Graduate Programs

Business success in the 21st century is increasingly dependent on the strategic development and use of technology. This is a complex challenge as the solution to many business problems relies on the convergence of a number of technologies and their proper alignment with customer requirements and business strategy.

Our educational programs are directed at:

- Technology professionals wishing to acquire business knowledge and management skills
- Business professionals wishing to learn about technology and how technology must be managed to achieve business objectives.

The School of Business offers the following master's degree programs:

- Master of Science in Business Intelligence and Analytics (BI&A)*
- Master of Science in Information Systems (MSIS)*
- Master of Science in Management (MSM)
- Master of Science in Finance (MFIN)*
- Master of Science in Financial Analytics (MFA)*
- Master of Science in Financial Engineering (MFE)*
- Master of Science in Enterprise Project Management (MS-EPM)
- Master of Science in Network & Communication Management & Services (NCMS)*
- Master of Business Administration (MBA)
- Master of Business Administration in Analytics (AMBA)
- Master of Science in Technology Management (MSTM)
- Executive MBA (EMBA)
- ▶ Ph.D. in Business Administration

* Designated STEM program

This catalog describes each of these degree programs in detail.

Educational Approach

The Business School's graduate programs are designed to maximize the management potential of each student. Students can choose concentrations within each degree program or electives that enable students to complement their degree by specializing in a number of areas ranging from soft skills development to technical specialties outside the domain of the concentration. Students may also choose electives from other schools at Stevens.

The School of Business faculty members are leaders in research and education in the business and technical disciplines that are relevant to decision making, innovation and action in an increasingly global, technology-driven world. Our educational programs provide students with knowledge that is both rigorous and relevant. Of equal importance, our programs emphasize the holistic development of each individual student through the development of life-long skills and abilities such as oral and written communication, team participation and leadership, decision making and ethical reasoning.

Ethics and Communications Education

Ethics Workshop: The ethics requirement is incorporated into the course work for the following required courses *MGT 609 Project Management Fundamentals, BIA 650 Optimization and Process Analytics (for BI&A students), MGT 635 Managerial Judgment & Decision Making (for MBA students) and MGT 798 Integration & Application of Technology Management (for MSTM and EMBA students).*

Students are automatically enrolled in *MGT 899 Ethics Workshop* at no cost. This workshop carries zero credit and will not appear on the student's official transcript. Completion of all exercises and the survey associated with the Ethics Workshop is sufficient to satisfy the ethics requirement.

Communication Skills: Written and oral communications training and assessment are conducted in conjunction with the following required courses: *MGT 609 Project Management Fundamentals, BIA 650 Optimization and Process Analytics (for BI&A students), MGT 630 Global Business & Markets (Oral Communications) and MGT 635 Managerial Judgment & Decision Making (Written Communications) (for MBA students.)*

Students in these courses are automatically enrolled in *MGT 898: Writing Support and Assessment Program.* This online workshop carries zero credit and will not appear on the student's official transcript. *Students in the MSTM and EMBA program take EMT 758 Oral & Written Communications, in lieu of MGT 898 for zero credit.* Students who do not pass the written assessment will be required to take *MGT 897: Online Writing Tutorial* for no cost for zero credit.

English Requirements for International Students

International students for whom English is a second language must demonstrate English language proficiency by submitting the results of a TOEFL or an IELTS test. TOEFL and IELTS score requirements are identical to the ELC requirements listed on pages 43-44 of the catalog.

MASTER OF SCIENCE IN BUSINESS INTELLIGENCE AND ANALYTICS (BI&A)

The MS in Business Intelligence and Analytics (BI&A) is designed for full-time and part-time students who have undergraduate degrees in science, mathematics, computer science or engineering. The program produces analytical thinkers who can pursue careers as data scientists in a variety of industries. The BI&A program includes courses in databases, data warehousing, data mining, social networking and risk modeling. The program is both theoretical and applied in that each course combines relevant theories and techniques with a number of examples and student exercises that illustrate industry applications of data analytics. A capstone course provides opportunity for students to apply the concepts, principles, and methods they have learned to real problems in an application domain of their choice.

The BI&A program prepares students for careers as business analysts and data scientists in multiple industries such as finance, manufacturing, retail and media and communications.

Degree Requirements: The MS in Business Intelligence and Analytics consists of 12 courses (36 credits). A minimum GPA of 3.0 is required to graduate.

Admission Requirements: The BI&A program is designed for students with a strong technical background in mathematics, economics, engineering, or computer science. Admissions decisions are made on a rolling basis. Students can apply at any time during the year.

All applicants to the BI&A program must submit a GMAT or GRE score.

Prerequisites: 4-year undergraduate degree; calculus (1 year); at least one course in programming or programming experience and one course covering basic probability, hypothesis testing and estimation.

Structure of the BI&A Program

The 12 required courses for the BI&A program encompass six subject areas that conceptually comprise the field of BI&A. The program culminates in a "practicum" course that applies the concepts and techniques learned in prior courses to realworld problems. Oral and written communications skills, analytical thinking and ethical reasoning are emphasized throughout the curriculum.

Organizational Context

FIN 615 Financial Decision Making

Data Management

- BIA 664 Data and Information Quality
- MIS 630 Dealing with Data
- MIS 636 Data Warehousing & Business Intelligence

Optimization and Risk Analysis

- ▶ BIA 650 Optimization and Process Analytics
- BIA 670 Risk Management & Simulation*

Statistics

- ▶ BIA 652 Multivariate Data Analytics
- ▶ BIA 654 Experimental Design

Data Mining and Machine Learning

- MIS 637 Data Analytics & Machine Learning
- BIA 656 Advanced Data Analytics & Machine Learning*

Social Network Analytics

- ▶ BIA 658 Social Network Analytics (cross-listed with MIS 669)
- ▶ BIA 660 Web Mining* (Not an Elective)

Management Applications

- ▶ BIA 672 Marketing Analytics*
- ▶ BIA 674 Supply Chain Analytics*

Big Data

- ▶ BIA 672 Data Stream Analytics: Internet of Things* (Elective)
- BIA 678 Big Data Seminar* (Elective)
- ▶ BIA 662 Cognitive Computing* (Elective)

Practicum

BIA 686 Practicum in Analytics

*Choose two out of these Six Elective courses with permission of an advisor.

Data Science Concentration

In their second semester in the BI&A program, students with strong computational background may apply for admission to the concentration in Data Science. Data Science students are required to take a minimum of three courses offered by the Computer Science, Financial Engineering and Mathematics departments at Stevens.

Electives

Many electives are available for qualified students who get placed out of one or more of the required courses (e.g., FIN 615). For example:

Computer Science

- CS 506 Introduction to IT Security
- CS 538 Visual Analytics
- CS 559 Machine Learning
- CS 578 Privacy in a Networked World
- CS 581 Online Social Networks
- CS 586 Machine Learning for Gaming
- SOC 653 Introduction to Text Mining and Statistical Natural Language Processing

Financial Engineering

- ▶ FE 511 Intro to Bloomberg & Thomson Reuters (1 credit)
- ▶ FE 515 Introduction to R (1 credit)
- ▶ FE 520 Intro to Python for Financial Applications (1 credit)
- ▶ FE 635 Financial Enterprise Risk Engineering
- ▶ FE 670 Algorithmic Trading Strategies

Information Systems

- MIS 714 Service Innovation
- MIS 710 Process Innovation and Management
- MIS 730 Integrating IS Technologies

International students may also elect to take a Curricular Practical Training (CPT) course (BIA 702) which involves an educationally relevant, practical assignment aimed at augmenting the academic content of the student's program. Students engage in a company project related to the focus of their academic program. The project is conducted under the supervision of a faculty advisor and an industry mentor. The CPT is intended to provide students with practical experience that complements their academic knowledge through active learning under real-world conditions.

MASTER OF SCIENCE IN INFORMATION SYSTEMS (MSIS)

Rapid advancements in technology, dynamic markets, and the changing global business environment have led to intense global competition in which shorter product life cycles and efficient and effective computing services are a competitive necessity. Information systems professionals are required to identify innovative opportunities for leveraging IT for competitive advantage. Close alignment of IT and business is essential. Organizations need IT professionals who are effective at working closely with their business partners, and business people need to better understand how to work closely with their IT partners.

This program is designed for information systems professionals seeking to advance their careers in the IT sector of the business, or as IT experts in other areas of business. It is also suitable for business professionals looking for ways to leverage their IT resources. In addition to strong practical, real-world IT and management skills, graduates of the program leave with improved communication, interpersonal, and team skills.

The MSIS program prepares students for careers such as: Business Analyst, Internal IT Consultant, IT Manager, Management Consultant, Data Analyst, Knowledge Manager, Social Media Expert and Technology Specialist.

In addition to off-campus (corporate-sponsored) programs, the MSIS program is offered on campus on weekdays via Stevens WebCampus platform. Courses are offered year-round, in fall, spring and summer semesters.

Degree Requirements: The MS in Information Systems consists of 12 courses (36 credits). A minimum GPA of 3.0 is required to graduate.

Admission Requirements: The Master of Science in Information Systems program is designed for working professionals with at least two years of work experience. Applicants who do not meet this work experience requirement, but have outstanding academic records, may be considered for admission. Admission to the program requires a bachelor's degree with at least a "B" average. Applications should include two letters of recommendation.

Meeting minimum admissions standards does not guarantee admission; minimum requirements serve as a guide to the minimum expected qualifications necessary to be considered for admission.

Admissions decisions are made on a rolling basis. Students can apply at any time during the year.

International students must also submit a GMAT/GRE score.

Structure of the MSIS Program

The MSIS program comprises eight core courses and two electives:

- MGT 609 Project Management Fundamentals
- FIN 615 Financial Decision Making
- MIS 630 Dealing with Data
- ▶ BIA 610 Applied Analytics
- MIS 699 Digital Innovation
- MIS 710 Process Innovation & Management
- MIS 730 Integrating IS Technologies
- MIS 760 Information Technology Strategy

MSIS Concentrations

The final 3 courses are free electives that can be chosen with the help of the faculty advisor, or a specific combination of courses selected from one of the designated concentrations in the MSIS program.

MSIS students can choose from specific 3-course concentrations:

- Business Intelligence & Analytics
- Business Process Management & Service Innovation
- Project Management
- ▶ Software Engineering
- Cybersecurity Risk Management

The courses comprising each of these MSIS concentrations are listed below.

Business Intelligence and Analytics

IT is emerging from an era in which the emphasis was on producing information to one in which competitive advantage can only be obtained by sophisticated analysis of large volumes of information. There is a strong demand on Wall Street and in all areas of business for graduates with the analytic skills provided by this concentration. We recommend that MSIS students with an interest in Business Intelligence and Analytics select courses from the BI&A program, such as BIA 652 Multivariate Analytics, or BIA 660 Web Mining. In addition, specific MIS courses with focus on Business Intelligence & Analytics exist, such as:

- MIS 635 Designing the Knowledge Organization
- MIS 636 Data Warehousing and Business Intelligence
- MIS 637 Data Analytics & Machine Learning

With approval of their advisor students can substitute BIA courses and select FE courses in the Business Intelligence and Analytics concentration.

Business Process Management & Service Innovation

Organizations need effective and efficient processes to execute their strategies and successfully compete in a rapidly changing world of global competition. Business School faculty members are leaders in research and education on business process management (BPM) with a particular emphasis on relationship of processes to organizational strategy and structure and supply chain management. There is strong demand in all areas of business for graduates who can analyze, design and implement effective business processes. Students interested in Business Process Management should choose the following courses:

- MIS 690 Supply Chain Management and Strategy
- MIS 712 Advanced Business Process Management
- MIS 714 Service Innovation

With approval of their advisor students can choose BIA 650 Process Optimization and Analytics and/or BIA 674 Supply Chain Analytics as electives in the Business Process Management & Service Innovation concentration.

Concentration:

- Cybersecurity Risk Management
- ▶ FIN 545 Financial Cybersecurity
- MIS 645 Cybersecurity Principles for Managers
- BIA 670 Risk Management

Student can replace one of the above courses by taking one Stevens CS/ECE Cybersecurity course from the following list:

- CS/MA 503 Discrete Mathematics for Cryptography
- CS 576 Secure Systems
- CS 577 Cybersecurity Laboratory
- CS 578 Privacy in a Networked World
- CS 579 Foundations of Cryptography
- CS 594 Enterprise Security and Information Assurance
- CS 665 Network Forensics
- CS 675 Threats, Exploits, and Countermeasures
- ▶ CS 693 Cryptographic Protocols
- CS 695 Host Forensics
- CPE 592 Multimedia Network Security
- ▶ EE 584 Wireless Network Security
- SSE 623 Systems Security Architecture and Design

Project Management

This concentration deals with project and program management concepts with an emphasis on managing technology-centric projects in private and public enterprises.

- MGT 610 Strategic Perspectives in Project Management
- ▶ MGT 611 Project Analytics
- MGT 612 Leader Development

Concentratoin

- Software Engineering
- SSW 540 Fundamentals of Software Engineering
- ▶ SSW 555 Agile Development
- SSW 567 Software Testing

Free Electives (no concentration option)

MSIS students may elect to take three courses that fit their interests rather than a specific concentration in the MSIS program. Courses may be chosen from within the School of Business or from other Schools at Stevens.

International students may also elect to take a Curricular Practical Training (CPT) course (MIS702) which involves an educationally relevant, practical assignment aimed at augmenting the academic content of the student's program. Students engage in a company project related to the focus of their academic program. The project is conducted under the supervision of a faculty advisor and an industry mentor. The CPT is intended to provide students with practical experience that complements their academic knowledge through active learning under real-world conditions.

MASTER OF SCIENCE IN MANAGEMENT (MSM)

The Master of Science in Management (MSM) program is a generalist graduate business program designed specifically for individuals with non-business academic backgrounds/degrees. Students do not need any professional work experience to be admitted to this 30-credit program. Grounded in the fields of management, economics, applied psychology, and quantitative methods, the unique 10-course curriculum encompasses the primary business disciplines to help you round out your undergraduate training and experience. Students will learn how economics, technology, social science and quantitative methods can be used to solve today's complex and managerial challenges.

In today's competitive global workplace, having the right technical skills is extremely important, but it is often not enough. Businesses need people who can enter the workplace with the ability to transform technical expertise into business solutions. Through the MSM coursework and other learning experiences, students are guided in developing a core set of critical thinking, collaboration, communication and innovation skills that are keys to success at the intersection business and technology. The MSM courses help students master business fundamentals and enrich their capacity to communicate effectively across business and technical domains.

Stevens is renowned for excellence in project management, leadership and innovation management. Not only are these skills important to technical professionals, they also impart a competitive edge regardless of previous field of study or current type of work. Our faculty includes thought leaders who are experienced professionals, many of whom were managers at Fortune 500 organizations. Be a part of a major technical university that on the one hand has a rich tradition of excellence in applied science and engineering, and on the other is also home to original thought leaders in management science.

The MS in Management program is offered on campus on weekdays and via the WebCampus platform. Courses are offered year-round, in fall, spring and summer semesters. Corporate sponsored programs are also offered at company sites.

Degree Requirements: The MS in Management degree comprises 10 courses (30 credits). A minimum GPA of 3.0 is required to graduate.

Admission Requirements: The Master of Science in Management program is designed for students having less than two years work experience. Admission to the program requires a bachelor's degree with at least a "B" average, and two letters of recommendation. Meeting minimum admissions standards does not guarantee admission; minimum requirements serve as a guide to the minimum expected qualifications necessary to be considered for admission.

Students can apply at any time during the year. Admissions decisions are made on a rolling basis.

International students must also submit a GMAT/GRE score.

Structure of the MSM Program

The MSM program comprises eight business core courses and two electives:

Business Core

- MGT 609 Project Management Fundamentals
- FIN 615 Financial Decision Making
- MGT 606 Economics for Managers
- MGT 641 Marketing Management
- MGT 657 Operations Management
- MGT 671 Technology and Innovation Management
- MGT 689 Organizational Behavior and Design
- MGT 699 Strategic Management

Electives

Students choose two additional electives from an array of courses. Courses may be chosen from within the School of Business or from other Schools at Stevens.

Students may also elect to take a Curricular Practical Training (CPT) course (MGT 702) which involves an educationally relevant, practical assignment aimed at augmenting the academic content of the student's program. Students engage in a company project related to the focus of their academic program. The project is conducted under the supervision of a faculty advisor and an industry mentor. The CPT is intended to provide students with practical experience that complements their academic knowledge through active learning under real-world conditions.

MASTER OF SCIENCE IN FINANCE (MFIN)

The Master of Science in Finance (MFin) is a 36-credit degree program that addresses the needs of students looking to advance their management careers in the financial sector. It consists of core courses covering fundamental topics in finance and economics, the management of financial technologies, and allows students to specialize in topics such as regulatory and market environments, the management of risks, or financial project management.

The Finance curriculum is structured in such a way as to provide students with a rigorous education that will familiarize them with the terminology, methods and application areas of economics, finance and financial technology, while providing an understanding of the financing needs of companies and the market mechanisms available to meet these needs. Graduates will be able to apply financial technologies for analysis, forecasting and management; assess the financial health of an organization; develop comprehensive plans that address financial management needs of an organization; and lead business and technology teams.

Graduates of the Master of Finance program will:

- be familiar with terminology, methods, and application areas of economics, finance, and financial technology
- understand the financing needs of organizations and the market mechanisms available to meet these needs
- be able to apply common financial technologies for analysis, forecasting, and management of financial enterprises
- be able to assess the financial health of an organization
- be able to develop a comprehensive plans that address the financial management needs of an organization
- lead combined business and technology teams in the delivery of change projects

Degree Requirements: The MS in Finance degree comprises 12 courses (36 credits). A minimum GPA of 3.0 is required to graduate.

Admission Requirements: The Master of Science in Finance is designed for working professionals who want to advance their management careers in the financial sector. Applicants should have a minimum of two years of work experience.

Applicants who do not meet the work experience requirement, but have outstanding academic records, may be considered for admission. Admission to the program requires a bachelor's degree with at least a "B" average, and two letters of recommendation. Meeting minimum admissions standards does not guarantee admission; minimum requirements serve as a guide to the minimum expected qualifications necessary to be considered for admission.

Meeting minimum admissions standards does not guarantee admission; minimum requirements serve as a guide to the minimum expected qualifications necessary to be considered for admission.

