



A New and Exciting Master of Science Degree in
Information Technology

<http://www.eecs.ku.edu/MSIT>

Department of Electrical Engineering and Computer Science
University of Kansas Edwards Campus

An Exciting New MS Degree in Information Technology

According to the U.S. Department of Labor, employment opportunities in information technology (IT) will be among the fastest growing in the U.S. for many years to come.

KU's Department of Electrical Engineering & Computer Science (EECS) is now proudly offering a new Master's of Science in Information Technology (MSIT). The new program is motivated by the above statement and is a direct response to the opportunities and challenges presented by the ever expanding information technologies as it relates to economic growth of the Kansas City metropolitan area.

The MSIT program will uniquely blend graduate courses in computer science (e.g., database management systems, information retrieval, programming languages), Internet engineering, information security, and software engineering/management to offer advanced education (combined with applied research opportunities) in contemporary information technology (IT) — a kind of hybrid knowledge and expertise that is essential in making important IT decisions and contributions.

The program is aimed both at practitioners seeking to enhance and upgrade their technical knowledge, and at recent graduates in computing sciences, business information systems, and other information technology related disciplines who wish to pursue advanced studies.

The educational opportunities offered by the new degree will help recent graduates and existing high-tech practitioners gain advanced knowledge, hence improved productivity and enhanced competitiveness. In the long-term, the educational varieties and their related applied research opportunities will help area industries to more effectively retain their existing IT infrastructures and encourage their expansion.

The new degree reflects the KU mission statement and its commitment to offer the highest quality professional and graduate programs to serve the workforce, economic and community development needs of the region.

Location and Scheduling Convenience

The new MSIT program is specifically designed for the software and IT professionals in the Kansas City metropolitan area to address their needs while accommodating their scheduling constraints and thus it is offered at the KU Edwards Campus in Overland Park.

By locating the program at the Edwards Campus, the EECS department is able to better address the KU's mission statement in offering high quality professional and graduate programs to serve the workforce, economic, and community development needs of the Kansas City metropolitan area, and is able to offer a program in which practitioners in information-intensive industries can earn a degree during the evenings without interrupting their professional careers.

To accommodate the IT professionals' busy day-time schedules, all MSIT courses are offered during the evening hours and each course meets once a week to minimize the overhead in driving to the campus. The program includes 30-33 credit hours and can be completed in two years. All courses are taught by highly qualified faculty who have earned Ph.D. degrees from well-known U.S. institutions of higher education and who are known nationally and internationally for their research contributions.

Admission Requirements

The admission requirements to the Master's of Science in Information Technology are the same as the requirements for admission to other EECS master's degree programs (see: www.eecs.ku.edu/graduate) and include the following:

Undergraduate Degree Requirement. An applicant is expected to have a baccalaureate degree in computer science or computer engineering with a GPA of 3.0+. However, a student with good preparation in some other field of engineering, mathematics, business, or science will qualify. The minimum GPA requirement may be waived, based on documented work experience and strong credentials.

GRE Requirement. Applicants should demonstrate evidence of aptitude for graduate studies by suitable test scores on the Graduate Record Examination (GRE). Minimum scores are 600 on verbal reasoning, 600 on quantitative reasoning, and four on analytical writing. A strong score in one area (e.g., on quantitative reasoning) will compensate for a slightly lower score on another area (e.g., on verbal reasoning).

The requirement to take the GRE may be waived where other data, and in particular, the applicants' documented work experience, are judged to be strong.

Industrial Background Requirement. In addition to the above requirements, an applicant is expected to have industrial experience in IT, software development and management, or computer networking. Industrial work experience requirement will be waived for newly graduated students in a computing field with a 3.0+ GPA.

TOEFL Requirement. Unless the applicant's native language is English or the applicant has received a baccalaureate degree or higher from an accredited U.S. institution, he or she must meet the department's standard for the Test of English as a Foreign Language (TOEFL). Minimum scores are: 250 (computerized exam) or 600 (written exam).

