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Information Technology

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Program Home Page: <http://www.it.rpi.edu/>

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 at 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 2005 Board of Trustees meeting.

- Govdy, 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).
- Isacson, 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).
- Miller, B.**—M.F.A. (New York University Graduate Film and Television Program) (Humanities and Social Sciences).
- 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).

Younessi, H.—Ph.D. (Swinburne University of Technology); 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).

Carothers, C.—Ph.D. (Georgia Institute of Technology); computer simulation, parallel simulation, parallel systems (Science).

Durgee, J.—(University of Pittsburgh) (Management).

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).

Mistur, M.—B.Arch. (Rensselaer Polytechnic Institute); architectural design (Architecture).

Nambisan, S.—Ph.D. (Syracuse University); information systems (Management).

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).

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).

Clinical Associate Professors

- Ellis, H.J.C.**—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).
- Heim, J.**—Ph.D. (University at Albany); money and banking, international economics (Humanities and Social Science).
- Martyn, T.O.**—Ed.D. (University of Massachusetts); database systems, management information systems, client/server systems (Rensselaer at Hartford).
- Peters, L.B.**—Ph.D. (Rensselaer Polytechnic Institute); management information systems (Management).
- 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).
- Bystroff, C.**—Ph.D. (University of California, San Diego); bioinformatics, protein folding, computational biology (Science).
- De, S.**—Sc.D. (Massachusetts Institute of Technology); numerical methods in engineering, multimodal virtual environments, fast computational techniques of MEMS (Engineering).
- 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).
- Nelson, M.**—Ph.D. (University at Albany); information systems (Management).

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.H.**—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).
- 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:

- n Synthesizes computing, systems, management, and humanities.
- n 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, communication 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 |
| | Physical-Science Elective | 4 credits |
| | Life-Science Elective | 4 credits |

Humanities and Social Sciences Requirements: (24 credits)¹

| | | |
|-----------|--|-----------|
| 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 |

¹ We encourage students to take ECON-296x — The Economics of ITEC as one of their H&SS electives prior to taking ITEC-4310 — Managing IT Resources.

Free Elective Requirements: (12 credits)

| | |
|---------------------|-----------|
| Free Elective | 4 credits |
| Free Elective | 4 credits |
| Free Elective | 4 credits |

IT Core Requirements: (35–40 credits)

Pick either the ECSE-2610/ENGR-2350/ECSE-2660² 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 |
| <i>or</i> | | |
| CSCI-2500 | Computer Organization | 4 credits |
| CSCI-2300 | Data Structures and Algorithms | 4 credits |
| ITEC-2110 | Exploiting the Information World | 4 credits |

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 ³ | 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 |

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 |

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

³ A special topics course.

The Concentrations from which students may choose are as follows:

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

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 |
| | Physical-Science Elective |

Spring

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

Second Year

Fall

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

One of:¹

| | |
|-----------|------------------------------------|
| ECSE-2610 | Computer Components and Operations |
|-----------|------------------------------------|

and

| | |
|-----------|------------------|
| ENGR-2350 | Embedded Control |
|-----------|------------------|

or

| | |
|-----------|-----------------------|
| CSCI-2500 | Computer Organization |
|-----------|-----------------------|

Spring

| | |
|-----------|--------------------------------------|
| ITEC-2210 | Intro. to Human Computer Interaction |
| | Concentration Course |

One of:¹

| | |
|-----------|--|
| ECSE-2660 | Computer Architecture, Networking and OS |
|-----------|--|

or

| | |
|-----------|--------------------------------|
| CSCI-2300 | Data Structures and Algorithms |
|-----------|--------------------------------|

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 |

¹ 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. Students interested in pursuing the MS in IT degree should take the CSCI-2500, CSCI-2300 sequence. CSCI-2300 is required for admission into the MS in IT program.

² 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 ³ Concentration Course |
| IT Elective (one of): | |
| CSCI-4380 | Database Systems |
| DSES-4530 | Information Systems |

Spring

| |
|---|
| Hum. and Soc. Sci. Elective ³ Concentration Course Concentration Course Free Elective |
|---|

Fourth Year**Fall**

| | |
|------------|---|
| ITEC- 4100 | IT Capstone Experience Concentration Course Hum. and Soc. Sci. Elective ³ Free Elective |
|------------|---|

Spring

| |
|--|
| Concentration Capstone Experience Concentration Course Hum. and Soc. Sci. Elective ³ 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:

n One of the following two:

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

n ITEC-2110 Exploiting the Information World

n Two of the following four:

- CSCI-1200 Computer Science II *
- ITEC-2210 Introduction to Human Computer Interaction
- ITEC-4310 Managing IT Resources **
- PHYS-2050 Science of Information Technology

³ See Hum. and Soc. Sci. Elective requirements in H&SS section of the catalog.

