IS'2002 COURSE SPECIFICATIONS AND LEARNING UNITS

This contains detailed descriptions of each the ISModel courses. Part of the details are a specification of the learning units. Each learning unit consists of a goal, learining 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, 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'2002. 0 Knowledge Work Software Tool Kit

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

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.

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

EXPLANATION AND EXPECTATIONS

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

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	1 1.1.1.2 Basic machine representation of non-numeric data 1 1.1.1.3 Finite precision of integer and floating point number representation
		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	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 devices 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, layered models, object-server model 1 1.4.2 Interaction of operating system and hardware architecture 1 1.6.1 DBMS: features, functions, architecture 1 1.6.13 Information retrieval: e.g. internet tools, image processing, hypermedia 1 1.6.9 DBMS products: recent developments in database systems (e.g., hypertext, hypermedia, optical disks) 1 2.2.11 Knowledge work, end user computing: support, role, productivity, activities 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, quality
		define, explain and use the concepts of knowledge work software	

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 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	2 1.6.1 DBMS: features, functions, architecture 2 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 2 1.6.7 Intelligent query processors and query organization, OLAP tools 2 2.2.11 Knowledge work, end user computing: support, role, productivity, activities 3 3.10.1 Systems construction 2 3.10.5 Systems integration and system testing: verification and validation, test plan generation, testing (acceptance testing, unit testing, integration testing, regression testing) 2 3.10.6 Training: e.g., user, management, operation, systems, training materials 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 documentation) 2 3.9.1 Design: logical, physical 2 3.9.3 Design objectives: e.g., usability, performance
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 identify, state, and implement solutions involving knowledge work software to simple organizational and personal tasks select and configure appropriate macros, tools and packages for implementation of personal systems	1 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision) 1 1.1.1.4 Errors in computer arithmetic and related portability issues 1 1.1.1.5 Basic concepts of computer architecture 1 1.1.3.6 CISC, RISC 1 1.2.1 Formal problems and problem solving 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 2.10.6 Proactive attitude and approach 1 2.10.7 Personal goal setting, decision making, and time management 1 2.10.8 Principle centered leadership 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 1 2.2.11 Knowledge work, end user computing: support, role, productivity, activities 2 2.2.16 Security and control, viruses and systems integrity 1 2.2.5 Determining goals and objectives of the IS organization 2 3.1.1 General systems theory 1 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 3 3.10.2 Software systems construction: e.g., programming, unit testing , load module packaging 1 3.10.7 Software project management: scoping, scheduling, configuration management, quality assurance; software reliability issues (safety, responsibility, risk assessment); maintenance 2 3.12.6 Office systems 3 3.2.4 End 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 and milestones 2 3.8.3 Requirements determination and specification 1 3.9.4 Techniques to enhance the creative design process

4	to introduce the relevance and application of information technology in society	describe and explain the relevance and impact of information technology on society explain the role of information systems within a company versus a global environment	1 1.5.1 International telecommunication standards, models, trends 1 1.5.2 Data transmission: media, signaling techniques, transmission impairments, encoding, error detection, compression 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 (e.g., hypertext, hypermedia, optical disks) 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, IS and quality, IS global impact and international considerations 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 3.12.10 Interorganizational systems 1 3.12.2 Management information systems 1 3.12.3 Group support systems 1 3.12.8 Image, and Work-flow systems 2 3.12.9 Functional support systems: e.g., process control, marketing

IS'2002. 1 Fundamentals of Information Systems

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.

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.

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

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. 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. 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.

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	2 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 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, quality
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	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	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 devices 2 1.4.1 Architecture, goals and structure of an operating system; structuring methods, layered models, object-server model 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	2 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 2 2.10.10 Fostering creativity and opportunity finding 2 2.10.2 Interviewing, questioning and listening 2 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 2.4.4 Teamwork, leadership and empowerment 2 2.4.8 Consensus building 2 3.1.4 System components and relationships 2 3.1.5 Systems control: standards, control theory, feedback, loops, measurement, quality 2 3.12.8 Image, and Work-flow systems 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 reviews 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
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	2 2.2.1 IS planning 3 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
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	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	2 2.9.2 Certification issues 2 2.9.3 Professional organizations: e.g. DPMA, ACM, TIMS, ASM, DSI, ACE, IEEE, ASQC, AIS, IAIM, INFORMS 2 2.9.4 Professional conferences 2 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team organization, reporting
12	to present and discuss the professional and ethical responsibilities of the IS practitioner	use professional code of ethics to evaluate specific IS actions describe ethical and legal issues; discuss and explain ethical considerations of software usage, sales, distribution, operation and maintenance	2 2.10.10 Fostering creativity and opportunity finding 2 2.10.4 Consulting skills 3 2.10.7 Personal goal setting, decision making, and time management 2 2.8.1 Software sales, licensing, and agency 2 2.8.2 Contract fundamentals 3 2.8.5 Ethics and Protection of intellectual property rights 3 2.8.6 Ethics: Personal and professional responsibility and codes; ethical models; ethical and social analysis 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, ASQC, AIS, IAIM, INFORMS 2 3.7.5 Project control: planning, cost estimation, resource allocation, software technical reviews, measurement, analysis, feedback, communications, ensuring quality, scheduling, milestones 3 3.7.7 Management concerns; stress and time management
13	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	3 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision)
		assess the increased productivity realized by implementation of personal systems	3 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision) 3 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 3 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 3 1.1.4 Computer system components: busses, controllers, storage systems, peripheral devices 3 1.4.11 OS interoperability and compatibility: e.g., open systems

IS'2002. 2 Personal Productivity with IS Technology

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)

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.

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 in

EXPLANATION AND EXPECTATIONS

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 pr oblem 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.

