

# INFORMATION SCIENCE AND TECHNOLOGY

Information science and technology (IS&T) offers an M.S. degree program. Information technology has transformed every aspect of our economy and society. Rapid spread of technology has generated the need for highly trained professionals to implement and maintain information systems. The M.S. in information science and technology is designed to educate students in the design, development, and successful application of information systems in organizations.

Also offered are a number of graduate certificates:

- AI, machine learning and automation in business
- Business analytics and data science
- Business intelligence
- Business project management
- Cybersecurity and information assurance management
- Digital media and web design
- Digital supply chain management
- Electronic and social commerce
- Enterprise resource planning
- Entrepreneurship and technological innovation
- Finance
- Financial technology
- Human-computer interaction and user experience
- Information systems project management
- Management and leadership
- Mobile business and technology

These graduate certificates are intended for students who wish to specialize and for working professionals who want to stay ahead of rapidly changing technology. Each graduate certificate program consists of a four-course sequence from existing graduate-level courses. Certificate credits earned by students admitted to the M.S. program will count toward their master's degree. Students admitted just to the certificate program will have non-matriculated status. However, if they complete the four-course sequence with a grade of "B" or better in each of the courses taken, they will be admitted to the M.S. program if they so choose. In addition, successful completion of the graduate certificate offered in the business program, with grades of "B" or better in each of the courses will also enable admission to the IS&T M.S. program. Admitted students must still meet the admissions requirements relative to undergraduate coursework prerequisites.

The faculty is active in studying the design and application of the web and has external support for research. Research experiences are integrated into the classroom experience. Specially equipped research laboratories are available to support studies in human-computer interaction and experiments with computer networks, as are general purpose computing laboratories that are available to all students. A large number of computing languages and special-purpose software tools are available on various platforms. While instruction and research are on the leading edge of information systems, the department endeavors to keep class sizes small to facilitate student and faculty interactions.

## Financial Assistance

Financial assistance is available to graduate students in the form of assistantships and fellowships. Research opportunities for advanced students exist. For application forms, contact the department.

## Additional Information

Contact us at 573-341-7216, bit@mst.edu or visit <http://bit.mst.edu>.

## Admission Requirements

In addition to the requirements set by the office of admissions and the office of graduate studies, specific requirements for admission to the M.S. in information science and technology (thesis or non-thesis) are as follows:

- Successful completion of an undergraduate degree from a recognized college or university with a GPA (grade point average or international equivalent) of 3.0/4.0 or better.
- Submission of scores from the Graduate Record Exam (GRE) or the Graduate Management Admissions Test (GMAT).
- TOEFL or IELTS scores must be submitted if English is not the candidate's natural language.
- Undergraduate coursework in Calculus; Statistics; Object-oriented Programming with Data Structures; Information Systems; Relational Database Management Systems; and Computer Architecture must be shown.

\*\*\*Please note that meeting the above requirements does not guarantee admission into the M.S. in information science and technology, but, rather, is used by the admissions committee in the decision-making process\*\*\*

## Degree Requirements

M.S. with thesis: The M.S. degree with thesis requires the completion of 24 hours of graduate course work (5000-level or above), 6 hours of research, and the successful completion and defense of a research thesis.

M.S. without thesis: The M.S. degree without thesis requires the completion of 30 hours of graduate course work (5000-level and above). Courses below the 5000-level will not count toward the M.S. degree, even if they are taken to fulfill prerequisites.

The following core courses are required of all M.S. students in information science and technology. These courses are designated to ensure that all IS&T masters students study the four information systems perspectives of networks and web design, human perception, application implementation, and organizational systems.

IS&T 5885	Human-Computer Interaction and User Experience
IS&T 6251	Technological Innovation, Entrepreneurship, and Economic Development
IS&T 6261	Advanced Information Systems Project Management
IS&T 6336	Internet Computing and the Internet of Things

The department of business and information technology offers a variety of graduate certificates. Each certificate program consists of four courses and is open to persons holding a bachelor's, master's or Ph.D. degree in areas such as business, social sciences, technology,

engineering, or related disciplines who have the required pre-requisites for the courses in the program. A student must maintain an average cumulative grade point of 3.0 or better on a 4.0 scale in the certificate courses in order to receive the graduate certificate.

