Rensselaer Polytechnic Institute

Master of Science

# Information Technology

**ITWS**

-- Version --

Fall 2021

**GUIDELINES**

In an effort to ensure all academic needs of our students are met, we are setting fourth guidelines for those students that require adjustments.

The following requests will be approved once reviewed by our Graduate Program Director, ONLY, if you meet with Linda Kramarchyk first and request said changes to ones Graduate Plan of Study *a semester* before the change.

1. F1 Visa Program Extensions: Changes to your POS must be approved a semester in advance, if a student has made unapproved changes to their POS and in their final semester requests an extension without first discussing these changes a semester in advance, the request will be denied.
2. OPT/CPT requests
	1. These requests take 3-4 weeks to process. Please be prepared. An updated approved plan of study is required to process these requests. Further, these requests go through several stages (Department, OGE and ISSS) before approval.
3. Graduate Plan of Study
* You must have an approved POS on file by the add deadline of your first semester.
* Do not make changes to your Plan of Study without first consulting Linda Kramarchyk. Changes to your Plan of Study will only be approved after any proposed changes are discussed with Linda first and then presented to the Graduate Program Director. These changes and approval take time, do not wait until the semester of to make changes.

This document will serve as guidelines moving forward from August 30, 2021 and is subject to be updated. Any updates or changes to these guidelines will be shared with all MS IT Graduate Students. These guidelines will allow us to better serve you all in a more time efficient manner and will also allow us to support the Office of Graduate Education.

**MS IT CURRIUCULUM AND PLAN OF STUDY**

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 Buisness Issues for Eningeers 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 Data Mining or Data Science. 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.

### Core Courses

To acquire a breadth of IT experience, master’s degree students take the five Core courses listed below and one elective to add depth to the degree. 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

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| **IT Core Area**  | **Course Number**  | **Course Title**  | **Term(s) Offered**  |
| **Database Systems**  | CSCI-4380  | Database Systems  | Spring/Fall  |
|  | ITWS-6250  | Database Systems  | Fall  |
| **Data Analytics**  | ITWS-6350  | Data Science  | Fall  |
| **Software Design and Engineering**  | CSCI-4440  | Software Design and Documentation  | Fall/Spring  |
| ITWS-6700  | Software Development  | Spring/Fall  |
| **Management of Technology\***  | ITWS-6300  | Business Issues for Engineers and Scientists (Professional Track Only)  | Fall/Spring  |
| **Human Computer** **Interaction**  | COMM-6420  | Foundations of HCI Usability  | Fall  |
| **Elective**  |   | Any 4000/6000 Level ITWS course found in the curriculum.  | Fall/Spring  |

**\*** 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.

\*For co-terminal ITWS students and students who are dual MS with Management, replace ITWS-6300 with a 4000/6000 level MGMT elective approved by advisor.

**One of:**

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| **Master’s Capstone**  | ITWS-6800  | Information Technology Master’s Capstone (Professional Track Only)  | Fall/Spring  |
| **Master’s Project**  | ITWS-6980  | Master’s Project (Research Track)  | Fall/Spring  |
| **Master’s Thesis**  | ITWS-6990  | Master’s Thesis (Research Track)  | Fall/Spring  |