* Cannot be used by CSCI and CSYS majors to satisfy this requirement.

** 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:

- n 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++)
- n 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)
- n 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 in Troy.

Applicants to the Hartford campus will be notified in writing if results of the Graduate Record Examination are required.

Master's Program Requirements

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

- n Ten courses in IT (a minimum of thirty credits)
- n A minimum of six courses (18 credit hours or more) at the graduate level (6xxx-level courses)
- n Five Core courses; one from each of the five Core Areas
- n A minimum of three courses (nine credit hours or more) in an approved Concentration
- n One elective approved by the adviser
- n 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 paid 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, among many others. 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. advisers 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. 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:

n Hartford: www.rh.edu/

n Education for Working Professionals: 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 | ITEC-6300 Business Issues for Engineers and Scientists | Fall/Spring |
| 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 term, making course listings subject to change. A new concentration in Financial Engineering is under development. For current status, please visit www.it.rpi.edu.

| 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 and Optical Networks | Spring |
| | ECSE-6670 Local Computer Networks and Multiaccess Communication | Spring |
| | ECSE-6600 Internet Protocols | Spring |
| | CSCI-4900 Computer Networking II | Fall/Spring |
| | ECSE-6820 Queuing Systems & Applications | Spring |
| | CSCI-6500 Distributed Computing Over the Internet | Spring |
| | ECSE-6900 Mobile Wireless Networks | Fall |
| | CSCI-6510 Distributed Algorithms & Systems | Spring |
| | CSCI-6900 Network Security | Fall |
| | CSCI-6900 Parallel & Distributed Simulation | Spring |
| | 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 |
| CSCI-6320 Graphical User Interfaces | | Fall |
| | COMM-6770 User Centered Design | Spring |

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| Database Systems Design | <i>Select three of the following courses:</i> | | |
| | CSCI-4020 Computer Algorithms | Spring | |
| | CSCI-6460 Advanced Database Management Topics | Spring | |
| | CSCI-6390 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 | |
| | CSCI-4150 Introduction to AI | Fall | |
| Software Design | <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-6500 Distributed Computing over the Internet | Spring | |
| | CSCI-6960 Program Analysis for Software Tools | Spring | |
| Information Systems Engineering | <i>Select one or more Database Systems Design or Software Design courses beyond the courses taken for the core. Select two or 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 | |
| | DSES-6610 Systems Modeling in Decision Sciences | Fall | |
| | Management Information Systems | <i>Select three of the following courses:¹</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 | |
| DSES-6180 Knowledge Discovery with Data Mining | | Spring | |
| DSES-6530 Decision Support & Expert Systems | | Spring | |
| MGMT-6690 Supply Chain Mgmt. for E-business | | Fall | |
| E-Business Engineering | | DSES-6570 IT and Systems for E-Business and | Spring |
| | <i>Select two of the following courses:¹</i> | | |
| | MGMT-6690 Supply Chain Mgmt. For E-Business | Fall | |
| | ECSE-6600 Internet Protocols | Spring | |
| | DSES-6180 Knowledge Discovery with Data Mining | Spring | |
| | MGMT-6560 Managing New Product Development | Fall | |
| | CSCI-6390 Database Mining | Fall | |

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

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| Bioinformatics | BIOL-6410 Bioinformatics I: 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:²</i> | |
| | DSES-6180 Knowledge Discovery with Data Mining | Spring |
| | CHEM-4330 Drug Discovery | Fall |
| | CSCI-6460 Advanced Database Management Topics | Spring |
| | CSCI-6390 Database Mining | Fall |
| | CHEM-6510 Computational Chemistry | Spring |
| Research Track (Example from Chemistry) | CSCI-6100 Machine and Computational Learning | Fall |
| | ITEC-6990 Master's Thesis (in place of IT Capstone) | TBD |
| IT Capstone Requirement | Course Number and Name | Term Offered |
| | ITEC-6800 IT Master's Capstone ³ | Spring |

² Additional electives available subject to approval.

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