Information Technology (MS)

The Master of Science (MS) in Information Technology prepares students for positions in industry and education, enhances skills for the practicing professional, and supplies a foundation for study at the doctoral level. Students with a bachelor’s degree in any field may enter the program. The program provides a broad foundation of study in information technology, as well as offering in-depth study in the areas of algorithms, databases, data mining and warehousing, information retrieval, networks, multimedia, interactive systems, and software engineering. A core of information technology courses is required, together with additional prescribed elective courses. Other electives and graduate courses in other departments may also be completed.

**Admission Requirements**

Apply to the UTRGV Graduate College:

**Step #1:** Submit a UTRGV Graduate Application at www.applytexas.org. The university application fee of $50 ($100 for International Applicants) can be paid online by credit card or electronic check (in the online application). All application fees are nonrefundable.

**Step #2:** Register on the UTRGV Recommenders and Document Upload Webpage (www.utrgv.edu/gradupload). This is where you will request recommenders and upload program requirement documents, and where the graduate office will upload your transcripts. If you do not complete this step, we will not be able to process your application.

**Step #3:** Request your transcripts and other supporting documentation to be mailed to:

The University of Texas Rio Grande Valley
The Graduate College
Marialice Shary Shivers Bldg. 1.158
1201 W. University Drive
Edinburg, TX 78539-2999

Review and submit all Program Requirements:

- Bachelor’s degree in Computer Science or a bachelor’s degree in another field and courses and/or experience that prepare the applicant for graduate work in Computer Science or Information Technology.
- Undergraduate GPA of at least 3.0.
- Official transcripts from each institution attended (must be submitted directly to UTRGV).
- Letter of Intent detailing professional goals and reasons for pursuing the graduate degree.
- Resume.

**Additional requirements for domestic applicants who attended foreign universities:**

- TOEFL or IELTS Language Proficiency Test with minimum scores: 550 on paper-based, 213 on computer based, or 79 on internet-based for the TOEFL; 6.5 for the IELTS. TOEFL and IELTS scores are valid for 2 years. For additional information, click here.
- English translation of educational records.
- Transcript Evaluation by the Foreign Credentials Service of America (FCSA). For additional information, click here.

**Additional requirements for international applicants:**

- TOEFL or IELTS Language Proficiency Test with minimum scores: 550 on paper-based, 213 on computer based, or 79 on internet-based for the TOEFL; 6.5 for the IELTS. TOEFL and IELTS scores are valid for 2 years. For additional information, click here.
- English translation of educational records.
- Transcript Evaluation by the Foreign Credentials Service of America (FCSA). For additional information, click here.
- Financial Documentation showing sufficient funds (minimum of $25,000) to cover all expenses (living and academic) for the first year of study. For additional information, click here.
- Immigration documents, including a current copy of your valid passport. For additional information, click here.

**Program Contact**

Program Director: Dr. Richard Fowler
Phone: (956) 665-3453
E-Mail: Richard.Fowler@utrgv.edu

**Deadlines**

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www.utrgv.edu/grad
Program Requirements

Required Courses 19
CSCI 6174: Open Problems in Computer Science and Information Technology 1
CSCI 6302: Foundations of Software and Programming Systems for Information Technology 3
CSCI 6303: Principles of Information Technology Systems 3
CSCI 6305: Foundations of Algorithms and Programming Languages 3
CSCI 6314: E-Commerce Systems and Implementation 3
CSCI 6315: Applied Database Systems OR
CSCI 6333: Advanced Database Design and Implementation 3
CSCI 6345: Advanced Computer Networks 3

Designated Electives (Minimum of 11 hours)
CSCI 6175: Seminar in Computer Science 1
CSCI 6307: Foundations of Systems in Computer Science 3
CSCI 6312: Advanced Internet Applications Programming 3
CSCI 6316: Design for Information Technology 3
CSCI 6318: Cybersecurity and Forensics 3
CSCI 6340: Advanced Software Engineering 3
CSCI 6350: Advanced Artificial Intelligence 3
CSCI 6355: Bioinformatics 3
CSCI 6360: Advanced Computer Graphics 3
CSCI 6361: Computer Visualization 3
CSCI 6363: Human Computer Interaction 3
CSCI 6365: Network Management and Security 3
CSCI 6366: Data Mining and Warehousing 3

Free Electives (Maximum 3 hours)
CSCI 6180: Problems in Computer Science 1
CSCI 6323: Design and Analysis of Algorithms 3
CSCI 6334: Advanced Operating Systems 3
CSCI 6335: Advanced Computer Architecture 3
CSCI 6336: Programming Languages and Compilers 3
CSCI 6339: Theoretical Foundations of Computer Science 3
CSCI 6354: Performance Evaluation 3
CSCI 6356: Parallel Computing 3
CSCI 6370: Topics in Computer Science 3
CSCI 6380: Problems in Computer Science 3
CSCI 6381: Independent Research and Study 3
CSCI 6382: Foundations of Programming 3

Capstone Requirement
Written Comprehensive Exam

Total graduate hours for degree: 36

Course Descriptions

CSCI 6174: Open Problems in Computer Science and Information Technology [1-0]
A survey of current research areas in computer science. Topics are discussed in an informal seminar setting. Prerequisite: Consent of instructor.