Admissions decisions are made on a rolling basis. Students can apply at any time during the year.

All applicants to the MS in Finance Program must submit a GMAT/GRE score.

Structure of the MS in Finance Program

Pre-requisites

Students should have taken undergraduate courses in Accounting, Finance, and Statistics, or demonstrable work experience in these areas. Students that lack background in either of these areas will take FIN 623 (for financial management), FIN 600 (for accounting) and/or MGT 620 (for statistics) during a pre-requisite semester.

Curriculum

Economics Core

- ▶ MGT 606 Economics for Managers
- ▶ FIN 620 Financial Econometrics
- MGT 700 Econometrics

Finance Core

- FIN 629 Fixed Income
- FIN 627 Investment Management
- ▶ FIN 638 Corporate Finance
- FIN 510 Financial Statement Analysis

Financial Technology Core

- ▶ FE 511 Introduction to Bloomberg & Thomson Reuters
- ▶ FE 515 Introduction to R
- ▶ FE 514 Introduction to SAS

Investment Banking and Valuation

This concentration is tailored to students who are aiming to compete for finance positions, primarily in equity analysis, investment banking and commercial banking, at corporations. This concentration is aligned with the CFA Level 1 exam.

Suggested courses:

- ▶ FIN 628 Derivatives*
- ▶ FIN 526 Private Equity and Venture Capital*
- FIN 530 Investment Banking
- ▶ FE 535 Introduction to Financial Risk Management

*Recommended for students planning to take the CFA Level 1 exam

Financial Analytics and Risk

Students who are interested in careers in analytics, financial technology and risk management are good fits for this concentration, which provides a thorough overview in regulation, business intelligence and risk. This concentration is aligned with the Financial Risk Manager – GARP exam.

Suggested courses:

- ▶ FIN 628 Derivatives*
- ▶ FE 535 Introduction to Financial Risk Management*

- ▶ FIN 545 Risk Management for Financial Cybersecurity*
- BIA 656 Advanced Data Analytics & Machine Learning
- *Recommended for students planning to take the FRM exam

Financial Planning

- FIN 550 Financial Planning and Risk Management
- ▶ ACC 555 Retirement and Estate Planning
- FIN 560 Federal Taxation of Individuals
- FIN 565 Financial Plan Development

Financial Services Operations

This option was created for the professional who wants to specialize in the operations and technical side of finance, and includes an introduction to Big Data and a look at project management and business processes.

Suggested elective courses:

- MGT 609 Project Management Fundamentals
- MIS 710 Process Innovation and Management
- FIN 535 Introduction to Financial Risk Management
- MIS 636 Data Warehousing and Business Intelligence

MASTER OF SCIENCE IN FINANCIAL ANALYTICS (MFA)

Financial Analytics focuses on advanced development in fundamental data processing, machine learning, statistical modeling and optimization. The target of a student in this program is on broader financial services and the financial technology industry. Program graduates are expected to be able to handle complex financial data, build advanced analytical models, deliver effective visualization product, and utilize cloud-based data-driven analytics technology.

Taught by renowned faculty who are practitioners and researchers, the master's degree consists of 11 courses (33 credits): 9 required core courses and 2 electives.

Required Core Courses

- ▶ FE 530: Introduction to Financial Engineering
 - Or FE 535: Introduction to Financial Risk Management
- ▶ FE 582: Foundations of Data Science with
 - FE 513: Practical Aspects of Database Design (lab)
- ▶ FE 541: Applied Statistics with Application in Finance
- ▶ FE 550: Data Visualization Application
 - Or EM 622: Data Analysis & Visualization for Decision-Making
- ▶ FE 542: Time Series with Applications to Finance
 - Or MA 641: Time Series Analysis I

- ▶ FE 590: Introduction to Knowledge Engineering
 - Or MIS 637: Statistical Learning
 - Or BIA 656: Data Analytics & Machine Learning
 - Or CS 513/SOC 550: Data Analytics & Machine Learning
- ▶ FE 595: Financial Technology
 - Or CS 549: Distributed Systems and Cloud Computing
- ▶ FE 630: Portfolio Theory and Applications
 - Or FE 646: Optimization Models and Methods in Finance
 - Or MA 629: Convex Analysis and Optimization
- ▶ FE 800: Special Projects in Financial Engineering

Elective Courses

Students are encouraged to take an integrated four-course sequence leading to a graduate certificate for the two electives; or choose the electives from our course catalog. All elective courses must be approved by an advisor. A list of available graduate certificates is included in this catalog and on the School of Systems and Enterprises website.

MASTER OF SCIENCE IN FINANCIAL ENGINEERING (MFE)

The vast complexity of financial markets compels industry to look for experts who not only understand how they work, but also possess the mathematical knowledge to uncover their patterns and the computer skills to exploit them. To achieve success, banking and securities industries must come to grips with securities valuation, risk management, portfolio structuring, and regulation-knowledge embracing applied mathematics, computational techniques, statistical analysis, and economic theory. The goal of the degree is to produce graduate who can make pricing, hedging, trading, and portfolio-management decisions in the financial services enterprise. With sharply honed practical skills complimented by strong technical elements, graduates are in demand in the industries-investment banking, risk management, securities trading and portfolio management. Students wishing to enroll in any of the FE programs must have an undergraduate degree in an engineering or science discipline and strong quantitative background.

This master's degree is also available in the 4+1 program; please see further information in the Undergraduate Programs section.

The master's degree requires 10 courses (30 credits): six core required courses and four elective courses.

Required Core Courses

- ▶ FE 610: Stochastic Calculus for Financial Engineers
- ▶ FE 620: Pricing and Hedging
- ▶ FE 621: Computational Methods in Finance
- ▶ FE 630: Portfolio Theory and Applications
- ▶ FE 680: Advanced Derivatives
- ▶ FE 800: Special Problems in Financial Engineering (3 credits)
 - Or FE 900: Thesis in Financial Engineering (6 credits)

Elective Courses

Students are encouraged to take an integrated four-course sequence leading to a graduate certificate for the four electives; or choose the electives from our course catalog. All elective courses must be approved by an advisor. A list of available graduate certificates is included in this catalog and on the School of Business website.

For example, the certificate in Financial Risk Engineering is very popular. Courses in this certificate program emphasize a blend of mathematics and finance that will help graduates to see the financial landscape from a market, credit, and systemic risk perspective and to analyze and manage the risk efficiently.

The following courses are required for this certificate:

- ▶ FE 535 Introduction to Risk Management
- ▶ FE 610 Stochastic Calculus for Financial Engineers
- ▶ FE 635 Financial Enterprise Risk Engineering
- ▶ FE 655 Systemic Risk and Financial Regulation

Another popular choice is the Algorithmic Trading Strategies certificate. This graduate certificate is designed to provide aspiring financial engineers with the necessary understanding of the design and implementation of financial trading systems, with an emphasis on the role of software and automated decision support systems in trading strategies. The certificate also is suitable for technical professionals interested in applying their unique skills to the fast-changing realm of finance.

The following courses are required for this certificate:

- ▶ FE 545 Design, Patterns and Derivatives Pricing
- ▶ FE 570 Market Microstructure and Trading Strategies
- ▶ FE 620 Pricing and Hedging
- ▶ FE 670 Algorithmic Trading Strategies

MASTER OF SCIENCE IN ENTERPRISE PROJECT MANAGEMENT (MS-EPM)

The 30-credit Stevens master's degree in Enterprise Project Management emphasizes a strategic perspective that's crucial to modern project management. The program prepares forward-thinking leaders through courses in strategic perspectives, project planning, project portfolio management and cross-project leadership, ensuring graduates can direct complex, enterprise-level initiatives on time and on budget. The curriculum is unique for its concentration on business, analytical and leadership skills, and is designed to both prepare technical professionals to become skilled managers while offering the opportunity to pursue a concentration in a field where industry desperately needs leadership, such as software engineering and construction management.

This curriculum encompasses a strategic approach to project management that goes beyond the traditional tools, tactics, and PMI Certification preparation taught in most PM programs. The Stevens EPM program prepares students to:

- Lead transformational, large-scale projects and project teams across units, enterprises and multiple organizations;
- Gain insight and skills pertaining to leadership, cultural and behavioral project environment
- Lead change and span boundaries across complex enterprise systems
- Bridge cultural and organizational gaps

The program offers a unique blend of small class sizes, intense collaboration, and global professional networking opportunities.

Graduates will leave Stevens with better communications, interpersonal and team skills enabling them to plan, implement and manage complex enterprise level projects.

Degree Requirements: The MS in Enterprise Project Management degree comprises 10 courses (30 credits). A minimum GPA of 3.0 is required to graduate.

Admissions Requirements: The Master of Science in Enterprise Project Management is designed for working professionals who want to excel in managing enterprise-level projects, programs, portfolios, and project management offices. Applicants should have a minimum of one-year work experience. Applicants who do not meet the work experience requirement, but have outstanding academic records, may be considered for admission. Admission to the program requires a bachelor's degree with at least a "B" average, and two letters of recommendation. Meeting minimum admissions standards does not guarantee admission; minimum requirements serve as a guide to the minimum expected qualifications necessary to be considered for admission.

Students can apply at any time during the year. Admissions decisions are made on a rolling basis.

International students must also submit a GMAT/GRE score.

Curriculum of the MS-EPM Program

The Master of Science in Enterprise Project Management (MS-EPM), a 30-credit degree program (10 courses) that encompasses courses in strategic perspectives, project planning, project portfolio management and cross-project leadership for an applied curriculum that teaches you to manage and serve as a leader. The three concentrations available are Software Engineering, Construction Management, and General Management.

Degree Requirements (Core 24 credits)

- MGT 609 Project Management Fundamentals
- MGT 610 Strategic Perspectives of Project Management
- MGT 611 Project Analytics
- MGT 612 Leader Development
- MGT 613 Project Portfolio Management and the Project Management Office
- MGT 619 Leading Across Projects

Concentrations

General Management

- MGT 641 Marketing Management
- MGT 699 Strategic Management
- ▶ FIN 615 Financial Decision Making
- MIS 710 Process Innovation

Software Engineering

- SSW 540 Fundamentals of Software Engineering
- SSW 565 Requirements Analysis
- SSW 555 Agile Development
- SSW Software Testing

Construction Management

- ▶ CM 510 Fundamentals of Construction Management
- CM 530 Strategic Responses to Cyclical Environments
- CM 650 Sustainable Design
- CM 590 Construction Management II

MASTER OF SCIENCE IN NETWORK & COMMUNICATION MANAGEMENT & SERVICES (MS-NCMS)

The Network & Communication Management & Services graduate program is an interdisciplinary program between the School of Business and the Electrical and Computer Engineering Department of the School of Engineering and Science. The School of Business administers the program. This program is STEM (Science, Technology, Engineering and Mathematics)-designated by the Department of Homeland Security. A CoOP is an available option for students seeking work experience.

The Network & Communication Management & Services curriculum addresses the demanding requirements of the global communications industry, businesses, and government for technical expertise combined with business skills. The program provides students with advanced technical knowledge of applied communications integrated with business management.

This program prepares students to plan, implement and manage leading edge communications capabilities. The goal of this student is to become a technical business and management professional responsible for planning communications products and services; for leading the resources required to implement the plan, including people, product, networks, and systems, and for the decisions and budgeting for development, acquisition, installation, and maintenance of products and services. Each sector of industry (government, regulatory, service providers, financial, equipment vendor, consultant, and R&D) will have corresponding profiles of professionals who need such technical expertise and management skills. This degree program builds an advanced foundation for more specialized study while enabling professionals from all industry sectors to understand and interact with customers and communications professionals who make the decisions on how businesses will exploit communications capabilities.

Specialized courses are available in the areas of management of wireless networks, broadband communications, communications security, and project management.

In addition to off-campus (corporate-sponsored) programs, Network & Communication Management & Services is offered on campus on weekdays and via the WebCampus platform. Courses are offered year-round, in fall, spring and summer semesters.

Degree Requirements: The MS in Network & Communication Management & Services degree comprises 12 courses (36 credits). A minimum GPA of 3.0 is required to graduate.

Admission Requirements: Admission to the Master of Network & Communication Management & Services program requires a bachelor's degree with at least a B average, including a semester of calculus. For students who lack this prerequisite, Stevens offers a non-credit calculus course for telecommunications management (e.g., TM 500).

Admissions decisions are made on a rolling basis. Students can apply at any time during the year.

International students must also submit a GMAT/GRE score.

Structure of the Network and Communication Management and Services Program

The MS in Network and Communication Management and Services program has 3 components:

- 1. Common Business Core (3 courses)
- 2. Degree Requirements (6 courses)
- 3. Concentrations (3 courses)

Common Business Core

- MGT 609 Introduction to Project Management
- ▶ FIN 615 Financial Decision Making
- MGT 689 Organizational Behavior and Design

Network and Communication Management and Services Degree Requirements

- ▶ TM 601 Principles of Applied Telecommunications Technologies
- TM 605 Probability and Stochastic Processes
- ▶ TM 610 Business Information Networks
- ▶ TM 612 Regulation & Policy in the Telecommunications Industry
- ▶ TM 615 Wireless Communications & Mobile Computing
- ▶ TM 630 Broadband Networking: Services & Technology

Network and Communication Management and Services Concentrations

The final 3 courses may be selected from one of two specific concentrations within the MS Network & Communication Management & Services program, or from within a general concentration category designed to accommodate a broad choice of electives.

The MS Network and Communication Management and Services program offers two concentrations.

- Management of Broadband and Converged Networks
- Management of Wireless Networks

The courses required to complete each of these concentrations are listed below.

Management of Broadband and Converged Networks

Students selecting this major will be eligible for a Graduate Certificate in the Management of Broadband Communications and Converged Networks.

- TM 617 Next Generation Wireless Networks
 - Or TM 650 Software Defined Networks and Network Function Virtualization
- ▶ TM 631 Broadband Service Management

Management of Wireless Networks Concentration

Students selecting this major will be eligible for a Graduate Certificate in the Management of Wireless Networks.

- TM 616 Global Wireless Industry
- TM 617 Next Generation Wireless Networks
- ▶ TM 618 Performance of Emerging Wireless Networks
 - Or TM/EE 584 Wireless Systems Security
 - Or TM 650 Software Defined Networks and Network Function Virtualization

Elective Options

Students may also choose from a broad range of electives to meet a student's specific growth objective in other domains intended to broaden his/her perspective while complementing the MS Network & Communication Management & Services degree. Students can select elective courses from the Business Intelligence & Analytics, Electrical Engineering, Financial Engineering, Computer Science, Management, and others. This option requires approval of a faculty advisor.

Courses may be chosen from within the School of Business or from other schools at Stevens.

Students may also elect to take a Curricular Practical Training (CPT) course (TM 702) which involves an educationally relevant, practical assignment aimed at augmenting the academic content of the student's program. Students engage in a company project related to the focus of their academic program. The project is conducted under the supervision of a faculty advisor and an industry mentor. The CPT is intended to provide students with practical experience that complements their academic knowledge through active learning under real-world conditions.

The courses that are available in each of these areas are described later in a separate section of the catalog.

MASTER OF BUSINESS ADMINISTRATION (MBA)

To stand out in today's business world, you need three essential competencies. First, you need to be proficient in the basic business disciplines, such as finance, accounting, and marketing. These three courses are prerequisites to the program (if you have not taken them previously you must take them as part of the program). Second, you must possess the key skills that enable you to collaborate and lead, communicate, be creative and think strategically. Third, with technology being essential to running nearly every facet of business, you need to understand how to nurture and leverage technology for business success.

The Stevens MBA is uniquely designed to equip you with these three essential elements. It will position you to operate effectively at the intersection of business and technology, which is where 21st century businesses need you to be.

You will learn from faculty members who remain connected with high-tech organizations around the globe and engage in cutting edge research in such areas as entrepreneurship, innovation and project management. You will draw upon Stevens' rich heritage in the management sciences, and its 140+ years as an applied technological university, which puts technology at the core of your learning experience.

There are three MBA program options - the Stevens MBA for full-time and part-time students having a minimum of two years work experience, the Analytics MBA for full time students who want to accelerate their studies and complete the program in one year, and the Experienced Professional MBA that is a weekend, cohort-based program that is offered on the Stevens campus on alternate Saturdays. Applicants to the EMBA must have 5+ years of work experience.

The following sections pertain to the Stevens MBA program. The Analytics MBA and the Experience Professional MBA program is discussed later in the catalog.

Incorporating a technology-centric approach with skills development the Stevens MBA program is designed to help students succeed in today's fast-paced technology-driven environment. Graduates from the program will be able to apply their skills to contribute to excellence at the intersection of business and technology, and lead their organizations in an increasingly complex and competitive world.

The Stevens MBA program is offered on campus on weekdays and via Stevens Online. It can also be delivered off-campus in corporate-sponsored programs,

Degree Requirements: The Stevens MBA degree comprises 13 courses (39 credits) plue the three prerequisite courses. A minimum GPA of 3.0 is required to graduate. Students with a master's degree from the Business School may be able to apply courses from their MS towards their MBA degree. Depending on concentration chosen, as few as eight additional courses may be required for the MBA degree.

Admission Requirements: Applicants to the Stevens MBA program are required to have completed a four-year bachelor's degree and it is preferred that they have at least two years of work experience. All applicants must submit transcripts showing academic achievement in prior studies (bachelor's degree with at least a "B" average), two letters of recommendation, and a resume. All applicants (domestic and international) to the MBA program must submit a GMAT score (or GRE score if taken previously). Note: The GMAT requirement is waived for domestic candidates possessing an MS degree and 5 years of work experience. Meeting minimum admissions standards does not guarantee admission; minimum requirements serve as a guide to the minimum expected qualifications necessary to be considered for admission.

Admission decisions are made on a rolling basis. Students can apply at any time during the year.

International students for whom English is a second language must demonstrate English language proficiency by submitting the results of a TOEFL or an IELTS test.

Structure of the Stevens MBA program

Prerequisite courses

The three prerequisite courses are intended to provide students with a solid foundation in basic business skills, to ensure their ability to meaningfully engage in high-level discussions with their classmates. Students with business degrees or backgrounds in these fields may speak with the program director about waiving one or more of these courses.