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

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

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### Concentrations

The ITWS 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>

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **COGNITIVE** **COMPUTING** ADVISOR: BRAM VAN HEUVELN  | 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.  |
| **Select three of the following courses:**  |
| COGS-4340/6340  | The Linguistics of Computational Linguistics  | Fall  |
| COGS-6210  | Cognitive Modeling I  | Spring  |
| CSCI-4150  | Machine Learning from Data  | Fall  |
| CSCI-6130  | Natural Language Processing  | Fall  |
| CSCI-6270  | Computational Vision  | Fall  |
| CSCI-6390  | Data Mining  | Fall  |
| COGS-6410  | Programming for Cog Sci and AI  | Fall  |
| CSCI-696X  | Cognitive Computing  | Fall  |
| ITWS-6400  | X-informatics  | Spring  |
| ISYE-4260  | Human Performance Modeling and Support  | Fall  |
| PSYC-4370  | Cognitive Psychology  | Fall  |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **DATA** **SCIENCE AND** **ANALYTICS** ADVISOR: THILANKAMUNASINGHE  | 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.  |
| **Select two or three of the following courses:**  |
| ITWS-6350  | Data Science  | Fall  |
| ITWS-6400  | X-Informatics  | Spring  |
| ITWS-6600  | Data Analytics  | Spring  |
| **If only two of the above were chosen, select one more of the following courses:**  |
| COMM-6880  | Interactive Data Visualization  | Summer  |
| CSCI-4020  | Design and Analysis of Algorithms  | Spring  |
| CSCI-4150  | Introduction to AI  | Fall  |
| CSCI-4220  | Network Programming  | Fall  |
| CSCI-4320/CSCI-6360  | Parallel Programming/ Parallel Computing  | Spring  |
| CSCI-6100  | Machine Learning from Data  | Fall/Spring  |
| CSCI-4020/6020  | Design and Analysis of Algorithms  | Spring  |
| CSCI-6270  | Computational Vision  | Fall  |
| CSCI-6130  | Natural Language Processing  | Fall  |
| CSCI-6390  | Data Mining  | Fall  |
| ISYE-4220  | Optimization Algorithms and Applications  | Fall  |
| ITWS-6360  | Data and Society  | Fall/Spring  |
| ITWS-6440  | Big Data Policies  | Fall/Spring  |
| MGMT-6100  | Statistics and Operations Management  | Fall  |
| MGMT-6560  | Intro to Machine Learning Aps  | Fall/Spring  |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **DATABASE** **AND** **INTELLIGENT** **SYSTEMS** ADVISOR: RICHARD PLOTKA  | 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.  |
| **Select three of the following courses:**  |
| CSCI-4150  | Introduction to AI  | Fall  |
| CSCI-6100  | Machine Learning from Data  | Fall  |
| CSCI-6390  | Data Mining  | Fall  |
| CSCI-6510  | Distributed Systems and Algorithms  | Fall  |
| ISYE-4810  | Computational Intelligence  | Fall  |
| ITWS-6350  | Data Science  | Fall  |
| ITWS-6600  | Data Analytics  | Fall/Spring  |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **FINANCIAL** **ENGINEERING\*** **\* prerequisite – knowledge in** **finance is required** ADVISOR: APARNA GUPTA   | 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.  |
| MATH-4740   | Intro. To Financial Mathematics and Engineering (required)  | Fall  |
| MGMT-7760  | Risk Management (required)  | Spring  |
| **With Advisor approval, choose three additional courses:**  |
| CSCI-696X  | Finance Computation and Simulation | Spring |
| ECON-4120  | Mathematical Methods in Economics  | Fall  |
| MATP-4700  | Mathematical Models of Operations Research  | Fall  |
| MATP-4820  | Computational Optimization  | Spring  |
| MGMT-6020  | Financial Management I  | Fall  |
| MGMT-6370  | Options, Futures and Derivatives Markets  | Fall  |
| MGMT-6400  | Financial Econometric Modeling  | Spring  |
| MGMT-6420  | Student Managed Fund | Fall  |
| MGMT-6510  | Financial Computation  | Fall  |
| MGMT-6520  | Financial Modeling and Optimization | Fall |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **HUMAN COMPUTER** **INTERACTION** ADVISOR: PATRICIA SEARCH  | 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:**  |
| COMM-4470  | Information Design  | Fall  |
| COMM-4690  | Interface Design: Hypermedia and Application  | Spring  |
| ARTS-6090  | Art and Code and Interactivity  | Fall  |
| COMM-6560  | Visual Design: Theory and Application  | Fall  |
| COMM-4880/6880  | Interactive Data Visualization  | Summer  |
| ISYE-4260  | Human Performance Modeling and Support  | Fall  |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **INFORMATION** **DOMINANCE** ADVISOR: BRIAN CALLAHAN  | 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.  |
| **Select two or three of the following courses:**  |
| CSCI-4220  | Network Programming  | Fall  |
| CSCI-6230  | Cryptography and Network Security I  | Fall  |
| ECSE-4670  | Computer Communication Networks  | Fall  |
| ISYE-4310  | Ethics of Modeling for Industrial Systems Engineering  | Fall  |
| ITWS-4370  | Information System Security  | Spring  |
| ITWS-6600  | Data Analytics  | Spring  |
| **If only two of the above were chosen, select one more of the following courses:**  |
| CSCI-6390  | Data Mining  | Fall/Spring  |
| ITWS-696X  | Big Data Policies  | Fall/Spring  |
| CSCI-4967  | Modern Binary Exploitation  | Fall  |
|   | CSCI-6450  | Principles of Program Analysis  | Spring  |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **INFORMATION** **SECURITY** ADVISOR: BRIAN CALLAHAN | 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.  |
| **Select two or three of the following courses:**  |
| CSCI-4210  | Operating Systems  | Spring  |
| CSCI-6230  | Cryptography and Network Security I  | Fall  |
| ITWS-4370  | Information System Security  | Spring  |
| **If only two of the above were chosen, select one more of the following courses:**  |
| CSCI-6390  | Data Mining  | Fall  |
| CSCI-4967  | Modern Binary Exploitation  | Fall  |
| ISYE-4310  | Ethics of Modeling for Industrial Systems Engineering  | Fall  |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **INFORMATION SYSTEMS** **ENGINEERING** ADVISOR: AL WALLACE  | 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.  |
| **Select three of the following courses:**  |
| CSCI-6390  | Data Mining  | Fall  |
| CSCI-6120  | 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-6610  | Systems Modeling in Decision Sciences  | Fall  |
| ISYE-6620  | Discrete-Event Simulation  | Fall  |
| ITWS-6600  | Data Analytics  | Fall/Spring  |
| MGMT-6140  | Information Systems for Management  | Spring  |
| MGMT-6170  | Advanced Systems Analysis and Design  | Fall/Spring  |
| MGMT-6570  | Advanced Data Resource Management  | Fall  |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **MANAGEMENT** **INFORMATION** **SYSTEMS** ADVISOR: MATTHEW GRILL   | 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  | Data Mining  | Fall  |
| MGMT-4150  | IT Project Management  | Spring  |
| MGMT-6060  | Business Implications of Emerging Technologies  | Fall/Spring  |
| MGMT-6080  | Network, Innovation and Value Creation I  | Fall  |
| MGMT-6140  | Manage, Digitize and Transform  | Spring  |
| MGMT-6560  | Intro to Machine Learning Apps  | Fall  |
| MGMT-6570  | Advanced Data Resource Management  | Fall  |
| MGMT-6720  | Internet Marketing  | Spring  |
|  | MGMT-6690 | Negotiations | Spring |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **NETWORKING** ADVISOR: CHRIS CAROTHERS  | 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  | Fall  |
| CSCI-4320/ CSCI-6360  | Parallel Programming/ Parallel Computing  | 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  |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **SOFTWARE** **DESIGN AND** **ENGINEERING** ADVISOR: RICHARD PLOTKA  | 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-4210  | Operating Systems  | Spring  |
| CSCI-4320/ CSCI-6360  | Parallel Programming/ Parallel Computing  | Spring  |
| CSCI-4430  | Programming Languages  | Fall  |
| 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  |
| 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-6880  | Interactive Data Visualization  | Summer  |