Students may apply to be admitted only to a graduate certificate program. If admitted, the student will have non-degree graduate status but will earn graduate credit for the courses completed. If a student completes the four graduate certificate courses with a grade of B or better in each of the courses taken, the student may be admitted to the master of business administration or to the master of science in information science and technology if the student so chooses. A student must, however, follow the normal application process and meet the undergraduate coursework prerequisites. The graduate certificate credits will count toward the student's MBA or M.S. degree.

Details about some of the graduate certificates are listed below; others are listed in the business administration section of the catalog.

## AI, Machine Learning and Automation in Business

Artificial Intelligence is a disruptive technology in the business realm with transformational impact. From detecting malware and preventing money laundering to automating insurance claims and optimizing inventory and improving product recommendations and more, AI will continue to necessitate changes in core business processes and models. Within the past few years, machine learning, while not fully tapped in the business sphere, has become more effective and widely utilized. Tomorrow's leaders and managers will need to integrate machine learning where appropriate, incorporating its capabilities with those of humans. The design and implementation of new combinations of technologies with human skills to meet customers' needs will require critical thinking skills, creativity, and project planning.

### Required Core Courses:

BUS 5730	Machine Learning and Artificial Intelligence for Business
IS&T 5535	Machine Learning Algorithms and Applications

### Elective courses (choose two):

IS&T 5420	Business Analytics and Data Science
IS&T 5520	Data Science and Machine Learning with Python
IS&T 6443	Information Retrieval and Analysis
IS&T 5445	Database Marketing
BUS 6723	Artificial Intelligence, Robotics, and Information Systems Management
ERP 6220	Data Modeling & Visualization Prototyping for Enterprise Decision Dashboard

## Business Analytics and Data Science

Data analytics facilitates realization of objectives by identifying trends, creating predictive models for forecasting, and optimizing business processes for enhanced performance. Three main categories of analytics are:

- Descriptive - the use of data to find out what happened in the past.
- Predictive - the use of data to find out what could happen in the future.
- Prescriptive - the use of data to prescribe the best course of action for the future.

Big data is an emerging phenomenon. Computing systems today are generating 15 petabytes of new information every day—eight times more

than the combined information in all the libraries in the U.S.; about 80% of the data generated every day is textual and unstructured data.

This graduate certificate is one of three graduate certificates offered by cooperating departments at Missouri S&T to fulfill the needs in the area described as "big data." The other two graduate certificates are:

- Big Data and Security
- Big Data Management and Analytics

### Required Core Courses:

IS&T 5420	Business Analytics and Data Science
IS&T 5450	Introduction to Information Visualization

### One course from the following:

BUS 5730	Machine Learning and Artificial Intelligence for Business
IS&T 5520	Data Science and Machine Learning with Python
ERP 5410	Use of Business Intelligence
COMP SCI 5204	Regression Analysis
COMP SCI 5402	Introduction to Data Mining
COMP SCI 6304	Cloud Computing and Big Data Management
COMP ENG 6330	Clustering Algorithms
STAT 5814	Applied Time Series Analysis

### One course from the following:

IS&T 5445	Database Marketing
IS&T 5535	Machine Learning Algorithms and Applications
IS&T 6443	Information Retrieval and Analysis
IS&T 6641	Advanced Digital Commerce and IoT Analytics
IS&T 6444	Essentials of Data Warehouses
IS&T 6448	Building the Data Warehouse
IS&T 6887	Research Methods in Business and IS&T
ERP 5210	Performance Dashboard, Scorecard and Data Visualization
ERP 6610	Advanced Customer Relationship Management in ERP Environment
ERP 6220	Data Modeling & Visualization Prototyping for Enterprise Decision Dashboard
BUS 6425	Supply Chain and Project Management

## Business Intelligence

Interest in business intelligence has been a recent strong theme among employers. Medium and large-sized businesses are especially interested.

In order to make appropriate decisions, upper-level administration of an organization needs to draw data together from different systems in order to get a unified picture of the status and performance of an organization and present it in helpful ways. Examples include the development of organizational scorecards, dashboards, and other tools that provide a picture of how an organization is performing. People capable of creating and maintaining such information are needed.

This graduate certificate focuses on the technologies that allow an organization to make effective business decisions based on operational data pulled together from many different sources inside and organization. The target audience consists of any individual who would manage any type of IT professionals, database administrators, business analysts, and any person who would need to understand the technologies and their capabilities.