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
13.0	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	

13.0.	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
13.0.	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
13.0.	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

13.0	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
13.0	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
13.0	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

13.0	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
13.0	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
13.1	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

13.1	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
13.1	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
13.1	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)

13.1.	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
13.1.	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
13.1.	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

14	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	3 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision)
		develop, document, and maintain small systems for personal productivity using high level database utilizing application development tools or environments	3 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision)
		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	3 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision) 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.2 Physical representation of digitized information: e.g., data, text, image, voice, video 3 1.1.2 Physical representation of digitized information: e.g., data, text, image, voice, video 3 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 3 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 3 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 3 1.1.3.6 CISC, RISC 3 1.1.4 Computer system components: busses, controllers, storage systems, peripheral devices 3 1.1.4 Computer system components: busses, controllers, storage systems, peripheral devices 3 1.1.4 Computer system components: busses, controllers, storage systems, peripheral devices 3 1.1.5 Multiprocessor architectures 3 1.1.5 Multiprocessor architectures 3 1.1.6 Digital logic and systems 3 1.1.6 Digital logic and systems 3 1.2.10 Advanced considerations 3 1.2.7 Algorithm efficiency, complexity and metrics 3 1.2.7 Algorithm efficiency, complexity and metrics 3 1.2.8 Recursive algorithms 3 1.4.11 OS interoperability and compatibility: e.g., open systems 3 2.2.16 Security and control, viruses and systems integrity
15	to present and apply strategies for accessing and using information resources	explain data administration and access to corporate and alternate information resources	3 1.1.1.1 Basic machine representation of numeric data
		intelligently discuss the differences between managing IS&T, IRM, Systems Development, Systems Maintenance, Systems Operations	3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia, video conferencing, value-added networks 2 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 1.5.9 Network security: encryption, digital signatures, authentication 2 1.6.11 Data and database administration 3 2.2.7 CIO and staff functions 2 2.8.3 Privacy law

IS'2002. 3 Information Systems Theory and Practice

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)

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.

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 a

EXPLANATION AND EXPECTATIONS

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 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. 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.

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	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	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-engineering, IS and quality, IS global impact and international considerations 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 Image, and Work-flow systems
		explain the strategic role of information systems in organizations	
		explain strategic relationship of IS activities to enhancing competitive position	
		explain the differences between strategic, tactical and operational level applications	
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	2 1.1.1.1 Basic machine representation of numeric data
		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	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 2.2.15 Management of sub-functions 2 2.2.17 Computer operations management: e.g. tape/DASD management, scheduling, automation-cross functional context 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 2.4.1 Job design theory 2 2.4.2 Cultural diversity 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 2 3.6.3 Contingency planning 2 3.7.3 Work breakdown structures and scheduling
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	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, voice, touch)

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	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 explain IS support for decision making; explain the use of expert systems in support of heuristic decision making explain and give an illustration of the Simon organizational decision model	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
22	to introduce systems theory, quality, and organizational modeling and demonstrate their relevance to information systems	discuss and explain systems goals, client expectation, and quality concepts discuss and explain systems components and relationships (flows) apply system concepts to define and explain the role of information systems explain the use of information and information systems in documentation, decision making and control of organizational activity	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-engineering, IS and quality, IS global impact and international considerations 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, quality 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	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	2 1.1.1.3 Finite precision of integer and floating point number representation 1 1.6.1 DBMS: features, functions, architecture 1 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 1 1.6.7 Intelligent query processors and query organization, OLAP tools 1 1.6.8 Distributed databases, repositories and warehouses 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 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 discuss how general systems theory is applicable to the analysis and development of an information system	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 2 2.10.8 Principle centered leadership 1 2.2.1 IS planning 2 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 2.3.1 Measurement and modeling 2 2.4.4 Teamwork, leadership and empowerment 2 2.9.6 IS industry: manufacturers, OEMs, system integrators, software developers 2 3.1.4 System components and relationships 2 3.1.5 Systems control: standards, control theory, feedback, loops, measurement, quality 2 3.8.1 Problem opportunity identification: e.g., service requests, from planning process

26	to discuss the relationship of IS planning to organizational planning	explain IS planning goals and processes explain the importance of corporate and strategic planning and of aligning the project to the information systems plan	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 3 3.10.7 Software project management: scoping, scheduling, configuration management, quality assurance; software reliability issues (safety, responsibility, risk assessment); maintenance 2 3.5.2 Planning the IS architecture 3 3.8.2 Relating the application to the enterprise model
27	to demonstrate specific classes of application systems including TPS and DSS	describe the classifications of information systems, e.g., TPS, DSS, ESS, WFS explain relevant organizational IS: TPS, DSS, EIS, ES, Work Flow Systems	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 Image, and 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 lifecycle, workflow, OOA, prototyping, risk-based models, spiral and other restricting models; show how this can be proactively furnished	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, event driven

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	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, marketing of services
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 discuss, explain and implement a methodology for tracking customer satisfaction within all phases of the life cycle explain methodologies to facilitate measurements to achievement of ISO 9000, Baldridge, National Performance Review and other quality standards	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 1 2.3.4 Decision models and IS: optimizing, satisficing 1 2.3.5 Group decision process
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	discuss and explain ethics and principled behavior and the concept of ethical practice in IS 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 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	2 2.10.6 Proactive attitude and approach 2 2.8.6 Ethics: Personal and professional responsibility and codes; ethical models; ethical and social analysis 2 2.8.7 Risks, losses and liability in computing applications

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 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	3 2.8.1 Software sales, licensing, and agency 3 2.8.3 Privacy law 3 2.8.5 Ethics and Protection of intellectual property rights 3 2.8.6 Ethics: Personal and professional responsibility and codes; ethical models; ethical and social analysis 3 2.8.7 Risks, losses and liability in computing applications 3 2.8.8 Warranties
123	to investigate issues relative to managing the information systems function	explain security and privacy issues explain the basis for a legal contract to develop systems	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 Ethics and Protection of intellectual property rights 2 3.5.5 Planning for IS security, privacy and control

IS'2002. 4 Information Technology Hardware and Software

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)

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.