CSCI 6175: Seminar in Computer Science [1-0]
Presentation and analysis of literature in a selected area. May be repeated for credit as
topics vary. A total of six hours may be counted toward fulfillment of degree requirements. 

Prerequisite: Consent of instructor.

CSCI 6180: Problems in Computer Science [1-0]  
An area of computer science is examined under the direction of a faculty member prior to enrollment in master’s thesis or project courses.  
Prerequisite: Consent of instructor.

CSCI 6302: Foundations of Software and Programming Systems for Information Technology [3-0]  
Focusing on a high level object oriented language (e.g., Java, C++), provides foundational study of algorithms, data structures, and programming systems in the context of information technology systems. Prerequisite: Knowledge of a high level programming language and consent of instructor.

CSCI 6303: Principles of Information Technology Systems [3-0]  
An introduction to information technology and computer systems. Specific topics provide an overview of databases, knowledge-based systems, e-commerce, software engineering, software tools, programming, and Internet. Prerequisites: Knowledge of a high level programming language and consent of instructor.

CSCI 6305: Foundations of Algorithms and Programming Languages [3-0]  
In-depth analysis of computing algorithms and data structures for implementation in the context of software engineering design using structured programming languages. Prerequisites: CSCI 6302 or CSCI 6382.

CSCI 6307: Foundations of Systems in Computer Science [3-0]  
In-depth analysis of operating systems, computer architecture, and distributed processing, focusing on principles of organization and applications across systems.

CSCI 6312: Advanced Internet Applications Programming [3-0]  
Course covers theoretical and practical methods and techniques for programming on the Internet with a focus on the Web server side. Students will be able to develop highly interactive Web-based applications. Prerequisite: Consent of instructor.

CSCI 6314: E-Commerce Systems and Implementation [3-0]  
Presents the principles E-commerce implementation, examining specific examples in depth. Students implement a working prototype site as class projects. Prerequisites: CSCI 6302 and consent of instructor.

CSCI 6315: Applied Database Systems [3-0]  
Course covers the application of a modern database system. Concepts covered include relational model, normalization, structured query language, Internet data formats, and server and client side technologies. The course is targeted at students who are interested in the development of application programs using a database system such as Oracle, or Microsoft SQL. Prerequisite: CSCI 6302 or equivalent.

CSCI 6316: Design for Information Technology Systems [3-0]  
Provides design techniques for information technology systems, including web and mobile technologies. Students complete projects focusing on the critique of existing systems and design of new application systems.

CSCI 6318: Cybersecurity and Forensics [3-0]  
Computer security fundamentals and standard of good practice, and Incident response strategies will be presented. Topics will include analyzing volatile and nonvolatile data, collecting network based evidence, forensic analysis techniques, web, email and registry activity reconstruction, and study of available tools. Prerequisite: CSCI 6303.
CSCI 6323: Design and Analysis of Algorithms [3-0]
Advanced topics in data structures and algorithms, including dynamic programming and classification of algorithms. Applications of various algorithms and data structures will be discussed and implemented. Prerequisite: CSCI 6305, or consent of instructor.

CSCI 6333: Advanced Database Design and Implementation [3-0]
Focuses on distributed database systems. Includes file allocation, directory systems, deadlock detection and prevention, synchronization, query optimization, and fault tolerance. The course will include one or more programming projects demonstrating implementation of concepts introduced. Prerequisite: CSCI 6305, or consent of instructor.

CSCI 6334: Advanced Operating Systems [3-0]
An in-depth treatment of operating systems concepts. Major course topics include process and processor management, primary and secondary storage management, system performance, network considerations (both local area and wide area) and system security. A significant programming project involving concurrent resource management is required. Prerequisite: CSCI 6307, or consent of instructor.

CSCI 6335: Advanced Computer Architecture [3-0]
Covers trends and measuring and reporting of improvements in computer technology; instruction set principles, hardware techniques for instruction level parallelism (ILP) as applied to reduced instruction set architecture (RISC) such as dynamic scheduling and thread-level parallelism; loop unrolling and enhancing loop level parallelism; memory hierarchy mapping and miss rate reduction techniques and performance calculations; and interconnection network and clusters related issues. This course is equivalent to ELEE 6335. Prerequisite: CSCI 6307.

CSCI 6336: Programming Languages and Compilers [3-0]
Formal and applied methods of program and language description, including denotational, operational and axiomatic semantics. Prerequisite: CSCI 6305 or consent of instructor.