How to Apply

Prospective applicants are encouraged to apply online at: www.graduate.ku.edu.

The online application should be accompanied by the following documents:

- One official copy of all university transcripts
- Statement of objective* and work experience summary[†]
- GRE score (see the admission requirements)
- TOEFL score (international students only)
- Three letters of reference[‡]

and sent via postal mail to the EECS Graduate Admission office:

EECS Graduate Admission
Eaton Hall 2001
University of Kansas
Lawrence, Kansas 66045

Application Due Dates. The official EECS application due dates are October 1st (for spring admissions) and March 1st (for fall admissions). Certain exceptions can be made for the MSIT program applicants.

*Describe your academic objectives, giving specific reasons for the selection of the graduate program degree in Information Technology.

[†]Please do not include a resume. Instead, briefly describe your professional work experience and responsibilities that are indicators of your practical competencies.

[‡]The letters of reference may be from current or former colleagues, supervisors or professors.

Program Completion Requirements

Course Requirements. There are two options for completing the MSIT degree:

1. **Thesis Option.** 24 credit hours of course work and six hours of thesis work
2. **Non-Thesis Option.** 33 credit hours of course work coupled with an oral exit exam

Focus Area Requirement. Regardless of the thesis/non-thesis option, a student should choose an “area of focus” for his or her graduate studies. The selection of an area of focus implies taking four or five courses in that area and when choosing the thesis option, completing the thesis research in that area.

There are currently three focus areas available under the Master’s of Science in Information Technology:

Software Engineering and Management. This focus area aims at uniting theory with industrial-strength practices to provide a solid education in software development, management and maintenance. The program contents emphasize skills in requirements engineering, software architecture, software project managements, software quality assurance and object technologies.

Internet Engineering. The focus area in Internet engineering covers important topics related to computer networks, networking performance tuning, routing architectures, information and network security, data retrieval, storage and transmission, and other important topics related to Internet applications and operations.

Information Security and Assurance. The focus area in information security and assurance will provide technical knowledge and practical skills in the science and methodologies for identifying important information assets, securing and protecting such assets, and assuring their availability for authorized users.

Focus Area Courses

The MSIT program includes common IT courses such as database management systems (EECS746), project management (EECS811), software engineering (EECS810), communication networks (EECS780), information search and retrieval (EECS767), and information security (EECS710). Each focus area will have its own required courses.

Required courses for the focus area in Software Engineering and Management include the following:

1. EECS810: Principles of Software Engineering
2. EECS811: Software Project Management
3. EECS814: Software Quality Assurance
4. EECS818: Software Architecture

Required courses for the focus area in Internet Engineering include the following:

1. EECS780: Communication Networks
2. EECS710: Information Security and Assurance
3. EECS767: Information Retrieval
4. EECS881: High-Performance Networking or
EECS882: Mobile Wireless Networking

Required courses for the focus area in Information Security include the following:

1. EECS710: Information Security and Assurance
2. EECS780: Communication Networks
3. EECS711: Security Management and Audit
4. EECS712: Network Security

MSIT Faculty

In addition to their academic background, most MSIT faculty also have extensive industrial/consulting experience.



Bo Luo (Ph.D., Penn State University, 2008), assistant professor. Expertise: XML access control enforcement mechanism, XML access control in native XML database vs. RDBMS-based XML database, Privacy preserving XML information brokerage.

Güneş Erçal-Özkaya (Ph.D., UCLA, 2008), assistant professor. Expertise: Game theory, graph theory, randomized algorithms, wireless networks, reliable routing, computational geometry, complexity theory, and machine learning.



Hossein Saiedian (Ph.D., Kansas State University, 1989), professor and associate chair. Expertise: Software project management, software process improvement, object-oriented technology, information security, database systems, software quality, software architecture.