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

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. 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 organizations that have developed the standards. The ISO seven layered model will be presented. The CCITT and IEEE standards will be reviewed. 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. Acquisition, installation, configuration and other details of management of the various technologies will be studied.

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	3 1.1.1.1 Basic machine representation of numeric data 3 1.1.1.1 Basic machine representation of numeric data 3 1.1.1.1 Basic machine representation of numeric data 3 1.1.1.1 Basic machine representation of numeric data 3 1.1.1.1 Basic machine representation of numeric data 3 1.1.1.1 Basic machine representation of numeric data 3 1.1.1.2 Basic machine representation of non-numeric data 3 1.1.1.2 Basic machine representation of non-numeric data 3 1.1.1.2 Basic machine representation of non-numeric data 3 1.1.1.2 Basic machine representation of non-numeric data 3 1.1.1.3 Finite precision of integer and floating point number representation 3 1.1.1.3 Finite precision of integer and floating point number representation 3 1.1.1.3 Finite precision of integer and floating point number representation 2 1.1.2 Physical representation of digitized information: e.g., data, text, image, voice, video 3 1.1.3 CPU architectures: CPU, memory, registers, addressing modes, instruction sets 3 1.1.3.6 CISC, RISC 3 1.1.3.7 Computer organization 3 1.1.3.8 Memory systems 2 1.1.5 Multiprocessor architectures 1 1.1.6 Digital logic and systems 2 1.4.1 Architecture, goals and structure of an operating system; structuring methods, layered models, object-server model 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 1.4.2 Interaction of operating system and hardware architecture 2 1.4.3 Process management: concurrent processes, synchronization

			2 1.4.5 Resource allocation and scheduling 1 1.4.8 Protection and security 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, video conferencing, value-added networks 2 1.5.2 Data transmission: media, signaling techniques, transmission impairments, encoding, error detection, compression 2 1.5.3 Line configuration: error control, flow control, multiplexing 2 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 1.5.8 Network configuration, performance analysis and monitoring 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 1 2.2.13 Backup, disaster planning and recovery 1 2.2.16 Security and control, viruses and systems integrity 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, marketing of services 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	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 describe and explain the major hardware and software components of a computing system and how they interact	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 devices 2 1.1.6 Digital logic and systems 2 1.5.1 International telecommunication standards, models, trends 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia, video conferencing, value-added networks 1 1.5.2 Data transmission: media, signaling techniques, transmission impairments, encoding, error detection, compression 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 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement, quality

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 explain the control of input/output functions; install and configure drivers	2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 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 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 3.10.2 Software systems construction: e.g., programming, unit testing , load module packaging 2 3.9.3 Design objectives: e.g., usability, performance
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 explain the concept of concurrency and multi-tasking explain routine behavior of task schedulers, priority queues, interrupt processing, memory management and file system	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	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, video conferencing, value-added networks

69	to discuss, explain and install multimedia facilities	discuss and explain the hardware and software requirements necessary to support multimedia explain development software tools which support multimedia environments; discuss the advantages and shortcomings of various development tools and environments install multimedia sound and video hardware and software components; install development environments and demonstrate use of the installed software systems	2 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 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 1.4.11 OS interoperability and compatibility: e.g., open systems 2 1.4.9 Distributed operating systems 2 3.10.5 Systems integration and system testing: verification and validation, test plan generation, testing (acceptance testing, unit testing, integration testing, regression testing)
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 install, configure and operate a multi-user operating system	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'2002. 5 Programming, Data and Object Structures

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.

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.

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

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. 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. 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. 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.

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level and Body of Knowledge Elements in Learning Units
42	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 describe the concept that data is a representation and measurement of real-world events and the process of capturing it in machine readable forms	2 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision) 1 1.1.2 Physical representation of digitized information: e.g., data, text, image, voice, video 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 speech recognition 2 1.7.5 Knowledge-based systems 2 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 2.3.1 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	3 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision) 3 1.1.2 Physical representation of digitized information: e.g., data, text, image, voice, video 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	4 1.1.1 Fundamental data representation: non-numeric, numeric (integers, reals, errors, precision) 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked-lists, stacks, queues, trees, graphs
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	2 1.1.1.4 Errors in computer arithmetic and related portability issues 2 1.1.1.5 Basic concepts of computer architecture 2 1.1.3.6 CISC, RISC 2 2.3.1 Measurement and modeling 3 3.10.3 Software integration: e.g., packages 1 3.9.7 Software development

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	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 2 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	3 1.1.1.1 Basic machine representation of numeric data 3 1.1.1.2 Basic machine representation of non-numeric data 3 1.1.1.3 Finite precision of integer and floating point number representation 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 (schema definition languages, graphical development tools, dictionaries, etc.) 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	3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.3.6 CISC, RISC 3 1.2.1 Formal problems and problem solving 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	
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	2 1.1.1.1 Basic machine representation of numeric data
		use algorithmic and modular design in the solution of a problem and implement the solution with a procedural language	2 1.1.1.3 Finite precision of integer and floating point number representation
		use parameter passing in implementing a modular solution to a problem; explain the importance of high cohesion and low coupling	2 1.1.1.3 Finite precision of integer and floating point number representation
		apply concepts of modular design to define cohesive modules of appropriate size	2 1.1.1.4 Errors in computer arithmetic and related portability issues 2 1.1.1.4 Errors in computer arithmetic and related portability issues 2 1.1.1.5 Basic concepts of computer architecture 2 1.1.1.5 Basic concepts of computer architecture 2 1.1.3.6 CISC, RISC 2 1.1.3.6 CISC, RISC 4 1.2.1 Formal problems and problem solving
		apply programming control structures and verify correctness	3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked-lists, stacks, queues, trees, graphs
		demonstrate ability to test and validate the solution	2 1.2.3 Complex data structures: e.g., of data, text, voice, image, video, hypermedia 4 1.2.4 Abstract data types 2 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 3.10.1 Systems construction 3 3.10.2 Software systems construction: e.g., programming, unit testing , load module packaging 3 3.9.1 Design: logical, physical 3 3.9.7 Software development

