

Rensselaer Polytechnic Institute

# Master of Science Information Technology

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# ITWS @ Rensselaer

-- Version --  
Fall 2017

# Overview

Rensselaer's Master of Science in Information Technology balances the study of management strategies and technology leadership with advanced course work in an IT concentration. Students complete a suite of Core and Capstone courses, and also select three to five additional courses to complete their Concentrations. Both a professional and research track are offered for the M.S. in IT degree.

Twelve concentrations are currently available at Rensselaer's Troy Campus: Cognitive Computing, Data Science and Analytics, Information Dominance, Web Science, Networking, Management Information Systems, Software Design and Engineering, Financial Engineering, Database and Intelligent Systems, Information Security, Information Systems Engineering and Human-Computer Interaction.

## Curriculum

Students admitted to the M.S. in IT develop an approved plan of study that includes the following:

- Ten courses in IT (A minimum of thirty credits)
- A minimum of six courses (eighteen or more credits) at the 6000 graduate level
- Five Core courses in Information Technology (IT Core). For the research track, replace ITWS-6300 Business Issues for Engineers and Scientists core course with one of the two semester courses ITWS-6980 Master's Project or ITWS-6990 Master's Thesis.
- A minimum of three courses (nine credit hours or more) in a Concentration
- One elective approved by the advisor to add further breadth or depth to the degree
- One of: ITWS-6800 Information Technology Master's Capstone course (Professional Track), ITWS-6980 Master's Project (Research Track) or ITWS-6990 Master's Thesis (Research Track)

The Core and Concentration courses are designed to accommodate a wide range of backgrounds. If students have previously completed a basic required Core course, they then complete the next level required course to add depth in that Core area. For example, if an equivalent course to Database Systems was completed in a prior degree, the Core requirement could be satisfied by taking Enterprise Database Systems or Database Mining. Our goal is to bring students to the next level of IT expertise.

Concentrations are chosen from twelve possibilities. Students who plan to complete the program in **Two-Semesters** select one concentration and complete most of their Core courses in the Fall followed by the Concentration and Capstone courses in the Spring for a total of ten courses. Students who elect the **Three-Semester** option are able to complete two Concentrations over three terms for a total of twelve courses. The Three-Semester students will also generally complete a significant salaried co-op/ internship assignment over the summer (or the summer/fall) terms.

The Financial Engineering Concentration is completed by taking core courses in Database Design, Software Design and Engineering, HCI and Data Analytics plus five Concentration Courses and the Capstone Course. An upper level course in Finance is a prerequisite.

The M.S. in IT Capstone course integrates the knowledge and professional practice of IT Core and Concentration courses. Topics in database systems, networking, data analytics, software design and engineering, management of technology, human computer interaction, and ethics are applied within a framework of global e-business strategy. The course utilizes an Information Technology Team Project with a real organization to practice the major concepts of the IT Degree. Team members select, develop, and present a significant technology implementation project, incorporating strategy, systems development and business planning.

Rensselaer currently offers numerous Ph.D. degrees with significant IT related research including the Multidisciplinary Science degree with a research track in Information Technology. There is no separate Ph.D. degree in Information Technology.

Transfer credit is not expected to fulfill Core or Concentration requirements. Students can waive an IT core area requirement and substitute an approved elective only if they have already taken the equivalent of all listed core courses. Students may request transfer credit for the elective, subject to advisor approval. Additionally, no more than half of all credits used towards the M.S. in IT degree may be taken from courses offered by the Lally School of Management and Technology. These courses are coded MGMT.

The IT master's is also available as part of the Advanced Professional Studies blended learning program, based in Troy, NY, Hartford and Groton, Connecticut. Students enrolling in the APS program should consult the following web site for concentrations, course offerings and degree requirements: <http://www.rpi.edu/dept/aps/>.

# Core Courses

To acquire a breadth of IT experience, master's degree students take the five Core courses listed below. If students have previously completed a Core course at Rensselaer or elsewhere, they fulfill the Core requirement by taking an advanced course in that area.