A student admitted to this graduate certificate must complete four courses:

### Required core courses:

ERP 5410	Use of Business Intelligence
IS&T 6444/ ERP 6444	Essentials of Data Warehouses

Two courses from the following list:

ERP 5110	Enterprise Resource Planning Systems Design and Implementation
ERP 5210	Performance Dashboard, Scorecard and Data Visualization
ERP 6610	Advanced Customer Relationship Management in ERP Environment
ERP 6220	Data Modeling & Visualization Prototyping for Enterprise Decision Dashboard
IS&T 6443	Information Retrieval and Analysis
IS&T 5445	Database Marketing

## Cybersecurity and Information Assurance Management

Cybersecurity is one of the fastest growing employment segments in IT. As technology grows and progresses, with our devices and lives becoming more and more interconnected, the challenges of cybersecurity and information assurance will continue to grow. This presents a career to those with the necessary skills that will be exciting, rewarding, fast-paced, and highly sought after.

A student admitted to this graduate certificate must complete four courses:

Required core courses:

BUS 5910	Privacy and Information Security
IS&T 5780	Human and Organizational Factors in Cybersecurity

Two courses from the following list:

ERP 5240	Enterprise Application Development and Software Security
IS&T 5335	Fundamentals of Mobile Technology for Business
IS&T 6336	Internet Computing and the Internet of Things
IS&T 6641	Advanced Digital Commerce and IoT Analytics
IS&T 5520	Data Science and Machine Learning with Python

## Digital Media and Web Design

Digital media is growing as consumers change the way they access information. In pursuing this certificate, students will acquire the skills and knowledge to create, design and analyze digital media. The focus will be on the media itself, the social/digital network that connects these media, the interfaces that connect these media with users, and the application of these skills in business and other creative contexts.

Thus this certificate program will address the pressing demand and opportunities for graduates with advanced knowledge and skills in areas such as networked communication and marketing, web-based media creation and design, and methods for designing and building effective human-media interfaces.

A student admitted to this graduate certificate must complete four courses:

Required core course:

IS&T 6654	Advanced Web Design and Digital Media Studies
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Two courses from the following list:

IS&T 5680	Digital Media Development and Interactive Design
IS&T 5885	Human-Computer Interaction and User Experience
MKT 5310	Digital Marketing and Promotions

One course from the following:

IS&T 5652	Advanced Web Development
IS&T 5886	Prototyping Human-Computer Interactions
IS&T 5168	Law and Ethics in E-Commerce

## Digital Supply Chain Management

Success in today's marketplace requires that organizations deliver products and services that provide easily identified value for their customers. This certificate draws on strengths within two departments to integrate source (strategic procurement and supply management), production (manufacturing and service operations), and delivery processes (demand fulfillment), with a focus on the use of information technologies as the critical enabler of supply chain efficiencies and responsiveness.

The certificate is designed to give students the tools and ideas that help shape and define the various components of value creation. Students can gain knowledge and skills in the full spectrum of supply chain activities: supplier relationships, purchasing management, operations and inventory management, logistics and transportation, quality management, and information technology.

A student admitted to this graduate certificate must complete four courses:

Required core courses:

ERP 5110	Enterprise Resource Planning Systems Design and Implementation
ERP 5310	Supply Chain Management Systems in an ERP Environment

One course from the following list:

MECH ENG 5708	Rapid Product Design And Optimization
ENG MGT 5614	Supply Chain Management Systems
BUS 6425	Supply Chain and Project Management

One course from the following list:

ERP 5410	Use of Business Intelligence
ERP 6120	Enterprise Resource Planning: Systems Config and Integration
ERP 6610	Advanced Customer Relationship Management in ERP Environment
MECH ENG 5656	Design For Manufacture
MECH ENG 5757	Integrated Product And Process Design
MECH ENG 5760/ AERO ENG 5760	Probabilistic Engineering Design
MECH ENG 5763	Computer Aided Design: Theory and Practice
BUS 5360	Business Operations

## Electronic and Social Commerce

Social commerce is just one sub-set of e-commerce, however it is growing rapidly. The department of business and information technology (BIT) has leveraged its' strengths in both business and technology for this program, which is designed to create successful students by developing skills in technological business practices that will provide opportunities for succeeding in today's fast paced world. To that end, the program focuses on the following competencies:

