MASTER OF SCIENCE
COMPUTING INFORMATION SYSTEMS
Program code: 1831

INTRODUCTION

The Department of Information Science offers a graduate program that leads to the degree of Master of Science in **Computing Information Systems (MSCIS)**. The program features a thesis and non-thesis option. The program allows students to select a group of courses that constitute a career-track. The program offers four career tracks: Information Systems Security, Information Systems Development, Data and knowledge Management, and Health Informatics. Each career track includes a core course and a set of track elective courses. The program is designed to allow its candidates acquire the knowledge, advanced skills, systems development methodologies, and technologies needed to design, manage, evaluate and implement Information Systems (ISs), applications and services within enterprises and organizations.

According to the University Council decision dated 4/2/2007, Thesis students admitted with effect from September 2007 are exempted from the comprehensive examination.

PROGRAM REQUIREMENT (Non-thesis option in parenthesis):

35(35)	**TOTAL COURSE CREDITS**	
14(14)	**GENERAL CORE COURSES**	
1831-511	Information Systems Infrastructure	(3)
1831-512	Information Systems Analysis, Modeling and Design	(3)
1831-513	Enterprise Models	(3)
2000-501	Scientific Writing and Communication Skills	(3)
2000-503	Ethics and Professionalism	(2)

3(6)	**ELECTIVE COURSES** (3 credits each)	
1831-514	Information System Strategy and Policy	
1831-516	Project and Change Management	
1831-517	Emerging Trends in Information System	
1831-533	Special Topic in Information Systems I	
1831-534	Special Topic in Information Systems II	
1831-540	Concepts in Information Systems Security	
1831-560	Advances in Information Systems Architecture and Design	
1831-570	Database Management Systems	
1831-580	Health Informatics	

9(12)   Track Courses
Student selects courses exclusively from one of the following four tracks as listed below.

TRACK 1: Information Systems Security
3(3)   COMPULSORY COURSES
1831-540   Concepts in Information Systems Security   (3)

6(9)   ELECTIVE COURSES (3 credits each)
A student (in the project option only) who is specialized in one of the following tracks is allowed to take one elective course from the other tracks with the condition that he/she gets the approval of the Program Director.
1831-541   Computer and Network Forensics
1831-542   Web Application Security
1831-543   Disaster Recovery Planning
1831-544   Information Security Strategies and Risk Management
1831-545   Special Topics in Information Systems Security I
1831-546   Special Topics in Information Systems Security II

TRACK 2: Information Systems Development
3(3)   COMPULSORY COURSES
1831-560   Advances in Information Systems Architecture and Design   (3)

6(9)   ELECTIVE COURSES (3 credits each)
A student (in the project option only) who is specialized in one of the following tracks is allowed to take one elective course from the other tracks with the condition that he/she gets the approval of the Program Director.
1831-561   Human Computer Interaction
1831-562   Design and Implementation of e-Governance
1831-563   Information System Testing, Quality Assurance, and Maintenance
1831-564   Design and Implementation of e-Commerce
1831-565   Special Topics in Information Systems Development I
1831-566   Special Topics in Information Systems Development II

TRACK 3: Data and Knowledge Management
3(3)   COMPULSORY COURSES
1831-570   Database Management Systems   (3)

6(9)   ELECTIVE COURSES (3 credits each)
A student (in the project option only) who is specialized in one of the following tracks is allowed to take one elective course from the other tracks with the condition that he/she gets the approval of the Program Director.

1831-571   Data Mining and Information Retrieval
1831-572   Data Warehousing and Enterprise Databases
1831-573   Knowledge Management and Decision Support
1831-574   Data Visualization
1831-575   Special Topics in Data and Knowledge Management I
1831-576   Special Topics in Data and Knowledge Management II

TRACK 4: Health Informatics
3(3)   COMPULSORY COURSES
1831-580   Health Informatics   (3)

6(9)   ELECTIVE COURSES (3 credits each)
A student (in the project option only) who is specialized in one of the following tracks is allowed to take one elective course from the other tracks with the condition that he/she gets the approval of the Program Director.

