



## Table of Contents

Undergraduate Programs	303
Graduate Program	307

# Information Technology

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Recognizing that Information Technology (IT) is the “enabler of the Information Age,” Rensselaer has made IT one of its top academic priorities. The Institute has developed a highly interdisciplinary program that emphasizes IT’s application to nearly every field from science and engineering to management to humanities and social sciences. The IT degree programs are designed for students with a strong technical aptitude that they wish to apply to other interests.

Rensselaer’s undergraduate and graduate IT degree programs consist of two components. The first is a set of core courses, many of which are technical in nature. The second is the concentration area in which students are expected to employ their technical expertise.

Each of Rensselaer’s five schools offers concentration area options to IT students. The curriculum of each of the five schools supported and formulated the IT degrees. Many Rensselaer faculty members representing a wide variety of the disciplines taught at the Institute contribute to this program, thereby providing students with a broad range of perspectives on IT and the breadth of its impact on the world.

Information technology degrees available at Rensselaer include the Bachelor of Science and the Master of Science. Opportunities for Ph.D. level work in IT are under development. Those holding these degrees are in great demand and command some of the highest starting salaries and bonuses in any profession.

## Faculty\*

### Professors

**Bailey, R.A.**—Ph.D. (McGill University); coordination chemistry and chemistry of molten salts (Science).

**Breneman, C.M.**—Ph.D. (University of California, Santa Barbara); physical organic chemistry (Science).

**Bringsjord, S.**—Ph.D. (Brown University); logic, philosophical logic, philosophy of artificial intelligence (Humanities and Social Sciences).

**Connor, K.**—Ph.D. (Polytechnic Institute of New York); electromagnetic theory, wave propagation, plasmas for fusion research and industrial applications, finite element methods (Engineering).

**Flaherty, J.E.**—Ph.D. (Polytechnic Institute of Brooklyn); numerical analysis, scientific computation, parallel computation, adaptive methods (Science).

**Gabriele, G.A.**—Ph.D. (Purdue University); design automation, design optimization (Engineering).

**Gerhardt, L.A.**—Ph.D. (State University of New York, Buffalo); communication systems, digital voice and image processing, adaptive systems and pattern recognition, integrated manufacturing (Engineering).

**Goldberg, M.K.**—Ph.D. (Institute of Mathematics, Novosibirsk, Russia); algorithms for combinatorial optimization, experimental algorithm design and analysis, computational learning theory, graph theory (Science).

\* Departmental faculty listings are accurate as of the date generated for inclusion in this catalog. For the most up-to-date listing of faculty positions, including end-of-year promotions, please refer to the Faculty Roster section of this catalog, which is current as of the May 2004 Board of Trustees meeting.