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| **Concentration**  | **Course Number**  | **Course Name**  | **Term(s) Offered**  |
| **WEB SCIENCE** ADVISOR: JIM HENDLER  | 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.  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.  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.  |
| **Select two or three of the following courses:**  |
| ITWS-6400  | X-Informatics  | Spring  |
| COMM-4580  | Advertising and Culture  | Fall  |
| COMM-4470  | Information Design  | Fall  |
| COMM-6510  | Communication Theory  | Fall  |
| COMM-6770  | User-Experience Design  | Fall  |
| COMM-6880  | Interactive Data Visualization  | Summer  |
| CSCI-4220  | Network Programming  | Fall  |
| CSCI-6510  | Distributed Systems and Algorithms  | Fall  |
| COMM-4960  | Interface Design: Hypermedia Theory and Application  | Spring  |
| MGMT-6720  | Internet Marketing  | Spring  |
| **Optional Data Course, select only one:**  |   |   |
| CSCI-6100  | Machine Learning from Data  | Fall  |
| ITWS-6350  | Data Science  | Fall  |
| ITWS-6600  | Data Analytics  | Spring  |
|  | CSCI-69XX | Ontologies  | Fall  |

**Registering for Independent Study**

To register for an independent study, students do not register online, but instead they complete an Independent Study Form (https://www.rpi.edu/dept/srfs/grindependent\_study.pdf).  Signatures are needed from the independent study supervisor, the research advisor, and our Graduate Program Director. Along with the form, a syllabus of the independent study must be attached. After the form is complete, the student must submit it to the registrar's office. The deadline is the same as the deadline to add classes.