1831-581   Advanced Health Informatics
1831-582   Health Informatics Knowledge Management
1831-583   Legal, Ethical, and Social Issues in Health Informatics
1831-584   Mobile and e-Health Informatics
1831-585   Special Topics in Health Informatics I
1831-586   Special Topics in Health Informatics II

9(3)   COMPOLSORY COURSES
1831-593   Project   (3) (non-thesis option only)
1831-597   Thesis   (0)
1831-598   Thesis   (0)
2000-599   Thesis   (9)

COURSE DESCRIPTION

**1831-511: INFORMATION SYSTEMS
                    INFRASTRUCTURE
                    CR: 3**
This course addresses the advanced concepts and practice of acquiring and setting the main building blocks of information systems (ISs) infrastructure for enterprise applications. Topics covered include ISs architecture and classifications, enterprise information infrastructure, enterprise network design & architecture, server architecture, web services, enterprise LAN/WAN services, storage identification and management, wireless

technologies, network security, systems platform, and resource management.

1831-512: INFORMATION SYSTEMS ANALYSIS, MODELING AND DESIGN
CR: 3

This course emphasizes modern object-oriented methods for information system analysis and design. Topics covered include: Systems development life cycle, analysis and design techniques, information systems planning and project identification & selection, requirements collection and structuring, process modeling, conceptual and logical data modeling, system design, design of human-computer interface, and system maintenance. The course also exposes students to the use of current generation tools such as rapid application development, prototyping, and visual development. Students are required to complete a term project.

1831-513: ENTERPRISE MODELS
CR: 3

This course provides a process-oriented view of the organization and its relationship with suppliers, customers, and competitors. Topics covered include: processes as vehicles for achieving strategic objectives and transforming the organization, process analysis, design, implementation, control and monitoring, processes as means of achieving compliance, impact on work, the role of enterprise resource planning (ERP), supply chain management (SCM), and customer relationship management (CRM) systems. The course also covers process continuum from structured to unstructured processes, impact on work practices, roles of systems in transforming organizations and markets, and the global perspectives.

1831-514: INFORMATION SYSTEMS STRATEGY AND POLICY
CR: 3 PR: 1831-513

This course covers the top management, strategic perspective for aligning competitive strategy, core competencies, and information systems. The course also covers the development and implementation of policies and plans to achieve organizational goals including defining the systems that support the operational, administrative, and strategic needs of the organization, its business units, and individual employees. Covered also are approaches used to manage information system functions in organizations, including examination of the dual

challenges of effectively controlling the use of well-established information technologies, while experimenting with selected emerging technologies. Role of the CIO is also covered.

1831-516: PROJECT AND CHANGE MANAGEMENT
CR: 3 PR: 1831-512

This course emphasizes managing projects within an organizational context. Topics include the processes related to initiating, planning, executing, controlling, reporting, and closing a project, project integration, scope, time, cost, quality control, and risk management, software size and cost estimation, assigning work to programmer and other team members, monitoring progress, version control, managing the organizational change process, identifying project champions, working with user teams, training, and documentation. Covered also are the change management role of the IS specialist, the use of sourcing and external procurement, contracts and managing partner relationships.

1831-517: EMERGING TRENDS IN INFORMATION SYSTEMS
CR: 3 PR: 1831-511

This course addresses emerging trends in information systems (ISs) design, implementation, and security. It emphasizes the growth of ISs and the effect of international political, social, economic and cultural factors on their evolvement. Topics covered include IS agility issues, enterprise resource planning (ERP) & forecasting, technology related privacy concerns, international perspectives on emerging technologies, future organizational and customer trends. The course also covers topics related to ISs technology forecasting methodologies including monitoring, expert opinion, and trend analysis.

1831-533: SPECIAL TOPICS IN INFORMATION SYSTEM I
CR: 3 PR: 1831-511, 1831-512, 1831-513

A set of most-up-to-date topics related to the field of Information Systems will be studied in this course.

1831-534: SPECIAL TOPICS IN INFORMATION SYSTEMS II
CR: 3 PR: 1831-511, 1831-512, 1831-513

A set of most-up-to-date topics related to the field of Information System will be studied in this course.

