INFORMATION SYSTEMS, MS

Banner Code: VS-MS-ISYS

Academic Advising

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Modern information systems manage data, information and knowledge to support enterprise functions and decision making as well as human social activity over the Internet. Increasingly, these systems are distributed, collaborative, involve big data and hosted in the cloud.

The mission of the MSIS program is to allow students of diverse baccalaureate and professional backgrounds obtain a high-quality MS degree that:

- provides students with the theoretical knowledge and hands-on project experience needed to analyze, design, build, deploy, maintain, manage and promote effective organizational use of modern information systems;
- allows students to further specialize in related areas of big data, data and knowledge engineering, decision support systems, web-based software engineering and information security assurance; and,
- prepares students for careers in information systems in large and small organizations in both industry and government.

Career paths open to graduates include systems analyst, data administrator, database administrator, information architect, systems architect, decision analyst, data warehouse administrator, database application developer, web-based information systems designer and developer, information engineer, knowledge engineer, chief information officer, chief knowledge officer, chief privacy officer and project manager.

Admissions & Policies

Admissions

Eligibility and Application Requirements

Applicants must hold a four-year (120-credit) baccalaureate degree from an accredited institution and have earned a GPA of 3.00 or better in the last 60 credits. They also must meet the following requirements:

- Submit the appropriate application with two letters of recommendation from people directly knowledgeable of the applicant's professional and academic competence, a one-page goals statement, and a work résumé.
- Complete the self-evaluation section of the online application. This information is used by the admissions committee to assess an applicant's academic preparation for the MS program. Students with some deficiencies in preparation may be admitted provisionally pending completion of foundation courses required for the program.
- The GRE is only required for those who have not earned a Bachelor's degree from a US Institution.
- International students must submit their English proficiency scores.

Policies

Foundation Requirements

To ensure students have an adequate background in mathematical methods, computer technology, and programming knowledge, the program requires the following foundation courses or their equivalents:

- INFS 501 Discrete and Logical Structures for Information Systems
- INFS 515 Computer Organization Course and Operating Systems
- INFS 519 Program Design and Data Structures
- SWE 510 Object-Oriented Programming in Java

Prospective students are asked to complete a department self-evaluation form indicating whether previously taken courses may satisfy these foundation requirements. On acceptance, students are advised of the necessary foundation courses to be satisfactorily completed to meet this requirement. Foundation courses do not earn credit toward the MS degree; however, they must be successfully completed with a grade of B or better before enrolling in the core curriculum.

Students may test out to indicate they have the requisite knowledge for the foundations courses. The exams are given before classes begin in January and August, and can only be taken once. Registration is not required; students need only be present at the date, time, and location specified, and bring some form of photographic identification. Detailed information is available on the department web site. Students failing any of the exams must take the equivalent course before enrolling in the core curriculum courses.

Advising

The department holds orientation meetings in January and August to advise newly admitted and continuing students. Members of the faculty are present to answer questions and offer advice concerning programs of study. Detailed information is available on the department web site.

The department also provides an advising function to students, as outlined in the student advising form available from the department. Each student is assigned a faculty advisor with whom to confer on matters related to degree requirements. A plan of study form for the MS degree should be completed and submitted by the student soon after admission to the program. This plan serves as a guide for the student.

Requirements

Degree Requirements

Total credits: 30

Core Courses

To provide a common background in the fundamentals of information systems, the following core courses, which constitute the technical body of knowledge for the program, are required of all students:

CS 550	Database Systems	3
INFS 612	Principles and Practices of Communication Networks	3
INFS 622	Information Systems Analysis and Design	3

ISA 562	Information Security Theory and Practice	3
Total Credits		12

Electives

Six courses selected from the lists which follow.	18
Total Credits	18

Electives are organized into the following emphasis areas: database management, data mining, electronic commerce, software engineering, knowledge management, and information security and assurance.

In addition to the core courses taken as part of the MS-ISYS curriculum, students may choose an emphasis within the program by taking six courses from one of the emphasis areas listed below. Students may also choose electives spanning several emphasis areas; they may also plan their electives so as to obtain certificates offered by the department. A list of approved electives is given within emphasis areas and by graduate program. A full list follows. Special courses may be used as electives with prior approval of the student's academic advisor and the graduate coordinator.

Students, with the consent of a faculty sponsor and faculty advisor, may also elect courses in individualized study, special topics, or a 6-credit thesis (INFS 799 Thesis), which is primarily intended for students planning to pursue a PhD in information technology with a concentration in information systems.