- Management concepts applied to IT
- Management concepts applied to support of electronic commerce
- Use of business processes in IT integration
- Competitive advantage through IT
- Electronic commerce through collaborative shopping

A student admitted to this graduate certificate must complete four courses:

Required core courses:

IS&T 6641	Advanced Digital Commerce and IoT Analytics
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Core Courses (choose one or two):

IS&T 5251	Management and Leadership of Technological Innovation
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BUS 6723	Artificial Intelligence, Robotics, and Information Systems Management
Elective courses (choose one or two):	
IS&T 5168/ PHILOS 4368	Law and Ethics in E-Commerce
IS&T 5335	Fundamentals of Mobile Technology for Business
IS&T 5445	Database Marketing
IS&T 5652	Advanced Web Development
IS&T 5680	Digital Media Development and Interactive Design
IS&T 5885	Human-Computer Interaction and User Experience
IS&T 5886	Prototyping Human-Computer Interactions
MKT 5310	Digital Marketing and Promotions
MKT 6580	Advanced Marketing Strategy

## Enterprise Resource Planning (ERP)

Corporations worldwide have focused on improving business processes for the past two decades. In fact, while most Fortune 500 companies have already adopted enterprise resource planning (ERP) systems, now many midsize companies are also planning ERP implementations. With a commitment to keep pace with these changes in business processes and technology, the University of Missouri system joined SAP's™ University Alliance and Microsoft's™ University Alliance programs in order to continue and expand classroom capabilities for integrating ERP software into the curriculum.

ERP systems can be used to reinforce many of the concepts covered in the business discipline. ERP systems incorporate state-of-the-art technology, providing a comprehensive teaching tool for business and for information systems. Universities that have successfully incorporated an ERP system into their curricula find unprecedented student demand for those subjects.

ERP can be viewed as a combination of business management practice and technology, where information technology integrates with a company's core business processes to enable the achievement of specific business objectives. This certificate prepares students for positions as both technical and business consultants in the ERP field.

A student admitted to this graduate certificate must complete four courses:

ERP 5110	Enterprise Resource Planning Systems Design and Implementation
ERP 6120	Enterprise Resource Planning: Systems Config and Integration
Two additional ERP courses at the 5000 level or above, such as:	
ERP 5240	Enterprise Application Development and Software Security
ERP 5210	Performance Dashboard, Scorecard and Data Visualization
ERP 5310	Supply Chain Management Systems in an ERP Environment
ERP 5410	Use of Business Intelligence
ERP 5510	ERP System Administration
ERP 6220	Data Modeling & Visualization Prototyping for Enterprise Decision Dashboard
ERP 6444/ IS&T 6444	Essentials of Data Warehouses
ERP 6610	Advanced Customer Relationship Management in ERP Environment

## Human-Computer Interaction and User Experience

There is a growing demand within industry for workers with expertise in human-computer interaction (HCI), who generally hold titles such as interface designer; usability researcher analyst; usability engineer; user

experience specialist; or information architect. HCI specialists bridge the gap in organizations between groups who build the technologies and groups who use the technologies. The qualifications for these positions generally fall into the following categories:

- Knowledge of human-computer interaction principles
- Skills in collecting user requirements
- Skills in developing prototypes, both low fidelity (e.g., paper) and high fidelity (e.g., html mock-up)
- Skills in evaluation of the impact of technologies on humans

A student admitted to this graduate certificate must complete four courses:

Required core courses:	
IS&T 5885	Human-Computer Interaction and User Experience
IS&T 5886	Prototyping Human-Computer Interactions
IS&T 5887	Human-Computer Interaction Evaluation
One course from the following:	
IS&T 5680	Digital Media Development and Interactive Design
IS&T 6887	Research Methods in Business and IS&T
IS&T 5168	Law and Ethics in E-Commerce

## Information System Project Management

Managing the development of large software systems is significantly different from managing construction or research projects. However, some of the tools developed for traditional project management continue to have value and can be adapted to development of software.

This certificate aims to equip students with a set of tools that will allow them to achieve Project Management Institute (PMI) standards in the project management area to successfully manage resources, and to analyze, evaluate and improve complex projects.