1831-540: CONCEPTS IN INFORMATION SYSTEMS SECURITY
CR: 3 PR: 1831-511

This course allows students to gain fundamental understanding of cryptography and security protocols, and their applications in various areas, including operating system security, database security, software security, and networking security. Emphases are on cryptanalysis and cipher security. Covered also are the DES algorithm, block and cipher feedback modes, the AES algorithm, public-key cryptography, the RSA algorithm, message authentication, hash functions, network encryption, and network attacks. Covered also are ethics and legal issues, and management of security systems.

1831-541 COMPUTER AND NETWORK FORENSICS
CR: 3 PR: 1831-540

This course covers cyber-attack prevention, planning, detection, response, and investigation with the goals of counteracting cybercrimes, and making the responsible persons/groups accountable. Topics covered include: fundamentals of digital forensics, forensic duplication and analysis, network surveillance, intrusion detection and response, incident response, anti-forensics techniques, anonymity and pseudonymity, cyber law, computer security policies and guidelines, and case studies.

1831-542 WEB APPLICATION SECURITY
CR: 3 PR: 1831-540

The course provides students with better understanding of web application vulnerabilities, specifically covering OWASP Top 10 and mitigation strategies to ensure applications are tested and secured against the latest threats. Focus will be on practical experience using vulnerability scanners and web proxy tools to detect and prevent input validation flaws. Cross-Site Scripting (XSS), Cross-Site Request Forgery (CSRF), SQL Injection, as well as in-depth understanding of authentication, access control, and session management, their weaknesses, how they can be hijacked, and how they are best defended.

1831-543 DISASTER RECOVERY PLANNING
CR: 3 PR: 1831-540

This course explores an in-depth coverage of disaster recovery planning including techniques to prevent, detect, and recover from loss of information availability. Particular emphasis is placed on assessing threats which may lead to disastrous events, evaluating control alternatives and implementing strategies. The course helps students to formulate a disaster and recovery plan, and test and implement the plan in the form of a project.

1831-544 INFORMATION SECURITY STRATEGIES AND RISK MANAGEMENT
CR: 3 PR: 1831-540

This course covers the strategies, procedures and policies to manage and mitigate risk in information systems. It also covers risk analysis techniques that can be used to identify and quantify both accidental and malicious threats to computer systems within an organization. In addition to technical solutions, the course considers strategies and policies that will provide cost effective and highly secure systems.

1831-545 SPECIAL TOPICS IN INFORMATION SYSTEMS SECURITY I
CR: 3 PR: 1831-540

A set of most-up-to-date topics related to the field of Information Systems Security will be studied in this course.

1831-546: SPECIAL TOPICS IN INFORMATION SYSTEMS SECURITY II
CR: 3 PR: 1831-540

A set of most-up-to-date topics related to the field of Information Systems Security will be studied in this course.

1831-560: ADVANCES IN INFORMATION SYSTEMS ARCHITECTURE AND DESIGN
CR: 3 PR: 1831-512

This course provides a working knowledge of the terms, principles and methods of information system architecture and module design. It explains the constraints on the design and the properties of capacity, response time, consistency, and concurrency. Topics include: architectural styles and patterns, interface isolation, decoupling, reuse, data structures, design simplification and refactoring, generalized design solutions for information system design problems, and the reuse of design patterns.

1831-561: HUMAN COMPUTER INTERACTION (HCI)
CR: 3 PR: 1831-560

This course covers the topics of human characteristics and their impacts on developing

human-centered information systems, fit between human, technology, and tasks to achieve high performance and satisfaction within organizational and business context, HCI development processes that concerns the entire lifecycle of the information system, HCI evaluation concerns, techniques, issues, and standards. Covered also in the course are the organizational and business context of HCI, interactive technologies, ergonomic engineering, cognitive engineering, affective engineering, Evaluation issues, concerns, techniques and standards, HCI design principles and guidelines, tasks in organizational context, componential design, HCI development methodology and its relation to systems analysis and design, impacts of HCI on users, organizations, and society, and business value of HCI.