James Sterbenz (D.Sc., Washington University, 1991), associate professor. Expertise: Resilient, survivable, and disruption-tolerant networks; mobile and wireless communication; programmable, active, and autonomic networking; high-performance systems and networks; Internet and PSTN protocols and architecture; design, modelling, and simulation of protocols and networks.



Preparing a Plan of Study

Early in the program a student must choose an adviser (upon admission, a student is assigned an initial graduate adviser, namely Professor Saiedian; however, the student may choose another EECS faculty as adviser based on his/her own academic/research interests). The student, together with the help of the adviser, must develop a Plan of Study that includes the courses that the student wishes to take to complete the program in a timely basis. Developing a plan of study has three important considerations:

1. Deciding on the thesis/non-thesis option; the graduate adviser will discuss the merits and challenges of each option.
2. Deciding on what EECS graduate classes should be taken. This decision is based primarily on the “focus area” chosen by the student. Each focus area has its own required and suggested supporting courses.
3. Deciding how many classes to take each semester and work out a schedule based on class prerequisites and when EECS graduate classes are offered.

Once the Plan of Study has been completed, it should be submitted online at: gradplan.engr.ku.edu.

Enrollment Planning Form. At the beginning of each semester, a student is required to complete an “enrollment planning form” that indicates what courses he or she plans to take. The student’s adviser must approve and sign the enrollment planning form to allow student’s registration. The enrollment planning form can be found at:

www.eecs.ku.edu/downloads/graduate/enrollment.pdf

Hold Removal. If a student does not have a Plan of Study on file, or if he/she has not prepared an enrollment planning form for a particular semester, he/she will not be able to enroll (his/her records will be “on hold”). An exception is made for the first semester of enrollment.

A Model Plan of Study

Focus Area: Software Engineering and Management

Thesis Option: Take the required core courses and four of the suggested electives.

Non-Thesis Option: Take the required core courses and seven of the suggested electives.

Course Title	Credit Hours
Required Core Courses	
EECS810: Principles of Software Engineering	3
EECS811: Software Project Management	3
EECS814: Software Quality Assurance	3
EECS818: Software Architecture	3
Required Course for All Graduates	
EECS802: EECS Colloquium	.2
Suggested Electives	
EECS710: Information Security and Assurance	3
EECS711: Security Management and Audit	3
EECS746: Database Management Systems	3
EECS761: Programming Paradigms	3
EECS764: Analysis of Algorithms	3
EECS780: Communication Networks	3
EECS812: Software Requirements	3
EECS816: Object-Oriented Software Engineering	3

A Model Plan of Study

Focus Area: Internet Engineering

Thesis Option: Take the required core courses and four of the suggested electives.

Non-Thesis Option: Take the required core courses and seven of the suggested electives.

Course Title	Credit Hours
Required Core Courses	
EECS780: Communication Networks	3
EECS710: Information Security and Assurance	3
EECS767: Information Retrieval	3
EECS881: High-Performance Networking OR	
EECS882: Mobile Wireless Networking	3
Required Course for All Graduates	
EECS802: EECS Colloquium	.2
Suggested Electives	
EECS746: Database Management Systems	3
EECS711: Security Management and Audit	3
EECS712: Network Security	3
EECS761: Programming Paradigms	3
EECS764: Analysis of Algorithms	3
EECS810: Principles of Software Engineering	3
EECS818: Software Architecture	3
EECS881: High-Performance Networking	3
EECS882: Mobile Wireless Networking	3

A Model Plan of Study

Focus Area: Information Security

Thesis Option: Take the required core courses and four of the suggested electives.

Non-Thesis Option: Take the required core courses and seven of the suggested electives.

