, implementation plan, and evaluation, in written and oral form	present and explain solutions to a peer group for critique and improvement (LO-0028) apply oral and written communication skills to present proposed solutions and accomplishments (LO-0125)	3 2.10.1 Communication skills 3 2.10.2 Interviewing, questioning and listening 3 2.10.3 Presentation skills 4 2.10.5 Writing skills 3 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line...

3350

Learning Unit 118: IS Deployment/Management - Support Services - Personal, Life-Long Learning (Level 4)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to discuss and apply the concept of life-long learning	discuss and apply the concept of learning to learn continuously (LO-0158)	4 2.2.3.4 Education and training

2942

Learning Unit 119: IS Theory - IT and Organizational Systems - Ethics and Legal Issues (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss and explain ethical and legal principles and issues; to discuss and explain ethical considerations of information systems development, planning, implementation, usage, sales, distribution, operation and maintenance	list and explain ethical and legal issues in development, ownership, sales, acquisition, use and maintenance of computer systems and software (LO-0215) explain the utilization of ethical models, e.g. principle centered leadership to IS life cycle stages give examples of the effects of social context on technology development	2 2.8.1 Software sales, licensing and agency 2 2.8.3 Privacy law 2 2.8.5 Protection of intellectual property rights 2 2.8.6 Ethics: Personal and professional responsibility; ethical models 2 2.8.7 Risks, losses and liability in computing applications 2 2.8.8 Warranties

3354

Learning Unit 120: IS Deployment/Management - Management of IS Function - IS Management and IS Department Organization (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to present and explain the evolving leadership role of information management in organizations	describe and explain the composition of personnel needed to make up the team for a given project and use personnel management strategies (LO-0153) explain to a non-IS knowledge worker what they have to do to manage their information resources and requirements (LO-0178)	2 2.2.3 Staffing and human resource management 3 2.4.3 Group dynamics 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.5 Use of influence, power and politics 2 2.8.3 Privacy law 2 2.8.4 Agencies and regulatory bodies 3 2.10.3 Presentation skills 3 2.10.8 Principle centered leadership 3 3.4.1.2 Tools: CASE tools, code generators, CDSS 3 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team... 3 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line...

IS'97 Learning Units

3390

Learning Unit 121: IS Deployment/Management - Management of IS Function - Personal, Leadership and IS (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to present and explain the evolving leadership role of information management in organizations	explain setting an ethical standard (LO-0171) explain the relevance and use of a professional code of ethics explain and demonstrate successful application of ethical argument in identifying and evaluating alternatives based on social contextual analysis in client centered information systems development environment explain the alignment of IS with organizational mission; explain the relationship of departmental processes with the strategic success of the organization explain budget planning and administration (LO-0172) explain and illustrate the application of ethical models, e.g.	3 2.2.1 IS Planning 3 2.2.5 Determining goals and objectives of the IS organization 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 2 2.2.8 IS as a service function: performance evaluation--external/internal, market... 2 2.2.9 Financial administration of IS: e.g., funding and charge out 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.5 Use of influence, power and politics 3 2.4.6 Cognitive styles 3 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building 3 2.8.6 Ethics: plagiarism, honesty, codes of ethics 3 2.10.6 Proactive attitude and approach 3 2.10.7 Personal goal setting, decision making, and time management

	principle centered leadership, in project management standards and practice	

3394

Learning Unit 122: IS Deployment/Management - Management of IS Function - IS Policies and Standards (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to examine the process for development of information systems policies, procedures and standards in the organization	explain the relevance of IS management aligning itself with business process (LO-0159) explain and develop standards and policies which are involved in the development of information systems of organizational scope (LO-0190) explain the benefits of cross-functional teams in policy and procedure development explain the benefits of team mission statement development, and of aligning team missions with organizational missions	3 2.2.1 IS planning 3 2.2.5 Determining goals and objectives of the IS organization 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 2 2.2.8 IS as a service function: performance evaluation -- external/internal, market... 2 2.2.9 Financial administration of IS: e.g., funding and charge out 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.5 Use of influence, power and politics 3 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building 3 2.8.6 Ethics: plagiarism, honesty, codes of ethics 3 2.10.6 Proactive attitude and approach 3 2.10.7 Personal goal setting, decision making, and time

		management 3 3.3.3 Data oriented methodologies 3 3.10.7 Software project management: scoping, scheduling, configuration manage...

2950

Learning Unit 123: IS Theory - IS Planning - IS Management of IS Function (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to investigate issues relative to managing the information systems function	explain security and privacy issues (LO-0128) explain the basis for a legal contract to develop systems (LO-0129)	2 2.8.1 Software sales, licensing and agency 2 2.8.2 Contract fundamentals 2 2.8.3 Privacy law 2 2.8.5 Protection of intellectual property rights 2 3.5.5 Planning for IS security, privacy and control

3008

Learning Unit 124: Information Technology - Telecommunications - IS Management of Emerging Technologies (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to discuss issues pertinent to the management and transfer of emerging technologies	explain and detail methods for environment scanning and selecting effective hardware and software (LO-0163) explain management of emerging technologies (LO-0168)	3 2.2.1 IS planning 2 2.2.14 Management of emerging technologies

3399

Learning Unit 125: IS Deployment/Management - Information Resource Management - IS Implementation and Outsourcing (Level 2)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss outsourcing and alternate implementations of the IS function	explain outsourcing as an alternative to an internal IS function (LO -0231) define, explain, and compare from a cost-benefit perspective various outsourcing arrangements (LO-0232) manage the IS function in a small organization (LO-0233) explain outsourcing (LO-0234)	2 2.1.6 Organizational structure: centralized, decentralized, matrix 2 2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing 2 2.2.4 IS functional structures -- internal vs outsourcing 2 2.2.5 Determining goals and objectives of the IS organization 2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS... 2 2.2.8 IS as a service function: performance evaluation -- external/internal, market... 2 2.2.9 Financial administration of IS: e.g., funding and charge out 2 2.2.12 IS policy and operating procedures formulation and communication

		2 2.2.15.8 Management consulting relationships, outsourcing 2 2.3.3 Cost/Value of information, competitive value of IS 1 2.8.7 Risks, losses and liability in computing applications 2 3.6.2 Risk management principles

3404

Learning Unit 126: Systems Development - Teams/Interpersonal - Personal, Time and Relationship Management (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge
to discuss management of time and interpersonal relations	explain four generations of time management concepts, and personal and interpersonal reasons for the success of each stage; use the mechanisms within a project environment (LO-0235)	4 3.7.7 Management concerns; stress and time management

3298

Learning Unit 127: Systems Development - Project Management - Quality and Performance Management (Level 3)		
Presentation Goals	Learning Unit Objectives	Body of Knowledge

to discuss performance evaluation consistent with quality management and continuous improvement	develop performance measures consistent with the concepts of valuing employees that facilitate team cooperation and discourage competitiveness among team members; discuss the reasons for such measures and explain the negative consequences of misunderstanding these issues (LO-0184)	3 2.2.3 Staffing and human resource management 3 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team...