- FIN 623 Financial Management
- FIN 600 Financial and Managerial Accounting
- MGT 606 Economics for Managers

MBA curriculum

- MGT 612 Leader Development
- MGT 620 Statistical Models *
- MGT 630 Global Business & Markets*
- MGT 699 Strategic Management
- MGT 641 Marketing Management
- MGT 657 Operations Management
- MGT 635 Managerial Judgment and Decision Making
- MGT 671 Technology and Innovation Management
- MGT 663 Discovering & Exploiting Entrepreneurial Opportunities
- MGT 798 Integration and Application of Technology Management**
- *Choose one. MGT 620 is required for students pursuing concentrations in Business Intelligence & Analytics, Finance or Project Management.
- **Full time students may substitute this course with MGT 810 Field Consulting Program, subject to availability.

Concentrations

Stevens recognizes that modern managers must be well versed in the use of technology to accomplish goals and solve problems. To provide future leaders with the skills required in their industries, the School of Business offers five technology-flavored concentrations that go beyond the basics to explore the ways technology will continue to evolve each particular discipline.

Each of the five concentrations of the Stevens MBA offers a deep dive into the ethical questions, technology issues and strategic concerns of these areas, preparing students for leadership roles in the most in-demand disciplines in business.

Business Intelligence & Analytics

As organizations better understand how Big Data is revolutionizing business, those companies need leaders with strong analytical skills and the ability to turn the numbers into actionable business insight. The Business Intelligence & Analytics concentration gives you the analytical skills to needed to work in this high-demand field, enabling you to pursue careers in data-rich environments and craft practical growth strategies.

- BIA 672 Marketing Analytics
- ▶ BIA 674 Supply Chain Analytics
- ▶ BIA 658 Social Network Analytics
- BIA 670 Risk Management & Simulation

Finance

The Finance concentration provides the basic theory and practice of corporate financial management and examines the structure of financial markets and major financial instruments. Stevens' proximity to Wall Street makes this major a natural choice for many students.

- FIN 638 Corporate Finance
- FIN 526 Private Equity and Venture Capital
- FIN 627 Investment Management
- FIN 628 Derivatives

Financial Analytics

Students are required to take the following courses:

- ▶ FE 511 Introduction to Bloomberg and Thomson Reuters
- ▶ FE 513 Database Design
- ▶ FE 515 Introduction to R
- ▶ FE 520 Introduction to Python for Financial Applications
- ▶ FE 582 Foundations of Financial Data Science
- ▶ FE 595 Financial Technology

and one of the following

- ▶ FE 550 Data Visualization Applications
- ▶ FE 590 Statistical Learning

Financial Engineering

The following courses are required:

- ▶ FE 543 Introduction to Stochastic Calculus for Finance
- ▶ FE 535 Introduction to Financial Risk Management
- ▶ FE 630 Portfolio Theory and Risk Management
- ▶ FE 620 Pricing and Hedging
- ▶ FE 610 Probability and Stochastic Calculus*
- ▶ FE 621 Computational Methods in Finance**
- *FE 610 can be taken in lieu of FE 543
- **FE 621 can be taken in lieu of FE 535 for MS Financial Engineering students

Information Systems

In today's globally connected world, information systems are integral to company operations. This concentration blends both strategic and tactical perspectives, providing you with skills that enable you to advance to the highest ranks within a corporate IT department.

- MIS 620 Analysis and Development of Information Systems
- MIS 630 Dealing with Data
- MIS 710 Process Innovation and Management
- MIS 730 Integration Information Systems Technologies

Marketing

Advances in technology are dramatically changing the way in which products and services are marketed. The Marketing concentration gives you an understanding of those changes and what is driving them, and provides you with the skills and technological savvy to pursue a successful marketing career.

- MGT 648 Consumer Behavior
- MIS 661 Marketing Online
- BIA 672 Marketing Analytics
- MGT 646 Marketing Strategy

Network & Communication Management & Services

Students are required to take the following courses:

- TM 601 Principles of Applied Telecom Tech
- ▶ TM 610 Business Information Networks
- TM 612 Regulation & Policy in Telecom Industry

and one of the following

- TM 615 Wireless Network Mobile Computing
- TM 630 Broadband Networking Service & Technology
- TM 650 Software Defined Networking & Network Function Virtualization

Project Management

Excellence in project execution is the hallmark of successful companies. This concentration provides you with the skills to lead complex projects and programs within organizations. It leverages new concepts in strategic project management and leadership that were developed by School of Business faculty and have achieved international acclaim.

- MGT 609 Project Management Fundamentals
- MGT 610 Strategic Perspectives on Project Management
- MGT 611 Project Analytics
- MGT 619 Leading Across Projects

Structure of the Analytics MBA

The analytics MBA at Stevens is structured around three areas of greatest need for the managers of tomorrow's technologydriven organizations, who must be able to speak the language of business, understand how to apply new innovations within business units and across the enterprise, and interpret data to make strategic recommendations and capitalize on new trends.

The curriculum is further enhanced by personal and career development threads that include intensive mentorship and leadership training, ensuring students complete the program as well-rounded professionals able to understand how the technical and specialized aspects of the company enable the business to function and fit into the overall growth strategy of the organization.

Prerequisites

The three prerequisite courses to the MBA are designed to provide a basic foundation in management principles to students from non-business backgrounds. Students may be exempt from these courses with relevant work history or an undergraduate business degree. Please consult the program director for information on whether you are eligible to waive these courses. The three courses can be taken in the month prior to the start of classes in the fall.

- FIN 623 Financial Management
- FIN 600 Financial and Managerial Accounting
- MGT 606 Economics for Managers

Language of business

One of the greatest points of frustration for technical employees is an inability to influence decision-making, as they are unable to translate their findings in ways that resonate with the C-suite. Courses in this block go beyond the basics to give you thorough command of how to understand scientific and technical advances from the viewpoint of a manager who must carefully deploy limited resources to ensure the pursuit of truly innovative developments.

- MGT 641 Marketing Management
- MGT 663 Discovering & Exploiting Entrepreneurial Opportunities
- ▶ FIN 638 Corporate Finance
- MGT 699 Strategic Management

Leadership and innovation

Courses in this block are designed to work in tandem with the curricular thread of personal development, nurturing aspiring leaders to think critically about problems and creatively about resources in order to attack corporate missions with fearlessness.

- MGT 612 Leader Development
- EMT 695 Leading Creative Collaboration
- EMT 696 Human-Centered Design Thinking
- MIS 714 Service Innovation

Analytical thinking

Most technical professionals are capable analysts who are most comfortable delving into technical, rather than financial or managerial, challenges. Courses in this block emphasize highly advanced analytics techniques that will teach you the ways successful managers look at and use data in understanding how markets work and making better recommendations to guide the enterprise.

- ▶ BIA 600 Business Analytics: Data, Models and Decisions
- ▶ BIA 652 Multivariate Data Analytics
- BIA 656 Advanced Data Analytics & Machine Learning
- ▶ BIA 610 Applied Analytics

Capstone

After completing the rest of the curriculum, students may choose one of the three capstone courses:

- MGT 678 Technology Commercialization Practicum.
- MGT 810 Field Consulting Program.
- ▶ MGT 798 Application and Integration of Technology Management.

Each of these courses demand the application of the lessons in analytics, leadership and innovation taught throughout the curriculum. Technology Commercialization Practicum is an opportunity for students to use what they've learned about entrepreneurship to start a business or create a product. The Field Consulting Program gives students real-world experience by putting them to work with managers at a company on an industry problem, concluding with a formal recommendation to corporate leadership. The application course is a high-intensity business simulation in which students manage the entire spectrum of a business as it attempts to grow through turbulent market changes.

Structure of the EMBA

The EMBA curriculum is designed to offer a high-level perspective on data-driven decision-making, strategic management, teaming and leadership, global business, and innovation and new product development. Coursework is supplemented by a leadership retreat that allows students to test what they've learned about trust, teamwork, communication and ethics by working together to complete an obstacle course. Furthermore, a global business seminar brings students to a foreign country, where meetings with local executives demonstrate firsthand how cultural differences shape the ways economies work and businesses function.

Core curriculum

- EMT 740 Team Leadership Development
- EMT 606 Economics
- EMT 642 Marketing Strategy
- ▶ EMT 624 Financial and Managerial Accounting
- EMT 623 Financial Management
- EMT 677 Managing Emerging Technology
- EMT 696 Design Thinking
- ▶ EMT 715 Strategic Management
- EMT 752 Corporate Entrepreneurship
- EMT 657 Operations Management *
- EMT 635 Managerial Judgment and Decision Making
- BIA 678 Big Data Seminar
- ▶ EMT 695 Leading Creative Collaboration
- ▶ EMT 638 Corporate Finance
- EMT 630 Global Business and Markets
- EMT 798 Integration & Application of TM / Business Simulation
- *Can be substituted with a technology elective

MASTER OF SCIENCE-MASTER OF BUSINESS ADMINISTRATION

The MS-MBA is a coordinated dual degree program enabling students who graduate with a Business School MS to apply relevant courses from their MS to their MBA degree. In most cases, the MBA degree can be obtained with 24-36 credits (8-12 courses) of additional course work depending on the chosen MBA concentration. MS graduates must submit an application for admission to the MBA program.

The combination of courses comprising the MS and MBA degrees provides in-depth preparation for graduates wishing to assume either general management or technology-related managerial positions. The program is designed to allow students to specialize in areas that are relevant to their careers.

MASTER OF SCIENCE IN TECHNOLOGY MANAGEMENT (MSTM)

The Master of Science in Technology Management (MSTM) is a part-time program specifically designed for experienced professionals wishing to move to a broader role in technology and business management. The MSTM program focuses on the effective management and use of technology in technology-intensive businesses. It integrates business and technology topics aimed at educating students to manage technology creatively in order to enhance business competitiveness in a global business environment. Students learn general business skills, such as accounting, finance and marketing, along with emphasis on development of technology management skills encompassing technology strategy, emerging technology and corporate entrepreneurship to assure alignment of technology strategy with business strategy.

The MSTM program consists of twelve courses that are completed in six trimesters. The courses are supplemented with workshops and practicums utilizing business simulation tools that reinforce classroom concepts, while providing students

with experience running a high-tech company. The Global Business and Markets course also encompasses an international study tour where students travel abroad to countries such as China where they participate in company visits and lectures, as well as some cultural and sightseeing activities, in order to gain first-hand experience and understanding of the unique business culture and context of that country.

Courses are scheduled on alternating Saturdays on the Stevens campus from 8:30 a.m. to 5:15 p.m. In the final semester, the capstone course requires 5 consecutive Saturday sessions on the Stevens campus. Students complete their MSTM degree in 21 months.

Degree Requirements: The MS in Technology Management consists of 10 courses (30 credits). A minimum GPA of 3.0 is required to graduate.

Admission requirements: Admission to the MSTM program requires that applicants have:

- A bachelor's degree in a relevant technical discipline.*
- ▶ 5 + years of relevant full-time work experience managerial experience is preferred but is not required for admission to the program.
- *Consideration will be given to prospective students with non-technical undergraduate degrees provided they have appropriate technology-based work experience.

Meeting minimum admission requirements does not guarantee admission; minimum requirements serve as a guide to the minimum expected qualifications to be considered for admission. Consideration will be given to prospective students with non-technical undergraduate degrees provided they have appropriate technology-based work experience.

Note: The GMAT is not required for admission to the MSTM program.

Structure of the MSTM Program

- ▶ EMT 740 Technology Leadership Development
- EMT 606 Economics
- EMT 642 Marketing Strategy
- EMT 624 Financial and Managerial Accounting
- ▶ EMT 623 Financial Management
- EMT 677 Managing Emerging Technology
- ▶ EMT 696 Design Thinking
- ▶ EMT 715 Strategic Business Management
- ▶ EMT 752 Corporate Entrepreneurship
- EMT 657 Operations Management

Master of Philosophy

The Master of Philosophy (M.Phil.) is a postgraduate research degree. It is offered to enrolled Ph.D. students who achieve a record of distinction during the pre-dissertation phase. Because the Master of Philosophy is not designed as a terminal degree, its requirements are integrated with the requirements for the Doctor of Philosophy degree: potential candidates for the Master of Philosophy degree must be qualified to pursue the doctorate and have been advised to apply for admission to a doctoral program.

This degree requires a minimum of two years of advanced study beyond the baccalaureate degree. Placed between the Master's degree and the Doctor of Philosophy, the Master of Philosophy marks a student's successful completion of all requirements for the doctorate, except the final phase of research and the dissertation. The degree is intended to provide recognition that a prospective doctoral candidate has successfully and expeditiously completed a major phase of graduate study and has achieved a comprehensive mastery of the general field of concentration.

PH.D. IN BUSINESS ADMINISTRATION

The School of Business Ph.D. in Business Administration program defines itself at the intersection of three research domains: Information Systems & Analytics, Entrepreneurship & Innovation Management and Finance. These three research domains are strongly represented by the faculty of the Business School and provide different perspectives on business administration.

The design of the Ph.D. program is based on the assumption that novel research ideas often occur at the intersection of different knowledge domains. The unique combination of these three research domains and their integrated discussion will lead to creative and innovative research questions within and across these domains. The combination will also encourage the development of the interdisciplinary skill sets necessary to conduct innovative research. The majority of Ph.D. programs focus on theory and analytical skills. The integration of three research domains complements this fundamental skill set with the skills necessary for creating and applying this knowledge. Our students are challenged to create new technologies for analyzing relevant research questions related to important problems we face today.

Students of the program will chose one of the three research domains as their research focus and they can study aspects of the other two domains as part of the program. Because of the specific integration of the knowledge domains the program offers a truly interdisciplinary experience. This is achieved by a common set of required courses and by the selection of individual courses.

Degree Requirements: The Ph.D. program in Business Administration consists of a minimum of 36 credits of coursework and a maximum of 18 research credits.

Admission Requirements: The Ph.D. program is designed for the exceptional student possessing a strong quantitative background and a degree in management or related topics. Students who are interested in joining the program must fulfill the following requirements:

- > Students must have earned a 4-year undergraduate degree from an accredited college or university.
- > Students must have earned a master's degree in Business, Finance, MIS or related field.
- ▶ Students must have attained a basic knowledge of statistics comparable to MGT620 Statistical Models.
- Students must have completed undergraduate course work in mathematics including the equivalent of two semesters of calculus and one semester of linear algebra, or they must acquire this background before entering the program.

International students for whom English is a second language must demonstrate English language proficiency by submitting the results of a TOEFL or an IELTS test.

All students are required to submit GMAT or GRE test scores not older than 3 years.

Admissions decisions are made beginning in February for the following fall semester. Students are encouraged to apply at any time during the year but it is preferred that complete applications are submitted by January 31.

Depending on the student's background, several non-credit business, information technology and finance foundation courses may also be required.

Structure of the Ph.D. Program

Course work (36 credits). All courses are worth 3 credits unless otherwise specified.

- ▶ Five common core courses addressing research methods, economic theory and research design.
- ▶ Two domain specific courses addressing fundamental research questions.
- ▶ Four elective courses that could involve independent study as well as master's and doctoral courses.
- Signature doctoral course PRV 961 required for all doctoral students at Stevens.
- Special Method Workshops (SEM, Conjoint Measurement etc.)
- MGT 960 Dissertation/ Research (18 credits)

A preliminary examination is usually taken after the second semester of fulltime study. A qualifying examination is usually taken after finishing the 4th semester of full-time study.

A proposal for the student's PhD dissertation is usually defended at the end of the third year of full-time study.

The final PhD dissertation is usually defended at the end of the fourth year of full-time study.

Program Learning Objectives

The program's learning objectives are to prepare students to pursue an academic or industry research career.

The program's required common courses will provide students with the foundations needed to conduct independent research.

The domain specific courses will introduce students to the foundations of the three research domains and equip them with the knowledge required to conduct research within a domain.

These courses develop skills in understanding and analyzing as well as in creating and applying.

- Understanding and analyzing skills are addressed by discussing the theoretical foundations of the domains and fundamental methods.
- Creating and applying skills are developed by theory building and developing tools to analyze specific social and economic phenomena.

PH.D. IN DATA SCIENCE

The PhD in Data Science is an interdisciplinary program managed jointly by the School of Engineering and Sciences and the School of Business. The program prepares students for research careers in academia or industry that involve the use of methods and systems for extracting insights from rich data sets, especially as applied to the fields of finances and the life sciences. The program responds to the demand by industry for data scientists with a deep knowledge of the theories, techniques and applications associated with "Big Data" and artificial intelligence. The program also recognizes the broad range of skills needed to successfully apply the tools of the digital revolution in industry. This is reflected in the four core areas of (1) mathematical and statistical modeling, (2) machine learning and artificial intelligence, (3) computational systems, and (4) data management at scale, all of which provide a strong foundation for a thorough strong understanding of (5) a field of application.

Programs of study in two application areas, Financial Services and Life Sciences, are described below. Students may design a program of study in another field of application with support of their advisor and approval of the department chair/program director.

To make progress on leading-edge subjects in a fast moving field like data science requires full-time study. Accordingly, students will be admitted only for full-time on-campus study in partnership with a full-time faculty advisor.

Admission Requirements. The PhD in Data Science is primarily designed for students with technical backgrounds. e.g., an undergraduate or master's degrees in computer science, computer engineering, business analytics, science or engineering from Stevens or other universities. Applicants to the program must fulfill the following requirements:

- A 4-year undergraduate degree from an accredited college or university.
- International students for whom English is a second language must demonstrate English language proficiency by submitting the results of a TOEFL or an IELTS test.
- GMAT or GRE test scores not older than 5 years.

Admissions decisions are made beginning in February for the following fall semester. Students are encouraged to apply at any time during the year but it is preferred that complete applications are submitted by January 31.

Credit Requirements. The PhD in Data Science requires 84 credits beyond the bachelor's degree. A prior master's degree may be transferred for up to 30 credits without specific course descriptions. The remaining 54 credits must include at least 12 credits of core courses, a minimum of 9 credits of field-specific courses and a minimum of 15 dissertation credits. Approval to enter the PhD in Data Science is generally only given when a student has completed work equivalent to a master's degree.

Structure of the Ph.D. Program in Data Science

Course work.

All courses are worth 3 credits unless otherwise specified.