1831-562: DESIGN AND IMPLEMENTATION OF E-GOVERNANCE
CR: 3 PR: 1831-560

This course addresses the design and implementation aspects of e-Governance. Students will be exposed to concepts and models of e-Government including stockholders and their rights. Topics include e-Government infrastructure, m-Government, v-Government, public administration & public policy, analysis of standards of e-Governance, transparency and Information Act. Management of e-Governmental database including security issues, integration of distributed systems including heterogeneous databases of different departments and regions are also discussed in the course.

1831-563: INFORMATION SYSTEM TESTING, QUALITY ASSURANCE, AND MAINTENANCE
CR: 3 PR: 1831-560

This course covers the concepts and techniques for testing an information system and assuring its quality. Topics include software testing at all levels, integration testing, techniques of test data selection, test oracle design, test data analysis, static vs. dynamic analysis, functional testing, inspections, software quality assessment, software maintenance, configuration management, and capacity management.

1831-564: DESIGN AND IMPLEMENTATION OF E-COMMERCE
CR: 3 PR: 1831-560

This course starts by introducing the concepts of e-commerce including nature and scope of e-commerce, success & failure of e-commerce operations and identifying key factors in their success or failure, promotional strategies, monitoring and adjusting e-commerce strategies. The course continues with e-commerce tools, e-commerce design, and e-commerce development. The course helps students to build fully functional web sites using database and client- and server-side technologies.

1831-565: SPECIAL TOPICS IN INFORMATION SYSTEMS DEVELOPMENT I
CR: 3 PR: 1831-560

A set of most-up-to-date topics related to the field of information systems development will be studied in this course.

1831-566: SPECIAL TOPICS IN INFORMATION SYSTEMS DEVELOPMENT II
CR: 3 PR: 1831-560

A set of most-up-to-date topics related to the field of information systems development will be studied in this course.

1831-570 DATABASE MANAGEMENT SYSTEMS
CR: 3 PR: 1831-512

The objective of this course is to help students develop their data organization and management skills by introducing them to the fundamentals of data collections, retrieval, storage, and processing. Topics covered include: data organization and management techniques, conceptual data modeling, organizational data implementation issues, data warehousing current and emerging techniques, business intelligence, organization data/information security, data stream management, data management tools, customer relationship management, business performance management, and decision making.

1831-571: DATA MINING AND INFORMATION RETRIEVAL
CR: 3 PR: 1831-570

This course explores web mining as the discovery of knowledge from online resources such as web page content, a hyperlink structure, and a usage log, to mention a few. Using the already learned knowledge in the Data Management course, this course allows students to use web mining techniques to broaden their selection of data sources. In addition, students will learn various online and offline information retrieval models,

algorithms, principles, and techniques on data sources such as text.

1831-572: DATA WAREHOUSE AND ENTERPRISE DATABASES
CR: 3 PR: 1831-570

The purpose of this course is to provide a comprehensive in-depth coverage on managing enterprise databases. The main part of this course covers concepts and techniques in the design, implementation, and administration of a data warehouse. Topics covered include: data warehouse architectures, logical and physical design issues, technical factors, and implementation considerations. The course also introduces Online Analytical Processing (OLAP) and multi-dimensional operations. The course also addresses database access standards for enterprise database systems. Special data warehousing concepts for CRM and web-based enterprise databases are also addressed.

1831-573: KNOWLEDGE MANAGEMENT AND DECISION SUPPORT
CR: 3 PR: 1831-570

This course covers knowledge management (KM) in large organizations doing business and/or providing services over the web. The course addresses issues that are involved in creating, organizing, and using knowledge in web applications. The topics include KM life cycle model, ontology modeling, role of standards, resource description framework (RDF), and business rules and automated reasoning mechanisms. The course also covers applications in decision support systems, expert systems, and recommendation systems.

1831-574: DATA VISUALIZATION
CR: 3 PR: 1831-570

This course covers the foundations of visually displaying data both for presentation and data analyzing tasks. The goals of the course include data description, understanding, presentation, discovery and analysis. The course starts by graphs and charts foundation, followed by introducing algorithms used to visualize scientific data sets. The course moves on to provide applications from several environments with both real and simulated datasets.