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	2 1.1.1.1 Basic machine representation of numeric data
		develop data flow designs and translate these designs to pseudocode or fourth GLs	2 1.1.1.4 Errors in computer arithmetic and related portability issues 2 1.1.1.4 Errors in computer arithmetic and related portability issues 2 1.1.1.5 Basic concepts of computer architecture 2 1.1.1.5 Basic concepts of computer architecture 2 1.1.3.6 CISC, RISC 4 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 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	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, voice, touch)
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	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 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	3 1.1.1.3 Finite precision of integer and floating point number representation 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.3.6 CISC, RISC 3 1.2.1 Formal problems and problem solving 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked-lists, stacks, queues, trees, graphs
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	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 develop user and system documentation for a program solution to a problem of moderate complexity	2 1.1.1.4 Errors in computer arithmetic and related portability issues 2 1.1.1.5 Basic concepts of computer architecture 2 1.1.3.6 CISC, RISC 3 1.2.1 Formal problems and problem solving 2 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked-lists, stacks, queues, trees, graphs 3 1.2.4 Abstract data types 2 2.10.2 Interviewing, questioning and listening 3 2.10.5 Writing skills 3 2.2.16 Security and control, viruses and systems integrity 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 documentation)

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.	3 1.1.1.1 Basic machine representation of numeric data
			3 1.1.1.1 Basic machine representation of numeric data
			3 1.1.1.1 Basic machine representation of numeric data
			3 1.1.1.2 Basic machine representation of non-numeric data
			3 1.1.1.2 Basic machine representation of non-numeric data
			3 1.1.1.3 Finite precision of integer and floating point number representation
			3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.3.6 CISC, RISC 3 1.1.3.6 CISC, RISC 3 1.2.1 Formal problems and problem solving
			3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked-lists, stacks, queues, trees, graphs
			3 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
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.	3 1.1.1.3 Finite precision of integer and floating point number representation 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.3.6 CISC, RISC 3 1.2.4 Abstract data types 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	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, touch)
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	3 1.1.1.1 Basic machine representation of numeric data 3 1.1.1.2 Basic machine representation of non-numeric data 3 1.1.1.3 Finite precision of integer and floating point number representation 3 1.1.1.3 Finite precision of integer and floating point number representation 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.3.6 CISC, RISC 3 1.1.3.6 CISC, RISC 3 1.2.1 Formal problems and problem solving 3 1.2.2 Basic data structures: lists, arrays, strings, records, sets, linked-lists, stacks, queues, trees, graphs 3 1.2.4 Abstract data types 3 3.1.3 Properties of open systems 3 3.10.2 Software systems construction: e.g., programming, unit testing , load module packaging 3 3.9.1 Design: logical, physical 3 3.9.7 Software development
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	1 1.2.10 Advanced considerations 1 1.2.8 Recursive algorithms 1 1.2.9 Neural networks and genetic algorithms 2 1.3.1 Fundamental programming language structures; comparison of languages and applications 2 1.3.2 Machine and assembly level languages 2 1.3.3 Procedural languages 2 1.3.4 Non-procedural languages: logic, functional, event driven 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 and servers

IS'2002. 6 Networking and Telecommunications

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.

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.

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

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. 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. 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. 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. Standards, standard organizations and resulting hardware and software consequences will be identified and studied. General principles will be expressed. Students will gain practical experience with cabling, installing, configuring and multi-user operating systems and LANs.

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 access a remote information system for file transfer in both LAN and WAN environments discuss and explain the telecommunications industry and the concepts of standards and regulation	2 1.5.2 Data transmission: media, signaling techniques, transmission impairments, encoding, error detection, compression 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	2 1.1.1.1 Basic machine representation of numeric data 2 1.1.5 Multiprocessor architectures 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia, video conferencing, value-added networks 2 1.5.8 Network configuration, performance analysis and monitoring 2 2.1.2 Organizational work groups 2 2.1.3 Organizational span: single user, work group, team, enterprise, global 3 2.3.4 Decision models and IS: optimizing, satisficing
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 explain the purpose of modems, bridges, gateways, hubs, and routers in interconnecting systems	2 1.1.1.1 Basic machine representation of numeric data 3 1.5.8 Network configuration, performance analysis and monitoring
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 explain digital coding of data relevant to telecommunications	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	3 1.1.4 Computer system components: busses, controllers, storage systems, peripheral devices 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, repositories and warehouses 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 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 identify and describe the organization and operation of bit and byte protocols discuss telecommunication services and analyze a specific implementation of the ISO model	2 1.4.11 OS interoperability and compatibility: e.g., open systems 2 1.5.1 International telecommunication standards, models, trends 2 1.5.10 High-speed networks: e.g., broadband ISDN, SMDS, ATM, FDDI 2 1.5.11 Emerging networks: ATM, ISDN, satellite nets, optic nets, etc., integrated voice, data and video 2 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia, video conferencing, value-added networks 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
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 explain the use of routers and hubs in 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	2 1.1.4 Computer system components: busses, controllers, storage systems, peripheral devices 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