## Required Core Courses

| IT Core Area                           | Course Number | Course Title   | Term(s) Offered |
|--|---------------|--|-----------------|
| <b>Database Systems</b>                | CSCI-4380     | Database Systems   | Spring/Fall     |
|  | ITWS-6960     | Database Systems   | Fall            |
| <b>Data Analytics</b>                  | ITWS-6350     | Data Science   | Fall            |
| <b>Software Design and Engineering</b> | CSCI-4440     | Software Design and Documentation                                      | Fall/Spring     |
|  | ITWS-6700     | Software Development   | Spring/Fall     |
| <b>Management of Technology*</b>       | ITWS-6300     | Business Issues for Engineers and Scientists (Professional Track Only) | Fall/Spring     |
| <b>Human Computer Interaction</b>      | COMM-6420     | Foundations of HCI Usability   | Fall            |

\* For the research track, replace ITWS-6300 Business Issues for Engineers and Scientists with one of the two semester courses ITWS-6980 Master's Project or ITWS-6990 Master's Thesis.

## Advanced Core options for students who have previously completed a Core Course

| IT Core Area                           | Course Number | Course Title                            | Term(s) Offered |
|--|---------------|---|-----------------|
| <b>Database Systems</b>                | CSCI-6390     | Database Mining                         | Fall            |
|  | ITWS-6350     | Data Science                            | Fall            |
| <b>Data Analytics</b>                  | CSCI-6390     | Database Mining                         | Fall            |
|  | ITWS-6400     | X-Informatics                           | Spring          |
|  | ITWS-6600     | Data Analytics                          | Spring          |
| <b>Software Design and Engineering</b> | CSCI-6500     | Distributed Computing Over the Internet | Spring          |
|  | ITWS-6400     | X-Informatics                           | Spring          |
| <b>Management of Technology</b>        | MGMT-6080     | Networks, Innovation and Value Creation | Fall            |
|  | MGMT-6140     | Information Systems for Management      | Spring          |
| <b>Human Computer Interaction</b>      | COMM-6620     | Information Architecture                | Spring          |
|  | COMM-6770     | User-Experience Design                  | Fall            |
|  | COMM-6880     | Interactive Data Visualization          | Summer          |

## One of:

|                          |           |  |             |
|--------------------------|-----------|--|-------------|
| <b>Master's Capstone</b> | ITWS-6800 | Information Technology Master's Capstone (Professional Track Only) | Fall/Spring |
| <b>Master's Project</b>  | ITWS-6980 | Master's Project (Research Track)                                  | Fall/Spring |
| <b>Master's Thesis</b>   | ITWS-6990 | Master's Thesis (Research Track)                                   | Fall/Spring |

# Concentrations

The IT faculty designed the IT Concentrations to provide an in-depth, leading-edge experience in the application of information technology. Students often select areas that complement their prior backgrounds (e.g., students with strong backgrounds in computer science may select MIS or Information Systems Engineering). Alternately, some students select a concentration area related to their prior backgrounds and then expand on that background through higher-level coursework.

**NOTES:**

- Courses taken to complete a Core requirement do not count towards the Concentration.
- Students must have the prerequisites knowledge for each course as described in the university catalog: <http://www.rpi.edu/academics/catalog/index.html>