- A minimum of 1 course and a maximum of 3 courses in each of the four core areas (mathematical modeling, machine learning and artificial intelligence, computational systems, and data management at scale).
- Completion of the signature doctoral course PRV 961 (3 credits, required of all doctoral students at Stevens) and MGT 719 Research Design (3 credits).
- A minimum of three courses (9 credits) in a field of application (e.g., financial services or life sciences).
- Doctoral students are expected to maintain a 3.7/4.0 cumulative grade-point average. Students failing to meet this requirement may be placed on probation at the discretion of the faculty.
- Scholarly work
 - **Research seminars.** PhD students are required to attend research seminars. Students failing to meet this requirement may be put on probation at the discretion of the faculty.
 - Qualifying Exam. The qualifying exam is an oral examination on a syllabus consisting of research papers, prepared jointly by the student and a committee including the advisor and two tenure-track faculty members. The goal is to establish scholarship in an area of research. The exam needs to be completed by the end of the 4th semester in the program. It consists of a presentation, followed by open-door questions from the audience and a closed-door examination from the committee. The committee can pass, fail, or request re-examination (either written or oral).
 - **Dissertation Work.** Students must complete a minimum of 15 credits of DS 960 Dissertation / Research. The dissertation must demonstrate the student's mastery of the associated topic area, it must exhibit sound research methodology and it must make a unique and substantial contribution to an area of data science research.
 - **Thesis Proposal.** By the end of their fourth semester, students must write and present a thesis proposal, where they lay out an intended course of research for their dissertation. The proposal should contain an explanation of the problem and why it is important, a sketch of the proposed solution, and background

information that serves to indicate that the problem is unsolved and what prior or related approaches to this or similar problems have already been investigated.

- **PhD Dissertation Defense.** The final PhD dissertation is usually defended at the end of the fourth year of full-time study.
- **Exceptions.** The faculty reserve the right to make exceptions to any of the rules and procedures described above in order to promote and preserve the health of the doctoral program and to ensure each student's prompt and effective progress through the program.

Prerequisites

A number of prerequisites are expected to be satisfied by the student's prior undergraduate or master's degrees before entering the program:

- Calculus (2 semesters)
- Statistics (1 semester)
- Probability (1 semester)
- Linear algebra (1 semester)
- ▶ Fluency in a programming language such as C++ or Java (2 semesters)
- Database management (1 semester)

These prerequisites could, for example, be satisfied during the students master of science degree by taking courses equivalent to the following Stevens courses: *MA 547 Advanced Calculus I, MA 541 Statistical Methods, MA 540 Introduction to Probability Theory, MA 552 Axiomatic Linear Algebra, CS570 Introduction to Programming, Data Structures, and Algorithms, CS590 Algorithms, and CS 561 Database Management Systems.*

Core Courses (Minimum of 12 and maximum of 24 credits)

To acquire the breadth of knowledge necessary for successful research in data science, students must complete at least one and at most three courses in each of the four core areas. Students who demonstrate competency in the topics covered by a core course may, with permission of their advisor, waive the core course and take an approved elective in its place. Students are also required to take the doctoral signature course PRV 961 and MGT719 Research Methods.

Mathematical and Statistical Modeling
 BIA 652 Multivariate Analytics
 FE 542 Time Series with Applications in Finance
 MA 661 Stochastic Optimal Control & Dynamic Programming
 Machine Learning and Artificial Intelligence
 BIA 656 Advanced Data Analytics & Machine Learning
 CS 541 Artificial Intelligence
 CS 559 Machine Learning: Fundamentals and Applications
 FE 690 Advanced Financial Analytics

3. Data management at Scale
BIA 678 Big Data Technologies
CS 522 Mobile Systems and Applications
CS 609 Data Management and Exploration on the Web
4. Computational Systems
BIO 668 Computational Biology (for Life Sciences majors)
FE 595 Financial Technology (for Finance majors)
CS 549 Distributed Systems and Cloud Computing
CS 600 Advanced Algorithm Design and Implementation
5. Signature Doctoral Course (3 credits)
PRV961 Doctoral Signature Credit Seminar/Project/TA

6. Research Methodology (3 credits)

MGT 719 Research Design

Students who demonstrate competency in the subject area of a particular core course may waive the course with the permission of their advisor and the program director.

Application (Major) Area (Minimum of 9 and maximum of 21 credits)

Depending on their major area of study, and with approval of their advisor, students choose at least three courses from either of the following two lists.

Financial services:

FE 546 Optimization Models & Methods in Finance

FE 545 Design Patterns and Derivative Pricing

FE 550 Data Visualization Applications

FE 610 Stochastic Calculus for Financial Engineers

FE 635 Financial Enterprise Risk Engineering

FE 680 Derivatives

FIN 638 Corporate Finance

FIN 628 Derivatives

FE 655 Systemic Risk and Financial Regulation

FE 670 Algorithmic Trading Strategies

FE 621 Computational Methods in Finance

FIN 703 Microeconomic Theory

FIN 704 Econometrics

FIN 705 Asset Pricing Theory and Applications

Life sciences CH 664 Computer Methods in Chemistry CH 760 Chemoinformatics CHE 660 Advanced Process Control CHE 661 Design of Control Systems CPE 610 Introduction to Bioinformatics Engineering CPE 686 Software Tools in Bioinformatics CS 544 Health Informatics CS 691 Introduction to System Biology

CS 694 Advanced Computational Modeling in Biology and Biomaterials Science

General Electives

Students who satisfy the minimum requirements for the program may, with approval of their advisor, take elective courses to make up the 54-credit total course requirement. Available elective courses include:

BIA 654 Experimental Design

BIA 660 Web Mining

BIA 662 Cognitive Computing

BIA 672 Marketing Analytics

BIA658 Social Network Analysis

CPE 646 Pattern Recognition and Classification

CPE 695 Applied Machine Learning

CS 522 Mobile Systems and Applications

CS 549 Distributed Systems and Cloud Computing

CS 582 Causal Inference

CS 598 Visual Information Retrieval

CS 600 Advanced Algorithm Design and Implementation

CS 601 Algorithmic Complexity

CS 609 Data Management and Exploration on the Web

CS 677 Parallel Programming for Many-core Processors

CS 696 Database Security

FE 541 Applied Statistics

FE 622 Simulation Methods in Comp. Finance and Economics

FE 635 Financial Enterprise Risk Engineering

FE 641 Advanced Multivariate Statistics

FE 646 Opt. Models & Methods in Finance

FE 655 Systemic Risk and Financial Regulation

FE 670 Algorithmic Trading Strategies FE 672 Modern Market Structure and HFT Strategies FE 710 Applied Stochastic Diff Equation FE 720 Volatility Surface - Risk & Models MA 541 Statistical Methods MA 611 Mathematical Probability MA 612 Mathematical Statistics MA 623 Stochastic Processes MA 629 Nonlinear Optimization MA 630 Advanced Optimization Methods MA 641 Time Series Analysis I MA 655 Optimal Control Theory MA 661 Stochastic Optimal Control & Dynamic Programming

PH.D. IN FINANCIAL ENGINEERING

As the first Financial Engineering doctoral program to be developed in the nation, the Doctor of Philosophy (Ph.D.) degree is designed to prepare students to perform research or high-level design in financial engineering.

With an emphasis on an interdisciplinary approach requiring knowledge in finance, economics, mathematics, probability/ statistics, operations research, engineering, computer science and systems thinking, the program gives graduates substantial expertise in key disciplines such as financial mathematics, risk management, financial statistics, portfolio optimization, financial standards, systemic risk, behavioral finance, microstructure finance, investment banking, data analytics, securities trading to name a few examples.

Students work alongside with faculty and perform transformative research in four crucial areas: Quantitative Finance, Financial Services Analytics, Financial Risk & Regulation, and Financial Systems. Graduates of the program are typically employed in world-class financial investment firms and academic research institutions.

The Ph.D. program requires completion of 54 credits beyond a relevant and approved Master's degree. The students are required to pass a qualifying exam within 2 years of starting their doctoral studies and maximum of 6 years to complete the program and defend their dissertation.

Graduate Certificate Programs

The School of Business offers the following programs leading to a graduate certificate of Special Study. Students are required to meet regular admission requirements for the master's program and complete the courses listed below. Each graduate certificate program is self-contained and highly focused, carrying 12 graduate credits. All of the graduate certificate courses may also be applied toward the master's degree.

Algorithmic Trading Strategies

Recent years have seen unprecedented change in financial systems technology. Algorithmic trading has become a dominant component of trade volumes on exchanges. The implementation of software and automatic decision support systems in dynamic markets has become part of the skills needed to succeed in the domain of algorithmic finance. This four-course certificate is designed to provide financial engineers with the necessary understanding of architecting and implementing a financial trading systems. The required courses are:

- ▶ FE 545 Design, Patterns and Derivatives Pricing
- ▶ FE 570 Market Microstructure and Trading Strategies
- ▶ FE 620 Pricing and Hedging
- ▶ FE 670 Algorithmic Trading Strategies

Financial Computing - 15 credits

The Financial Computing certificate will enable students to operate effectively in the complex financial computing environment. Students will develop expertise in implementation of financial computing models, knowledge of financial databases, financial engineering software and specialized programming languages. The hands-on skills combined with a real-life financial computing project will enable them to compete in the financial industry.

The required courses are:

- ▶ FE 505 Technical Writing in Finance 1 credit
- ▶ FE 522 C++ Programming in Finance 3 credits
- ▶ FE 511 Introduction to Bloomberg and Thomson Reuters 1 credit
- ▶ FE 621 Computational Methods Finance 3 credits
- ▶ FE 699 Project in Financial Computing 2 credits

Choose one elective between:

- ▶ FE 543 Introduction to Stochastic Calculus for Finance 3 credits
- ▶ FE 610 Stochastic Calculus for Finance 3 credits

Choose two electives between:

- ▶ FE 513 Practical Aspects of Database Design 1 credit
- ▶ FE 514 VBA in Finance 1 credit
- ▶ FE 515 Introduction to R 1 credit
- ▶ FE 516 MATLAB for Finance 1 credit
- ▶ FE 517 SAS for Finance 1 credit
- ▶ FE 518 Mathematica for Finance 1 credit
- FE 519 Advanced Bloomberg 1 credit
- ▶ FE 520 Introduction to Python in Financial Applications 1 credit
- ▶ FE 521 Web Design 1 credit
- ▶ FE 529 GPU Computing 1 credit

Financial Engineering

The components of financial problem solving are embedded in the methods of applied mathematics, computational techniques, statistical analysis and economic theory. In a financial engineering program, those components are directed towards solving problems in securities valuation, risk management, portfolio structuring and regulatory concerns with emphasis on tools and training in stochastic modeling, optimization and simulation techniques.

The required courses are:

- ▶ FE 610 Stochastic Calculus for Financial Engineers
- ▶ FE 620 Pricing and Hedging
- ▶ FE 621 Computational Methods in Finance
- ▶ FE 630 Portfolio Theory and Applications

Financial Planning

The Graduate Certificate in Financial Planning is designed for working professionals or part-time and full-time MS in Finance students who are looking to specialize in the area of financial planning and become personal financial advisors. The core curriculum of the Graduate Certificate is aligned with the material covered in the CFP® Certification exam, including the completion of a financial plan development (capstone) course which is registered with the CFP Board.

Certificate Requirements: The Graduate Certificate in Financial Planning consists of 6 courses (18 credits).

▶ FIN 510	ACC 555	FIN 565

▶ FIN 550 ▶ FIN 560 ▶ FIN 627

Financial Risk Engineering

The recent turbulence in the financial system heightened the need for a much stronger understanding of the financial system, its environment and the risk measures applied in the industry to quantify risk it in its multiple hierarchies. This certificate enables the graduate to fill this need and play an important role in balancing the interests of shareholders with the appropriate levels of risk taken by the managers and decision makers.

The required courses are:

- ▶ FE 535 Introduction to Risk Management
- ▶ FE 610 Stochastic Calculus for Financial Engineers
- ▶ FE 635 Financial Enterprise Risk Engineering
- ▶ FE 655 Systemic Risk and Financial Regulation

Financial Services Analytics - 5 course, 15 credits

Financial services analytics (FSA) is the science and technology of creating data-driven insights and analytics decisionmaking for the financial services industry. These insights increase the effectiveness of business operations, enhance customer relationships, improve product offerings, and improve risk analysis and risk management. This certificate will prepare students with an array of statistical learning methods and database skills in order to create end-to-end business decision making data analytic tools from an enterprise level systems approach. The required courses are:

- ▶ FE 582 Foundations of Financial Data Science 2 credits
- ▶ FE 513 Practical Aspects of Database Design (lab) 1 credit
- ▶ FE 590 Statistical Learning 3 credits
- ▶ FE 595 Financial Technology (Analytical Financial Systems Design) 3 credits
- ▶ FE 550 Data Visualization Applications 3 credits
- ▶ FE 800 Special Projects in Financial Engineering 3 credits

Financial Software Engineering

This graduate certificate is aimed at intra-system super structural software applications (ISSS). Retail software platforms, web trading desks, pricing software tools for new instruments including derivatives products and stochastic portfolio simulators, and cutting edge information and knowledge discovery tools in a firm are all examples of software engineering or ISSS in financial institutions. This certificate explores these applications and how they work within a financial institutions overall enterprise system.

The required courses are:

- SSW 540 Fundamentals of Software Engineering
- SSW 565 Software Architecture and Component-based Design
- ▶ FE 610 Stochastic Calculus for Financial Engineers
- ▶ FE 620 Pricing and Hedging

Financial Statistics

In our data driven world the capability of analyzing and drawing meaningful conclusions from said data is paramount. This statement is valid to all areas of science and engineering, particularly to finance. The certificate as designed will allow a student to have all the necessary tools to be able to analyze data in a scientific and fundamentally correct way.

The required courses are:

- ▶ FE 541 Applied Statistics with Applications in Finance
- ▶ FE 542 Time Series and Applications to Finance
- ▶ FE 590 Statistical Learning
- ▶ FE 610 Stochastic Calculus for Financial Engineering

Machine Learning in Finance

The Machine Learning in Finance certificate will provide the technical and programming knowledge needed to excel in new roles such as technical financial analyst and Data Scientist in Finance as well as be capable of implementing the models developed and put them in production. The certificate is designed to cover probability, statistics then machine learning techniques used in Finance. The final course in the certificate provides the FinTech know how to be able to produce an end-to-end solution from data to customers. Knowledge of R and Python is required throughout the certificate.

The required courses are:

- ▶ FE 540 Probability Theory for Financial Engineering
- ▶ FE 541 Applied Statistics with Applications in Finance
- ▶ FE 690 Machine Learning in Finance
- ▶ FE 595 Financial Technology

Software Engineering in Finance

Clearing systems, payment systems and settlement systems are all examples of inter-system infrastructural software (ISIS). For example the Clearing House Interbank Payments System (CHIPS) is a patented algorithm for payment netting whose participants must have an account with the New York Federal Reserve Bank. The FedWire, SWIFT and SunGard are at the core of ISIS where the "Buy" side of the market meets the "Sell" side of the market through intermediaries and Banks with clearinghouses and custodians. The graduate certificate in software engineering in finance explores this class of problems dealing with inter-financial systems information flows.

The required courses are:

- SSW 540 Fundamentals of Software Engineering
- SSW565 Software Architecture and Component-based Design
- ▶ FE 595 Financial Technology
- MGT 623 Financial Management
 - Or MGT 638 Corporate Finance

Industry-Oriented Certificates

Healthcare Management (4 courses, 12 credits)

- MGT 616 Healthcare Leadership and Management
- MGT 609 Project Management Fundamentals
- MGT 612 Leader Development

One elective chosen from the following:

- MGT 614 Advanced Project Management
- MIS 689 IT Management for the Healthcare Professional.
- MGT 689 Organizational Behavior & Design

Discipline-Based Certificates

Business Intelligence and Analytics (4 courses, 12 credits)

All graduate certificate students will normally take:

- MIS 636 Data Warehousing & Business Intelligence*
- MIS 637 Data Analytics & Machine Learning*

Practitioners will normally take 2 of the following 3 courses:

- BIA 652 Multivariate Data Analytics*
- ▶ BIA 658 Social Network Analytics*
- BIA 672 Marketing Analysis
- BIA 674 Supply Chain Analysis

People intending to go on to the BI&A MS Degree will normally take 2 of the following 3 courses:

- ▶ BIA 652 Multivariate Data Analytics
- BIA 656 Advanced Data Analytics & Machine Learning
- ▶ BIA 660 Web Mining
- *These four graduate certificate courses are available online.