- Gowdy, J.M.**—Ph.D. (West Virginia University); ecological economics, industrial organization and public regulation, regional economics (Humanities and Social Sciences).
- Haddock, J.**—Ph.D. (Purdue University); modeling of production and service systems including simulation and optimization techniques (Management).
- Herron, I.**—Ph.D. (Johns Hopkins University); applied mathematics, fluid mechanics, hydrodynamics, stability (Science).
- Hess, D.**—Ph.D. (Cornell University); science, culture, and power; social studies of alternative medicine (Humanities and Social Sciences).
- Hsu, C.**—Ph.D. (Ohio State University); metadatabase and information systems, Internet enterprises planning, database and knowledge-based systems, computerized manufacturing, enterprise integration and modeling, information visualization, economic evaluation of cyberspace-augmented enterprises (Engineering).
- Isaacson, D.**—Ph.D. (New York University); mathematical physics, biomedical applications (Science).
- Kapila, A.**—Ph.D. (Cornell University); applied mathematics, combustion, fluid mechanics (Science).
- Lahey, R.T., Jr.**—Ph.D. (Stanford University); multiphase flow and boiling heat transfer, reactor safety analysis, reactor thermal-hydraulics, and applications of chaos theory (Engineering).
- List, G.F.**—P.E., Ph.D. (University of Pennsylvania); intelligent transportation systems, sensors, instrumentation and control, multiobjective stochastic routing and siting, freight network planning (Engineering).
- Malmborg, C.J.**—Ph.D. (Georgia Institute of Technology); modeling and analysis of problems in facility design, materials handling, materials flow, storage systems, simulation-based optimization methods, manufacturing systems, decision analysis (Engineering).
- McLaughlin, H.W., II**—Ph.D. (University of Maryland); applied geometry (Science).
- Musser, D.**—Ph.D. (University of Wisconsin); programming methodology, generic software libraries, formal methods of specification and verification, automated theorem proving (Science).
- Napolitano, J.**—Ph.D. (Stanford University); experimental nuclear and particle physics (Science).
- Nierzwicki-Bauer, S.A.**—Ph.D. (University of New Hampshire); plant molecular biology; subsurface microbiology (Science).
- Rajan, K.**—Sc.D. (Massachusetts Institute of Technology); electron microscopy, electronic materials, thin films and super lattices (Engineering).
- Restivo, S.**—Ph.D. (Michigan State University) information and society; social robotics; nanotechnology and social organization; the knowledge society (Humanities and Social Sciences).
- Roberge, W.G.**—Ph.D. (Harvard University); theoretical astrophysics (Science).
- Rolnick, N.B.**—Ph.D. (University of California, Berkeley) music composition including interaction between computers and performers, distributed performance (over I2 or other networking technologies), computer as a musical instrument (Humanities and Social Sciences).
- Salerno, J.C.**—Ph.D. (University of Pennsylvania); bioenergetics, spectroscopy, metalloproteins (Science).
- Siegel, D.**—Ph.D. (Columbia University) economics of technological change, productivity analysis, corporate social responsibility (Humanities and Social Sciences).
- Siegmann, W.L.**—Ph.D. (Massachusetts Institute of Technology); applied mathematics, wave propagation (Science).
- Spooner, D.L.**—Ph.D. (Pennsylvania State University); database systems, database security, and database browsing and visualization (Science).
- Wait, S.C., Jr.**—Ph.D. (Rensselaer Polytechnic Institute); spectroscopy, vibrational and electronic spectroscopy (Science).
- Warden, J.T.**—Ph.D. (University of Minnesota); ESR spectroscopy, photosynthetic electron transport mechanisms (Science).

**Willemain, T.**—Ph.D. (Massachusetts Institute of Technology); probabilistic modeling, data analysis, forecasting (Engineering).

### **Clinical Professors**

**Danchak, M.M.**—Ph.D. (Rensselaer Polytechnic Institute); human computer interaction, usability, information visualization, techniques for distance learning and human learning models (Science).

**DeNoia, L.**—Ph.D. (Brown University); telecommunications, networking, network management, effective IT organizations (Rensselaer at Hartford).

**Hughes, G.**—Ph.D. (Princeton University); global economics, economics of information technology (Management).

**McKim, J.**—Ph.D. (University of Iowa); computer and information sciences (Rensselaer at Hartford).

### **Associate Professors**

**Adali, S.**—Ph.D. (University of Maryland); heterogenous distributed information systems, database systems (Science).

**Breyman, S.**—Ph.D. (University of California, Santa Barbara); political economy of environment, science, and society (Humanities and Social Sciences).

**Embrechts, M.J.**—Ph.D. (Virginia Polytechnic Institute); fusion engineering, applied chaos theory, neural networks (Engineering).

**Fortun, K.**—Ph.D. (Rice University); international politics, environmentalism and the law (Humanities and Social Sciences).

**Hanna, M.H.**—Ph.D. (University of Illinois); slime mold development and genetics (Science).

**Hannigan, J.**—M.Arch. (Pratt Institute); product design, sustainable systems, history of communication (Humanities and Social Science).

**Kalsher, M.J.**—Ph.D. (Virginia Polytechnic Institute and State University); human factors, industrial/organizational psychology, applied experimental psychology (Humanities and Social Sciences).

**Krishnamoorthy, M.S.**—Ph.D. (Indian Institute of Technology); programming languages, analysis of algorithms (Science).

**Krueger, T.**—M.Arch. (Columbia University); human-environment interaction, design (Architecture).

**Leifer, R.**—Ph.D. (University of Wisconsin); organizational behavior and organizational design, management information systems (Management).