| Concentration              | Course Number   | Course Name                                  | Term(s) Offered |
|----------------------------|---|--|-----------------|
| <b>COGNITIVE COMPUTING</b> | <p>Different people take 'cognitive computing' to mean different things. Roughly, we can split these different meanings in two groups. The first group uses 'cognitive computing' to denote computational methods that attempt to mimic the way the human mind processes information: stand-alone technologies that have cognitive capacities in and of themselves. An example would be a deep learning neural network that performs image recognition. The second group uses the term to denote computational tools that 'fit' and 'enhance' the human mind: human-centered technologies that are cognitively ergonomic and cognitively enabling: technologies that take into account the scope and limits of human cognition but that allow the human user to augment their cognitive capacities. An example would be Watson as a paramedic. Of course, these two different meanings are not exclusive. In fact, in order for a system to augment the cognitive powers of a human user, the system is likely to require some intelligence in and of itself. Our program of Cognitive Computing is along the lines of the second meaning of the term: it is a program that studies how human cognition can be extended through the use of intelligent technology. As such, the program draws largely from the cognitive sciences, information sciences, and communication sciences.</p> <p><b>Select three of the following courses:</b></p> |  |                 |
|                            | COGS-4620   | Cognitive Engineering                        | Fall            |
|                            | COGS-696X   | Affective Computing                          | Fall            |
|                            | COGS-496X   | The Linguistics of Computational Linguistics | Fall            |
|                            | COGS-6210   | Cognitive Modeling I                         | Spring          |
|                            | COGS-6240   | Logic and Artificial Intelligence            | Spring          |
|                            | COGS-696X   | Computational Linguistics                    | Fall            |
|                            | CSCI-4150   | Introduction to AI                           | Fall            |
|                            | CSCI-6100   | Machine Learning from Data                   | Fall            |
|                            | CSCI-6130   | Natural Language Processing                  | Fall            |
|                            | CSCI-6270   | Computational Vision                         | Fall            |
|                            | CSCI-6390   | Database Mining                              | Fall            |
|                            | CSCI-696X   | Cognitive Computing                          | Fall            |
|                            | CSCI-696X   | Computational Social Choice                  | Spring          |
|                            | ITWS-6400   | X-informatics                                | Spring          |
|                            | ISYE-4260   | Human Performance Modeling and Support       | Fall            |
|                            | ISYE-4810   | Computational Intelligence                   | Fall            |
|                            | PSYC-4370   | Cognitive Psychology                         | Fall            |

| Concentration                             | Course Number   | Course Name   | Term(s) Offered |
|---|---|---|-----------------|
| <b>DATA<br/>SCIENCE AND<br/>ANALYTICS</b> | Data and Information analytics extends analysis (descriptive and predictive models to obtain knowledge from data) by using insight from analyses to recommend action or to guide and communicate decision-making. Thus, analytics is not so much concerned with individual analyses or analysis steps, but with an entire methodology. Key topics include: advanced statistical computing theory, multivariate analysis, and application of computer science courses such as data mining and machine learning and change detection by uncovering unexpected patterns in data. |   |                 |
|   | <b>Select two or three of the following courses:</b>  |   |                 |
|   | ITWS-6350   | Data Science  | Fall            |
|   | ITWS-6400   | X-Informatics   | Spring          |
|   | ITWS-6600   | Data Analytics  | Spring          |
|   | ISYE-6180/ISYE-696X   | Knowledge Discovery with Data Mining/<br>Big Data Analytics | Spring          |
|   | <b>If only two of the above were chosen, select one more of the following courses:</b>  |   |                 |
|   | ARTS-496X   | Creative Data Design  | Spring          |
|   | COMM-6880   | Interactive Data Visualization                              | Summer          |
|   | CSCI-4020   | Computer Algorithms   | Spring          |
|   | CSCI-4150   | Introduction to AI  | Fall            |
|   | CSCI-4220   | Network Programming   | Spring          |
|   | CSCI-4320/<br>CSCI-6360   | Parallel Programming/<br>Parallel Computing                 | Spring          |
|   | CSCI-6100   | Machine Learning from Data                                  | Fall            |
|   | CSCI-6210   | Design and Analysis of Algorithms                           | Spring          |
|   | CSCI-6270   | Computational Vision  | Fall            |
|   | CSCI-6130   | Natural Language Processing                                 | Fall            |
|   | CSCI-6390   | Database Mining   | Fall            |
|   | ISYE-4220   | Optimization Algorithms and<br>Applications                 | Fall            |
|   | ISYE-4760   | Mathematical Statistics                                     | Spring          |
|   | ISYE-4810   | Computational Intelligence                                  | Spring          |
|   | ITWS-696X   | Data and Society  | Spring          |
|   | ITWS-696X   | Big Data Policies   | Fall            |
|   | ITWS-696X   | Data Analysis Research Lab                                  | Fall            |
|   | MGMT-6100   | Statistics and Operations Management                        | Fall            |
|   | MGMT-6560   | Technology Fundamentals for Business<br>Analytics           | Fall            |
|   | MGMT-696X   | Applied Analytics and Predictive<br>Modeling                | Spring          |
|   |   |   |                 |
|   |   |   |                 |