Database Management

CS 530	Mathematical Foundations of Computer Science	3
CS 787	Decision Guidance Systems	3
INFS 623	Web Search Engines and Recommender Systems	3
INFS 740	Database Programming for the World Wide Web	3
INFS 760	Advanced Database Management	3
INFS 772	Intelligent Agents and the Semantic Web	3
INFS 796	Directed Readings in Information Systems	3

Data Mining

CS 504	Principles of Data Management and Mining	3
CS 530	Mathematical Foundations of Computer Science	3
CS 657	Mining Massive Datasets with MapReduce	3
CS 674	Data Mining on Multimedia Data	3
CS 782	Machine Learning	3
INFS 623	Web Search Engines and Recommender Systems	3
INFS 796	Directed Readings in Information Systems	3

Electronic Commerce

CS 530	Mathematical Foundations of Computer Science	3
INFS 640	Introduction to Electronic Commerce	3
INFS 770	Knowledge Management for E-Business	3
INFS 772	Intelligent Agents and the Semantic Web	3
INFS 774	Enterprise Architecture	3
INFS 796	Directed Readings in Information Systems	3
ISA 656	Network Security	3

Software Engineering

CS 530	Mathematical Foundations of Computer Science	3
SWE 619	Object-Oriented Software Specification and Construction	3
SWE 621	Software Modeling and Architectural Design	3
SWE 622	Distributed Software Engineering	3
SWE 625	Software Project Management	3
SWE 631	Software Design Patterns	3
SWE 632	User Interface Design and Development	3
SWE 637	Software Testing	3
SWE 642	Software Engineering for the World Wide Web	3
SWE 721	Reusable Software Architectures	3
SWE 727	Quality of Service for Software Architectures	3
SWE 795	Advanced Topics in Software Engineering	3

Knowledge Management

CS 530	Mathematical Foundations of Computer Science	3
CS 580	Introduction to Artificial Intelligence	3
CS 681	Knowledge Engineering	3
INFS 623	Web Search Engines and Recommender Systems	3
INFS 740	Database Programming for the World Wide Web	3
INFS 770	Knowledge Management for E-Business	3
INFS 772	Intelligent Agents and the Semantic Web	3
INFS 774	Enterprise Architecture	3
INFS 796	Directed Readings in Information Systems	3

Information Security and Assurance

CS 530	Mathematical Foundations of Computer Science	3
CS 531	Fundamentals of Systems Programming	3
ISA 652	Security Audit and Compliance Testing	3
ISA 656	Network Security	3
ISA 673	Operating Systems Security	3
ISA 674	Intrusion Detection	3
ISA 681	Secure Software Design	3
ISA 763	Security Protocol Analysis	3
ISA 764	Security Experimentation	3
ISA 785	Research in Digital Forensics	3
ISA 796	Directed Readings in Information Security	3

Certificates

Certificates may also be obtained in the following areas: Information Security and Assurance Graduate Certificate, Software Engineering Graduate Certificate, Foundations of Information Systems Graduate Certificate, and Web-Based Software Engineering Graduate Certificate.

Approved Electives

Information Systems (INFS)

INFS 623	Web Search Engines and Recommender Systems	3
INFS 640	Introduction to Electronic Commerce	3
INFS 697	Topics in Information Systems	1-6
INFS 740	Database Programming for the World Wide Web	3
INFS 760	Advanced Database Management	3
INFS 770	Knowledge Management for E-Business	3
INFS 772	Intelligent Agents and the Semantic Web	3
INFS 774	Enterprise Architecture	3
INFS 796	Directed Readings in Information Systems	3
INFS 797	Advanced Topics in Information Systems	1-6

Information Security and Assurance (ISA)

ISA 564	Security Laboratory	3
ISA 650	Security Policy	3
ISA 652	Security Audit and Compliance Testing	3
ISA 656	Network Security	3
ISA 673	Operating Systems Security	3
ISA 674	Intrusion Detection	3
ISA 681	Secure Software Design	3
ISA 697	Topics in Information Security	1-6
ISA 763	Security Protocol Analysis	3
ISA 764	Security Experimentation	3
ISA 785	Research in Digital Forensics	3
ISA 797	Advanced Topics in Information Security	3

Software Engineering (SWE)