Course Title	Credit Hours
Required Core Courses	
EECS710: Information Security and Assurance	3
EECS711: Security Management and Audit	3
EECS712: Network Security	3
EECS780: Communication Networks	3
Required Course for All Graduates	
EECS802: EECS Colloquium	.2
Suggested Electives	
EECS746: Database Management Systems	3
EECS767: Information Retrieval	3
EECS761: Programming Paradigms	3
EECS764: Analysis of Algorithms	3
EECS810: Principles of Software Engineering	3
EECS882: Mobile Wireless Networking	3
EECS818: Software Architecture	3
EECS819: Cryptography	3

The Thesis Option

A student interested in the thesis option should choose an area of research as early in his/her graduate program as possible and identify a *thesis adviser* who would be interested in supervising the thesis work. The student together with his/her adviser will then select the other two thesis committee members. The process will proceed as follows:

1. During the first year of graduate studies, the student, together with the help of the adviser, should define an “open problem” statement as the basis for the thesis research.
2. The student should continually research that area (obtain and read related articles) and refine and more formally define the problem statement.
3. Ideally the actual thesis work (and the enrollment in the thesis hours, i.e., EECS899) should be planned over a period of one year (not one semester). During this period, the student should regularly visit with his/her thesis adviser.
4. The thesis defense should be planned during the last semester of graduate studies. During the spring semesters, the defense should be scheduled no later the third week of April; during the fall semesters, the defense should be scheduled no later than the third week of November.
5. The thesis manuscript should be released to the committee members at least three weeks prior to the defense date.
6. Thesis defense presentation will be formal and open to the public. Announcements will have to be posted on the departmental bulletin boards and by means of electronic mail.
7. The presentation of defense should take about 40 minutes. After the presentation, the first Q/A session starts during which the audience and committee members may ask questions. After the first Q/A session, the audience is dismissed and a second Q/A session begins. The graduate student will then be asked to leave the room and the committee members will make a decision.

Graduate School’s Due Dates. A student should be aware of the Graduate School’s due dates for the submission of the thesis and other paper work. The date is normally during the first week of May or December.

Course Descriptions

The following is a description of the EECS courses offered at the Edwards Campus.

EECS 710: Information Security and Assurance (3 credit-hours). *Critical information assets, information security, operating systems security, database security, network security, e-commerce security, security risks, encryption and cryptography, viruses, security management, security models. Prerequisites: Graduate standing in EECS*

EECS 711: Security Management and Audit (3 credit-hours). *Administration and management of security of information systems and networks, intrusion detection systems, vulnerability analysis, anomaly detection, computer forensics, auditing and data management, risk management, contingency planning and incident handling, security planning, e-business and commerce security, privacy, traceability and cyber-evidence. Prerequisite: EECS710*

EECS 712: Network Security (3 credit-hours). *Introduction to the basic concepts, components, protocols, and software tools to achieve secure communication in a public network. The concept of encryption, integrity verification, authentication, security models, and the robustness analysis. Emphasis on the application level protocols and vulnerabilities: firewalls, viruses, worm attack, Trojan horses, password security, secure multicast, biometrics, VPNs, internet protocols such as SSL, IPSec, PGP, and SNMP. The policies for access control, user privacy, and trust establishment and abuse in open environments such as eBay. Prerequisite: EECS780 or undergraduate communication network course*

EECS 746: Database Management Systems (3 credit-hours). *Introduction to Database Systems (3). Introduction to the concept of databases and their operations. Basic concepts, database architectures, storage structures and indexing, data structures: hierarchical, network, and relational database organizations. Emphasis on relational databases and retrieval language SQL. Theory of databases, normal forms, normalization, candidate keys, decomposition, functional dependencies, multivalued depen-*

dencies. Introduction to the design of a simple database structure and a data retrieval language. Prerequisite: Graduate standing in EECS

EECS 761: Programming Paradigms (3 credit-hours). *Advanced Programming Paradigms. An investigation of alternative programming paradigms and their representative effect on programming expressiveness and style. Emphasis is on a comparative understanding of a spectrum of programming paradigms, with some facility in the use of at least one typical language representative of each paradigm studied. This course will review and investigate as appropriate imperative, functional, object-oriented, parallel, logical, and scripting programming paradigms, plus additional paradigms as relevant. Prerequisites: Graduate standing in EECS*