| Concentration                | Course Number   | Course Name  | Term(s) Offered |
|------------------------------|---|--|-----------------|
| <b>INFORMATION DOMINANCE</b> | <p>The Information Dominance concentration prepares students for careers designing, building, and managing secure information systems and networks. The concentration includes advanced study in encryption and network security, formal models and policies for access control in databases and application systems, secure coding techniques, and other related information assurance topics. The combination of coursework provides comprehensive coverage of issues and solutions for utilizing high assurance systems for tactical decision-making. It prepares students for careers ranging from secure information systems analyst, to information security engineer, to field information manager and chief information officer. It is also appropriate for all IT professionals who want to enhance their knowledge of how to use pervasive information in situational awareness, operations scenarios, and decision-making.</p> |  |                 |
|                              | <b>Select two or three of the following courses:</b>  |  |                 |
|                              | CSCI-4220   | Network Programming  | Spring          |
|                              | CSCI-6230   | Cryptography and Network Security I                                      | Fall            |
|                              | ECSE-4670   | Computer Communication Networks  | Fall            |
|                              | ISYE-4310   | Ethics of Modeling for Industrial Systems Engineering                    | Fall            |
|                              | ISYE-6180/ISYE-696X   | Knowledge Discovery with Data Mining/Big Data Analytics                  | Spring          |
|                              | ITWS-4370   | Information System Security  | Spring          |
|                              | ITWS-6600   | Data Analytics   | Spring          |
|                              | <b>If only two of the above were chosen, select one more of the following courses:</b>  |  |                 |
|                              | CSCI-6390   | Database Mining  | Fall            |
|                              | CSCI-6240   | Cryptography and Network Security II                                     | Spring          |
|                              | CSCI-696X   | Security Topics Course   | Fall            |
|                              | ITWS-696X   | Big Data Policies  | Fall            |
|                              | ISYE-6500   | Information and Decision Technologies for Industrial and Service Systems | Fall/Spring     |
|                              |   |  |                 |

| Concentration      | Course Number   | Course Name   | Term(s) Offered |
|--------------------|---|---|-----------------|
| <b>WEB SCIENCE</b> | <p>The study of Web Science gives students insights into understanding what the web is and how to engineer its future and ensure its social benefit. The new Web Science concentration contains courses focused on one of the most powerful research, social and commercial technologies of our time.</p>   |   |                 |
|                    | <p>The leader of the concentration is Dr. James Hendler, an internationally renowned figure in Web research and one of the pioneers of the Semantic Web. Along with colleagues Dr. Peter Fox and Dr. Deborah McGuinness, Dr. Hendler is working on research to advance scientific discovery and innovation by enabling rapid and easy collaboration between scientists, educators, students, policy makers, and even "citizen scientists" around the world wide web. They have created an innovative set of courses that focus on new trends in eScience and new technologies for the World Wide Web.</p> |   |                 |
|                    | <p>IT professionals who complete this concentration can apply their knowledge to careers in web-based businesses, web-based startup companies, or to playing the role of innovators in their organizations' use of the web.</p>   |   |                 |
|                    | <p><b>Select two or three of the following courses:</b></p>   |   |                 |
|                    | ITWS-6400   | X-Informatics                                       | Spring          |
|                    | COMM-4580   | Advertising and Culture                             | Fall            |
|                    | COMM-4470   | Information Design                                  | Fall            |
|                    | COMM-4690   | Interface Design: Hypermedia Theory and Application | Spring          |
|                    | COMM-6510   | Communication Theory                                | Fall            |
|                    | COMM-6770   | User-Experience Design                              | Fall            |
|                    | COMM-6880   | Interactive Data Visualization                      | Summer          |
|                    | CSCI-4220   | Network Programming                                 | Spring          |
|                    | CSCI-696X   | Semantic Web Topics Course                          | Fall            |
|                    | CSCI-696X   | Cloud Computing Seminar                             | Spring          |
|                    | CSCI-696X   | Distributed Systems and Algorithms                  | Fall            |
|                    | MGMT-6720   | Internet Marketing                                  | Spring          |
|                    | <p><b>Optional Data Course, select only one:</b></p>  |   |                 |
|                    | ARTS-496X   | Creative Data Design                                | Spring          |
|                    | CSCI-6100   | Machine Learning from Data                          | Fall            |
|                    | ITWS-6350   | Data Science  | Fall            |
|                    | ITWS-6600   | Data Analytics                                      | Spring          |
|                    | ISYE-6180   | Knowledge Discovery with Data Mining                | Spring          |
|                    |   |   |                 |
|                    |   |   |                 |