**Massie, W.**—M.Arch. (Columbia University); architectural design, advanced computer applications and emerging technologies, computerized construction, architectural practice (Architecture).

**Parsons, R.H.**—Ph.D. (Oregon State University); cellular physiology, epithelial transport (Science).

**Phan, P.**—Ph.D. (University of Washington); strategic management, entrepreneurship (Management).

**Piper, B.R.**—Ph.D. (University of Utah); computer-aided geometric design, numerical analysis, computer graphics (Science).

**Ravichandran, T.**—Ph.D. (Southern Illinois University, Carbondale); management information systems (Management).

**Sanderson, S.**—Ph.D. (University of Pittsburgh); International business, manufacturing policy, and new product development (Management).

**Saulnier, G.J.**—Ph.D. (Rensselaer Polytechnic Institute); circuits and electronics, communication systems, digital signal processing (Engineering).

**Woodhouse, E.J.**—Ph.D. (Yale University); policy of science and technology, decision making (Humanities and Social Sciences).

**Younessi, H.**—Ph.D. (Swinburne University of Technology); computer and information sciences (Rensselaer at Hartford).

**Clinical Associate Professors**

- Ellis, H.**—Ph.D. (University of Connecticut); computer and information sciences (Rensselaer at Hartford).
- Grice, R.**—Ph.D. (Rensselaer Polytechnic Institute); information usability, human-computer interfaces, applications of computers to technical communication, information development in industry (Humanities and Social Sciences).
- Hartley, T.**—M.S. (University of Connecticut); database systems, natural language processing, information retrieval (Rensselaer at Hartford).
- Heim, J.**—Ph.D. (State University of New York at Albany); money and banking, international economics (Humanities and Social Science).
- Martyn, T.**—Ed.D. (University of Massachusetts); database systems, management information systems, client/server systems (Rensselaer at Hartford).
- Mistur, M.**—B.Arch. (Rensselaer Polytechnic Institute); architectural design (Architecture).
- St. John, W.C.**—Ph.D. (Rensselaer Polytechnic Institute) accounting information systems, systems compliance with the Sarbanes-Oxley Act (Management).
- Triscari, T.**—Ph.D. (Rensselaer Polytechnic Institute); information systems (Management).

**Assistant Professors**

- Akera, A.**—Ph.D. (University of Pennsylvania); history of scientific and technical computing, innovation studies (Humanities and Social Sciences).
- Bustamante, N.**—M.F.A. (San Francisco Art Institute) art (Humanities and Social Sciences).
- Carothers, C.**—Ph.D. (Georgia Institute of Technology); computer simulation, parallel simulation, parallel systems (Science).
- De, S.**—Sc.D. (Massachusetts Institute of Technology); numerical methods in engineering, multimodal virtual environments, fast computational techniques of MEMS (Engineering).
- Hart-Davidson, W.**—Ph.D. (Purdue University); professional writing theory and practice, usability and participatory design, rhetorical theory, design for the World Wide Web and electronic media, theories and histories of writing techniques (Humanities and Social Sciences).
- Hübscher-Younger, T.**—Ph.D. (Auburn University); computer-supported collaborative learning; educational technology; human-computer interaction; usability evaluation; software engineering; web application and interface design and development (Humanities and Social Sciences).
- Korniss, G.**—Ph.D. (Virginia Polytechnic Institute); theoretical and computational physics (Science).
- Lonsway, B.**—M.Arch. (Columbia University); architectural theory and electronic media (Architecture).
- Magdon-Ismail, M.**—Ph.D. (California Institute of Technology); machine learning, computational finance, bioinformatics (Science).
- Nambisan, S.**—Ph.D. (Syracuse University); information systems (Management).
- Nelson, M.**—Ph.D. (University at Albany); information systems (Management).
- Torres, R.**—Ph.D. (Chalmers Tekniska Högskola, Gothenburg, Sweden); architectural acoustics, auralization of sound fields, subjective effects of room acoustics (Architecture).