A student admitted to this graduate certificate must complete four courses:

IS&T 6261	Advanced Information Systems Project Management
ENG MGT 5320	Project Management
ENG MGT 6322	Case Studies in Project Management
ENG MGT 6323	Global Project Management

## Mobile Business and Digital Transformation

Interest in the use of mobile technology and digital transformation among organizations has seen a strong, upward trend over the past few years. Indeed, many organizations now have Chief Digital Officers, whose role differs from the Chief Information Officer. The CDO's role is principally centered around positioning the organization to leverage emerging technologies, in contrast to the CIO's role of supporting existing technologies.

People capable of creating and maintaining digital technology strategies are needed.

This certificate is designed to cover managing emerging technologies. The focus will be on allowing an organization to make decisions in this dynamic domain.

A student admitted to this graduate certificate must complete four courses:

Three courses from the following list:

IS&T 5335	Fundamentals of Mobile Technology for Business
IS&T 6641	Advanced Digital Commerce and IoT Analytics
IS&T 6654	Advanced Web Design and Digital Media Studies
IS&T 5251	Management and Leadership of Technological Innovation
IS&T 6723	Artificial Intelligence, Robotics, and Digital Transformation
ERP 5240	Enterprise Application Development and Software Security
Elective courses (choose one):	
ERP 5210	Performance Dashboard, Scorecard and Data Visualization
ERP 5310	Supply Chain Management Systems in an ERP Environment
ERP 6610	Advanced Customer Relationship Management in ERP Environment
IS&T 5652	Advanced Web Development
IS&T 5886	Prototyping Human-Computer Interactions
IS&T 5168	Law and Ethics in E-Commerce
IS&T 5680	Digital Media Development and Interactive Design
MKT 5310	Digital Marketing and Promotions

**Randy Lawrence Canis**, Adjunct Professor

JD University of Missouri-Columbia

Privacy and information security law, patent law, intellectual property for computer scientist, legal environment for engineers.

**Langtao Chen**, Assistant Professor

PHD Georgia State University

Data analytics, human-computer interaction, social media, health informatics, machine learning, gameful design.

**Yu Hsien Chiu**, Teaching Professor

MASTER University of Wisconsin-Milwaukee

Enterprise resource planning, management information systems, business intelligence.

**Cecil Chua**, Associate Professor

PHD Georgia State University

**Cassandra Carlene Elrod**, Associate Professor

PHD University of Missouri-Rolla

Marketing in higher education, operations management, supply chain management, continuous improvement, project management, quality, and lean enterprise.

**Li-Li Eng**, Associate Professor

PHD University of Michigan Ann Arbor

Financial and managerial accounting, international accounting.

**Hanqing Fang**, Assistant Professor

PHD Mississippi State University

Strategic management, family business, entrepreneurship.

**Nobuyuki Fukawa**, Associate Professor

PHD Louisiana State University

Consumer behavior, marketing research, marketing strategy.

**Michael Gene Hilgers**, Professor

PHD Brown University

Modeling and simulation, leaning technologies, and human-computer interaction.

**Bih-Ru Lea**, Associate Professor

PHD Clemson University

Enterprise resource planning, performance dashboards, accounting information systems, data visualization, business process integration, and supply chain management.

**Xiaoyu Li**, Assistant Teaching Professor

PHD University of North Carolina-Greensboro

**Yu Liu**, Assistant Professor

PHD University of Oregon

Empirical corporate finance, investment, OTC market, public finance, and political economics.

**Fiona Fui-Hoon Nah**, Professor

PHD University of British Columbia

Management information systems, E-commerce, mobile commerce, human-computer interaction.

**Elizabeth Ortmann Vincenzo**, Adjunct Instructor

JD Loyola University Chicago

**Keng Leng Siau**, Professor

PHD University of British Columbia

Artificial intelligence/machine learning, business intelligence/analytics, design science, mobile, and ubiquitous business.

**Sarah Margaret Stanley**, Associate Professor

PHD Saint Louis University

Brand relationships, advertising effectiveness, social marketing and its effects on consumer brand choice.

**Wen-Bin Yu**, Associate Professor

PHD University of Louisville

Business intelligence, text mining, data mining, demand forecasting, simulation, and agent bases systems.