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	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 explain, install and test bridges and routers on appropriate hardware install and operate terminal emulation software on a PC explain and construct organizational plans for the use of EDI	2 1.1.1.1 Basic machine representation of numeric data 3 1.5.12 Application: e.g., client server, EDI, EFT, phone network, e-mail, multimedia, video conferencing, value-added networks 3 1.5.2 Data transmission: media, signaling techniques, transmission impairments, encoding, error detection, compression 3 1.5.3 Line configuration: error control, flow control, multiplexing 3 1.5.5 Wide area networks: switching techniques, broadcast techniques, routing 2 2.8.3 Privacy law
41	to explain how to design, install, configure and manage a LAN	design, install and manage a LAN explain and implement security appropriate for an end-user environment involving access to an enterprise level IS	2 1.1.1.1 Basic machine representation of numeric data 3 1.5.4 Local area networks 3 1.5.8 Network configuration, performance analysis and monitoring

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	2 2.2.1 IS planning
		explain management of emerging technologies	2 2.2.14 Management of emerging technologies

IS'2002. 7 Analysis and Logical Design

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)

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.

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

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

Learning Unit Number	Learning Unit Goal	Learning Unit Objectives	Competency Level 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 detect problem to solve, re-engineer physical flow	3 2.10.10 Fostering creativity and opportunity finding 3 3.6.1 Feasibility assessment 3 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 explain the concepts of acquiring computer hardware and software explain the process of writing bids and contracts explain all phases of contracts and write realistic examples for consultant relationships, software and hardware acquisition, or other relevant examples	3 2.8.1 Software sales, licensing, and agency 3 2.8.2 Contract fundamentals 3 2.8.3 Privacy law 3 2.8.4 Agencies and regulatory bodies 3 2.8.5 Ethics and Protection of intellectual property rights 3 2.8.7 Risks, losses and liability in computing applications 3 3.7.11 Scoping and scope control
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 conduct a JAD session using a GDS tool (either manual or electronic) use CASE , I-CASE or other automated or non-automated tools be able to use a commercial CASE tool to generate "upper case" documentation	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 reviews

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	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	2 3.5.1 Infrastructure planning: hardware, communications, database, site 2 3.6.1 Feasibility assessment 2 3.8.3 Requirements determination and specification 2 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 identify, explain and use development methodologies compatible with the concept of process of continuous improvement 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 at an enterprise or multi-department level, develop physical flows as well as a complete work flow design	3 2.10.10 Fostering creativity and opportunity finding 3 2.10.8 Principle centered leadership 3 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 3 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS critical success factors 3 2.3.1 Measurement and modeling 3 3.1.5 Systems control: standards, control theory, feedback, loops, measurement, quality

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 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 3 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 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	3 2.3.4 Decision models and IS: optimizing, satisficing 3 2.3.5 Group decision process 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 2.4.8 Consensus building
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 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 1.6.12 Data dictionary, encyclopedia, repository 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 and referential integrity 3 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 3 1.6.7 Intelligent query processors and query organization, OLAP tools 3 3.9.2 Design methodologies: e.g., real time, object oriented, structured, event driven 3 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	2 1.4.1 Architecture, goals and structure of an operating system; structuring methods, layered models, object-server model 2 1.4.2 Interaction of operating system and hardware architecture 2 3.5.4 Metrics for size, function points, control of complexity 2 3.7.13 System development quality assurance 2 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line documentation) 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	2 1.1.3.7 Computer organization 2 1.2.7 Algorithm efficiency, complexity and metrics 2 1.2.7 Algorithm efficiency, complexity and metrics 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
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	3 3.7.10 System metrics 3 3.7.13 System development quality assurance 3 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 explain setting an ethical standard 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	2 2.10.6 Proactive attitude and approach 2 2.8.3 Privacy law 2 2.8.5 Ethics and Protection of intellectual property rights 2 2.8.6 Ethics: Personal and professional responsibility and codes; ethical models; ethical and social analysis 2 2.9.1 Current literature periodicals, professional, academic journals 2 2.9.2 Certification issues 2 2.9.3 Professional organizations: e.g. DPMA, ACM, TIMS, ASM, DSI, ACE, IEEE, ASQC, AIS, IAIM, INFORMS 2 2.9.4 Professional conferences

IS'2002. 8 Physical Design and Implementation with DBMS

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)

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.

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

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'9 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. 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. 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.

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 explain negotiation and interdependent activities	2 2.10.1 Communication skills 2 2.10.10 Fostering creativity and opportunity finding 2 2.10.6 Proactive attitude and approach 2 2.10.9 Principles of negotiation 2 2.3.5 Group decision process 2 2.4.3 Group dynamics 2 2.4.4 Teamwork, leadership and empowerment 2 2.4.5 Use of influence, power and politics 2 2.4.6 Cognitive styles 2 2.4.7 Negotiating and negotiating styles 2 2.4.8 Consensus building
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	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 2.2.3 Staffing and human resource management 3 3.7.7 Management concerns; stress and time management
88	to develop skill with data modeling which describe databases	use DBMS, data modeling, and data manipulation languages 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	3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 3 1.7.1 Knowledge representation 3 1.7.2 Knowledge engineering 3 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, application generator, reuse, program generators, software implementation languages

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	2 1.6.2 Data models: relational, hierarchical, network, object, semantic object 2 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 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 explain database administration and maintenance	3 2.10.10 Fostering creativity and opportunity finding 3 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