**Clinical Assistant Professors**

- Boyer, K.**—Ph.D. (McGill University); IT, cities and social change; gender, work, and the politics of technology (Humanities and Social Sciences).
- Brown, R.**—M.S.E.E. (University of Illinois); computer communication networks, network management, client/server architectures (Rensselaer at Hartford).
- Murtagh, J.P. Jr.**—Ph.D. (Rensselaer Polytechnic Institute); investment analysis and financial services (Management).

**Peters, L.B.**—Ph.D. (Rensselaer Polytechnic Institute); management information systems (Management).

**Robbins, R.W.**—M.S. (Binghamton University); accounting, information systems implementation (Management).

**Sands, R.**—M.S., MBA (University at Albany); organizational behavior and human resource management (Management).

### Other

**Hollinger, D.L.**—M.S. (Rensselaer Polytechnic Institute); machine learning, AI applications for the World Wide Web, genetic algorithms, Web programming (Lecturer – Computer Science) (Science).

**Kolb, J.**—PE., M.Eng. (Rensselaer Polytechnic Institute); Management of Information Systems (Chief Information Officer, DotCIO) (Management).

**Miner, J.**—M.S. (Stevens Institute of Technology); information technology management, enterprise computing architectures (Director- IACS, Integrated Administrative Computing Services, DotCIO) (Management).

## Undergraduate Programs

The objectives of the BSIT curriculum are to prepare students to enter a rewarding career in IT and to pursue further professional and/or graduate education. The program:

- Synthesizes computing, systems, management and humanities
- Extends the student's horizons from the focused core of IT to the disciplinary knowledge of a student chosen application domain.

It also promotes the integration of traditional education with engaged learning and the spirit of entrepreneurship that pervades the IT industry. The program is designed especially for students with interests outside the technical world, but nevertheless requires substantial technical talents and skills.

### Baccalaureate Programs

Completion of the B.S. in Information Technology requires a total of 128 credit hours, of which 56 credits constitute an IT Core and 32 credits are devoted to a concentration. The remaining credit hours fulfill Rensselaer degree requirements. The IT core requirements establish a solid foundation for applying IT to any discipline. The Rensselaer requirements ensure the degree's breadth and its consistency with long-established Rensselaer traditions. The required concentration provides an opportunity for in-depth study of an IT application area. Concentration options include arts, communications and networks, law, management information systems, medicine, psychology, and numerous others. In consultation with a faculty adviser, students may also design their own concentration through the selection of courses that match their individual interests.

The specific requirements for the B.S. in Information Technology are illustrated below.

#### *Math and Science Requirements: (24 credits)*

MATH-1010	Calculus I.....	4 credits
	Math Elective .....	4 credits
CSCI-1100	Computer Science I .....	4 credits
CSCI-1200	Computer Science II .....	4 credits
	Science Elective .....	4 credits
	Science Elective .....	4 credits

**Humanities and Social Sciences Requirements: (24 credits)**

ITEC-1210	Information in History and Society .....	4 credits
ITEC-1220	Politics and Economics of IT.....	4 credits
	Humanities Elective .....	4 credits
	Social Science Elective .....	4 credits
	Hum. or Soc. Sci. Elective .....	4 credits
	Hum. or Soc. Sci. Elective .....	4 credits

**Free Elective Requirements: (12 credits)**

Free Elective .....	4 credits
Free Elective .....	4 credits
Free Elective .....	4 credits

**IT Core Requirements: (35-36 credits)**

Pick either the ECSE-2610/ENGR-2350/ECSE-2660<sup>2</sup> sequence or the CSCI-2300/2500 sequence:

ECSE-2610	Computer Components and Operations .....	4 credits
ENGR-2350	Embedded Control .....	4 credits
ECSE-2660	Computer Architecture, Networking, and OS .....	4 credits

or

CSCI-2500	Computer Organization .....	4 credits
CSCI-2300	Data Structures and Algorithms .....	4 credits

ITEC-2110	Exploiting the Information World .....	4 credits
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**IT Technology Elective (one of):**

CSCI-4380	Database Systems .....	4 credits
DSES-4530	Information Systems.....	4 credits

ITEC-4310	Managing IT Resources .....	4 credits
ITEC-2960	Creativity and IT <sup>1</sup> .....	4 credits
ITEC-2210	Intro. to Human Computer Interaction .....	4 credits