**Hongxian Zhang**, Associate Professor

PHD University of Texas at San Antonio

Corporate finance, investments, public pension funds.

**Wangchuchu Zhao**, Specialist

MS Missouri University of Science and Technology

**Cui Zou**, Specialist

MS Missouri University of Science and Technology

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**IS&T 5000 Special Problems** (IND 0.0-6.0)

Problems or readings on specific subjects or projects in the department. Consent of instructor required.

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**IS&T 5001 Special Topics** (LEC 0.0-6.0)

This is designed to give the department an opportunity to test a new course. Variable title.

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**IS&T 5040 Oral Examination** (IND 0.0)

After completion of all other program requirements, oral examinations for on-campus M.S./Ph.D. students may be processed during intersession. Off-campus M.S. students must be enrolled in oral examination and must have paid an oral examination fee at the time of the defense/comprehensive examination (oral/ written). All other students must enroll for credit commensurate with uses made of facilities and/or faculties. In no case shall this be for less than three (3) semester hours for resident students.

**IS&T 5099 Research** (IND 0.0-15)

Investigations of an advanced nature leading to the preparation of a thesis or dissertation. Consent of instructor required.

**IS&T 5131 Foundations of Computer Architecture** (LEC 3.0)

Design-oriented foundations of computer components and operation. Standard codes; number systems; base conversions; computer arithmetic; boolean algebra; operating system components including memory management, device management; plus related computer architecture topics. Research paper required. Prerequisites: Graduate Standing, strong programming knowledge.

**IS&T 5168 Law and Ethics in E-Commerce** (LEC 3.0)

Provides the ethical framework to analyze the ethical, legal, and social issues that arise for citizens and computer professionals regarding the computerization of society. Topics include: free speech, privacy, intellectual property, product liability, and professional responsibility. (Co-listed with Philos 4368).

**IS&T 5251 Management and Leadership of Technological Innovation** (LEC 3.0)

The course covers strategic management of technological innovation and leadership in managing technology-based organizations. It focuses on developing a general management perspective on technology, innovation, industry dynamics of technological innovation, and new product development. Prerequisite: Senior or Graduate Standing.

**IS&T 5335 Fundamentals of Mobile Technology for Business** (LEC 3.0)

A broad overview of mobile technology use in business environments. Topics include the mobile industry; mobile network and wireless standards; mobile devices; mobile web design and app development; social and user experience issues; mobile marketing and commerce. Prerequisites: Junior standing or above.

**IS&T 5420 Business Analytics and Data Science** (LEC 3.0)

Analysis of large business data sets via statistical summaries, cross-tabulation, correlation, and variance matrices. Techniques in model selection, prediction, and validation utilizing general linear and logistic regression, Bayesian methods, clustering, and visualization. Extensive programming in R is expected. Prerequisites: Calculus, Statistics, and Programming knowledge.

**IS&T 5423 Foundations of Data Management** (LEC 3.0)

Foundational concepts of database management systems. Issues in database architecture, design, administration, and implementation. Extensive use of SQL with Oracle to create and manage databases. Significant project dealing with triggers or stored procedures. Prerequisites: Strong programming knowledge required.

**IS&T 5445 Database Marketing** (LEC 3.0)

Intro to methods and concepts used in database marketing: 1) predictive modeling techniques (e.g., regression, decision trees, cluster analysis) and 2) standard processes for mapping business objectives to data mining goals to produce a deployable marketing model. Metrics like lifetime value of a customer and ROI will be covered. Prerequisite: Statistics understanding, programming understanding, familiarity with spreadsheets.

**IS&T 5450 Introduction to Information Visualization** (LEC 3.0)

Topics include: the visualization development framework, traditional presentations of data, human perception and aesthetics, colorspace theory, visualization algorithms and software, modern visualizations of large data sets. Application of R packages will be emphasized throughout. Prerequisites: Statistics, Calculus, and Programming Knowledge.

**IS&T 5520 Data Science and Machine Learning with Python** (LEC 3.0)

Examines data science methodologies for scraping, manipulating, transforming, cleaning, visualizing, summarizing, and modeling large-scale data as well as supervised and unsupervised machine learning algorithms applied in various business analytics and data science scenarios. Python libraries such as Pandas, NumPy, Matplotlib, and Scikit-learn are utilized. Prerequisites: One of Stat 3111, Stat 3113, Stat 3115, or Stat 3117; one of IS&T 1552, IS&T 1562, Comp Sci 1575; for Graduate Students: knowledge of calculus, statistics, and programming.