SWE 620	Software Requirements Analysis and Specification	3
SWE 625	Software Project Management	3
SWE 626	Software Project Laboratory	3
SWE 631	Software Design Patterns	3
SWE 632	User Interface Design and Development	3
SWE 642	Software Engineering for the World Wide Web	3
SWE 645	Component-Based Software Development	3
SWE 699	Special Topics in Software Engineering	3
SWE 721	Reusable Software Architectures	3
SWE 727	Quality of Service for Software Architectures	3
SWE 763	Software Engineering Experimentation	3
SWE 795	Advanced Topics in Software Engineering	3
SWE 796	Directed Readings in Software Engineering	3
SWE 798	Research Project	3

Computer Science (CS)

CS 504	Principles of Data Management and Mining	3
CS 530	Mathematical Foundations of Computer Science	3
CS 531	Fundamentals of Systems Programming	3
CS 540	Language Processors	3
CS 580	Introduction to Artificial Intelligence	3
CS 583	Analysis of Algorithms	3
CS 584	Theory and Applications of Data Mining	3
CS 635	Foundations of Parallel Computation	3
CS 640	Advanced Compilers	3
CS 650	Advanced Database Management	3
CS 657	Mining Massive Datasets with MapReduce	3
CS 662	Computer Graphics Game Technologies	3
CS 672	Computer System Performance Evaluation	3
CS 673	Multimedia Computing and Systems	3
CS 674	Data Mining on Multimedia Data	3
CS 681	Knowledge Engineering	3
CS 682	Computer Vision	3
CS 683	Parallel Algorithms	3
CS 684	Graph Algorithms	3
CS 685	Autonomous Robotics	3
CS 686	Image Processing and Applications	3
CS 687	Advanced Artificial Intelligence	3
CS 688	Pattern Recognition	3
CS 700	Quantitative Methods and Experimental Design in Computer Science	3
CS 706	Concurrent Software Systems	3
CS 752	Interactive Graphics Software	3
CS 755	Advanced Computer Networks	3
CS 756	Performance Analysis of Computer Networks	3
CS 773	Real-Time Systems Design and Development	3
CS 777	Human-Computer Intelligent Interaction	3
CS 779	Topics in Resilient and Secure Computer Systems	3
CS 782	Machine Learning	3
CS 795	Advanced Topics in CS	3

Electrical and Computer Engineering (ECE)

ECE 511	Microprocessors	3
ECE 521	Modern Systems Theory	3
ECE 528	Introduction to Random Processes in Electrical and Computer Engineering	3
ECE 535	Digital Signal Processing	3
ECE 545	Digital System Design with VHDL	3
ECE 548	Sequential Machine Theory	3
ECE 584	Semiconductor Device Fundamentals	3
ECE 586	Digital Integrated Circuits	3
ECE 611	Advanced Microprocessors	3

ECE 612	Real-Time Embedded Systems	3
ECE 620	Optimal Control Theory	3
ECE 621	Systems Identification	3
ECE 624	Control Systems	3
ECE 630	Statistical Communication Theory	3
ECE 633	Coding Theory	3
ECE 635	Adaptive Signal Processing	3
ECE 641	Computer System Architecture	3
ECE 642	Design and Analysis of Computer Communication Networks	3
ECE 643	Network Switching and Routing	3
ECE 645	Computer Arithmetic	3
ECE 646	Cryptography and Computer Network Security	3
ECE 650	Robotics	3
ECE 680	Physical VLSI Design	3
ECE 681	VLSI Design for ASICs	3
ECE 732	Mobile Communication Systems	3
ECE 734	Detection and Estimation Theory	3
ECE 741	Wireless Networks	3
ECE 746	Advanced Applied Cryptography	3

Operations Research (OR)

OR 540	Management Science	3
OR 541	Operations Research: Deterministic Models	3
OR 542	Operations Research: Stochastic Models	3
OR 635	Discrete System Simulation	3
OR 640	Global Optimization and Computational Intelligence	3
OR 641	Linear Programming	3
OR 642	Integer Programming	3
OR 643	Network Modeling	3
OR 644	Nonlinear Programming	3
OR 645	Stochastic Processes	3
OR 647	Queuing Theory	3
OR 681	Decision and Risk Analysis	3
OR 690	Optimization of Supply Chains	3

Psychology (PSYC)

PSYC 734	Seminar in Human Factors and Applied Cognition	3

Statistics (STAT)