Marketing Analytics

▶ BIA 672 Marketing Analytics*

Choose 3 out of the following courses:

- BIA 652 Multivariate Data Analytics
- BIA 658 Social Network Analytics
- BIA 660 Web Mining
- MIS 637 Data Analytics & Machine Learning
- *Required for a Graduate Certificate in Marketing Analytics

Supply Chain Analytics

BIA 672 Supply Chain Analytics*

Choose 3 out of the following courses:

- BIA 650 Process Analytics and Optimization
- MGT 657 Operations Management
- ▶ BIA 658 Social Network Analytics
- MIS 637 Data Analytics & Machine Learning
- * Required for a Graduate Certificate in Supply Chain Analytics

Business Process Management & Service Innovation (4 courses, 12 credits)

Choose four of the following courses:

- MIS 690 Supply Chain Management and Strategy
- MIS 710 Process Innovation & Management
- MIS 712 Advanced Business Process Management
- MIS 714 Service Innovation
- BIA 650 Optimization and Process Analytics
- BIA 657 Supply Chain Analytics
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Information Management (4 courses, 12 credits)

- MIS 620 Analysis and Development of Information Systems
- MIS 630 Dealing with Data
- MIS 710 Process Innovation & Management
- MIS 760 Information Technology Strategy

Project Management (4 courses, 12 credits)

- MGT 609 Introduction to Project Management
- MGT 610 Strategic Perspectives on Project Management
- MGT 611 Project Analytics
- MGT 612 Leading People and Projects

Fundamentals of Management (4 courses, 12 credits)

- MGT 612 Leader Development
- MGT 641 Marketing Management
- MGT 657 Operations Management
- MGT 699 Strategic Management

Fundamentals of Finance (4 courses, 12 credits)

- MGT 606 Economics for Managers
- ▶ FIN 600 Financial And Managerial Accounting
- FIN 623 Financial Management
- ▶ FIN 638 Corporate Finance

Network and Communication Management and Services (4 courses, 12 credits)

- ▶ TM 601 Principles of Applied Telecommunications Technology
- TM 605 Probability and Stochastic Processes
- TM 610 Business Information Networks
- ▶ TM 612 Regulation and Policy in the Telecommunications Industry

Management of Broadband and Converged Networks (4 courses, 12 credits)

- TM 612 Regulation & Policy in the Telecommunications Industry
- ▶ TM 617 Next Generation Wireless Networks
 - Or TM 650 Software Defined Networks and Network Function Virtualization
- ▶ TM 630 Broadband Networking: Services & Technology
- ▶ TM 631 Broadband Service Management

Management of Wireless Networks (4 courses, 12 credits)

- ▶ TM 615 Wireless Communications & Mobile Computing
- ▶ TM 616 Global Wireless Industry
- TM 617 Next Generation Wireless Networks
- TM 618 Performance of Emerging Wireless Networks
 - Or TM/EE 584 Wireless Systems Security
 - Or TM 650 Software Defined Networks and Network Function Virtualization

International Programs

Master of Science in Financial Engineering (MFE) at SIT and Master in Finance (MAF) at ITESM, Master in International Business (MIB) at ITESM or Master in Business Administration (MBA) at ITESM

Candidates take the following Stevens Institute of Technology financial engineering courses:

- ▶ FE 610 Stochastic Calculus for Financial Engineers
 - Or FE 543 Introduction to Stochastic Calculus for Finance
- ▶ FE 620 Pricing and Hedging
- ▶ FE 621 Computational Methods in Finance

And three out of the following electives:

- ▶ FE 630 Portfolio Theory and Applications
- ▶ FE 680 Advance Derivatives
- ▶ FE 635 Financial Enterprise Risk Engineering
- ▶ FE 655 Systemic Risk and Financial Regulation

ITESM Masters in International Business candidates take the following international business courses:

- ► GA 4044 Introduction to Economics
- ▶ GA 4075 Managerial Accounting
- ▶ GA 4076 Financial Accounting
- ▶ GA 4081 Fundamentals of Finance
- ▶ GA 4043 Interpersonal Skills for International Management
- GA 4048 Consulting Project I
- ▶ GA 4053 Leadership for Sustainable Development
- ▶ GA 4083 Introduction to Latin American Management
- ▶ GA 4084 Quantitative Methods
- ► GA 4040 Marketing
- GA 4045 NAFTA Business Environment
- ► GA 4042 Elective I
- GA 4047 Elective II

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ITESM Master in Finance candidates take the following courses:

One course of the following ITESM courses:

- AD 4003 Business Policy, Ethics & Corporate Social Responsibility
- ▶ DS 4002 Leadership for Sustainable Development

And seven of the following ITESM courses:

- ▶ FZ 5004 Finance Project
- S 4009 Financial Econometrics
- ▶ FZ 4005 Financial Economics
- ▶ FZ 4006 Introduction to Corporate Finance
- FZ 4008 Investments
- ▶ FZ 5000 International Financial Management
- ▶ FZ 4007 Advanced Corporate Finance
- ▶ FZ 5003 Capstone Seminar in Finance

ITESM Masters in Business Administration candidates take the following courses:

One course of the following ITESM courses:

- AD 4003 Business Policy, Ethics & Corporate Social Responsibility
- ▶ DS 4002 Leadership for Sustainable Development

And seven of the following ITESM courses:

- ▶ EC 4005 Managerial Economics
- CD 4000 Operations Management
- MT 4001 Marketing Management
- RH 4000 Leadership and Organizational Behavior
- AD 4004 Competitive Strategy and Business Design
- ▶ AD 4005 Entrepreneurship and Intrapreneurship
- AD 5000 Negotiations and Decisions in Multicultural Environments
- AD 5001 Seminar in Transnational Management and Corporate Strategy

COURSE OFFERINGS

Accounting

ACC 351 Federal Taxation of Individuals

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This course deals with the methods and principles of US Federal income taxation. It is concerned with the history and politics behind the federal income tax laws and regulations, including major emphasis on tax provisions common to all types of taxpayers, particularly individuals. Topics include: tax authority, research, compliance and planning; gross income and exclusions; individual deductions and credits; tax rate schedules and calculation; filing status; investments and property transactions; self-employment income; retirement planning; home ownership and professional ethics. Prerequisite: BT 200 Financial Accounting

ACC 352 Federal Taxation of Business Entities

This course presents the legal and income tax applications relative to various types of taxable entities, including sole proprietorship, corporations, partnerships, limited liability companies and S-Corporations. This course also presents an overview of the applicable tax problems associated with the organization, operation, and distribution from and liquidation/ dissolution of each type of entity. Prerequisite: ACC 311 Intermediate Accounting I and ACC 312 Intermediate Accounting II

ACC 620 Accounting Regulations: Research and Applications

Research skills are important for success in accounting, regardless of specific career path. This course focuses primarily on applied research done in practice, often in conjunction with the preparation or review of financial statements or tax returns. Applied accounting research typically involves qualitative skills, but the course also introduces academic accounting research. Students will acquire an understanding of different research skills in applying those skills to conduct research projects in accounting, auditing, and taxation. The course emphasizes communication and problem-solving while also extending the students' technical accounting knowledge and ability to apply accounting rules and regulations.

ACC 311 Intermediate Accounting I

The course is the first of a two-semester course of intensive study of accounting theory and its application. The course will focus on the accounting principles that shape the financial reporting practices followed by entities that prepare financial statements in accordance with generally accepted accounting principles (GAAP). After taking this course, students should be able to: - demonstrate an understanding of the conceptual framework of financial reporting; - apply steps in the financial reporting process (record transactions and prepare a trial balance) and prepare financial statements; - explain and apply time value of money concepts using present value and future value tables; and - demonstrate an in-depth understanding of specific assets and liabilities such as cash, receivables, inventories, property and equipment, intangibles, current liabilities, contingencies, and long-term liabilities. Prerequisite: BT 200 Financial Accounting

ACC 312 Intermediate Accounting II

This course is a continuation of ACCXXX Intermediate Accounting I. The primary objectives of this course are to advance your knowledge of GAAP applicable to specific topics, including: current liabilities, bonds and long-term notes, stockholders' equity, taxes, pensions, leases, derivatives, and the Statement of Cash Flows. Prerequisite: ACC 311 Intermediate Accounting I

ACC 555 Retirement and Estate Planning

This course introduces students to the principles of retirement and estate planning as well as current issues in these areas. The course is designed to enable students to understand and be conversant with the basic language of retirement and estate planning, and to understand the pertinent provisions of the US Internal Revenue Code related to these topics. The course focuses on training an individual's ability to use this information for making both short-term and long-term planning decisions. The course progresses at a rapid pace and requires students to prepare regularly for each class session instead of waiting until the exams. Topics include retirement planning tools, techniques and plans, estate and gift tax calculation and compliance, estate planning tools and techniques (both pre and post death), probate and non-testamentary disposition of assets, the use and purpose of trusts, family gifting strategies, estate liquidity, business succession planning, Social Security, Medicare and Medicaid and retirement plan distributions.

Business and Technology

BT 100 Principles of Management

This course designed to provide a foundation of knowledge on the subject of management, while moving you closer to being an effective manager yourself. We discuss the functions, tasks, and responsibilities of managers in modern organizations. And we will focus on how managers engage their resources to achieve their goals. As this in an introductory course, we will survey a broad range of topics relevant to management scholars and managers.

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analytical tools are common, their application within different departments can and will vary. The course will consist of two components: 1. Lectures and reading on decision-making tools, methods and procedures. 2. Business case discussion on

BT 181

BT 200 **Financial Accounting**

This course deals with the methods and principles of financial accounting. It is concerned with the measurement of the results of business activities and with the preparation and use of financial reports such as the balance sheet and income statement. Topics include: the accounting cycle, principles of accrual accounting, the measurement and reporting of detailed balance sheet items and the analysis of financial reports. Ethical issues in accounting will be addressed.

This course will broadly address the issue of how management decisions are made in a corporate business environment. The focus will be on understanding the tools, people and processes that are used in large public companies to make major decisions. We will explore this in the context of the major decisions made by senior management, as opposed to day-to-day decision-making. As a survey course we will only highlight the theory and detailed mechanics of complex decision-making. Our focus will be to discuss the issues faced by executives in solving complex problems that require their attention and review the methods used by business executives to handle uncertainty, mitigate risk and create outcomes that address the needs of the business. Throughout the course we will examine the decision-making process from the perspective of different departments; marketing, sales, corporate planning, production, financing, etc. While many of the planning, financial and

BT 214 Marketing Analytics and Research

the application of decision-making tools to timely issues faced by leading corporations.

Seminar in Business

This course exposes students to the entire marketing research process, from the problem formulation stage(at the very beginning) to the research findings report(at the very end). This objective is achieved in two ways: in the classroom, where the approach is one of discussion, lecture, and in-class exercises; and in the real world, where students are required to work closely with an actual business client on a marketing research project concerning an actual product or service. (The instructor assists the students in securing a business client.) During the course, the topics covered include: the marketing research process and problem formulation, research design, primary data collection, data collection forms, attitude measurement, sampling procedures, sample size, collecting the data, data analysis interpretation of results, and the final research report. The course builds heavily on the statistical foundation laid down during the prerequisite BT221 Statistics. A statistical package (SPSS) will be used during the analysis stage of the research process. Prerequisites: BT 221 or QF 112

BT 215 Managerial Accounting

This course deals with the mothods and principles of managerial accounting. It is concerned with the use of accounting data by individuals within a business in order to enhance managerial decision-making and control. Topics include costs estimation, cash flow statements and financial statement analysis. Prerequisite: BT 200

general, and to marketing research applications in particular. Topics include: descriptive statistics; probability theory, discrete and continuous probability distributions; sampling theory and sampling distributions; interval estimation; hypothesis testing; statistical inference about means, proportions, and variances; tests of goodness-of-fit and independence; analysis of variance

BT 221 Statistics

BT 223 Applied Models and Simulation

and experimental design; simple and multiple regression; correlation analysis.

This course covers contemporary decision support models of forecasting, optimization and simulation for business activity. Students learn how to identify the problem situation, choose the appropriate methods, collect the data and find the solution. Handling the information and generating of alternative decisions based on operations research optimization, statistical simulation and system dynamic forecasting. Computer simulations will be performed on PCs equipped by user-friendly graphical interface with multimedia reports generation for visualization and animation. Students will also be trained in business game simulations for group decision support.

BT 243 Macroeconomics

The forces which govern the overall performance of the national economy are covered. Areas discussed include the essence of the economic problem, supply and demand analysis, national income theory, the monetary system, alternative approaches to economic policy, current macroeconomic problems, and international economics.

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(3 - 3 - 0)This course provides students with an understanding of the use of statistical methods as applied to business problems, in

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BT 244 **Microeconomics**

The focus of this course is on the behavior of and interactions between individual participants in the economic system. In addition to providing a theoretical basis for the analysis of these economic questions, the course also develops applications of these theories to a number of current problems. Topics include: the nature of economic decisions, the theory of market processes, models of imperfect competition, public policy towards competition, the allocation of factors of production, discrimination, poverty and earnings, and energy.

BT 290 **Business Career Semimar**

This seminar is a no-credit, pass-fail course designed to provide sophomore students in their fall semester with tools, resources and support to start their job search and manage their careers. Each week, students will learn about a different aspect of strategic career planning and get practice applying lessons learned to their own future careers. Students will also get some exposure to the underlying theory of strategic career planning - e.g., motivational, network, and job satisfaction theories - as well as to major research findings.

BT 301 Introduction to Strategy

Students learn how to set preliminary goals, objectives, and strategies. They begin to develop the specific aspects of their business plan, including an actual sales/revenue plan. Topics covered also include preparing an research and development plan and the use of historical information to prepare sales, revenues, and marketing expense estimates. Students work independently and in class, individually and in teams.

BT 310 Programming for Mobile Applications

This course will introduce application development for mobile devices using the MIT App Inventor. In addition, we will examine the basic operation of a mobile wireless network with the focus of understanding the limitations of programming in a mobile environment. The course will also examine best practices for mobile application design. If we are able to cover all planned topics in mobile app development, we will also introduce Internet web-site design. Prerequisites: One semester programming course

BT 321 **Corporate Finance**

This course will focus on the appropriate capital structure for a corporation. Topics covered include financial statement analysis, time value of money, valuation of financial instruments, risk and reward, capital structures, the capital asset pricing model and cash management. Prerequisite: BT 200

BT 325 **Financial Statement Analysis**

This course will review how firms communicate through financial statements. It discusses how accounting regulations and managerial discretion influence financial statements. The course will cover how to use financial statement analysis as an integral part of the strategic analysis of firms. The course will focus on how to interpret financial statements, analyze cash flows and make judgments about earnings quality. Prerequisites: BT 200, BT 321

BT 330 Social Psychology and Organizational Behavior

Using an applied and experiential format, this course exposes students to theory, methods and research in organizational behavior and social psychology. Topics relating to individual differences and group dynamics in organizational settings are stressed. Learning occurs through discussion, group activities, and the completion of assessment instruments. Emphasis is on helping students understand and improve their skills in key areas, including decision-making, leadership, negotiation, and conflict resolution.

BT 333 Database Management

The course addresses the application of relational databases to solve business problems. It focuses on relational database model, multi-table query languages, file and index organization and integrity. Advanced topics include calculations in creating professional and useful reports, pivot tables and charts for data mining, database maintenance and the customization of a database with programming languages. Upon completion of this course students will be able to design, implement and maintain a relational database. Prerequisite: MIS 201

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(3 - 3 - 0)The purpose of this course is to provide the conceptual frameworks and decision tools required for the success in both technology-based and non-technology-based markets: the student learns to define and select specific customer segments; to monitor the business environment for both opportunities and threats, with particular attention to the ever changing technological and global context; and to develop marketing strategies for serving each targeted customer segment profitably. Although this course introduces the student to the basic theory and analytical methods characterizing modern marketing practice, there is an emphasis on both the marketing of technology products/services as well as the impact of technology on the general practice of marketing. Students are required to present both detailed marketing plans and several rigorous case analyses.

BT 353 **Project Management**

This course will describe the problems of managing a project within a permanent organization for the purpose of achieving a specific objective. It will broadly cover the operational and conceptual issues faced by modern project managers. At the end of this course, students should be able to develop, execute, and control a basic project plan capable of supporting business objectives linked to measures of success for a single project.

BT 360 International Business

The International Business course focuses on the impact of variation in the economic, political, legal, social, and cultural contexts of nations on the competitive business strategies of local and multinational firms.

BT 372 Entrepreneurship

Students are confronted with the challenges, problems and issues faced by inventors who seek to transform their inventions into economic viable innovations. This integrative course develops the fundamental business skills necessary to identify, evaluate, develop and exploit business opportunities.

BT 401 Should be Advanced Strategy

Students learn how to use their business plan, deal with problems encountered, update, and get funding. They are exposed to the issues of law, ethics, and negotiation as applied to business implementation. Students are required to make their first full-plan presentation to peers and faculty. Topics include type of capital and alternative sources, venture capital, and building the organizational infrastructure for plan support. Prerequisite: BT301

BT 403 Marketing Strategy in a Digital World

Marketing Strategy in a Digital World is a course designed to give Marketing students an intensive and application-oriented look at how marketing strategy works in the real world. The emphasis of the case is going to be on cases, analysis, real life examples, and presentations. Prerequisite: BT 350

BT 343 Intermediate Macroeconomic Theory

This is an intermediate macroeconomics course designed with the goal of providing a deeper understanding of current events, macroeconomic theory and economic policy. The course will cover long-run economic performance and its determinants, as well as short-run dynamics and economic fluctuations. This distinction should allow students to comprehend the implications of public policies that have a persistent impact on the economy, such as those that address growth, structural unemployment, inflation and government debt, from the monetary and fiscal policies that have a more immediate effect on economic outcomes. The role of central banks, governments, financial institutions, and globalization will also be addressed. Throughout the course, examples of the real world will be considered and the final part of the course will address recent issues in the macroeconomic debate. Prerequisite: BT243

BT 344 Intermediate Microeconomic Theory

This is a course in intermediate microeconomics designed with the goal of providing students with a deeper understanding of economic analysis. It broadly involves the study of consumer and firm behavior starting from the standard perfect competiton paradigm and introducing models of imperfect competition. Throughout the course, formal models will be motivated and discussed. The theory will be accompanied by the study of real world applications, as well as considering economic policies targeted at specific industries or sectors. Prerequisite: BT244

BT 350 Marketing

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BT 413 **Business Law**

The course introduces students to the fundamental concepts and legal principles that they can expect to encounter in various roles as managers/professionals in public and private companies, consultants and/or entrepreneurs, together with the ethical criteria, moral values and social norms in the environments they will face. The course will cover the American judicial system, international law in a global economy, ethics and business decision making, and different forms of business structure, contracts, business torts, products liability, insurance, employment law, criminal law and the recent Dodd-Frank Wall Street Reform & Consumer Protection Act.

Business Process Management BT 416

The course addresses the methods and techniques required to analyze, design, implement, automate, and evaluate business processes. Structured along the phases of the Business Process Management (BPM) life cycle, students learn to analyze organizational performance from a process perspective, redesign processes using value-focused techniques, design workflows and implement them in BPM systems, simulate new process designs, and create process analytics applications using dashboards. The course leads students from process discovery through conceptual and technical process design through the implementation and management of workflows to the structure of process-aware information systems. Upon completion of this course students will be able to assess the efficiency and effectiveness of an organization from a process perspective, conduct process improvement projects, and determine the role of technology in supporting corporate processes. Prerequisite: MIS 201

BT 419 Entrepreneurship Practicum

This capstone course within the Entrepreneurship minor is designed to develop the content and presentation of the technical and business elements of students' entrepreneurial business plans. Starting with the technical aspects of the design project, students are led through the components of a complete business plan, with instruction and practice in the writing and presentation of the plan. As a capstone exercise, students complete the course by presenting their business plans in an 'Elevator Pitch' event at which venture capitalists and other investors rate the quality of student presentations and entrepreneurial business ideas. Prerequisite: BT 372 or MGT 472

BT 421 Systems Analysis and Design

This course focuses on the analysis and development of systems to meet the increasing need for information within organizations. It presents and analyzes various topics such as systems development life cycle, analysis and design techniques, information systems planning and project identification and selection, requirements collection and structuring, process modeling, data modeling, design of interface and data management, system implementation and operation, system maintenance, and change management implications of systems.