EECS 764: Analysis of Algorithms (3 credit-hours). *Models of computations and performance measures; asymptotic analysis of algorithms; basic design paradigms including divide-and-conquer, dynamic programming, backtracking, branch-and-bound, greedy method and heuristics; design and analysis of approximation algorithms; lower bound theory; polynomial transformation and the theory of NP-completeness; additional topics may be selected from arithmetic complexity, graph algorithms, string matching, and other combinatorial problems. Prerequisite: EECS660*

EECS 767: Information Retrieval (3 credit-hours). *The objective of this course is to give students a hands on introduction to information retrieval systems. Classic textual information retrieval systems are studied, followed by presentation of current research in the area. Topics include: file structures, term-weighting schemes, text preprocessing, World Wide Web search engines, multimedia retrieval systems, artificial intelligence applications. Prerequisites: EECS 746 or graduate standing in EECS*

EECS 780: Communication Networks (3 credit-hours). *Comprehensive in-depth coverage of communication networks with emphasis on the Internet and the PSTN (wired and wireless). Extensive examples of protocols and algorithms are presented at all levels, including: client/server and peer-to-peer applications; session control; transport protocols, the end-to-end arguments and end-to-end congestion control; network architecture, forwarding, routing, signalling, addressing, and traffic manage-*

ment; quality of service, basic queuing (basic M/M/1 and Little's law) and multimedia applications; LAN architecture, link protocols, access networks and MAC algorithms; physical media characteristics and coding; network security and information assurance; network management. Prerequisites: Basic working knowledge of computer systems, the Internet, and probability and statistics; basic programming skills. Credit may not be received for both EECS563, EECS663 and EECS780.

EECS 800: Special Topics (3 credit-hours). Advanced courses on special topics of current interest in EECS given as the need arises.

EECS 801: Directed Graduate Readings (3 credit-hours). Graduate level directed readings on a topic in EECS, mutually agreed-on by the student and instructor. May be repeated for credit on another topic.

EECS 802: EECS Colloquium (0.2 credit-hours). A student is expected to attend 12 professional talks or presentations. These can be scheduled EECS/ITTC colloquium talks, MS thesis or PhD dissertation defenses, or professional talks or seminars. Prerequisites: None.

EECS 810: Principles of Software Engineering (3 credit-hours). Principles concepts in software engineering with a focus on formalism as well as managerial issues and a project-intensive approach; software development process models; software development life cycle activities; project management, requirements analysis, specification, design, implementation, testing, maintenance; metrics and planning. Prerequisite: Data Structures)

EECS 811: Software Project Management (3 credit-hours). Management issues in the creation, development, and maintenance of software. Various estimate techniques, planning, risk analysis, project administration and configuration management. Fundamentals of software process modeling and definition; process improvement, frameworks for quality software, process properties and measurements, capability maturity evaluation, validation and verification, applications of TQM and SQA to software. Prerequisite: Graduate standing in EECS

EECS 812: Software Requirements Engineering (3 credit-hours). *Objectives, processes, and activities of requirements engineering and requirements management; characteristics of good requirements; types of requirements; managing changing requirements; languages, notations and methodologies for modeling and defining the requirements; formal and semi-formal methods of presenting and validating the requirements; requirements standards; requirements tracability issues. Prerequisite: EECS810*

EECS 814: Software Quality Assurance (3 credit-hours). *Software quality engineering as an integral facet of development, from requirements through delivery, maintenance, and process improvement; inspections, manual and automated static analysis techniques, fundamental concepts in software testing, verification, validation, test case selection, testing strategies such as black-box testing, white-box testing, integration testing, regression testing, systems testing, acceptance testing; design for testability, fundamental concepts in software integration, configuration management, models for quality assurance; documentation; industry and government standards for quality. Prerequisite: EECS810*