|   |   |                                      |        |
|---|---|--------------------------------------|--------|
| <b>DATABASE<br/>AND<br/>INTELLIGENT<br/>SYSTEMS</b> | The Database and Intelligent Systems concentration prepares students for careers in database design, database administration, database application development, or database systems implementation. Database design focuses on modeling some aspect of a physical or conceptual world that must be captured in a database as part of a larger application system. Database administration (DBA) focuses on installation, operation, and maintenance of a database system and its applications on a day-by-day basis for an organization or company. Database application development focuses on building complex application systems, including web-based applications that use a database at their core. Database systems implementation focuses on creating the underlying database system itself and is most likely done with a career in a database vendor company. |                                      |        |
|   | <b>Select three of the following courses:</b>   |                                      |        |
|   | CSCI-4150   | Introduction to AI                   | Fall   |
|   | CSCI-6100   | Machine Learning from Data           | Fall   |
|   | CSCI-6390   | Database Mining                      | Fall   |
|   | CSCI-6510   | Distributed Systems and Algorithms   | Fall   |
|   | CSCI-696X   | Cloud Computing Seminar              | Spring |
|   | ISYE-4810   | Computational Intelligence           | Fall   |
|   | ISYE-6180   | Knowledge Discovery with Data Mining | Spring |
|   | ITWS-6350   | Data Science                         | Fall   |
|   | ITWS-6600   | Data Analytics                       | Spring |

|                                 |   |   |             |
|---------------------------------|---|---|-------------|
| <b>INFORMATION<br/>SECURITY</b> | The Information Security concentration prepares students for careers designing, building, and managing secure computer systems and networks. The concentration includes advanced study in encryption and network security, formal models and policies for access control in databases and application systems, secure coding techniques, and other related information assurance topics. The combination of coursework provides comprehensive coverage of issues and solutions for building and operating high assurance systems. It prepares students for careers ranging from secure systems analyst, to security engineer, to security manager and chief security officer. It is also appropriate for other IT professionals who want to enhance their knowledge of information assurance. |   |             |
|                                 | <b>Select two or three of the following courses:</b>  |   |             |
|                                 | CSCI-4210   | Operating Systems                                     | Fall/Spring |
|                                 | CSCI-6230   | Cryptography and Network Security I                   | Fall        |
|                                 | ITWS-4370   | Information System Security                           | Spring      |
|                                 | CSCI-696X   | Security Topics Course                                | Fall        |
|                                 | <b>If only two of the above were chosen, select one more of the following courses:</b>  |   |             |
|                                 | CSCI-6390   | Database Mining                                       | Fall        |
|                                 | CSCI-6240   | Cryptography and Network Security II                  | Spring      |
|                                 | ISYE-4310   | Ethics of Modeling for Industrial Systems Engineering | Fall        |
|                                 | ISYE-6180   | Knowledge Discovery with Data Mining                  | Spring      |
|                                 | MATH-4020   | Introduction to Number Theory                         | Spring      |