**Probability and Statistics Elective (one of):**

DSES-2010	Statistics for Management .....	4 credits
ENGR-2600	Modeling and Analysis of Uncertainty .....	3 credits
MGMT-2100	Statistical Methods .....	4 credits
PSYC-2310	Experimental Methods and Statistics .....	4 credits

ITEC-4100	IT Studio/Capstone Experience .....	4 credits
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**Student-Selected Concentration: (32 credits)**

Concentration course .....	4 credits
Concentration course .....	4 credits
Concentration course .....	4 credits
Concentration course .....	4 credits
Concentration course .....	4 credits
Concentration course .....	4 credits
Concentration course .....	4 credits
Concentration Capstone Experience .....	4 credits

<sup>1</sup> A special topics course.

<sup>2</sup> If this sequence is chosen, ENGR-2350 can be counted towards the free elective requirement.

The Concentrations from which students may choose are as follows:

Arts	Management Information Systems
Building Sciences (Architecture)	Mechanical/Aeronautical Engineering
Civil Engineering	Medicine
Communication	Pre-law
Communication and Networks	Product Design and Innovation (PDI) <sup>2</sup>
Computer Hardware	Psychology
Economics	Science and Technology Studies:
E-Commerce	Information and Society
Entrepreneurship	Science Informatics
Finance	Special Interest
Industrial Engineering	Web Technologies
Machine and Computational Learning	

The above list, as well as associated required courses for each Concentration, is available on the IT program web page. The list expands as new Concentrations are developed. Students wishing to devise a special interest Concentration specific to individual interests should consult their faculty advisers.

Each Concentration also stipulates an appropriate probability and statistics course for students who pursue it. This course is taken as part of the IT core. Courses that fulfill this purpose include: ENGR-2600, MGMT-2100, PSYC-2310, and DSES-2010.

Below is a typical, but not required, eight-semester course schedule for obtaining the B.S. in IT.

### First Year

#### Fall

ITEC-1210	Information in History and Society
CSCI-1100	Computer Science I
MATH-1010	Calculus I
	Science Elective

#### Spring

ITEC-1220	Politics and Economics of IT
CSCI-1200	Computer Science II
	Math Elective
	Science Elective

### Second Year

#### Fall

ITEC-2960	Creativity and IT
ITEC-2110	Exploiting the Information World
	Concentration Course

One of:\*

ECSE-2610	Computer Components and Operations
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and

ENGR-2350	Embedded Control
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or

CSCI-2500	Computer Organization
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#### Spring

ITEC-2210	Intro. to Human Computer Interaction
	Concentration Course

One of:\*

ECSE-2660	Computer Architecture, Networking and OS
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or

CSCI-2300	Data Structures and Algorithms
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Probability and Statistics Elective (one of):

DSES-2010	Statistics for Management
ENGR-2600	Modeling and Analysis Uncertainty
MGMT-2100	Statistical Methods
PSYC-2310	Experimental Methods and Statistics

\* Students must select either the ECSE-2610, ENGR-2350, ECSE-2660 sequence or the CSCI-2500, CSCI-2300 sequence. Students cannot mix courses from these sequences.

<sup>2</sup> The PDI concentration is 132 credits. Upon completion of this concentration, the student will receive a dual degree with IT and STS. See the H&SS Interdisciplinary Programs and Research Section of the catalog for the eight-semester schedule (pp. 294).

**Third Year****Fall**

ITEC-4310	Managing IT Resources Hum. and Soc. Sci. Elective ** Concentration Course
IT Elective (one of):	
CSCI-4380	Database Systems
DSES-4530	Information Systems

**Spring**

Hum. and Soc. Sci. Elective **
Concentration Course
Concentration Course
Free Elective

**Fourth Year****Fall**

ITEC- 4100	IT Capstone Experience Concentration Course Hum. and Soc. Sci. Elective ** Free Elective
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**Spring**

Concentration Capstone Experience
Concentration Course
Hum. and Soc. Sci. Elective **
Free Elective

Only free electives and six credits of the H&SS electives may be taken with the Pass/No Credit option.

