MS (IT) – Master of Science in Information Technology

Program Philosophy
This intensive program is designed for students who have obtained their Bachelor’s degree in science, commerce, arts or management and wish to build a professional career in Information Technology. The courses have been carefully designed to take the student through from basic concepts to current practice in industry, and hands-on laboratory experience is emphasized at every stage of the program.

Profile of the Graduate of this program
At the end of this intensive two-year program, it is expected that a Graduate of the program will be well-trained in three important and complementary requirements for building a successful IT career. These are: a sound theoretical foundation; an ability to analyze, conceptualize and design systems; and fluency with modern software design and development tools. With these abilities, a Graduate of this program can expect to build a satisfying career in the challenging field of Information Technology – as software engineer, analyst, system designer, team leader.

List of Courses
(NB: Exact credit structure and sequencing of courses subject to review.)

**Semester I**
- Mathematics 3-1-0-4
- Computer Systems & Networks 3-0-2-4
- Database Design & Programming 3-0-4-5
- Computer Programming 2-0-4-4
- IT Skills 2-0-4-4
- **Total credits:** 21
- **Hours per week:** 28

**Semester II**
- Object-Oriented Programming 3-0-4-5
- Algorithms and Data Structures 3-0-2-4
- Systems and Network Programming 3-0-2-4
- Web Applications & Programming 3-0-4-5
- Network Economy & Society 3-0-0-3
- Communication Skills 2-0-0-2
- **Total credits:** 23
- **Hours per week:** 29

Summer Internship (on-campus) 04
Semester III

Object-Oriented Analysis & Design  3-0-2-4
Software Engineering  3-0-2-4
Principles of Management  3-0-0-3
Technical Elective I  (min)  3-0-0-3
Technical Elective II  (min)  3-0-0-3

Total credits:  17 (min)  
Hours per week:  19 (min)

Semester IV

IT Project  Full-time  16

Credits required for graduation:  83

Course Outlines

[Mathematics (3-1-0-4) This course introduces the basic mathematical concepts useful in analyzing and designing information systems. Topics include: propositional logic; sets, relations and functions; partial orders; graphs and trees; phrase structure grammars, regular expressions and finite state machines. Basic numerical techniques: round-off and truncation errors; solution of a system of linear equations; Newton-Raphson method; numerical integration; curve-fitting.

Computers Systems & Networks (3-0-2-4) Computer systems, in their hardware and software components, are key elements of IT. This course brings out the basic hardware architecture of a computer system and a computer network – processor, main memory, functional units; the I/O subsystem; number systems; basic concepts of combinational and sequential circuits; characteristics of various peripheral devices; types of computer networks and characteristics of associated network devices.

Database Design & Programming (3-0-4-5) This course covers information systems design and implementation within a database management system environment. Students will design and construct a physical system using database software to implement the logical design. Topics include data models and modeling tools/techniques; structured and object design approaches; models for databases: relational and object oriented designs; query languages; design and planning of client-server applications.]
Computer Programming (2-0-4-4) This course aims to develop proficiency in programming skills, using the programming language C as the vehicle. In addition, students are also expected to learn the basic productivity tools such as word-processors, spreadsheets and presentation software.

IT Skills (2-0-4-4): Understanding customer requirements and proposing design solutions is an integral part of an IT professional’s work. Therefore, basic IT productivity skills, must be acquired by any person working in the field of IT. This practice-oriented course introduces the student to some of the basic skills which will prove useful to him/her in achieving professional success.

Communication Skills (2-0-0-2): This course is designed to provide students with (a) the skills to enhance communication – both verbal and written, as well as presentations skills, (b) skills for job interviews (c) self-motivation and measurable goal-setting, (d) professional behavior, and (e) principles of consultation as an appropriate tool for relating to others.

Object-Oriented Programming (3-0-4-5) This course introduces the fundamental concepts of programming from an object-oriented perspective. Topics include: the object model; classes, objects, methods and messages, encapsulation and inheritance, interface and implementation, reuse and extension of classes, inheritance and polymorphism. The student develops his programming skills, and is introduced to good software engineering principles, in the context of an object-oriented programming language.

Algorithms and Data Structures (3-0-2-4) This course introduces the basic concepts and techniques of data structures and algorithms. These include stacks, queues, arrays, linked lists, trees, graphs, algorithms for manipulating data structures, binary trees, balancing trees and hashing. The course also covers the file processing environment, file organization, searching and sorting. Students will implement algorithms using C++ or Java.

Systems and Network Programming (3-0-2-4) This course brings out the design, structure and functions of operating systems and network software, with examples and case studies taken from systems presently used widely. Topics such as system architecture, design issues, current technologies, the Internet protocol stack, performance issues and applications will be discussed, and typical user level and programming interfaces will be introduced.

Web Applications & Programming (3-0-4-5) This course focuses on client-server web applications built using different technologies such as HTTP, ASP, XML and sockets; implementation of a database-driven website, and study of the relevant technologies and performance tradeoffs at each tier of the architecture. Students will build a distributed
system using distributed object frameworks such as CORBA or Web Services. Security issues and strategies in an enterprise-wide web-based application will also be discussed.

Network Economy & Society (3-0-0-3) This is a sociology/economics course aimed at analyzing the relationships between information technologies and the society. Topics discussed include: Technology and society; the Information Technology revolution; the Internet society; the network economy; the network enterprise and transformation of work, management and employment; the digital divide; and the issues of governance and politics. The concluding theme touches on technology and social responsibility.

Object-Oriented Analysis & Design (3-0-2-4) This course introduces the Object Oriented Analysis and Design methods using the Unified Modeling Language (UML). Topics include: Review of concepts related to the object model; the process and relevant notation of object-oriented requirements specification, analysis and design; case studies and applications using an object oriented design tool and programming language.

Software Engineering (3-0-2-4) An IT professional needs to have a good understanding of the principles of software engineering, so that he or she can contribute effectively towards the planning and development of software and software systems. This course teaches the fundamentals of software engineering, the life cycle models, and the software process phases including requirements engineering, design, coding, testing and quality assurance.

Principles of Management (3-0-0-3) This course is an introduction to the various aspects of management of business: Types of organization; basic concepts of financial management; product development; marketing; operations management; quality management; personnel management; importance of team-work, creativity, personal management and communication skills.

IT Project (Full-time) A system will be designed and developed by the student under the guidance and supervision of a guide from industry and/or a faculty member. The work will follow the full system development life cycle, with stage-wise reviews. As part of the completion requirements, the student will present a report and documentation based on the completed project work. Assessment of the project will be through milestone reviews and phase-end reviews, in terms of quality of design, time-bound progress, the quality of implementation and documentation.

Possible electives:

- Multi-media Technology
- Remote Sensing & GIS
- Information Systems Security
- Data Warehousing & Mining
- Distributed Computing for IT Systems
- Methods of Optimization