BT 422 **Decision Making**

The objective is to acquaint you with the research and principles of judgment and decision making. Most of the material covered is about understanding and improving the judgment and decision making processes of managers and other professionals. Understanding decision making involves examining how decision makers think about difficult problems and characterizing the limitations of human decision making ability. By understanding how decisions are made, we can provide guidelines and techniques for overcoming limitations and improving the quality of decision making. This includes understanding statisticallybased decision making, the psychological aspects of decision making and rational approaches to decision making. The course's goal is to provide insights and tools that will enable you to support and improve your own decision making, to understand the decision making of others, and to enhance the decision quality of team and groups that you lead.

BT 411 Senior Design I

BT411 is divided into two segments. The first segment involves working in teams on a pre-defined problem; working through one full cycle of Lean Business Processes. For the second segment, armed with this stem-to-stern experience, students then plan and focus on work for a client's business. Teams form into project teams, propose a project for approval, submit a project plan, work though several cycles of each stage of Lean Business development, to test, refine, and build a sustainable program to help your client's business.

BT 412 Senior Design II

BT 412 is the second of a two-semester sequence. In this course students focus on refining their business models and consulting plans, especially by clarifying their diagnoses and hypotheses, systematically testing assumptions, prototyping and testing solutions, and working to execute their recommendations. Teams will present their final 'product' (business model & prototype, consulting analysis & solution) to their client and to the School of Business community. Prerequisite: BT 411

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An introduction to the investment management process emphasizing measuring and managing investment risk and return. Topics will include investment objectives and constraints, modern portfolio theory, CAPM, efficient markets, stock and bond valuation models, performance evaluation, futures and options. Cross-listed with: BT321

BT 426 **Equity Valuation**

BT 425

This is an advanced course that is designed to provide you with a comprehensive perspective of how financial theory is applied to valuation problems. The tools and techniques that will form the foundation of the course can be applied to a broad range of valuation topics that extend beyond securities (or public equities) and will encompass pricing for: private enterprise valuation and term sheets; intellectual property rights and patents; marketing and distribution agreements; commercial real estate leases; licensing agreements; options and insurance contracts. The course will center on intrinsic enterprise or project evaluation and will build upon the concepts introduced in the basic Corporate Finance course. Cross-listed with: BT321

BT 435 Social Media and Network Analysis

Portfolio Management

Recently, the advent of electronically mediated social networks has transformed the way we interact in government, educational, and business institutions. A set of social network analysis methods, with roots in sociology, graph theory, and computer science, can help us make sense of this complicated phenomenon. This course will provide a basic understanding of electronically mediated social networks in the context of the management discipline of marketing. In order to provide this understanding, we will survey ideas that have surfaced in, management, psychology, computer science, and sociology. By the end of the course, students will be capable of understanding electronically mediated social networks: the way they form, the way they grow, and the way they are applied in business. Students will be capable of analyzing existing networks, and will also be able to build new networks. That is, there will be labs in which tools and techniques for both understanding and designing electronically mediated social networks will be explained and used. Students will also be asked to actively participate in creating a part of an electronically mediated social network: working in teams, they will attempt to create ideas or applications that will go viral: they will attempt to create an information cascade. Prerequisite: BT350

BT 440 Money, Banking and Financial Institutions

This course explores the economics of banking and financial markets. Topics to be discussed include: an overview of finanical markets and institutions, the theory of interest rates, rational expectations theory, the Efficient Market Hypothesis, the roles, functions, and structures of financial institutions, the U.S. banking industry, and central banking and the conduct of monetary policy. Prerequisite: BT 321

BT 442 **Fixed Income Analysis**

The aim of this course is to provide you with an introduction to the valuation of fixed income securities and the management of fixed income investment portfolios. We will start with the basics of bond pricing - the relationship between the price of a bond, measures of return on the bond and measures of risk. Next, we will discuss the credit rick assessment and bond issuance process from a market practitioner perspective. The tools for the valuation of bonds, fixed income derivatives and credit derivatives will be the focus of the third segment of the course. Prerequisites: BT 321, BT 440

BT 445 Virtual and Physical Consumer Behavior

Marketing begins and ends with the consumer. The purpose of this course is to introduce students to the study of consumer behavior. This is an interdisciplinary course that integrates perspectives from marketing, psychology, sociology, anthropology, and economics in order to examine the elements of the consumer decision-making process and to enable formulation of marketing strategies. Students will take the perspective of a marketing manager who needs knowledge of consumer behavior in order to develop, evaluate and implement effective marketing strategies. The course integrates lectures, case analysis, and discussions to focus on the implications of social science concepts for marketing strategy. Prerequisite: BT350

BT 447 Creativity and Innovation

This course is about creativity and innovation, which are now the main sources of competitive advantage in many industires. Many firms now rely on products developed within the prior three to five years for a large portion of their revenues and profits. In this course, we will explore such key topics as the industry dynamics of technological innovation, the formulation of technological innovation strategy, and the implementation of technological innovation strategy. We will strive to go beyond simply learining concepts, although understanding major concepts is of critical improtance to hte management of technology and innovation. Throughout the course, key conceptual frameworks will be linked to applications in a variety of organizational inad industrial settings.

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BT 450 Global Management Seminar

This seminar will examine the processes of globalization for multi-national companies and why they seek markets in other countries. US and foreign countries cultural, labor and management issues will be compared. How management practices transfer across cultures will also be examined. Includes visits to overseas companies as part of a field study experience.

BT 454 International Economics and Finance

"This course applies principles of economics and finance to the international setting. The first half of the course deals with microeconomic and macroeconomic issues of international trade and covers such issues as (i) why countries trade, (ii) the theory and practice of trade policy including multilateral trade liberalization within the WTO and regional economic integration, (iii) exchange rates. The second half of the course teaches students how to be effective global financial managers. To achieve this goal, the course focuses on important topics that include the fundamentals of the macroeconomic environment of international financial managers must function, and foreign exchange management and financial management in a multinational firm." Prerequisites: BT 243 or BT 244, and BT 321

BT 465 Integrated Marketing Communications

This course will give students an insightful overview of the practice and power of public relations, and its role in the marketing mix. No longer an industry relegated to sending out press releases as a means to communicate, this course will help students understand the power of communication across all genres, and appreciate the role of communication/reputation management in all aspects of business. From corporate earnings announcements to employee relations and philanthropic endeavors, this course will relay the basic elements for this effective tool. This course, taught by a practicing professional, will give an overview of outside PR counsel; internal PR departments; and how to manage the specialty function.

BT 499 Independent Study

Independent study allows the student to participate in research, explore a topic not covered by existing courses, or continue to study in greater depth a topic introduced by a course. Independent study courses must be conducted under the guidance of a full time faculty member, whose approval is required prior to enrollment. The student and faculty member must agree on the scope and details of participation in advance. The Associate Dean of the Undergraduate Enterprise must also give approval before the enrollment of the student. Independent Study courses carry one to three credits.

Business Intelligence and Analytics

BIA 600 Business Analytics: Data, Models & Decisions

Many managerial decisions—regardless of their functional orientation—are increasingly based on analysis using *quantitative* models from the discipline of management science. Management science tools, techniques and concepts (e.g., data, models, and software programs) have dramatically changed the way businesses operate in manufacturing, service operations, marketing, transportation, and finance. Business Analytics explores data-driven methods that are used to analyze and solve complex business problems. Students will acquire analytical skills in building, applying and evaluating various models with hands-on computer applications. Topics include descriptive statistics, time-series analysis, regression models, decision analysis, Monte Carlo simulation, and optimization models.

BIA 610 Applied Analytics

Applied Analytics is a capstone course for the analytic-focused MBA program. It is intended to integrate all previously taken coursed in the program by presenting a set of increasingly complex business problems. These problems can be solved through analytic skill taught in this and previous courses. In particular, the course is intended to reinforce the understanding of analysis as way to build models that can focus attention on parts of the system that can be improved through intervention. The early part of the course uses synthetic data and empirical data readily available for analysis. The second part of the course encourages students to state and solve their own problem, gathering their own data as a part of the analytic process.

BIA 650 Optimization and Process Analytics

This course covers basic concepts in optimization and heuristic search with an emphasis on process improvement and optimization. This course emphasizes the application of mathematical optimization models over the underlying mathematics of their algorithms. While the skills developed in this course can be applied to a very broad range of business problems, the practice examples and student exercises will focus on the following areas: healthcare, logistics and supply chain optimization, capital budgeting, asset management, portfolio analysis. Most of the student exercises will involve the use of Microsoft Excel's "Solver" add-on package for mathematical optimization.

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BIA 652 Multivariate Data Analysis I

This course introduces basic methods underlying multivariate analysis through computer applications using R, which is used by many data scientists and is an attractive environment for learning multivariate analysis. Students will master multivariate analysis techniques, including principal components analysis, factor analysis, structural equation modeling, multidimensional scaling, correspondence analysis, cluster analysis, multivariate analysis of variance, discriminant function analysis, logistic regression, as well as other methods used for dimension reduction, pattern recognition, classification, and forecasting. Students will build expertise in applying these techniques to real data through class exercises and a project, and learn how to visualize data and present results. This proficiency will enable students to become sophisticated data analysts, and to help make more informed design, marketing, and business decisions. Prerequisite is MGT 620 or equivalent; basic knowledge of descriptive and inferential statistics is expected.

BIA 654 Experimental Design II

This course introduces basic methods underlying multivariate analysis through computer applications using R, which is used by many data scientists and is an attractive environment for learning multivariate analysis. Students will master multivariate analysis techniques, including principal components analysis, factor analysis, structural equation modeling, multidimensional scaling, correspondence analysis, cluster analysis, multivariate analysis of variance, discriminant function analysis, logistic regression, as well as other methods used for dimension reduction, pattern recognition, classification, and forecasting. Students will build expertise in applying these techniques to real data through class exercises and a project, and learn how to visualize data and present results. This proficiency will enable students to become sophisticated data analysts, and to help make more informed design, marketing, and business decisions. Prerequisite is MGT 620 or equivalent; basic knowledge of descriptive and inferential statistics is expected.

BIA 656 Advanced Data Analytics & Machine Learning

The significant amount of corporate information available requires a systematic and analytical approach to select the most important information and anticipate major events. Statistical learning algorithms facilitate this process understanding, modeling and forecasting the behavior of major corporate variables. This course introduces time series and statistical and graphical models used for inference and prediction. The emphasis of the course is in the learning capability of the algorithms and their application to finance, direct marketing, operations, and biomedicine. Students should have a basic knowledge of probability theory, and linear algebra.

BIA 658 Social Network Analysis

This course introduces concepts and theories of social networks as well as techniques to conduct marketing research from a network perspective. Network concepts covered include graph-theoretic fundamentals, centrality, cohesion, affiliations, equivalence, and roles. Network theories covered include embeddedness, social capital, homophily, and models of network growth. Design issues will also be covered, including data sampling and hypothesis testing. Another focus of this course is on marketing applications of social network analysis, in particular the use of knowledge about network properties and behavior, such as hubs and paths, the robustness of the network, and information cascades, to better broadcast products and search targets. Application areas include customer profiling, community detection, targeting, sentiment analysis, and development of recommendation systems. Prerequisites are BIA 652, BIA 654, MIS 637, and BIA 656. Knowledge and skills learned in these required courses (e.g., R, python, machine learning) are applied to social network analysis.

BIA 660 Web Mining

In this course, students will learn through hands-on experience how to extract data from the web and analyze web-scale data using distributed computing. Students will learn different analysis methods that are widely used across the range of internet companies, from start-ups to online giants like Amazon or Google. At the end of the course, students will apply these methods to answer real scientific question or to create a useful web application. Prerequisites: BIA 652, MIS 637, BIA 656

BIA 662 **Cognitive Computing**

This course explores the area of cognitive computing and its implications for today's big data analytics and evidence-based decision making. Topics covered as part of this seminar include: cognitive computing design principles, natural language processing, knowledge representation, advanced analytics, as well as IBM's Watson DeepQA and Google's TensorFlow deep learning architectures. Students will have an opportunity to build cognitive a as well as explore how knowledge-based artificial intelligence and deep learning are the field of data science. This course is open to students in Business Intelligence and Analytics, Information Systems, and Masters of Business Administration, or with the permission of the instructor.

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BIA 670 Risk Management & Simulation

Theoretical and practical aspects of risk assessment and management will be covered. Major topics include: Importance of innovation and technological changes in current competitive environment, risk and uncertainty, decision trees, binomial methods and derivation of Black-Scholes option pricing formula, extension of option methodology to non-financial (real) options, VAR (value at risk), a framework of risk assessment, and several real-world case studies. The course is designed for all students in the School of Technology Management. Prerequisites: TM 605 or CS 505, TM 500

BIA 672 Marketing Analytics

In this course, students will learn about marketing analytics techniques such as segmentation, positioning, and forecasting, which form the cornerstone of marketing strategy in the industry. Students will work on cases and data from real companies, analyze the data, and learn to present their conclusions and make strategic recommendations. Prerequisite: BIA 656

BIA 674 Supply Chain Analytics

Supply chain analytics is one of the fastest growing business intelligence application areas. Important element in Supply Chain Management is to have timely access to trends and metrics across key performance indicators, while recent advances in information and communication technologies have contributed to the rapid increase of data-driven decision making. The topics covered will be divided into strategic and supply chain design and operations, including -among others- supplier analytics, capacity planning, demand-supply matching, sales and operations planning, location analysis and network management, inventory management and sourcing. The primary goal of the course is to familiarize the students with tactical and strategic issues surrounding the design and operation of supply chains, to develop supply chain analytical skills for solving real life problems, and to teach students a wide range of methods and tools -in the areas of predictive, descriptive and prescriptive analytics- to efficiently manage demand and supply networks.

BIA 676 Data Streams Analytics: Internet of Things

In recent years, the progress in sensor technologies, RFID (Radio Frequency Identification) tags, smart phones and other smart devices has made it possible to measure, record, and report large streams of transactional data in real time. Such data sets, which continuously and rapidly grow over time, are referred to as Big Data Streams. Analysis of streaming data poses a number of unique challenges which are not easily solved through direct applications of well-known data mining methods and algorithms developed for traditional static data. This course will serve as a first course on the emerging field of "Data Streams Analytics". It will provide an introduction to IoT, sensors & devices, the architecture and environment in which these devices generate data streams, the data quality & data cleaning, data acquisition, and emerging methodologies and algorithms for knowledge discovery from data streams. Topics include: synopsis & sampling techniques, sliding windows, computing the entropy in streams, data streams correlations, change detection, outliers & anomaly detection.

BIA 678 Big Data Technologies Seminar

The field of Big Data is emerging as one of the transformative business processes of recent times. It utilizes classic techniques from business intelligence & analysis (BI&A), along with a new tools and processes to deal with the volume, velocity, and variety associate with big data. As they enter the workforce, a significant percentage of BIA students will be directly involved with big data as technologists, managers, or users. This course will build on their understanding of the basic concepts of BI&A to provide them with the background to succeed in the evolving data-centric world, not only from the point of view of the technologies required, but also in terms of management, governance, and organization.

BIA 680 Applied Analytics/Life Sciences

The capstone course brings together the key elements of the business intelligence and analytics curriculum. Students have an opportunity to apply the concepts, principles, and methods they have learned to real problems in an application domain associated with their area of interest. At the end of the course, students present their projects in a poster session for review by industry practitioners in pharmaceutical and life sciences.

BIA 686 Practicum in Analytics

Business intelligence and analytics is key to enabling successful competition in today's world of "big data". This course focuses on helping students to not only understand how best to leverage business intelligence and analytics to become more effective decision makers, making smarter decisions and generating better results for their organizations. Students have an opportunity to apply the concepts, principles, and methods associated with four areas of analytics (text, descriptive, predictive, and prescriptive) to real problems in an application domain associated with their area of interest.

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BIA 702 Curricular Practical Training

This course involves an educationally relevant, practical assignment that augments the academic content of the student's program. Students engage in a project in a company project related to the focus of their academic program. The project is conducted under the supervision of a faculty advisor and an industry mentor. During the semester, the student must submit written progress reports and at the end of the semester, a detailed written report that describes his/her activities and knowledge gained during that semester. This is a one-credit course that may be repeated up to a total of three credits.

Data Science

DS 801 Special Problems in Data Science (PhD) (1 to 6 - -) With permission of the instructor. Limit of six credits for the degree of Doctor of Philosophy.

Finance

FIN 510 **Financial Statement Analysis**

This course deals with (1) interpretation of financial statements, (2) evaluation of the alignment between business strategies and financial performance, (3) identification of potential business risks, and (4) comparison of performance of different companies. The course introduces business analysis and valuation techniques and utilizes real world data to help students comprehend financial statement analysis tools. Topics covers financial statement information, tools of financial statement analysis, and forecasting and valuation techniqes.

FIN 526 Private Equity and Venture Capital (3 - 3 - 0)

This course addresses the fundamentals of venture capital, which includes the venture capital industry, the structure of venture capital firms and venture capital investments. It addresses in some detail the relationship between venture risk and return, the cost of venture capital and the valuation of high growth companies. The course covers a variety of valuation methods as well as analysis of company capital structure or "cap tables".

Financial Planning and Risk Management FIN 550

This course will review the fundamental principles of financial planning, professional conduct, education planning, risk management and regulation. The course is aligned with the principle knowledge topics evaluated on the CFP® Certification Examination. The course introduces you to the financial planning process and teaches you how to work with clients to set goals and assess risk tolerance. Learn how to process and analyze information, construct personal financial statements, develop debt management plans, recommend financing strategies, and understand the basic components of a written comprehensive financial plan. The course also covers the regulatory environment, time value of money, and economic concepts.

FIN 560 Federal Taxation of Individuals

This course will review the fundamental principles of financial planning, professional conduct, education planning, risk management and regulation. The course is aligned with the principle knowledge topics evaluated on the CFP® Certification Examination. The course introduces you to the financial planning process and teaches you how to work with clients to set goals and assess risk tolerance. Learn how to process and analyze information, construct personal financial statements, develop debt management plans, recommend financing strategies, and understand the basic components of a written comprehensive financial plan. The course also covers the regulatory environment, time value of money, and economic concepts.