If a student chooses to pursue a dual degree with Information Technology as one of the degrees, the dual degree must be the degree that is closest to the student's Concentration. For example, if a student's Concentration is Psychology then the dual degree would need to be in Psychology. Currently, Electronic Media, Arts & Communication (EMAC) and Management are not available as a dual degree option.

**Minor Programs**

The IT minor requires four courses:

■ One of the following two:

- ITEC-1210/IHSS-1210 Information in History and Society
- ITEC-1220/IHSS-1220 Politics and Economics of IT

■ ITEC-2110 Exploiting the Information World

■ Two of the following four:

- CSCI-1200 Computer Science II <sup>3</sup>
- ITEC-2210 Introduction to Human Computer Interaction
- ITEC-4310 Managing IT Resources <sup>4</sup>
- PHYS-2050 Science of Information Technology

\*\* See Hum. and Soc. Sci. Elective requirements in H&SS section of the catalog.

<sup>3</sup> Cannot be used by CSCI and CSYS majors to satisfy this requirement.

<sup>4</sup> Cannot be used by MGMT majors to satisfy this requirement.

## Graduate Program

Information Technology is the focal point of a revolution in which computer science and computing tools and techniques drive innovation across a wide spectrum of businesses and industries. Rensselaer's interdisciplinary Master of Science program in Information Technology, distinguished by its currency, intensity and rigor, is educating a cadre of leaders in this revolution.

Rensselaer's degree is not an overview nor an introduction to the IT field. Students gain a theoretical grounding in computing not often acquired "on the job" and a significant body of course work in a technical IT Concentration area that will qualify them as IT specialists in that field. Rensselaer's IT graduates are able to "do" as well as "talk about" the application of Information Technology.

The MS in IT program prepares students for advanced level employment and/or advanced study in Information Technology fields. Student interaction with Rensselaer faculty who are working on leading-edge IT research has encouraged a significant number of master's students to continue for IT related Ph.D.'s.

The Rensselaer IT master's program provides graduates with a breadth of experience in database systems, networking, software design, management of technology, and human computer interaction through the IT Core. In addition, students obtain in-depth experience in the application of information technology by selecting one of nine Concentrations.

The IT program is available through the Troy, N.Y., campus; Rensselaer at Hartford in Hartford, Conn.; and via Rensselaer's Office of Education for Working Professionals.

Students seeking admission must have highly competitive academic records and have completed course work that is equivalent to the following Rensselaer courses prior to applying:

- CSCI-1100 Computer Science I (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 Computer Science II (pointers, classes, operator overloading, deep vs. shallow copy constructors, inheritance, file I/O, templates in C++, introductory algorithm analysis, and data structures)
- CSCI-2300 Data Structures and Algorithms (advanced topics including mathematical induction and its application to algorithm design, linear structures, trees and balanced trees, heaps and priority queues, graphs and graph algorithms)

The Graduate Record Examination (GRE) is required of all full and part-time applicants.

### Master's Program Requirements

Students admitted to the M.S. in IT develop an approved Plan of Study that must include the following:

- Ten courses in IT (a minimum of thirty credits)
- A minimum of six courses (18 credit hours or more) at the graduate level (6xxx-level courses)
- Five Core courses; one from each of the five Core Areas
- A minimum of three courses (nine credit hours or more) in an approved Concentration
- One elective approved by the adviser
- The IT Master's Capstone course

The Core and Concentration courses are designed to accommodate a wide range of backgrounds. Students can waive an IT Core area requirement and substitute an approved elective only if they have already taken the equivalent of all the courses listed in that Core area. If students have previously completed the basic required Core course, they must 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 area requirement could be satisfied by taking Enterprise Database Systems. Students may request transfer credit only for the elective, subject to adviser 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 M.S. in IT Master's Capstone course integrates the knowledge and professional practice of IT Core and Concentration courses. The Capstone utilizes an Information Technology Team Project with a real organization to practice the major concepts of the IT master's degree. The Team Project involves strategic and business planning, systems development, and technology implementation. Expertise in database systems, networking, software design, decision sciences, management of technology, human computer interaction, and ethics are applied within a framework of global e-business strategy.