1831-575: SPECIAL TOPICS IN DATA AND KNOWLEDGE MANAGEMENT I
CR: 3 PR: 1831-570

A set of most-up-to-date topics related to the field of Data and Knowledge Management will be studied in this course.

1831-576: SPECIAL TOPICS IN DATA AND KNOWLEDGE MANAGEMENT II
CR: 3 PR: 1831-570

A set of most-up-to-date topics related to the field of Data and Knowledge Management will be studied in this course.

1831-580 HEALTH INFORMATICS
CR: 3 PR: 1831-513

This course covers the concepts of health informatics and explores the impact of Information Technology (IT) on healthcare enterprise. Topics covered include: introduction to healthcare information, healthcare data Quality; identification of healthcare organization business functions and their modeling, current and emerging use of clinical information systems, healthcare information system standards and security issues. The course also covers the topics related to strategic planning for healthcare information systems and health IT leadership. The course helps students to plan and build healthcare information systems through a set of course projects.

1831-581: ADVANCED HEALTH INFORMATICS
CR: 3 PR: 1831-580

This course explores the latest advances in health informatics and the electronic applications in healthcare delivery and management. The course explores the recent impact of IT on the healthcare domain in improving the health related complex decisions, efficient and accurate diagnostics procedure, effective healthcare delivery, and rehabilitation. The topics covered include IT applications in surgical decisions, genetics explorations, cancer detection, medical imaging, and ultrasound.

1831-582: HEALTH INFORMATICS KNOWLEDGE MANAGEMENT
CR: 3 PR: 1831-580

The goal of this course is to characterize healthcare knowledge and to examine the technical issues related to the development and deployment of knowledge management solutions for managing healthcare knowledge to support three main activities: Clinical decision support, practitioner

and patient education, and health administration. The course examines technical issues related to the management of healthcare knowledge from an enterprise perspective. It deals with methods to capture, organize and utilize healthcare knowledge to improve the delivery of healthcare. The course is designed along the lines of the standard knowledge management lifecycle, including topics that address knowledge acquisition, organization, processing, sharing and operationalization within a healthcare enterprise.

1831-583: LEGAL, ETHICAL, AND SOCIAL ISSUES IN HEALTH INFORMATICS
CR: 3 PR: 1831-580

This course addresses the legal, ethical, and social issues related to healthcare informatics. The course covers regulatory informatics requirements as they apply to healthcare data and information management systems. Topics covered include: privacy and security, fraud and abuse, confidentiality, antitrust law, intellectual property, disclosure, and compliance programs.

1831-584: MOBILE AND E-HEALTH INFORMATICS
CR: 3 PR: 1831-580

This course explores the changes occurring in the structure and delivery of health services as a result of technologies such as the Internet and mobile devices including smart phones and tablets. Topics include the provision of health services and information via mobile technologies such as mobile phones and wearable sensors, e-health records, e-public information systems, and specific applications of e-health such as e-rehabilitation, e-medicine, e-homecare, e-diagnosis support systems, telemedicine and e-health intelligence. The course also covers strategies in e-healthcare technology management, e-health security issues, and the impacts of e-technologies.

1831-585: SPECIAL TOPICS IN HEALTH INFORMATICS I
CR: 3 PR: 1831-580

A set of most-up-to-date topics related to the field of Health Informatics will be studied in this course.

1831-586: SPECIAL TOPICS IN HEALTH INFORMATICS II
CR: 3 PR: 1831-580

A set of most-up-to-date topics related to the field of Health Informatics will be studied in this course.

1831-593: PROJECT
CR: 3

The student undertakes an independent project on a research topic of theoretical and/or experimental focus under the supervision of a faculty member listed in the supervisory list of the College of Graduate Studies. The objective is to provide the student with an opportunity to integrate and apply the knowledge gained throughout the course of study in a practical problem. The student must document the project in a scientific report following standard research writing guidelines and give a public presentation to the project examination committee.

1831-597: THESIS
CR: 0

1831-598: THESIS
CR: 0

2000-599: THESIS
CR: 9