FIN 565 **Financial Plan Development**

This course integrates the different aspects of the financial planning process and demonstrates how to apply this knowledge to the development of a comprehensive financial plan. Students learn how to solve the main problems related to the financial planning process: cash management, debt management, taxation, insurance, retirement, investment, portfolio optimization, and estate planning. At the end of the course, students should be able to construct a plan according to the CFP Board's Financial Planning Practice Standards and client objectives. The course is appropriate for students who want to become financial planners and especially for those that plan to take the CFP® Certification Examination. Prerequisites: FIN 550, ACC 555, FIN 560

FIN 600 Financial and Managerial Accounting

This course will develop accounting analysis useful for managerial decision-making purposes. Topics will include an introduction to elements of financial accounting, cost-profit-volume analysis, manufacturing costs and elements of cost accounting, special decision analysis, budgeting, variances, and controllability and responsibility accounting.

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FIN 615 **Financial Decision Making**

Corporate financial management requires the ability to understand the past performance of the firm in accounting terms; while also being able to project the future economic consequences of the firm in financial terms. This course provides the requisite survey of accounting and finance methods and principles to allow technical executives to make effective decisions that maximize shareholder value.

FIN 620 **Financial Econometrics**

This course introduces the main concepts of data analysis and econometrics applied to financial problems. The course explores data analysis techniques; time series models; multivariate, factor and Bayesian models applied to high frequency trading, volatility forecast, risk management, portfolio optimization, and asset pricing. Students will work with historical databases, conduct their own analysis, and test trading and/or investment strategies based on the techniques reviewed during the class. Prerequisite: BIA 652 or MGT 700

FIN 623 **Financial Management**

This course covers the fundamental principles of finance. The primary concepts covered include the time value of money, principles of valuation and risk. Specific applications include the valuation of debt and equity securities as well as capital budgeting analysis, financial manager's functions, liquidity vs. profitability, financial planning, capital budgeting, management of long term funds, money and capital markets, debt and equity, management of assets, cash and accounts receivable, inventory and fixed assets. Additional topics include derivative markets. Prerequisites: MGT 600 or MGT 615 or FIN 615

FIN 625 Capital Markets

This course is designed to familiarize the student with the current workings of the capital markets. This course describes fundamental analytical techniques and state-of-the-art financial instruments. It begins with the time value of money and progresses to bond mathematics, portfolio management, and derivatives. The role of information technology is emphasized in both the development and delivery of financial instruments. Students will learn to structure IT applications to meet the needs of a trader or broker. Topics include the time value of money, bond math, the yield curve, analytical tools, trading and investment strategies, money market instruments and repurchase agreements, corporate bonds, macroeconomic dynamics, derivatives, securitization, equities, and the role of IT in capital markets Prerequisites: MGT 600

FIN 627 **Investment Management**

This course takes a practical approach to managing investments. It covers a wide variety of investment vehicles ranging from pure equity and debt offerings to complex derivatives and options. Various investment strategies are presented which are focused on the different fundamental approaches and tactics used by leading investors to achieve their financial goals. The course also focuses on investment styles, including momentum, growth, income, distressed, asset allocation, and vulture investing, to name just a few. Students participate in real time simulation experiences to create viable portfolios of stocks, bonds and other investments; while tracking their performance against the overall market and the class on a weekly basis throughout the course. Prerequisites: MGT 623

FIN 628 Derivatives

This course covers the fundamentals of financial derivatives, including the basic properties and the pricing of futures, options and swaps. It also explores trading and hedging strategies involving financial derivatives. Special topics, such as exotic options and credit derivatives, are explored. The course provides the foundation of financial derivatives and lays the ground for a rigorous risk management course and other advanced quantitative courses, such as stochastic finance.

FIN 629 **Fixed Income**

This is an intermediate/advanced level course that addresses money flows and the cost of credit for major money market institutions, including banks, bank holding companies and the "shadow banking" system. It entails a broad survey of the structure and financial condition of the banking industry. The course provides a theoretical and practical understanding of why these markets exist, who the key players are; how the markets work, the rules governing their operation and how they are evolving. We will spend considerable time in discussing regulation of the financial markets and financial services industry.

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"This course serves as a second semester sequence in corporate finance. Students enrolling should have a mastery of the topics of covered in Managerial Finance I (EMT 623), including time value of money, capital budgeting, risk adjusted hurdle rates, managerial accounting, and ratio analysis. Among the topics covered in EMT 723 are: leverage on the balance sheet and weighted average cost of capital; bankruptcy, turnarounds, and recapitalizations; international currency hedging; stock options; private equity valuation; mergers and acquisitions; and the issuance of public and private securities." Cross-listed with: EMT 638 Prerequisites: BT 221, MGT 600, and MGT 623

FIN 681 Financial Service Industry Trends and Issues

Corporate Finance

FIN 638

This course concentrates on IT trends and issues in the financial services industry. Due to the diversity of this industry (banking, brokerage, and insurance), along with the assortment of customer characteristics (i.e. retail vs. institutional), we will modularize the lectures by industry and customer partitions. This segregation will provide for a better understanding of this ever-changing industry. Upon successful completion of this course, students will have a solid understanding of the industry, market dynamics, and how their roles in technology have an immense impact in the industry. This course will cover the structure and functioning of financial services, from the perspective of banking, insurance, capital markets, and brokerage. Topics include industry consolidation and globalization, investment banking, fixed-income markets, the equity markets, the regulatory environment, and financial analysis approaches. Trends in IT and its effect on each of these areas will be discussed.

FIN 683 Financial Services Industry Back Office

This course is designed to provide the student with an in-depth understanding of the back-office trade process and the role of information technology (IT) in this process, with the goal of helping the student to be an effective provider of information system development and operations in this arena. The various phases of the trade process will be described, including key regulatory requirements. The current contributions of IT to the process will be reviewed, including straight-through processing, T+1 and foreign exchange trades. Topics include the structure and vocabulary of a trade and trade processing, the street-side view of a process flow, global processing, regulatory and compliance, back-office best practices, improving efficiencies and real-time processing.

FIN 684 Financial Services Industry Marketing and Sales

This course concentrates on effective selling and marketing IT strategies in the financial services industry. Due to the diversity of this industry (banking, brokerage, and insurance), along with the multiplicity of customer characteristic (retail vs. institutional), we will modularize the lectures by industry and customer partitions. This segregation will provide for a better understanding of this ever-changing industry. Upon successful completion of this program, students will identify client constituent's product needs and the ability for financial services companies to deliver this product (service) in a timely, cost-effective fashion. Corporate branding and marketing strategies will be reviewed and challenged by the student. Topics include the "sell-side", the "buy-side", the selling distribution process, e-business selling strategies, marketing strategies and corporate bonding, the role of data warehousing and sales data mining, and partnership with the client.

FIN 702 Curricular Practical Training

This course involves an educationally relevant, practical assignment that augments the academic content of the student's program. Students engage in a project in a company project related to the focus of their academic program. The project is conducted under the supervision of a faculty advisor and an industry mentor. During the semester, the student must submit written progress reports and at the end of the semester, a detailed written report that describes his/her activities and knowledge gained during that semester. This is a one-credit course that may be repeated up to a total of three credits. With approval of the Program Director and faculty supervisor, students may also take this course for up to three credits in one semester.

FIN 705 Asset Pricing Theory and Applications

This course is a review of asset pricing theory, with an emphasis on discount-factor models and generalized method of moments (GMM) procedure. The discount factor, as a unifying framework, calculates prices of stocks, bonds and options in terms of price-dividend ratios, expected return-beta representations, returns, moment conditions, continuous versus discrete-time implication, etc. The topics presented in the course provide a rigorous grounding in key aspects of the field of asset pricing that allows the student to conduct academic research in topics related to portfolio optimization, investment or risk management, among others. At the same time, the student will gain an appreciation of the common foundation of the topics presented.

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FIN 708 Corporate Finance Theory and Applications

This course is designed to provide Ph.D. students of the Business Administration track (and also some other disciplines) with a rigorous foundation in modern corporate finance theory. This PhD course considers a number of topics that are at the center of ongoing research in contract theory/corporate finance. FIN 800A provides an introduction to Contract Theory (and in particular its contributions to Corporate Finance) and considers the main theoretical contributions to Corporate Finance. The class material will be divided in three parts: (i) Fundamentals of Contract Theory; (ii) The Theory of Corporate Finance and (iii) Empirical Topics on Corporate Finance. This is mostly a research-oriented course. I expect students to come up with new ideas and are able to put these ideas into models and test them empirically.

FIN 730 Seminar in Information Economics

Information economics studies economic interactions where imperfect or asymmetric information impacts behavior of people and organizations. Methods of information economics help explain observed phenomenon and are used to guide design of economic mechanisms, institutions, organizations, and government policies. Applications span corporate finance, banking, accounting, marketing, strategy, and healthcare among others. The course discusses the tools of information economics and game theory that form the building blocks for most theoretical research in social sciences and surveys research articles exemplifying applications in finance and various other fields. Students gain an appreciation of how information economics shapes business world, acquire ability to understand and critique theoretical research models, and develop a toolkit to model their research insights.

FIN 800 With permission o	Special Problems in Finance (MS) f the instructor. Limit of six credits for the degree of Master of Science.	(1 to 6)
FIN 801 With permission o	Special Problems in Finance (PHD) f the instructor. Limit of six credits for the degree of Doctor of Philosophy.	(1 to 6)
FIN 810 A participating ser	Special Topics in Finance minar on topics of current interest and importance in Management of Finance.	(3)
FIN 900	Thesis in Finance (MS)	(1 to 12)

For the degree of Master of Science. Hours and credits to be arranged.

Financial Engineering

FE 505Financial Lab: Technical Writing in Finance(1 - 0 - 1)

This course teaches financial engineers how to write well-constructed, persuasive technical papers, and how to make oral presentations more effectively. It uses practical examples, in-class assignments, and homework exercises. This course reduces the anxiety that is frequently associated with technical writing and speaking. It emphasizes the collaborative aspects of the technical writing and revision process. It teaches the use of the LaTeX typesetting system for preparing technical manuscripts and presentations. In addition, the course teaches students how to present their work to both technical and not-technical audiences by creating cogent, striking, and well-designed figures and presentation slides.

FE 511 Introduction to Bloomberg and Thomson Reuters

This course is designed to teach students the nature and availability of the financial data available at Stevens. The focus of the course will be on equity, futures, FX, options, swaps, CDS's, interest rate swaps etc. They will learn to how use a Bloomberg terminal. As part of the course the students will be certified in the 4 areas that Bloomberg offers certification. We will cover the Thomson–Reuters Tick history data and basics of using this data. The course also introduces basics of applied statistics. Bloomberg terminal access will be required for any student taking the course on the web.

FE 512 Database Engineering

The course provides an introduction to SQL databases and NoSQL databases as available to the Hanlon Financial Systems Lab. At the end of the course the students will be familiar with all the lab resources as well as a working knowledge on how to use them. The students will receive hands on instructions about setting up and working with databases. Most of the software will be introduced using case studies or demonstrations, followed by a lecture of related fundamental knowledge. The course covers SQL (MySQL, WinSQL, PosgreSQL), NoSQL (IBM DB2, OneTick) and database managers Aqua. The course will cover accessing databases using API, SQLConnect and Access methods for DB2.

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FE 513 Financial Lab: Practical Aspects of Database Design

The course provides a practical introduction to SQL databases and Hadoop cluster systems as available in the Hanlon Financial Systems Lab. Students will receive hands on instruction about setting up and working with databases. Most of the software will be introduced using case studies or demonstrations, followed by a lecture of related fundamental knowledge. The course covers SQL, NoSQL, and database management systems. The course will cover accessing databases using API.

FE 514 Financial lab: VBA in Finance

This course is an introduction to programming with VBA - the Visual Basic for Applications language. In particular, we will be using VBA within MS Excel, and time permitting, MS Access as well. Excel is used everywhere in finance, and VBA allows practitioners to go beyond standard spreadsheet calculation and modeling. Programming with VBA (and using macros) enhances the versatility and power of Excel. The goal of this course is to teach our students Excel usage at a high level using VBA, for front office applications in financial institutions. Financial and mathematical applications will be presented and studied throughout the course.

FE 515 Introduction to R

In this course the students will learn the basics of the open source programming language R. The language will be introduced using financial data and applications. Basic statistical knowledge is required to complete the course. The course is designed so that upon completion the students will be able to use R for assignments and research using data particularly in finance.

FE 516 MATLAB for Finance

In this course the students will learn the basics of Matlab programming using financial data and applications. The language will be introduced using financial data and applications. This short course is intended for students with little or no experience with the software covering Matlab's basic operations and features. In addition, the course works through several simple applications, to give the students the necessary knowledge on developing their own projects. Topics covered include iteration, functions, arrays, and Matlab graphics. Assignments are designed to build an appreciation for randomness, simulation, and the role of approximation.

FE 517 SAS for Finance

In this course the students will learn the basics of SAS programming using financial data and applications. The course provides an introduction to programming, graphics, and data analysis using SAS Software. The course concentrates on fundamental components of SAS Software: data processing, managing SAS libraries, graphical and statistical procedures, creating, formatting and exporting reports. In addition, several advanced topics will be introduced: SAS SQL procedures and SAS Macro Language. The supporting applications illustrate financial data analysis with special emphasis on large data sets.

FE 518 Mathematica for Finance

The course provides an introduction to programming, graphics, and financial data analysis using Mathematica. Students will learn programming in Mathematica Software, starting with elementary but quickly moving to advanced programming. They will learn it as an integrated quantitative methodology for analysis of markets, and optimal trading in stocks and options. The course is based on "hands-on" projects dealing with contemporary topics in financial mathematics and it complements theoretical courses of finance.

FE 520 Introduction to Python for Financial Applications

This course is a primer on Python (language syntax, data structures, basic data processing, Python functions, modules and classes). The remainder of the course covers open source Python tools relevant to solving financial programming problems. The lecture, supporting examples, and practical applications are intertwined. The content will be delivered in a fully equipped financial computing laboratory where the students are immersed in case studies of real life applications. There will be reading assignments of the corresponding chapters in the textbook and additional materials will be provided.

FE 521 Web Design

This course is designed to teach students how to configure and code using PHP Hypertext Processor. Students will also learn how to create dynamically generated web pages using PHP and how to connect to databases.

FE 522 C++ Programming in Finance

This course is a hands on C++ introduction for Financial applications. The course will teach the basics of C++ and will teach the student how to program for finance. Very little time will be spent on the philosophy and much more time on the actual programming. QT and Visual Studio will be used as IDE's throughout the course. The course will be designed as a prerequisite for other advanced courses at Stevens.

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FE 529 GPU Computing in Finance

In this course the students will learn the basics of CUDA programming using financial data and applications. They will learn how to use C++, Matlab and R to access the GPU in their computer and to use the Stevens GPU cluster. The course is designed for Nvidia CUDA but the basics are easily transferable to Open CL. Prerequisite: FE 522

FE 530 Introduction to Financial Engineering

This course introduces a range of topics that the current scope of financial engineering encompasses. Topics include basic terminology and definitions, markets, instruments, positions, conventions, cash flow engineering, simple derivatives, mechanics of options, derivatives engineering, arbitrage-free theorem, efficient market hypothesis, introductory pricing tools, and volatility engineering.

FE 535 Introduction to Financial Risk Management

This course deals with risk management concepts in financial systems. Topics include identifying sources of risk in financial systems, classification of events, probability of undesirable events, risk and uncertainty, risk in games and gambling, risk and insurance, hedging and the use of derivatives, the use of Bayesian analysis to process incomplete information, portfolio beta and diversification, active management of risk/return profile of financial enterprises, propagation of risk, and risk metrics.

FE 540 Probability theory for FE

Topics include discrete and continuous distributions, multivariate probability, transformations, pattern appearance, moment generating functions, Laws of large numbers, Markov chains and diffusion processes, prices in markets as random variables and processes, filtrations and information. Applications target financial engineering examples.

FE 541 Applied Statistics with Applications in Finance

The course prepares students to employ essential ideas and reasoning of applied statistics. Topics include data analysis, data production, maximum likelihood, method of moments, Bayesian estimators, hypothesis testing, tests of population, multivariate analysis, categorical data analysis, multiple regression, analysis of variance, nonlinear regression, risk measures, bootstrap methods and permutation tests. The course is designed to familiarize students with statistical software needed for analysis of the data. Financial applications are emphasized but the course serves areas of science and engineering where statistical concepts are needed. This course is a graduate course and is covering topics for a deeper understanding than undergraduate courses such as MA331 and BT221. Furthermore, the course will cover fundamental statistical topics which are the basis of any advanced course applying statistical notions such as MGT718, BT652 as well as courses on machine learning, knowledge discovery, big data, time series, etc.

FE 542 Time Series with Applications to Finance

In this course the students will learn how to estimate financial data model and predict using time series models. The course will cover linear time series (ARIMA) models, conditional heteroskedastic models (ARCH type models), non-linear models (TAR, STAR, MSA), non-parametric models (kernel regression, local regression, neural networks), non-parametric methods of evaluating fit such as bootstrap, parametric bootstrap and cross-validation. The course will also introduce multivariate time series models such as VAR. Prerequisite: FE 541 or MA 331 or MA 541 or MA 612

FE 543 Introduction to Stochastic Calculus for Finance

This course introduces the stochastic calculus to students of finance and financial engineering. The course deals with Markov chains, Poisson processes, random walks, Brownian motion, asset prices as processes, limits of stochastic sequences, Ito sums and integral, fundamental models in modern finance, price dynamics and elementary examples of stochastic differential equations.

FE 545 Design, Patterns and Derivatives Pricing

This course covers the design and implementation of financial models using object oriented programming. It discusses advanced applications on quantitative finance with special emphasis on derivatives pricing.