Core courses are generally taken in the fall and Concentration courses in the spring. Full-time students normally begin in the fall term and take five courses in the fall and five the following spring to complete the program. Part-time students typically complete the program in two and one-half years of continuous study. Students may elect to extend the program to three semesters enabling the completion of two concentrations (12 courses) and a summer or summer/fall co-op assignment.

Rensselaer currently offers numerous Ph.D. degrees with significant IT related research, e.g. computational chemistry and physics, science and technology studies, decision sciences, applied mathematics and human-computer interaction. Students who are planning doctoral study may choose to apply simultaneously for admission to the Ph.D. in the relevant Rensselaer department and also for the M.S. in IT. Once admitted to both, the student and the Ph.D. and M.S. adviser determine if the regular IT curriculum or the IT Research Track is preferred. If the Research Track is chosen, the student and the adviser select a set of concentration courses that lead to an IT intensive Master's Thesis in place of the IT Master's Capstone course.

### IT Core Requirements

To acquire a breadth of IT experience, master's degree students take the five Core courses listed below. Alternate courses are also listed for those who have previously completed the required Core course. Courses may be delivered in a variety of modes including on-site, synchronous, asynchronous, and via videoconferencing. Also noted is the usual term in which the required Troy campus Core course is offered. Course offerings change frequently to keep pace with rapid advancement in IT; some courses are delivered in alternate years. Please see the Troy IT Web site for the most current information: [www.it.rpi.edu](http://www.it.rpi.edu). Students enrolling at the Hartford campus or via Rensselaer's Office of Education for Working Professionals should consult the following Web sites for course options:

■ Hartford: <http://www.rh.edu/>

■ Education for Working Professionals: <http://www.pde.rpi.edu/>

IT Core Area	Course Name	Term(s) Offered
Database Systems	CSCI-4380 Database Systems	Fall/Spring
Networking	ECSE-4670 Computer Communication Networks	Fall
Software Design	ECSE-6770 Software Engineering I	Fall
Management of Technology	ENGR-6100 Business Issues for Engineers and Scientists	Fall
Human Computer Interaction	COMM-6420 Foundations of HCI Usability	Fall

## IT Advanced Core

Students who have already completed the Core courses listed above select one of the advanced courses noted below:

Advanced Core	Course Name	Term(s) Offered
Database Systems	DSES-6520 Enterprise Database Systems	Spring
	CSCI-6460 Advanced Database Management Topics	Spring
Networking	ECSE-6600 Internet Protocols	Spring
	ECSE-6660 Broadband Networks	Spring
Software Design	CSCI-6090 Generic Software Design	Fall
	CSCI-6320 Graphical User Interfaces	Fall
Management of Technology	MGMT-6610/DSES-6470 Global Strategic Management of Technological Innovation	Fall/Spring
	MGMT-6810 Management of Technical Projects	Fall
Human Computer Interaction	COMM-6750 Communication Design for WWW	Fall
	COMM-6760 Electronic Coaching Systems	Spring

## Concentration Requirements

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 computer backgrounds may select MIS or e-business). Alternately, some students select a Concentration related to their prior backgrounds and then expand on that background through higher-level course work. The course taken to complete a Core requirement does not count toward the Concentration.

Rensselaer's course offerings are dynamic and new courses are developed each semester, making course listings subject to change.

Concentration	Course Number and Name	Term(s) Offered
Networking	<i>Select three of the following courses:</i>	
	CSCI-4220 Network Programming	Spring
	ECSE-6660 Broadband Networks	Spring
	ECSE-6670 Local Computer Networks	Spring
	ECSE-6600 Internet Protocols	Spring
	CSCI-4900 Computer Networking II	Fall/Spring
	ECSE-6820 Queuing Systems & Applications	Spring
	CSCI-6900 Distributed Computing Over the Internet	Spring
	ECSE-6900 Mobile Wireless Networks	Fall
Human-Computer Interaction	<i>Select three of the following courses:</i>	
	COMM-6760 Electronic Coaching Systems	Spring
	COMM-6750 Communication Design for the WWW	Fall
	COMM-6810 Studio Design in HCI	Spring
Database Systems Design	CSCI-6320 Graphical User Interfaces	Fall
	<i>Select three of the following courses:</i>	
	CSCI-4020 Computer Algorithms	Spring
	CSCI-6460 Advanced Database Management Topics	Spring
	CSCI-6930 Database Mining	Fall
	DSES-6180 Knowledge Discovery with Data Mining	Spring
	DSES-6520 Enterprise Database Systems	Spring
	CSCI-6900 Multimedia Database Systems	Spring
DSES-6530 Decision Support & Expert Systems	Spring	
ECSE-6710 Fuzzy Sets & Expert Systems	Fall	