CSCI 6339: Theoretical Foundations of Computer Science [3-0]
Examines classes of languages and abstract machines including finite state automata, pushdown automata, Turing machines and the Chomsky hierarchy of formal languages, including regular sets, context-free languages, context-sensitive languages and recursively enumerable languages. Prerequisite: CSCI 6305, or consent of instructor.

CSCI 6340: Advanced Software Engineering [3-0]
An overview of the software engineering process, including software project management, system and software requirements analysis, structured analysis, object-oriented analysis, design and implementation of software. Data-flow, object-oriented, user interface and real-time design methods. Software quality assurance and testing methods. Use of CASE tools. Will include a major design project. Prerequisite: CSCI 6305 or consent of instructor.

CSCI 6345: Advanced Computer Networks [3-0]
In-depth study of theory, design, implementation and performance of computer and communications networks. Current network types, including point-to-point, satellite, packet switch, local area and wide area networks, are studied, as well as evolving technologies such as ATM. Provides an introduction to queueing analysis and includes network programming projects.
CSCI 6350: Advanced Artificial Intelligence [3-0]
Issues of knowledge representation, including a survey of important knowledge-based systems. Current research issues, including neural networks, object-oriented programming in AI, natural language understanding, device understanding, and perception. **Prerequisite:** CSCI 6305 or consent of instructor.

CSCI 6354: Performance Evaluation [3-0]
Methods and concepts of system performance evaluation are introduced and discussed. Topics include stochastic processes, measurement techniques, monitor tools, statistical analysis of performance experiments, simulation models, analytic modeling and queuing theory, and workload characterization. **Prerequisite:** MATH 4337 or equivalent background in probability, or consent of instructor.

CSCI 6355: Bioinformatics [3-0]
Examines the creation and development of advanced information and computational techniques for problems in the biosciences, including biology, biochemistry, biotechnology, and medicine. Presents advanced concepts and techniques of bioinformatics and computational biology tools to solve problems in topics such as sequence alignment, gene and motif finding, restriction mapping, microarray data analysis and gene expressions. **Prerequisite:** CSCI 6305 or consent of instructor.

CSCI 6356: Parallel Computing [3-0]
Studies models, architectures, languages, and algorithms of parallel computing. Topics include parallel computing models, algorithm designs, software tools, parallel architectures, and performance evaluation. **Prerequisite:** CSCI 6323 or consent of instructor.

CSCI 6360: Advanced Computer Graphics [3-0]
Studies models, architectures, languages, and algorithms of parallel computing. Topics include parallel computing models, algorithm designs, software tools, parallel architectures, and performance evaluation. **Prerequisite:** CSCI 6323 or consent of instructor.

CSCI 6361: Computer Visualization [3-0]
Visualization systems augment quantitatively based systems for presentation of data in a manner facilitating understanding and insight. This course provides an in-depth study of the theory, design, and implementation of computer-based visualization systems. In addition to scientific visualization, visualization of semantic information is also examined. **Prerequisite:** CSCI 6307.

CSCI 6363: Human Computer Interaction [3-0]
Presents theory of human-computer interaction, as well as development methods for interfaces, such as user-centered design, prototyping, and participatory design. Course presents evaluation and testing techniques, such as heuristic evaluation, the cognitive walkthrough, and usability testing, as well as user-interface programming and ethical and societal issues. **Prerequisite:** CSCI 6302 or equivalent.

CSCI 6365: Network Management and Security [3-0]
This course covers topics in the administration of a secure network. Topics covered include: proper planning and installation of a network operating system, administrations of groups, users and resources, challenges and vulnerabilities, authentication and authorization, public key encryption, key management, and Internet protocol security architecture.

CSCI 6366: Data Mining and Warehousing [3-0]
As a multidisciplinary field, draws on work from areas including database technology, artificial intelligence, machine learning, neural network, statistics, information retrieval, and data visualization. Theoretical and practical methods will be presented on knowledge discovery and
systems design and implementation.  
Prerequisite: CSCI 6305.

CSCI 6370: Topics in Computer Science  
[3-0] In-depth study of specific issues in computer science. Subject matter varies from semester to semester. May be repeated when subject matter changes. A total of six hours may be counted toward fulfillment of degree requirements. Prerequisite: Consent of instructor.

CSCI 6380: Problems in Computer Science  
[3-0] An area of computer science is examined under the direction of a faculty member prior to enrollment in master’s thesis or project courses. Prerequisite: Consent of instructor.

CSCI 6381: Independent Research and Study  
[3-0] Independent study of an area of current research allowing students to work with faculty in performing research, participating in ongoing faculty research, or reading in depth on a topic. Prerequisite: Consent of instructor.

CSCI 6382: Foundations of Programming  
[3-0] This is an introductory course in computer programming. Topics include basic concepts in object oriented and structured programming, testing and debugging, abstract data types, basic searching and sorting techniques, and recursion. Prerequisite: MATH 1314 or MATH 2412 or MATH 2413.