**Full-Time Status**

Many students need to maintain full-time status. Full-time status is required for aid eligibility and for student visas. The minimum number of credits per semester to still maintain full-time status is 9 for teaching assistants and 12 for all others. The maximum number of credits without paying additional tuition is 15. These rules apply to the Fall and Spring semesters. Students are not required to take additional credits during the summer to maintain full-time status.

**Graduate Tuition Policy**

***Overall Policy Guidelines***

1. Tuition for all graduate programs, full-time and part-time, is set each year by the Board of Trustees upon recommendation by the President.
2. Full-time graduate academic year tuition will be set at the same level as the undergraduate rate. All full-time students will pay this tuition.
3. To receive a degree from Rensselaer, a student must be enrolled in an approved degree program, (i.e., matriculated).
4. Full-time graduate tuition will be paid the entire time a student is matriculated and in residence, except for special cohort programs.
5. Full-time status for all students, except teaching assistants, requires registration of at least 12 credits per semester.
6. TA’s must register for at least 9 credits per semester.
7. Payment of full-time graduate tuition allows a student to register for 12 to 15 credit hours in each of the fall and spring semesters. TA’s may register for 9 to 15 credits.
8. Only full-time students will be eligible for financial support in the form of a tuition waiver, stipend, research assistantship, teaching assistantship, or fellowship.
9. All assistantships and internal fellowships are indivisible and a student cannot be both a TA and RA within the same semester.
10. All graduate students receiving stipends from the Institute, from contracts/grants, and from Institute administered external sources, must be paid the minimum stipend as established by the Institute. For **FY22** the stipend for the academic year is $23,830 and tuition for the academic year is set at $57,100.
11. Students enrolling for more than 15 credits during the Fall or Spring terms will be charged the academic year tuition rate plus an incremental per credit hour rate, for each credit hour exceeding 15 credits. Any credits taken in the summer sessions will be charged the incremental per credit hour rate for each credit hour.

***TA Supported Policy Guidelines***

A number of institutionally supported positions which include TAs, and Research Assistantships, will be assigned to each school in order to assist them in attracting the very highest quality students. In the selection of these students, strong consideration should be given to the research potential and interest of the student. For each of these positions, Rensselaer will provide tuition waivers and stipends from a centralized pool administered by the Dean of the Graduate Education. These positions are indivisible within a semester. It is expected that, once the student is no longer supported institutionally, faculty will support the student from externally funded research programs for the remainder of the student's degree program, in accordance with graduate tuition policy.

1. A graduate Teaching Assistant (TA) is expected to work under faculty supervision for course-related responsibilities (i.e., no TA will be the primary  instructor for a course) of the assigned course(s) TA positions are not assigned to individual faculty, nor are they assigned  for research work, but rather are to support the teaching function in an assigned course or courses. As such, during the time a student is supported as a TA, he/she is expected to work towards the completion of his/her non-research related degree requirements, while at the same time attempting to identify a thesis advisor.
2. A graduate Internal Research Assistant (IRA) or Start-up Research Assistant (SRA) receives support from internal funding and performs research duties under the supervision of a faculty member responsible for that research.
3. A student may be institutionally supported up to one year for Masters students.

**Part-time Student Policy Guidelines**

Although the principal focus on the Troy campus is on full-time students that support the research mission of the Institute, part-time graduate students are also encouraged. The principal focus of the Hartford Campus is on working professionals and part-time students.

1. With the exception of students enrolled in special cohort programs and those taking classes via distance learning, all Troy-based, non-matriculated students, wishing to enroll for less than 12 hours/semester, will be considered part-time and will be charged the part-time tuition.
2. Students wishing to take 12 or more credits per semester will be considered full-time, must pay the full-time tuition, and must have been admitted to an approved degree program, (i.e., must be matriculated).
3. Part-time students enrolled in the core (general studies) programs at Rensselaer at Hartford will pay the part-time tuition.
4. The tuition for students enrolled in cohorts and other special programs will be determined separately.
5. Part-time students are not eligible for financial support from Rensselaer.