STAT 544	Applied Probability	3
STAT 554	Applied Statistics I	3
STAT 652	Statistical Inference	3
STAT 655	Analysis of Variance	3
STAT 656	Regression Analysis	3
STAT 662	Multivariate Statistical Methods	3
STAT 663	Statistical Graphics and Data Exploration I	3
STAT 674	Survey Sampling II	3

Systems Engineering (SYST)

SYST 520	System Engineering Design	3
SYST 530	Systems Engineering Management I	3
SYST 542	Decision Support Systems Engineering	3
SYST 560	Introduction to Air Traffic Control	3
SYST 573	Decision and Risk Analysis	3
SYST 611	System Methodology and Modeling	3
SYST 620	Discrete Event Systems	3
SYST 659	Topics in Systems Engineering	3
SYST 660	Air Transportation Systems Modeling	3
SYST 671	Judgment and Choice Processing and Decision Making	3
SYST 680	Principles of Command, Control, Communications, Computing, and Intelligence (C4I)	3
SYST 683	Modeling, Simulation, and Gaming	3

Accelerated Master's

Applied Computer Science, BS/ Information Systems, Accelerated MS

Overview

Highly-qualified students in the Applied Computer Science, BS program have the option of obtaining an accelerated Information Systems, MS. See AP.6.7 Bachelor's/Accelerated Master's Degrees.

Students in an accelerated degree program must fulfill all university requirements for the master's degree. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements

Students in the Applied Computer Science, BS program can apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30. Students must have successfully completed:

Code	Title	Credits
CS 310	Data Structures	3
CS 330	Formal Methods and Models	3
CS 367	Computer Systems and Programming	4
Total Credits		10

Accelerated Option Requirements

Students must complete all credits that satisfy requirements for the BS and MS programs, with 6 credits overlap.

Students register for two 500-level computer science core courses (6 credits) in place of the corresponding 400-level computer science courses, as part of the undergraduate degree requirements. Specifically, students must take

Code	Title	Credits
CS 583	Analysis of Algorithms	3
Select one of the following:		3
CS 540	Language Processors	
CS 550	Database Systems	
CS 551	Computer Graphics	

CS 555	Computer Communications and Networking	
CS 571	Operating Systems	
CS 580	Introduction to Artificial Intelligence	
CS 584	Theory and Applications of Data Mining	
Total Credits		6

Note:

Students complete all MS in Information Systems core courses and apply the two courses from above toward the elective requirements.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.

Computer Science, BS/Information Systems, Accelerated MS

Overview

Highly-qualified students in the Computer Science, BS have the option of obtaining an accelerated Information Systems, MS.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements

Students in the Computer Science, BS program may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30. Students must have successfully completed CS 310 Data Structures, CS 330 Formal Methods and Models and CS 367 Computer Systems and Programming.

Accelerated Option Requirements

Students must complete all requirements for the BS and MS programs, with 6 credits overlap. Students register for 6 credits of CS 500-level basic courses in place of the corresponding CS 400-level courses required for the undergraduate degree requirements. Specifically, students must register for two of the following courses in place of the corresponding 400-level courses:

Code	Title	Credits
CS 540	Language Processors	3
CS 550	Database Systems	3
CS 551	Computer Graphics	3
CS 555	Computer Communications and Networking	3
CS 571	Operating Systems	3
CS 580	Introduction to Artificial Intelligence	3
CS 583	Analysis of Algorithms	3
CS 584	Theory and Applications of Data Mining	3

Note:

Students complete all MS in Information Systems core courses and apply the two courses from above toward the elective requirements.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.

Information Technology, BS/Information Systems, Accelerated MS

Overview

Highly-qualified students in the Information Technology, BS have the option of obtaining an accelerated Information Systems, MS.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements

Students in the Information Technology, BS program may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30. Criteria for admission are identical to the criteria for admission to the Information Systems, MS program.

Accelerated Option Requirements

Students must complete all credits that satisfy requirements for the BS and MS programs, with 6 credits overlapping with the following two courses:

Code	Title	Credits
INFS 614	Database Management (satisfies IT 414 requirement in the BS program)	3
INFS 622	Information Systems Analysis and Design (satisfies as one DTP concentration course in the BS program)	3

Note:

Students must complete MATH 125 Discrete Mathematics I (Mason Core) as their discrete math requirement and IT 306 Program Design and Data Structures as part of their concentration requirements in the BS program.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.