91	to develop skills with application and structuring of database management systems	develop editors to facilitate data entry into the database	3 1.1.1.1 Basic machine representation of numeric data
		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	3 1.1.1.3 Finite precision of integer and floating point number representation
		design and implement simple reports to validate the performance of application systems	3 1.1.1.3 Finite precision of integer and floating point number representation
		apply software development principles, methods and tools to implementation of an IS application	3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.3.7 Computer organization 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 1.6.11 Data and database administration 3 1.6.12 Data dictionary, encyclopedia, repository 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 3 1.6.7 Intelligent query processors and query organization, OLAP tools 3 1.6.9 DBMS products: recent developments in database systems (e.g., hypertext, hypermedia, optical disks) 3 2.3.1 Measurement and modeling 3 3.10.1 Systems construction 3 3.10.2 Software systems construction: e.g., programming, unit testing , load module packaging 3 3.2.2 Package acquisition and implementation 3 3.2.3 Integrating software components 3 3.2.5 Selecting a systems development approach 3 3.5.1 Infrastructure planning: hardware, communications, database, site 3 3.9.7 Software development
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	3 1.1.1.1 Basic machine representation of numeric data
		explain and apply networking considerations in implementing distributed models	3 1.1.1.2 Basic machine representation of non-numeric data
		develop client server applications and install and operate them in a multi-user environment	3 1.1.1.2 Basic machine representation of non-numeric data 3 1.1.1.3 Finite precision of integer and floating point number representation 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 1.6.2 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 and referential integrity 3 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 3 1.6.6 Application interface 3 2.10.6 Proactive attitude and approach 3 2.3.1 Measurement and modeling 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

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 identify security and privacy considerations and how they may be solved within the context of the telecommunications system explain configuration controls develop consistent with good practice a departmental level DBMS project, and develop systems development and user documentation work in teams tracking individual and team results; develop assignments and performance rating measures to evaluate and ensure quality assurance in the development process develop program level, system and user documentation apply development concepts to a project of reasonable complexity in a team environment	3 1.1.1.1 Basic machine representation of numeric data 3 1.1.1.3 Finite precision of integer and floating point number representation 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.3.6 CISC, RISC 3 1.1.3.7 Computer organization 3 1.2.4 Abstract data types 3 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 1.6.11 Data and database administration 3 1.6.2 Data models: relational, hierarchical, network, object, semantic object 3 1.6.4 Integrity (referential, data item, intra-relation): representing relationships; entity and referential integrity 3 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 3 1.6.9 DBMS products: recent developments in database systems (e.g., hypertext, hypermedia, optical disks) 3 2.1.4 Role of IS within the enterprise: strategic, tactical and operations 3 2.10.3 Presentation skills 3 2.10.4 Consulting skills 3 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 3 2.2.11 Knowledge work, end user computing: support, role, productivity, activities 3 2.2.13 Backup, disaster planning and recovery 3 2.2.16 Security and control, viruses and systems integrity 3 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS critical success factors 3 2.2.8 IS as a service function: performance evaluation -- external/internal, marketing of services 3 2.3.1 Measurement and modeling 3 2.3.3 Cost/Value of information, competitive value of IS 3 2.3.5 Group decision process 3 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 3 3.1.4 System components and relationships 3 3.10.1 Systems construction 3 3.10.5 Systems integration and system testing: verification and validation, test plan generation, testing (acceptance testing, unit testing, integration testing, regression testing) 3 3.12.1 Transaction processing systems 3 3.7.1 Project planning and selection of appropriate process model; project scheduling and milestones 3 3.7.11 Scoping and scope control 3 3.7.12 Configuration management 3 3.7.14 Project tracking: e.g., PERT, Gantt 3 3.7.2 Project organization, management, principles, concept and issues 3 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team organization, reporting 3 3.7.5 Project control: planning, cost estimation, resource allocation, software technical reviews, measurement, analysis, feedback, communications, ensuring quality, scheduling, milestones 3 3.7.8 Systems documentation 3 3.8.3 Requirements determination and specification 3 3.9.4 Techniques to enhance the creative design process

95	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 explain the use of critical success factors translate a logical system design into a physical design in a target environment, and, implement this specification into an operational system using DBMS technology	3 1.6.4 Integrity (referential, data item, intra-relation): representing relationships; entity and referential integrity 3 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 3 2.1.1 Hierarchical and flow models of organizations 3 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 3 2.1.6 Organizational structure: centralized, decentralized, matrix 3 2.10.10 Fostering creativity and opportunity finding 3 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS critical success factors
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	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 3 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 3 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 design networked solutions and install the DBMS on the server along with appropriate OS and telecommunications hardware and software	2 2.4.6 Cognitive styles 2 2.7.1 Reasons for resistance to change 2 2.7.2 Strategies for motivating change 2 2.7.3 Planning for change 2 2.7.4 Managing change 2 3.10.4 Systems conversion: approaches, planning, implementation 2 3.10.6 Training: e.g., user, management, operation, systems, training materials 2 3.9.7 Software development

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	3 1.1.1.1 Basic machine representation of numeric data
		develop, test, install and operate both client and server applications; ensure that all multi-user aspects of the application function as planned	3 1.1.1.1 Basic machine representation of numeric data
		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 1.1.1.2 Basic machine representation of non-numeric data 3 1.1.1.3 Finite precision of integer and floating point number representation 3 1.1.1.3 Finite precision of integer and floating point number representation 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.1.5 Basic concepts of computer architecture 3 1.1.3.6 CISC, RISC 3 1.1.3.6 CISC, RISC 3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.6.11 Data and database administration 3 1.6.12 Data dictionary, encyclopedia, repository 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 and referential integrity 3 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 3 2.4.4 Teamwork, leadership and empowerment 3 2.4.8 Consensus building 3 3.10.3 Software integration: e.g., packages 3 3.10.4 Systems conversion: approaches, planning, implementation 3 3.10.5 Systems integration and system testing: verification and validation, test plan generation, testing (acceptance testing, unit testing, integration testing, regression testing) 3 3.10.7 Software project management: scoping, scheduling, configuration management, quality assurance; software reliability issues (safety, responsibility, risk assessment); maintenance 3 3.10.8 Systems installation 3 3.10.9 Post implementation review 3 3.11.1 Service request and change control 3 3.11.3 Tuning and balancing 3 3.11.4 Systems and software maintenance concepts 3 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code reviews