**Graduate Tuition**

Full-time graduate tuition is $57,100 per academic year for **FY22**. Payment of this tuition allows a student to register for 12 to 15 credit hours in each of the fall and spring semesters. A student paying tuition and taking between 12 and 15 credits in the fall and spring is considered a full-time student throughout that calendar year. Students must register for at least 12 credits per semester to maintain full-time status. The only exception to this requirement is for those students serving as teaching assistants. These students may register for a minimum of 9 credits to maintain their full-time status. Students enrolling for more than 15 credits, with prior approval, during the fall or spring terms will be charged the academic year tuition rate plus a per-credit-hour rate of $2,380.00 for each credit hour exceeding 15 credits or for each credit taken in the summer sessions.

*Part-time graduate tuition is paid on a per-credit-hour basis of $2,380.00 per credit hour.*

**Cooperative Education**

Graduate students may participate in the Co-op Program (Co-op) on a “permission only” basis. While on assignment, Co-op employees are considered full-time students, and no tuition is assessed. Students who are on a Co-op in the local area are still required to pay the activity and health service fees.

Graduate students may apply for Co-op positions that take place during the summer and/or semester (up to a maximum of one year). All jobs must be reviewed and approved by the academic advisor, Graduate Program Director, and the Dean of Graduate Education. In addition, international students must also have the position approved by International Student Services prior to commencing work.

**Guidelines for Teaching Assistant Appointments**

Adopted by the Dean’s Council on 1/8/03. Revised on 9/1/03

The purpose of this document is to describe the guidelines, rights, and responsibilities of graduate students, faculty and departments with regards to graduate student teaching at Rensselaer Polytechnic Institute. The goals of these guidelines are to ensure that teaching assistants are adequately prepared, given appropriate teaching assignments and workloads, and that there is appropriate oversight and mentoring by the department and faculty. Rensselaer Polytechnic Institute recognizes that the primary objective of a teaching assistant is to make steady progress toward an advanced degree. Teaching assistant employment status is dependent upon student status. The primary responsibility for all courses taught at the Institute is and will continue to rest with the faculty.

**Definitions:**

Graduate Teaching Assistant (GTA) is a registered full-time graduate student chosen as a result of excellent scholarship and promise as a teacher. The GTA minimally holds a baccalaureate degree in a field that is closely related to the one in which he/she will be assisting.

Under faculty supervision, the duties of a GTA may include providing help sessions; leading discussion, recitation, laboratory or quiz sections; holding office conferences with students; preparing materials for faculty-guided classroom or laboratory instruction; assisting professors in the design of a course; assisting in the design and/or preparation of exams or quizzes; proctoring examinations; and grading student papers and/or examinations to faculty guided standards.

TA’s are not and should not be held responsible for the intellectual or instructional content of a course, for the selection of student assignments, for planning examinations and/or defining policies that determine final course grades. The GTA is not to be assigned responsibility for instructing or lecturing the entire enrollment of a course, or for providing the entire instruction of a group of students in a course for a prolonged period.

Guidelines For Teaching Assistance Appointments

**Responsibilities:**

Students holding a teaching assistantship share a responsibility for promoting the scholarly and educational objectives of the department in which they are employed. Graduate Teaching Assistants, like faculty, should treat students with respect, do their best to get to know the students assigned to their class, and to have a genuine interest in their academic progress. Graduate Teaching Assistants are subject to policies and procedures of their departments and of the Institute and should respect and conform to the rules and procedures of the department or laboratory/center to which they are assigned.

Graduate Teaching Assistants are not permitted to hold appointments that require an average of more than 20 hours per week, therefore the GTA responsibilities should be consistent with this rule.

Each semester, departments are expected to provide all appointees with timely notification of specific assignments clearly outlining their duties and responsibilities for a given term. A reasonable effort should be made to take into consideration the competencies and preferences of the graduate teaching assistant, as well as try to accommodate her/his course schedule when determining assignments.

The department is expected to carry out a review of the graduate assistant’s performance each term. This review will be conducted jointly by the faculty instructor(s) to whom the GTA is assigned and the appropriate department chairperson. Also, it is expected that adequate work space and access to needed equipment be provided, as well has a place for receiving mail.

Each department is responsible for providing orientation, training, and supervision for all graduate teaching assistants. All GTA’s are required to attend scheduled orientations; failure to do so can result in termination of the appointment. At least one faculty member needs to be assigned to work closely with each graduate assistant to assist him/her in carrying out his or her assignments and to help facilitate professional development. The faculty member and the graduate assistant should meet on a regular basis throughout the term. If the GTA is instructing a laboratory, or recitation section for the first time, the faculty member should arrange to observe the instruction several times.