|  |  |  |             |
|--|--|--|-------------|
| <b>INFORMATION<br/>SYSTEMS<br/>ENGINEERING</b> | <p>The Information Systems Engineering (ISE) concentration prepares students to succeed in the Information Systems (IS) profession as a technically competent systems analyst, software designer, and application developer. The IS profession is generally made up of business analysts, systems designers, and programmers; where business analysts identify requirements with end users, systems designers construct the information architecture (networks, databases, and applications) required, and programmers develop the software implementation. Graduates of this ISE concentration will claim the middle domain, systems designer, while being perfectly capable of moving into either of the other two domains. The graduates could go anywhere information systems are used, meaning essentially any modern organizations in any sector of the economy. The ISE curriculum combines competencies in databases and software engineering with technical analysis and design tools to give graduates a unique blending of knowledge.</p> |  |             |
|  | <b>Select three of the following courses:</b>  |  |             |
|  | CSCI-6390  | Database Mining                        | Fall        |
|  | CSCI-696X  | Computational Finance                  | Fall        |
|  | ECSE-6860  | Evaluation Methods for Decision Making | Fall        |
|  | ISYE-4310  | Ethics of Modeling for ISYE            | Fall        |
|  | ISYE-4530  | Information Systems                    | Fall        |
|  | ISYE-6180  | Knowledge Discovery with Data Mining   | Spring      |
|  | ISYE-6610  | Systems Modeling in Decision Sciences  | Fall        |
|  | ISYE-6620  | Discrete-Event Simulation              | Fall        |
|  | ISYE-6870  | Introduction to Neural Networks        | Spring      |
|  | ISYE-696X  | Data Analytics Research Lab            | Fall        |
|  | ITWS-6600  | Data Analytics                         | Spring      |
|  | MGMT-6140  | Information Systems for Management     | Spring      |
|  | MGMT-6170  | Advanced Systems Analysis and Design   | Spring/Fall |
| MGMT-6570                                      | Advanced Data Resource Management  | Fall                                   |             |

**NETWORKING**

The Computer Networking concentration prepares students for careers in network design and planning, network monitoring and management, network application development, or network deployment and customization. Network design and planning focuses on projecting the organization or company needs onto the structure and configuration of its network, including capacity, security and applications. Network monitoring and management focuses on installation, operation, and maintenance of a network, including identifying and responding to the failures and attacks, on a day-by-day basis for an organization or company. Network application development focuses on building complex distributed software systems that depend heavily in their execution on networking. Network deployment and customization focuses on creating the network for a company or organization, including customization of the general network features. Typical careers will place graduates at network vendor companies, Internet service or application providers (ISP or ASP) or at the IT departments of any organization or enterprise.

**Select three of the following courses:**

|                         |   |        |
|-------------------------|---|--------|
| CSCI-4220               | Network Programming                         | Spring |
| CSCI-4320/<br>CSCI-6360 | Parallel Programming/<br>Parallel Computing | Spring |
| CSCI-6500               | Distributed Computing over the Internet     | Spring |
| CSCI-6230               | Cryptography and Network Security I         | Fall   |
| CSCI-6250               | Frontiers of Network Science                | Fall   |
| CSCI-6510               | Distributed Systems and Algorithms          | Fall   |
| ECSE-4670               | Computer Communication Networks             | Fall   |
| ECSE-6600               | Internet Protocols                          | Spring |
| ECSE-6660               | Broadband and Optical Networking            | Spring |

**SOFTWARE  
DESIGN AND  
ENGINEERING**

The Software Design concentration prepares students for careers in design and development of software applications and infrastructure. For software applications design and development, students obtain necessary skills and perspective for supervising and participating in all phases of software projects: architecture, high-level design, detailed design, documentation, implementation, testing, systems integration, and system maintenance. These same phases are also important in developing software infrastructure, including software component libraries and other foundations for productive applications development. Additional issues for software infrastructure include systematic classification of software library components, design of interfaces for interoperability, and assuring reliability and high performance even as existing components are redesigned for broader applicability. Areas in which there is high demand for software applications designers include, among many others, simulation software, distributed systems, embedded systems, web technologies and protocols, and graphical user interfaces. Companies and organizations developing such applications are also increasingly recognizing the role of specialists in software infrastructure.

**Select two or three of the following courses:**

|                         |   |             |
|-------------------------|---|-------------|
| CSCI-4020               | Computer Algorithms                         | Spring      |
| CSCI-4210               | Operating Systems                           | Fall/Spring |
| CSCI-4220               | Network Programming                         | Spring      |
| CSCI-4320/<br>CSCI-6360 | Parallel Programming/<br>Parallel Computing | Spring      |
| CSCI-4430               | Programming Languages                       | Fall/Spring |
| CSCI-4440               | Software Design and Documentation           | Fall/Spring |
| CSCI-6140               | Computer Operating Systems                  | Fall        |
| CSCI-6210               | Design & Analysis of Algorithms             | Spring      |
| CSCI-6510               | Distributed Systems and Algorithms          | Fall        |
| CSCI-696X               | Semantic Web Topics Course                  | Fall        |
| ISYE-4220               | Optimization Algorithms and Applications    | Fall        |
| ITWS-6400               | X-Informatics                               | Spring      |
| ITWS-6700               | Software Development                        | Spring/Fall |
| MGMT-6170               | Advanced Systems Analysis and Design        | Spring/Fall |
|                         |   |             |
|                         |   |             |