Software Design	CSCI-4150 Introduction to AI	Fall
	<i>Select three of the following courses:</i>	
	MGMT-6170 Advanced Systems Analysis and Design	Fall
	CSCI-4440 Software Design and Documentation	Fall/Spring
	CSCI-6090 Generic Software Design	Fall
	CSCI-6320 Graphical User Interfaces	Fall
	ECSE-6780 Software Engineering II	Spring
	COMM-6810 Studio Design in HCI	Spring
	CSCI-6900 Distributed Computing over the Internet	Spring
	CSCI-6960 Program Analysis for Software Tools	Spring
Information Systems Engineering	<i>Select a second course in Database Systems or Software Design</i>	
	<i>Select two more of the following courses:</i>	
	DSES-6500 Information and Decision Technologies for Industrial and Service Systems	Fall
	DSES-6570 IT and Systems for E-Business	Spring
	DSES-6560 IT and Systems for Enterprise Engineering	Fall
	DSES-6530 Decision Support and Expert Systems	Spring
DSES-6620 Discrete Event Simulation	Fall	
Management Information Systems	<i>Select three of the following courses: <sup>1</sup></i>	
	MGMT-6170 Advanced Systems Analysis and Design	Fall
	MGMT-6180 Strategic IS Management	Spring
	MGMT-6810 Management of Technical Projects	Fall
	MGMT-4130 Enterprise Information Architecture	Spring
	MGMT-6710 Designing, Developing and Staffing of High Performance Organizations I	Summer/Fall
	DSES-6180 Knowledge Discovery with Data Mining	Spring
	DSES-6530 Decision Support & Expert Systems	Spring
	MGMT-6690 Supply Chain Mgmt. for E-business	Fall
	MGMT-6120 Fundamentals of E-Business <i>and/or</i>	Fall
DSES-6570 IT and Systems for E-Business	Spring	
E-Business Engineering	<i>Select two of the following courses: <sup>1</sup></i>	
	MGMT-6690 Supply Chain Mgmt. For E-Business	Fall
	MGMT-6200 Marketing and the WWW	Fall/Spring
	ECSE-6600 Internet Protocols	Spring
	DSES-6180 Knowledge Discovery with Data Mining	Spring
	MGMT-6560 Managing New Product Development	Fall
	BIOL-6410 Bioinformatics I: Biological Sequence Analysis	Fall
	BIOL-6420 Bioinformatics II: Molecular Modeling	Spring
	CSCI-6390 Database Mining <i>or</i>	Fall
	CSCI-6210 Design and Analysis of Algorithms	Fall
<i>Select one of the following electives: <sup>2</sup></i>		
DSES-6180 Knowledge Discovery with Data Mining	Spring	
BIOL-69xx Molecular Basis of Biotechnology	Spring	
CHEM-4330 Drug Discovery	Spring	
Bioinformatics		

Research Track (Example from Chemistry)	CSCI-6460 Advanced Database Management Topics	Spring
	CSCI-6390 Database Mining	Fall
	CHEM-6510 Computational Chemistry	Spring
	CSCI-6100 Machine and Computational Learning	Fall
	ITEC-6990 Master's Thesis (in place of IT Capstone)	TBD
<b>IT Capstone Requirement</b>	<b>Course Number and Name</b>	<b>Term Offered</b>
	ITEC-6800 IT Master's Capstone <sup>3</sup>	Spring

<sup>1</sup> A maximum of five management courses (code: MGMT) may be taken towards the IT degree.

<sup>2</sup> Additional electives available subject to approval.

<sup>3</sup> The Research Track and the Bioinformatics Concentration require a Master's Thesis in place of the IT Master's Capstone course.