**IS&T 5535 Machine Learning Algorithms and Applications** (LEC 3.0)

Introduces techniques of modern machine learning methods with applications in marketing, finance, and other business disciplines. Topics include regression, classification, resampling methods, model selection, regularization, decision trees, support vector machines, principal component analysis, and clustering. R programming is required. Prerequisites: One of Stat 3111, Stat 3113, Stat 3115, Stat 3117; one of IS&T 1552, IS&T 1562, Comp Sci 1575; or Graduate Standing with knowledge of calculus, statistics, and programming.

**IS&T 5652 Advanced Web Development** (LEC 3.0)

Advanced web development techniques to provide dynamic interaction; methods for extracting and delivering dynamic information to/from web servers - a hands-on approach. Emphasis on interaction with servers; mobile software development; processing of graphics and web video. Project work is required. Prerequisites: IS&T 4654; one of IS&T 1551, IS&T 1561.

**IS&T 5680 Digital Media Development and Interactive Design** (LEC 3.0)

This course covers techniques and tools for design and development of digital and interactive media, including text, graphics, animation, audio, and video. Prerequisites: A grade of "C" or better in IS&T 1551, IS&T 1561 or Comp Sci 1570.

**IS&T 5780 Human and Organizational Factors in Cybersecurity** (LEC 3.0)

In-depth examination of human and organizational factors in cybersecurity and information assurance. Study of how to protect information integrity, availability, and confidentiality, as well as tools, methods, principles, and analytics for fraud prevention, insider threat detection, and forensic investigations. Assumes prior exposure to cybersecurity or IA.

**IS&T 5885 Human-Computer Interaction and User Experience** (LEC 3.0)

Introduction to the field of Human-Computer Interaction (HCI). Students examine issues and challenges related to the interaction between people and technology. The class explores the social and cognitive characteristics of people who use information systems. Students learn techniques for understanding user needs, interface prototyping & interface evaluation.

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**IS&T 5886 Prototyping Human-Computer Interactions** (LEC 3.0)

This course explores novel HCI and UX technologies as well as methods and tools for creating system prototypes, including best practices and guidelines for optimal user experiences. Example concepts include mobile applications, behavioral monitoring, gamification, natural user interfaces, haptics, and computers as social actors. Prerequisite: Preceded or accompanied by IS&T 5885.

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**IS&T 5887 Human-Computer Interaction Evaluation** (LEC 3.0)

This course covers research and analysis methods and tools for evaluation of the impact of information technology systems on humans and organizations. The focus will be on practical evaluation with the goal of providing recommendations for improving system functionality and usability. Prerequisite: Preceded or accompanied by IS&T 5885.

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**IS&T 6000 Special Problems** (IND 0.0-6.0)

Problems or readings on specific subjects or projects in the department. Consent of instructor required.

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**IS&T 6001 Special Topics** (LEC 0.0-6.0)

This is designed to give the department an opportunity to test a new course. Variable title.

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**IS&T 6050 Continuous Registration** (LEC 1.0)

Doctoral candidates who have completed all requirements for the degree except the dissertation, and are away from the campus must continue to enroll for at least one hour of credit each registration period until the degree is completed. Failure to do so may invalidate the candidacy. Billing will be automatic as will registration upon payment.

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**IS&T 6099 Research** (IND 0.0-15)

Investigations of an advanced nature leading to the preparation of a thesis or dissertation. Consent of instructor required.

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**IS&T 6251 Technological Innovation, Entrepreneurship, and Economic Development** (LEC 3.0)

Technological innovation is an important driver of entrepreneurship and economic development. The course covers essential practices, methods, and tools for successful innovation and entrepreneurship to enhance economic development.

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**IS&T 6261 Advanced Information Systems Project Management** (LEC 3.0)

Project management principles, first from a general perspective, and then focused specifically on information system application development are explored. Topics include requirements analysis, project scheduling, risk management, quality assurance, testing, and team coordination. Report writing and research literature searches are required. Prerequisites: Strong programming knowledge required.