**If only two of the above were chosen, select one more of the following courses:**

|           |   |        |
|-----------|---|--------|
| COMM-4690 | Interface Design: Hypermedia Theory and Application | Spring |
| COMM-6560 | Visual Design: Theory and Application               | Fall   |
| COMM-6770 | User-Experience Design                              | Fall   |
| COMM-6810 | Studio Design in HCI                                | Spring |
| COMM-6880 | Interactive Data Visualization                      | Summer |

**MANAGEMENT  
INFORMATION  
SYSTEMS**

The Management Information Systems concentration is designed for professionals seeking executive positions with responsibilities for achieving competitive advantage through the effective development and integration of information technology into organizations. The emergence of Internet and the World Wide Web has ushered in a new paradigm for organizing in which information technology and IT management capabilities could determine winners and losers in electronic markets. The net result is a growing need for managers in all functional areas to be conversant with strategies and tactics for managing the use of information technology. This concentration is designed to fulfill this need and expose students to IT management concepts and theories. The courses use an interdisciplinary approach, are project and case based and provide a solid grounding in systems analysis and design, IT project management, enterprise information architecture planning and design, evaluation of IT value, identification and assessment of opportunities for IT-enabled business transformation and information systems management. MIS graduates can find managerial positions in the information systems departments in organizations and in consulting.

**Select three of the following courses**

**Note: A maximum of five management courses (prefix: MGMT) may be taken towards the IT degree.**

|           |  |             |
|-----------|--|-------------|
| CSCI-6390 | Database Mining                                | Fall        |
| MGMT-4130 | Enterprise IT Integration                      | Spring      |
| MGMT-4150 | IT Project Management                          | Spring      |
| MGMT-6060 | Business Implications of Emerging Technologies | Fall/Spring |
| MGMT-6080 | Networks, Innovation and Value Creation        | Fall        |
| MGMT-6140 | Information Systems for Management             | Spring      |
| MGMT-6170 | Advanced Systems Analysis and Design           | Spring/Fall |
| MGMT-6560 | Technology Fundamentals for Business Analytics | Fall        |
| MGMT-6570 | Advanced Data Resource Management              | Fall        |
| MGMT-6720 | Internet Marketing                             | Spring      |
| MGMT-6810 | Management of Technical Projects               | Fall        |
|           |  |             |

|   |  |  |             |
|---|--|--|-------------|
| <p style="text-align: center;"><b>FINANCIAL ENGINEERING*</b></p> <p>* prerequisite – knowledge in finance is required</p> | <p>The Financial Engineering concentration prepares students for careers in the financial industry, with opportunities in financial analysis, management, and consulting and also in banking, investments, and insurance. The combination of advanced study in IT and Financial Engineering uniquely qualifies graduates to assist firms seeking IT solutions to financial systems. The FE concentration is offered jointly with the Lally School of Management and Technology. Students are introduced to the mathematical approach to risk analysis, portfolio selection, investment planning and derivative instruments, among other financial topics. Focus will be on modeling, optimization, statistical and other computational techniques.</p> |  |             |
|   | MATH-4740  | Intro. To Financial Mathematics and Engineering (required)   | Fall        |
|   | MGMT-7760  | Risk Management (required)                                   | Fall        |
|   | <b>With Advisor approval, choose three additional courses:</b>   |  |             |
|   | CSCI-696X  | Computational Finance  | Fall        |
|   | ECON-4120  | Mathematical Methods in Economics                            | Fall        |
|   | ECON-6570  | Advanced Econometrics  | Spring      |
|   | ISYE-6100  | Time Series Analysis   | Spring      |
|   | MATH 4800  | Numerical Computing  | Fall/Spring |
|   | MATH-4820  | Introduction to Numerical Methods for Differential Equations | Spring      |
|   | MATH-6740  | Financial Mathematics and Simulation                         | Spring      |
|   | MATP-4620  | Mathematical Statistics                                      | Spring      |
|   | MATP-4700  | Mathematical Models of Operations Research                   | Fall        |
|   | MATP-4820  | Computational Optimization                                   | Spring      |
|   | MATP-6640  | Linear Programming   | Spring      |
|   | MGMT-6020  | Financial Management I                                       | Fall        |
|   | MGMT-6210  | Managerial Accounting  | Spring      |
|   | MGMT-6240  | Financial Trading and Investing                              | Spring      |
|   | MGMT-6370  | Derivatives Markets  | Fall        |
|   | MGMT-6400  | Financial Econometric Modeling                               | Spring      |
|   | MGMT-6410  | Investments I  | Fall        |
|   | MGMT-6430  | Advanced Financial Statement Analysis                        | Fall/Spring |
|   | MGMT-6510  | Financial Computation  | Fall        |
|   | MGMT-6520  | Financial Modeling   | Fall        |
|   | MGMT-696X  | Fixed Income   | Spring      |