EECS 816: Object-Oriented Software Development (3 credit-hours). *Abstract data types, classes and objects, polymorphic functions, class associations, modeling with objects, object-oriented analysis and design, components, frameworks, UML and the Rational Unified Process, reusability, design patterns, object management, CORBA. Prerequisite: EECS810*

EECS 818: Software Architecture (3 credit-hours). *Design methodologies, software architectural qualities; architectural styles; architecture and design; common architectural patterns and reuse; domain specific architectures; tradeoff analysis, software architecture case studies. Prerequisite: EECS810*

EECS 819: Cryptography (3 credit-hours). *Introduction to the mathematical background, basic concepts, components, and protocols to enforce secrecy, integrity, and privacy through cryptographic mechanisms. The concept of symmetric and asymmetric encryption, integrity verification, authentication, key establishment and update, and authorization. Emphasis on the design of protocols that apply and integrate various modules*

to achieve safety objectives: time-stamping, digital signature, bit commitment, fair coin-flip, zero knowledge proof, oblivious transfer, and digital cash. The policies for key generation and management, information storage and access control, legal issues, and design of protocols for real applications.

EECS 881: High-Performance Networking (3 credit-hours). *Comprehensive coverage of the discipline of high-bandwidth low-latency networks and communication, including high bandwidth delay products, with and emphasis on principles, architecture, protocols, and system design. Topics include high-performance network architecture, control, and signalling; high-speed wired, optical, and wireless links; fast packet, IP, and optical switching; IP lookup, classification, and scheduling; network processors; end system design and protocol optimization; network interfaces; end-to-end protocols, mechanisms, and optimizations; high-bandwidth low-latency applications; storage networks. Principles will be illustrated with many leading-edge and emerging protocols and architectures. Prerequisites: EECS 563 or 780.*

EECS 882: Mobile Wireless Networking (3 credit-hours). *Comprehensive coverage of the discipline of high-bandwidth low-latency networks and communication, including high bandwidth delay products, with and emphasis on principles, architecture, protocols, and system design. Topics include high-performance network architecture, control, and signalling; high-speed wired, optical, and wireless links; fast packet, IP, and optical switching; IP lookup, classification, and scheduling; network processors; end system design and protocol optimization; network interfaces; end-to-end protocols, mechanisms, and optimizations; high-bandwidth low-latency applications; storage networks. Principles will be illustrated with many leading-edge and emerging protocols and architectures. Prerequisites: EECS 563 or 780.*

EECS 899: Thesis (1-6 credit-hours). *A research project, designed and executed under the supervision of the chair and approval by members of the graduate committee. The student will develop and perfect a number of skills including the ability to design, conduct, analyze, and report the results in writing of an original, independent scientific investigation.*

Additional and Contact Information

EECS Graduate Web site. This information booklet is an abridged version of the EECS graduate catalog and includes the most essential information for the individuals interested in the MSIT program. Once admitted into the program, a student is strongly encouraged to visit the EECS's graduate Web site for additional information:

www.eecs.ku.edu/graduate

Other Web sites with important and useful information include:

- EECS Department www.eecs.ku.edu
- KU Edwards Campus www.ec.ku.edu
- University of Kansas www.ku.edu

Contact Information. You may direct all your questions and inquiries to the program director, Professor Hossein Saiedian:

Professor Hossein Saiedian
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**KU EDWARDS
CAMPUS**
The University of Kansas

12600 Quivira Road
Overland Park, KS 66213
(913) 897-8400

The mission of the KU Edwards Campus is to serve the workforce, economic, and community development needs of the region by bringing the high-quality academic programs, research and public service of the University of Kansas to the greater Kansas City community. The campus serves the workforce development needs of the region by providing working professionals with educational opportunities leading to master's and doctoral degrees in many areas.

The KU Edwards Camps is committed to providing its programs to all persons, regardless of race, religion, color, sex, disability, national origin, ancestry, sexual orientation, martial status, parental status, age or veteran status.

For enrollment and additional information, please call (913) 897-8400, or visit the Web site: www.ec.ku.edu.