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**IS&T 6335 Mobile Technology for Business** (LEC 3.0)

Overview of mobile technology use in business environments. Topics include: mobile industry; mobile network and wireless standards; mobile devices; mobile web design and app development; social and user experience issues; mobile marketing and commerce. Project required.

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**IS&T 6336 Internet Computing and the Internet of Things** (LEC 3.0)

The course principally focuses on what's "under the hood" in the Internet. What are the underlying protocols and how do they work? How can constellations of devices (both traditional computing as well as Internet of Things) be configured into networks using the Internet Protocol suite to communicate with each other? Prerequisite: IS&T MS entrance requirements, including solid programming knowledge.

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**IS&T 6443 Information Retrieval and Analysis** (LEC 3.0)

Covers the applications and theoretical foundations of organizing and analyzing information of textual resources. Topics include information storage and retrieval systems, web search engines, text mining, collaborative filtering, recommender systems. Students will also learn the techniques with the use of interactive tools such as SAS. Prerequisite: ERP 5410 or statistics knowledge.

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**IS&T 6444 Essentials of Data Warehouses** (LEC 3.0)

This course presents the topic of data warehouses and the value to the organization. It takes the student from the database platform to structuring a data warehouse environment. Focus is placed on simplicity and addressing the user community needs. Project required. Prerequisite: IS&T 5423 or equivalent relational database experience. (Co-listed with ERP 6444).

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**IS&T 6448 Building the Data Warehouse** (LEC 3.0)

Data modeling and processes needed to populate a data warehouse; tradeoffs among several models and tools; technical issues that are faced, such as security, schemas, Web access, other reporting techniques. Prerequisite: IS&T 6444.

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**IS&T 6450 Information Visualization** (LEC 3.0)

Topics/activities include: the visualization development framework, traditional presentations of data, human perception and aesthetics, colorspace theory, visualization algorithms and software, case studies of modern topology, research into visualization algorithms and implementations in R. Students will produce significant programs and visualizations. Prerequisites: Statistics, Calculus, and Programming Knowledge.

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**IS&T 6641 Advanced Digital Commerce and IoT Analytics** (LEC 3.0)

We discuss methods and techniques of data analytics on data from eCommerce websites and Internet of Things (IoT) devices that help create understanding of online business or detect patterns of IoT sensors. Challenges of data collection, key digital marketing metrics, and results interpretation and communication will be covered. Prerequisites: Knowledge of management information systems.

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**IS&T 6654 Advanced Web Design and Digital Media Studies** (LEC 3.0)

The course covers web design and digital media, including topics such as social media, cyberculture, service design thinking, citizen journalism, crowd intelligence, brain-computer interfaces, privacy, and copyright. This course is an advanced version of Web Design and Digital Media Studies.

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***IS&T 6680 Advanced Digital Media Development and Interactive Design*** (LEC 3.0)

This course covers advanced techniques and tools for the design and development of digital and interactive media, including text, graphics, animation, audio, and video. This course is an advanced version of IST 4680, with additional assignments. Prerequisites: Some knowledge of programming.

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***IS&T 6723 Artificial Intelligence, Robotics, and Digital Transformation*** (LEC 3.0)

The course, designed for business executives, covers management of information to revitalize business processes, improve business decision-making, embrace emerging and disruptive technologies, and gain competitive advantages. The course also covers implications of AI, automation, machine learning, and robotics on business and society. MBA core. Prerequisites: Graduate standing. (Co-listed with Bus 6723).

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***IS&T 6780 Adv Human and Organizational Factors in Cybersecurity*** (LEC 3.0)

In-depth examination of human and organizational factors in cybersecurity and information assurance. Examines current challenges to protecting the integrity, availability, and confidentiality of information, as well as tools, methods, principles, and analytics for fraud prevention, insider threat detection, and forensic investigations. Project Required. Prerequisite: None, but recommended: IS&T 3333 or IS&T 6336 or Comp Sci 3600 or another introductory cybersecurity or information assurance course.

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***IS&T 6887 Research Methods in Business and IS&T*** (LEC 3.0)

This course covers quantitative and qualitative research methods for exploring the interaction between people and information technologies. The course covers techniques and tools for carrying out literature reviews, forming research goals, designing research, conducting data analyses; and preparing manuscripts and live presentations. (Co-listed BUS 6887).

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