In the event of a GTA’s serious illness or physical incapacitation, the department chair or his/her designee will arrange for completion of the teaching assignments. In this event, the GTA shall receive salary and health benefits for the remainder of the academic term.

**Appointment Guidelines**

The following guidelines must be used in appointing Graduate Teaching Assistants. Exceptions to these requirements must be made individually and in writing to the Dean of Graduate Education.

A Graduate Teaching Assistant must:

* Be a full-time, degree seeking graduate student at Rensselaer without existing registration problems imposed by the Registrar, Dean of Students, or Dean of Graduate Education.
* Have a GPA of at least 3.3 in previous academic work and have a demonstrated background in the course that they will be assisting.
* Have no more than one grade of I (Incomplete).
* Be under the mentorship of a faculty member who has responsibility for course content.
* A teaching assistant must register for at least 9 credits per semester.

The GTA must receive a letter that states the general conditions of the appointment and that specifies the salary, general duties, duration, any fringe benefits, and other pertinent terms of appointment. A copy of this document should be included with the letter. The appointment letter is sent in duplicate to the student. To accept the appointment, the student signs the copy and returns it to the designated authority. The student should retain the original.

GTA positions are not assigned to individual faculty, nor are they assigned for research work, but rather are to support the teaching function in an assigned course or courses. However, part of the TA's assigned responsibility will be to conform to departmental policies and guidelines for graduate study.

When a student accepts an appointment in writing, that appointment shall be binding and in accordance with the University’s graduate tuition policies. However, a GTA, after accepting an appointment for the semester, may resign in writing four (4) weeks before the beginning of a semester. A department may, during the term of appointment, transfer a student, with the student’s consent, from a teaching assignment to another assignment as a Graduate Research Assistant (GRA) or to another appropriate assignment, which provides for essentially equal financial benefits and professional opportunities.

**Duration of Appointment**

Appointment dates for GTA’s shall be consistent with the academic year of the Institute. For those given a two semester assignment at the beginning of the academic year, the term will be consistent with faculty academic year appointments (August 15 to May 16). For those given fall semester only appointments, their terms shall begin with the start of the academic year appointments (August 15) and be completed two days after the last day of final exams at the end of the fall term. For those given spring semester only appointments, their terms shall begin one week before the start of classes and end two days after the last day of final exams at the end of the spring term. These dates can be modified by the department for special cases where responsibilities may extend beyond these dates (e.g. Distance courses).

A student will be supported on a teaching assistantship for a maximum of two years for PhD students and one year for Masters students, (except for MArch students for which a different policy will pertain).

**Immigration and ESL Requirements**

Immigration laws require employers to verify that a job applicant is authorized to be employed in the United States. Each new GTA is required to verify that he/she is either a U.S. citizen or authorized to be employed in this country. All international GTA’s who are involved in student contact must possess adequate English language fluency for effective communication with students. GTA’s who are nonnative speakers of English must be evaluated by the Institute ESL specialist and possess the recommended level of English fluency consistent with their teaching assignment. Any GTA’s not meeting the recommended levels of fluency must enroll in language enhancement courses. If a GTA does not obtain a satisfactory score by the time of reappointment, it is sufficient cause for non-renewal.

**Termination**

A GTA appointment can be terminated for non-performance. Termination proceedings can only be initiated if the GTA has been evaluated on a regular basis and has received appropriate written warning of his/her performance, or has violated one or more Institute policies. The GTA must be informed in writing by the dean of the school in which they are enrolled of the reasons for the termination, and the appeals procedure.

**Grievance Situations**

Any GTA who believes that they are being treated unfairly according to the guidelines set forth here should first discuss the problem with the course supervisor, and then, if resolution cannot be achieved, with the appropriate department chairperson. If resolution cannot be reached at the department level, the grievance can be presented to the Dean of the GTA’s school for further evaluation, adjudication, and advice on additional grievance procedures.

Appeals must be submitted within one week of notice to the Dean of Graduate Education. The Dean of Graduate Education can decide to convene an appeals panel of two faculty, or handle the appeal by him/herself. Final determination of the appeal should occur within 21 days of receipt of the formal appeal.

**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.

**For Additional Information:**

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