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 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 IDEF 3 type drawing; convert the IDEF3 drawing into an event driven model satisfactory for a graphical user interface	2 2.10.2 Interviewing, questioning and listening 2 2.3.5 Group decision process 2 2.4.4 Teamwork, leadership and empowerment 2 2.4.7 Negotiating and negotiating styles 2 2.4.8 Consensus building
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 apply oral and written communication skills to present proposed solutions and accomplishments	4 2.10.1 Communication skills 4 2.10.2 Interviewing, questioning and listening 4 2.10.3 Presentation skills 4 2.10.5 Writing skills 4 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line documentation)
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	3 2.2.3 Staffing and human resource management 3 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team organization, reporting

IS'2002. 9 Physical Design and Implementation with Programming Environments

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)

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.

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

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 f ourth generation programming language capable of calling DBMS functions. 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. 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. 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.

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.) use productivity tools to develop conceptual data and functional models	3 1.1.1.2 Basic machine representation of non-numeric data 3 1.1.1.3 Finite precision of integer and floating point number representation 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 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 3 1.6.6 Application interface 3 2.10.10 Fostering creativity and opportunity finding 3 2.3.1 Measurement and modeling 3 3.1.2 Systems concepts: e.g., structure, boundaries, states, objectives 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, application generator, reuse, program generators, software implementation languages 3 3.8.2 Relating the application to the enterprise model 3 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	2 1.3.6 Object oriented extensions to languages 2 1.4.10 OS support for human interaction: e.g., GUI, interactive video 2 3.3.5 Behavior oriented (event modeling) methodologies 2 3.3.6 Object oriented methodologies 2 3.9.6 Human-computer interaction (e.g., ergonomics, graphical-user interfaces, voice, touch)
103	to be able to develop program tests and system tests	construct effective queries using both structured and unstructured query tools	3 1.1.1.3 Finite precision of integer and floating point number representation
		reverse engineer data flows from fourth GL applications to ensure verification	3 1.1.1.4 Errors in computer arithmetic and related portability issues 3 1.1.1.5 Basic concepts of computer architecture 3 1.2.1 Formal problems and problem solving 3 1.2.4 Abstract data types 3 1.3.4 Non-procedural languages: logic, functional, event driven 3 1.6.7 Intelligent query processors and query organization, OLAP tools 3 3.10.2 Software systems construction: e.g., programming, unit testing , load module packaging 3 3.11.2 Reverse and re-engineering 3 3.8.3 Requirements determination and specification 3 3.9.7 Software development
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	2 1.3.1 Fundamental programming language structures; comparison of languages and applications 2 1.3.5 Fourth-generation languages 2 1.3.6 Object oriented extensions to languages 2 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	4 2.10.6 Proactive attitude and approach 4 2.10.8 Principle centered leadership 4 2.3.5 Group decision process 4 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 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	4 2.3.5 Group decision process 4 2.4.3 Group dynamics 4 2.4.3 Group dynamics 4 2.4.4 Teamwork, leadership and empowerment 4 2.4.8 Consensus building
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 discuss and apply mission directed work by aligning team mission to project mission by tracking to ensure the results	4 2.10.2 Interviewing, questioning and listening 4 2.10.8 Principle centered leadership 4 2.2.1 IS planning 4 2.3.5 Group decision process 4 3.10.7 Software project management: scoping, scheduling, configuration management, quality assurance; software reliability issues (safety, responsibility, risk assessment); maintenance 4 3.9.4 Techniques to enhance the creative design process

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 explain functions of IS management, CIO, project manager ...	3 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 3 2.2.15 Management of sub-functions 3 2.2.7 CIO and staff functions 3 2.3.2 Decisions under certainty, uncertainty, risk 3 2.3.3 Cost/Value of information, competitive value of IS 3 3.10.9 Post implementation review 3 3.5.2 Planning the IS architecture 3 3.5.3 Planning for operations 3 3.6.1 Feasibility assessment 3 3.6.3 Contingency planning
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	4 1.1.1.1 Basic machine representation of numeric data
		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 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.)	4 2.1.5 Effect of IS on organizational structure; IS and continuous improvement 4 2.2.12 IS policy and operating procedures formulation and communication 4 2.2.13 Backup, disaster planning and recovery 4 2.2.2 Control of the IS function: e.g., EDP auditing, outsourcing 4 2.2.3 Staffing and human resource management 4 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS critical success factors 4 2.2.8 IS as a service function: performance evaluation -- external/internal, marketing of services 4 2.2.9 Financial administration of IS: e.g., funding and chargeout 4 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 4 3.1.5 Systems control: standards, control theory, feedback, loops, measurement, quality 4 3.10.2 Software systems construction: e.g., programming, unit testing , load module packaging 4 3.10.3 Software integration: e.g., packages 4 3.10.4 Systems conversion: approaches, planning, implementation 4 3.10.5 Systems integration and system testing: verification and validation, test plan generation, testing (acceptance testing, unit testing, integration testing, regression testing) 4 3.10.8 Systems installation 4 3.11.4 Systems and software maintenance concepts 4 3.2.1 Systems development models: e.g., SDLC, prototyping 4 3.2.2 Package acquisition and implementation 4 3.2.5 Selecting a systems development approach 4 3.3.7 Software engineering process and products 4 3.7.1 Project planning and selection of appropriate process model; project scheduling and milestones 4 3.7.12 Configuration management 4 3.7.2 Project organization, management, principles, concept and issues 4 3.7.6 Managing multiple projects 4 3.7.7 Management concerns; stress and time management 4 3.8.1 Problem opportunity identification: e.g., service requests, from planning process 4 3.9.7 Software development