**HUMAN-  
COMPUTER  
INTERACTION**

The Human-Computer Interaction concentration prepares IT professionals for careers in information technology design and development. The focus is on the ways technical skills in IT can be applied in a user-centered rather than a strictly technology-centered or developer-centered way.

In the HCI Concentration, students are given the opportunity to:

- practice the research and design skills necessary to produce effective, usable human interfaces for IT systems
- deepen their understanding of cognitive and social theories underlying effective human interface design, and
- acquire the ability to make strategic decisions based on user data which will enhance the processes and products associated with IT design

Students with an HCI concentration may go on to careers in fields such as User-Centered Design, Human Factors and Usability Engineering, and Quality Assurance, contributing to a wide variety of hardware and software product areas.

**Select three of the following courses:**

|           |  |        |
|-----------|--|--------|
| ARTS-496X | Creative Data Design                   | Spring |
| COMM-4470 | Information Design                     | Fall   |
| COMM-4690 | Interface Design                       | Spring |
| COMM-6530 | Media Communications Research          | Spring |
| COMM-6560 | Visual Design                          | Fall   |
| COMM-6810 | Studio Design in HCI                   | Spring |
| COMM-6770 | User-Experience Design                 | Fall   |
| COMM-6880 | Interactive Data Visualization         | Summer |
| COMM-696X | Mobile AR                              | Fall   |
| ISYE-4260 | Human Performance Modeling and Support | Fall   |
|           |  |        |

## Admissions Requirements

Applicants are expected to have prior academic records that indicate their ability to excel in advanced coursework. Prospective students should also have completed the equivalent to the following three Rensselaer courses prior to enrollment:

- CSCI-1100 Computer Science I (Fundamentals of Computer Science) – Number systems; basic computer architecture; stepwise refinement of algorithms; functions and parameter passing; basic programming concepts through two-dimensional arrays and pointer basics using C++.
- CSCI-1200 Data Structures – Pointers; classes; operator overloading; deep vs. shallow copy constructors; inheritance; file I/O; templates in C++, introductory algorithm analysis and data structures.
- CSCI-2300 Introduction to Algorithms – Topics including mathematical induction and its application to algorithm design; linear structures; trees and balanced trees; heaps and priority queues; graphs and graph algorithms; backtracking, divide-and-conquer and greedy algorithms.

The GRE (Graduate Record Examination) and a resume are required of all applicants.



“When I compare the opportunities I had before and after the IT program, it has been a complete turnaround. I got more interviews and I saw a lot of respect from the recruiters”.

-Deepika Singh  
B.A. Architecture, M.S. Information Technology  
Concentration in Software Design

“Oracle employs some of the most talented developers and technical staff in the world. Being in that sort of environment, you must have a firm grasp of technical aspects as your team is constantly immersed in all kinds of situations. Both my overall experience and focused studies in particular courses at RPI prepared me for this environment.”

-Scott Jablonski  
B.S. Psychology, M.S. Information Technology  
Concentration in Information Systems Engineering



**For Additional Information:**

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