118	to discuss and apply the concept of life-long learning	discuss and apply the concept of learning to learn continuously	
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 explain to a non-IS knowledge worker what they have to do to manage their information resources and requirements	3 1.1.1.2 Basic machine representation of non-numeric data 3 2.10.3 Presentation skills 3 2.10.8 Principle centered leadership 3 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 3 2.8.3 Privacy law 3 2.8.4 Agencies and regulatory bodies 3 3.7.4 Project staffing considerations: e.g., matrix management, human factors, team organization, reporting 3 3.7.9 User documentation (e.g., reference manuals, operating procedures, on-line documentation)

IS'2002. 10 Project Management and Practice

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)

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.

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 pr

EXPLANATION AND EXPECTATIONS

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

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	3 2.10.10 Fostering creativity and opportunity finding 3 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 and empowered actions	4 2.3.5 Group decision process 4 2.4.4 Teamwork, leadership and empowerment 4 2.4.8 Consensus building 4 3.4.2 Group-based methods: e.g., JAD, structured walkthroughs, design and code reviews
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	4 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 scheduling and milestones 4 3.7.14 Project tracking: e.g., PERT, Gantt 4 3.7.5 Project control: planning, cost estimation, resource allocation, software technical reviews, measurement, analysis, feedback, communications, ensuring quality, scheduling, milestones
108	to select the proper project management tools and demonstrate their use	use project management concepts and tracking tools (PERT, GANTT) use project management techniques e.g. tracking, PERT, GANTT use CASE and other tools	4 3.4.1 CASE 4 3.7.14 Project tracking: e.g., PERT, Gantt 4 3.7.5 Project control: planning, cost estimation, resource allocation, software technical reviews, measurement, analysis, feedback, communications, ensuring quality, scheduling, milestones

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	2 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 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 1.6.11 Data and database administration 4 1.6.2 Data models: relational, hierarchical, network, object, semantic object 4 1.6.4 Integrity (referential, data item, intra-relation): representing relationships; entity and referential integrity 4 3.10.1 Systems construction 4 3.2.3 Integrating software components 4 3.5.1 Infrastructure planning: hardware, communications, database, site 4 3.5.2 Planning the IS architecture
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 solve the organizational problem and define the related database application	4 1.6.1 DBMS: features, functions, architecture 4 1.6.12 Data dictionary, encyclopedia, repository 4 1.6.2 Data models: relational, hierarchical, network, object, semantic object 4 1.6.3 Normalization 4 1.6.5 Data definition languages (schema definition languages, graphical development tools, dictionaries, etc.) 4 3.3.2 Data modeling: e.g., entity-relationship diagrams, normalization 4 3.8.3 Requirements determination and specification

121	to present and explain the evolving leadership role of information management in organizations	explain setting an ethical standard	3 2.10.6 Proactive attitude and approach 3 2.10.7 Personal goal setting, decision making, and time management
		explain the relevance and use of a professional code of ethics	3 2.2.1 IS planning
		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	3 2.2.5 Determining goals and objectives of the IS organization 3 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS critical success factors 3 2.2.8 IS as a service function: performance evaluation -- external/internal, marketing of services
		explain the alignment of IS with organizational mission; explain the relationship of departmental processes with the strategic success of the organization	3 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
		explain budget planning and administration	3 2.4.6 Cognitive styles 3 2.4.7 Negotiating and negotiating styles 3 2.4.8 Consensus building
		explain and illustrate the application of ethical models, e.g. principle centered leadership, in project management standards and practice	3 2.8.6 Ethics: Personal and professional responsibility and codes; ethical models; ethical and social analysis
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	2 2.10.6 Proactive attitude and approach 2 2.10.7 Personal goal setting, decision making, and time management 2 2.2.1 IS planning
		explain and develop standards and policies which are involved in the development of information systems of organizational scope	
		explain the benefits of cross-functional teams in policy and procedure development	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 critical success factors 2 2.2.8 IS as a service function: performance evaluation -- external/internal, marketing of services
		explain the benefits of team mission statement development, and of aligning team missions with organizational missions	2 2.2.9 Financial administration of IS: e.g., funding and chargeout 2 2.4.4 Teamwork, leadership and empowerment 2 2.4.5 Use of influence, power and politics 2 2.4.7 Negotiating and negotiating styles 2 2.4.8 Consensus building 2 2.8.6 Ethics: Personal and professional responsibility and codes; ethical models; ethical and social analysis 2 3.10.7 Software project management: scoping, scheduling, configuration management, quality assurance; software reliability issues (safety, responsibility, risk assessment); maintenance 2 3.3.3 Data oriented methodologies
125	to discuss outsourcing and alternate implementations of the IS function	explain outsourcing as an alternative to an internal IS function (LO -0231)	2 1.1.3.8 Memory systems 2 2.1.6 Organizational structure: centralized, decentralized, matrix 2 2.2.12 IS policy and operating procedures formulation and communication
		define, explain, and compare from a cost-benefit perspective various outsourcing arrangements	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
		manage the IS function in a small organization	2 2.2.6 Managing IS as a business: e.g., customer definition, defining IS mission, IS critical success factors 2 2.2.8 IS as a service function: performance evaluation -- external/internal, marketing of services
		explain outsourcing	2 2.2.9 Financial administration of IS: e.g., funding and chargeout 2 2.3.3 Cost/Value of information, competitive value of IS 2 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	3 3.7.7 Management concerns; stress and time management	

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