FE 550 Data Visualization Applications

Effective visualization of complex data allows for useful insights, more effective communication, and making decisions. This course investigates methods for visualizing financial datasets from a variety of perspectives in order to best identify the right tool for a given task. Students will use a number of tools to refine their data and create visualizations, including: R and associated visualization libraries, Ruby on Rails visualization tools, ManyEyes, HTML5 & CSS 3, D3 is and related javascript libraries, Google Chart Tools, Google Refine, and image-editing programs. Prerequisite: FE 540

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Hedge funds are among the most influential participants in the financial markets with unique features. They are subject to less regulation and their strategies vary significantly from one another. Examples of common strategies include discretionary investing, quantitative equity investing, global macro, managed futures and exploitation of arbitrage opportunities. This course provides an overview of the hedge fund industry by going into the mechanics of the industry and then follows with detailed descriptions of the different strategies employed. Furthermore, it provides the economic intuition behind each of these strategies as well as the implementation along with practical considerations. It also discusses various examples of how financial engineering toolsets can be utilized to enhance hedge fund performance. In addition, this course emphasizes on the practical techniques of building a quantitative trading system using R programming language. Topics such as the lifecycle of developing a sound trading strategy and strategy validation in the form of back-testing are introduced. Prerequisite: FE 570

FE 575 Introduction to Econophysics

The course will apply certain concepts from statistical physics to the description of real-life financial time series. It will introduce the notion of Random Walk from the physicist stand-point and propose various statistical tests as comparisons of real-life financial time series properties with those of a Random Walk. The course will introduce statistical description of financial data with emphasis on long-memory correlation functions. The course will introduce Levy stochastic processes and their analytical properties and use them to parameterize the real-life financial time series probability density functions. Through homework's and final project, the course will stress phenomenological hands-on work with financial data. The course will culminate with the final project in which students will learn to extract the learned price anomalies through development of basic trading strategies. The dangers of over fitting of financial data will be studied through walk-forward outof-sample trading simulations, which will teach student to become more prudent practical quantitative analysis.

FE 580 Securitization of Financial Assests

This course provides a theoretical and practical analysis of the asset-backed security market. Topics include: Duration And Convexity of Bond Yields, Price Dynamics of Mortgages and Cash Flows, Default Risk, Interest Rate Volatility, Interest Rate Risk Management of Mortgage-Backed Securitization, Corporate Debt and The Securitization Markets, Asset-Backed Commercial Paper, Collateralized Loan Obligations, Structuring Synthetic Collateralized Loan Obligations, Securitization of Revolving Credit, Financial Derivatives and Their Use as Hedging Tools. Half of the course is in the Hanlon Financial Systems Lab, where theoretical models are illustrated with real scenarios.

FE 582 Foundations of Financial Data Science

This course will provide an overview of issues and trends in data quality, data storage, data scrubbing, data flows, and data encryption. Topics will include data abstractions and integration, enterprise level data issues, data management issues with collection, warehousing, preprocessing and querying. Furthermore, the Hadoop based programming framework for big data issues will be introduced along with any governance and policy issues. Corequisite: FE 513

Building effective and efficient tools for next generation integration of data analysis into strategic decision-making requires knowledge of existing software packages as well as the ability to build or extend software when needed. This course will address strategies for representing complex data through coverage of responsive web technologies, programming methods, libraries, and current techniques for transforming local and distributed data sets into meaningful visualizations using data acquisition and machine learning techniques. Prerequisite: FE 540

FE 570 Market Microstructure and Trading Strategies

The course offers an overview of modern financial markets for various securities: equities, FX, and fixed income, different types of traders, orders, and market structures, market microstructure models used for describing price formation in dealer markets (inventory models and information-based models), models of the limit-order markets, optimal order execution: optimal order slicing, and maker-versus-taker strategies. The course introduces several typical trading strategies by introducing technical analysis, including trend, momentum, and oscillator-based strategies, arbitrage trading strategies, including pair trading, implementation and methods of strategies back-testing.

FE 571 Quantitative Hedge Fund Strategies

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FE 590 Statistical Learning

Introduction to information theory: the thermodynamic approach of Shannon and Brillouin. Data conditioning, model dissection, extrapolation, and other issues in building industrial strength data-driven models. Pattern recognition-based modeling and data mining: theory and algorithmic structure of clustering, classification, feature extraction, Radial Basis Functions, and other data mining techniques. Non-linear data-driven model building through pattern identification and knowledge extraction. Adaptive learning systems and genetic algorithms. Case studies emphasizing financial applications: handling financial, economic, market, and demographic data; and time series analysis and leading indicator identification.

FE 595 Financial Technology

This course deals with financial technology underlying activities of markets, institutions and participants. The overriding purpose is to develop end-to-end business decision making data analytics tools along with enterprise level systems thinking. Statistical learning algorithms will be connected to financial objects identification and authentication along with the appropriate databases to create enterprise level financial services analytics systems.

FE 610 Stochastic Calculus for Financial Engineers

This course provides the mathematical foundation for understanding modern financial theory. It includes topics such as basic probability, random variables, discrete continous distributions, random processes, Brownian motion, and an introduction to Ito's calculus. Applications to financial instruments are discussed throughout the course.

FE 620 Pricing and Hedging

This course deals with basic financial derivatives theory, arbitrage, hedging, and risk. The theory discusses Ito's lemma , the diffusion equation and parabolic partial differential equations, and the Black-Scholes model and formulae. The course includes applications of asset price random walks, the log-normal distribution, and estimating volatility from historic data. Numerical techniques, such as finite difference and binomial methods, are used to value options for practical examples. Financial information and software packages available on the Internet are used for modeling and analysis. Corequisite: FE 610

FE 621 Computational Methods in Finance

This course provides computational tools used in industry by the modern financial analyst. The current financial models and algorithms are further studied and numerically analyzed using regression and time series analysis, decision methods, and simulation techniques. The results are applied to forecasting involving asset pricing, hedging, portfolio and risk assessment, some portfolio and risk management models, investment strategies, and other relevant financial problems. Emphasis will be placed on using modern software. Prerequisite: FE 543 or FE 610

FE 625 Emerging Markets: Risks and Models (3 -

This course covers the basics of Emerging Markets instruments, models, risks, hedging and trading practices. Emerging Markets have seen a dramatic increase in volume, especially since the latest crisis in the developed markets. Geographically the course will be focused on the 4 BRIC countries (Brazil, Russia, India and China) and Mexico. The student should develop a deep understanding of the main differences between Developed Markets and Emerging Markets risk and trading. Many of the unique attributes and models in Emerging Markets have now been adopted by Developed Markets since the 2008 crisis, given students an edge in understanding the latest trends in the markets. Main topics to be covered include: funding in EM; XC basis markets; OIS and local collateralization; Credit Valuation Adjustment (CVA); Extinguishable XC swaps; Inflation indexes and inflation currencies; Capital Constraints, Convertibility and Transferability.

FE 630 Portfolio Theory and Applications

This course introduces the modern portfolio theory and optimal portfolio selection using optimization techniques such as linear programming. Topics include contingent investment decisions, deferral options, combination options and mergers and acquisitions. The course introduces various concepts of financial risk measures.

FE 641 Multivariate Statistics and Advanced Time Series in Finance

The course is an advanced statistics course designed to incorporate the newest areas of statistics research and applications in the Stevens Institute curriculum. Topics include multivariate statistics methods such as principal components, independent components, factor analysis, discriminant analysis, mixture models, and lasso regression. Advanced topics in time series such as Granger causality, vector auto regressive models, co-integration, and error corrected models, VARMA models and multivariate volatility models will be presented.

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FE 635 Financial Enterprise Risk Engineering

This course deals with risk assessment and engineering in financial systems. It covers credit risk, market risk, operational risk, liquidity risk, and model risk. Topics include classical measures of risk such as VaR, methods for monitoring volatilities and correlations, copulas, credit derivatives, the calculation of economic capital, and risk-adjusted return on capital (RAROC). The nature of bank regulation and the Basel II capital requirements for banks are examined. Case studies illustrate risk engineering successes and failures in financial enterprises. Prerequisite: FE 535

FE 655 Systemic Risk and Financial Regulation

This course deals with aspects of systemic risk in financial systems. It covers a review of classical risk measures and introduces non-classical risk measures such as Extreme Value Theory. It also covers the study of financial systems as a system of complex adaptive systems, agent-based modeling, history and analysis of bubble formations as a systemic risk, the role of rating agencies, the financial systems ecosystem, risk and regulatory environment, risk and the socio-political environment. It also studies international financial inter-system risk propagation and containment and its impact on international financial systems, the International Monetary Fund assessments and the effect of extreme risk on poverty, international instability and globalization. Prerequisite: FE 535

FE 670 Algorithmic Trading Strategies

This course investigates statistical methods implemented in multiple quantitative trading strategies with emphasis on automated trading and based on combined technical-analytic and fundamental indicators to enhance the trade-decision making mechanism. Topics explore high-frequency finance, markets and data, time series, microscopic operators, and micro-patterns. Methodologies include, but not limited to, Bayesian classifiers, weak classifiers, boosting and general metaalgorithmic emerging methods of machine learning applied to trading strategies. Back-testing and assessment of model risk are explored. Prerequisites: FE 545, FE 570

FE672 Advanced Market Structure and HFT Strategies

This course extends the basic knowledge on market microstructure theory and trading strategies to the most recent advancement in related topics and covers the latest financial market structure theory and practical techniques of the high frequency trading (HFT) paradigm. High frequency trading is a difficult, but profitable, endeavor that can generate stable profits in various market conditions. But solid footing in both the theory and practice of this discipline are essential to success. This course aims to address everything from new portfolio management techniques for high frequency trading and the latest technological developments enabling HFT to updated risk management strategies and how to safeguard information and order flow in both dark and light markets. Topics include: modern microstructure theory, order types, limit-order book, dark pool trading, market-making strategies, arbitrage strategies, directional strategies, performance and risk assessment, as well as related market regulations. Half of the course is in the Hanlon Financial Systems Lab, where theoretical models are illustrated with real scenarios. This course will leverage the market tick data available at the Hanlon Systems Lab and the GPU cluster to allow students to practice high speed trading strategies with advanced programming language.

FE 680 Advanced Derivatives

This course deals with fixed-income securities and interest-rate sensitive instruments. Topics include term structure of interest rates, treasury securities, strips, swaps, swaptions, one-factor, two-factor interest rate models, Heath-Jarrow-Merton (HJM) models and credit derivatives: credit default swaps (CDS), collateralized debt obligations (CDOs), and Mortgagebacked securities (MGS).

FE 690 Machine Learning in Finance

This course focuses on advanced machine learning models and their applications to finance. Building on fundamental statistical learning theory, the course covers advanced topics in classification, supervised learning, unsupervised learning, latent space models, graphical models, mixture models, online learning, deep learning, and big-data analytics. Learning and building from financial data sets, the lectures will introduce machine learning models in quantitative investing, portfolio management, algorithmic trading, risk management, client-relationship management, and beyond. A final project on related topics is required.

FE 699 Project in Financial Engineering

A student is given a particular problem in financial engineering to be completed in one semester. The nature of the problem may be computational or theoretical depending on the student's track. It is encouraged that the problems be related and, in some instances, posed by the financial engineering industry.

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FE 700 Master's Thesis in Financial Engineering

This is the thesis option equivalent to one elective and FE 699. The thesis option requires the approval of the advisor and is recommended only for full-time students. The student will produce a Master's thesis in financial engineering.

FE 710 Applied Stochastic Differential Equations

Topics include Ito calculus review, linear stochastic differential equations (SDE's), examples of solvable SDE's, weak and strong solutions, existence and uniqueness of strong solutions, Ito-Taylor expansions, SDE for Markov processes with jumps, Levy processes, forward and backward equtions and the Feynman-Kac representation formula, and introduction to stochastic control. Applications are mostly from fianncial engineering but applications in areas such as population dynamics, energy, climatology and seismology may also be presented. Prerequisites: FE 610, MA 611, MA 623

FE 720 The Volatility Surface: Risk and Models

In this course students will understand the implied volatility, and the empirical static and dynamic behavior of the volatility surface formed using option prices for all strikes and expirations. The students will also examine the volatility risk, stochastic volatility and local volatility models, numerical methods for volatility surface calibration, Monte Carlo simulation of stochastic volatility models, and pricing options through fast Fourier transform. Topics include: the Black-Scholes implied volatility, empirical statics and dynamics of the volatility surface, volatility risk premium, stochastic volatility models (Heston, Hull-White, Stein-Stein, SABR, Bates, Scott, etc), Dupire's local volatility model, Heston-Nandi GARCH model, arbitrage-free properties of the volatility surface, volatility surface parametrization and calibration, simulation of the Heston model, stochastic volatility model with jumps, option pricing based on fast Fourier transforms, and volatility derivatives (Variance swap, CBOE VIX futures and options, etc). Other advanced current research topics will be introduced as well. The students are required to have a solid working knowledge of stochastic calculus, and FE610 is a pre-requisite for this course. The course uses statistical softwares such as Matlab or R throughout. A companion one credit of a relevant lab course is recommended if this knowledge is not acquired before. Prerequisite: FE 610

FE 800 Project in Financial Engineering

Three credits for the degree of Master of Science (Financial Engineering). This course is typically conducted as a one-on-one course between a faculty member and a student. A student may take up to two special problems courses in a master's degree program. A department technical report is required as the final product for this course. Prerequisite: consent of instructor.

FE 810 Selected Topics in Financial Engineering

Selected topics from various areas within Financial Engineering. This course is typically taught to more than one student and often takes the form of a visiting professor's course. Prerequisite: consent of instructor.

FE 900 Master's Thesis in Financial Engineering (3 - 3 - 0)

For the degree of Master of Science (Financial Engineering). A minimum of six credit hours is required for the thesis. Hours and credits to be arranged.

Information Systems

MIS 201 Fundamentals of Information Systems

This course provides an introduction to systems and development concepts, information technology and application software. It explains how information is used in organizations and the effects IT has on the organization's structure, processes, employees, customers, and suppliers. In addition, the course describes how IT enables improvement in quality, timeliness, and competitive advantage. Structure and functions of computers and telecommunications systems are also examined.

MIS 460 IT Strategy: Strategic Issues in IT Management

This course introduces students to the use of computerized information systems to satisfy strategic business needs. It outlines the concepts of information systems for competitive advantage, data as a resource and IS and IT planning and implementation. It concentrates on developing the students' competency in current/emerging issues in creating and coordinating the key activities necessary to manage the day-to-day IT functions of a company.

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MIS 620 Analysis and Development of Information Systems

This course presents and analyzes various approaches to information analysis and development of organizational information systems within a system development life-cycle (SDLC), e.g. the waterfall, concentric, and prototyping approaches. Topics include strategic planning for SDLC, front-end and back-end phases of SDLC, project management, CASE methodologies, and balancing user, organizational, and technical considerations.

MIS 630 Dealing with Data

This course deals with strategic uses of data, data structures, file organizations and hardware as determinants of planning for and implementing a enterprise-wide data management scheme. Major course topics include data as valuable enterprise resource, inherent characteristics of data, modeling the data requirements of an enterprise, data repositories and system development life cycles.

MIS 635 Designing the Knowledge Organization

This course will focus on the design and management of the knowledging organization organizations that generate and apply knowledge. A central theme of this course is the design of knowledge work. We concentrate on both micro- and macro-design and their interrelationships: individual, team, task, process, and organization levels. This courses comprises what is generally termed knowledge management and by extension the learning organization.

MIS 636 Data Warehousing and Business Intelligence

This course focuses on the design and management of data warehouse (DW) and business intelligence (BI) systems. The course is organized around the following general themes: Knowledge Discovery in Databases, Planning and Business Requirements, Architecture, Data Design, Implementation, Business Intelligence, Deployment, Maintenance and Growth, and Emerging Issues. Practical examples and case studies are presented throughout the course.

MIS 637 Data Analytics & Machine Learning

This course will focus on Data Mining & Knowledge Discovery Algorithms and their applications in solving real world business and operation problems. We concentrate on demonstrating how discovering the hidden knowledge in corporate databases will help managers to make near-real time intelligent business and operation decisions. The course will begin with an introduction to Data Mining and Knowledge Discovery in Databases. Methodological and practical aspects of knowledge discovery algorithms including: Data Preprocessing, k-Nearest Neighborhood algorithm, Machine Learning and Decision Trees, Artificial Neural Networks, Clustering, and Algorithm Evaluation Techniques will be covered. Practical examples and case studies will be present throughout the course.

MIS 685 The Healthcare Value Chain

This course has been designed to provide foundational knowledge about the healthcare industry for information technology (IT) professionals working in (or aspiring to work in) the healthcare industry. After an introduction to the U.S. healthcare system from a stakeholder perspective, students learn about the information and communication needs of key interdependent stakeholders: healthcare providers (hospitals, physicians), suppliers of surgical and non-surgical equipment and drugs, third-party insurers and payers (including government), and the healthcare consumer (patients). The course materials include readings by current thought leaders, in-depth case studies, background summaries prepared by the instructor, and public Web-based resources. Students gain up-to-date knowledge about current healthcare IT solutions used by key players in the healthcare valuechain, and also learn about resources for understanding future IT-related trends in this fast-changing industry. This course is also a pre-requisite for three MIS courses that focus on specific types of HIT applications and the process changes and healthcare data needed to support them: MIS 686, MIS 687, and MIS 688

MIS 689 IT Management for the Healthcare Professional

This course has been designed to provide the healthcare professional (physicians, nurses, allied health, and other healthcare professionals) with a foundation in information management. The adoption of clinical systems (electronic medical records, computerized physician ordering, e-prescribing) by healthcare providers, and the growth of evidence-based decision support systems within healthcare providers, suppliers, insurers, and payers in the healthcare value chain, is expected to significantly increase. For the effective utilization of these investments, healthcare professionals who have a mastery of IT management fundamentals are needed to participate in the design, development, and support of all of these types of IT investments. Students will gain an up-to-date knowledge about managing healthcare IT (HIT), and also become familiar with resources for keeping up-to-date with IT terminology and trends in this fast-changing industry.

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MIS 690 Supply Chain Management and Strategy

This course serves as the foundation course for studying strategic supply chain management within the Howe School. The course explores the major elements of the supply chain, and exposes students to leading edge thinking on supply chain strategy as well as practical tools and methods for its implementation. Topics covered include: Supply Chain Management Principles and the Customer: Supply Chain Networks and Organizations: Product Lifecycle Implications to Supply Chains; Forecasting and Inventory Management; Supply Chain Processes; Supply Chain Information Systems; Supply Chain Performance and Metrics: Lean Supply Chains: Risk Management; and Legal and Ethical Issues.

MIS 691 Procurement and Supplier Management

The Procurement and Supplier Management course explores the strategic issues in procurement and supply management, including the purchasing process, procurement cycle, purchasing research, relationships with suppliers, negotiation, commodity planning, as well as price and value analysis. The course covers the organizational, strategic, and operational aspects of procurement and supply management, along with an integrated view of how product/service supply networks are being designed and deployed to meet the needs of a highly differentiated customer base.

MIS 692 Distribution and Logistics Management

The Distribution and Logistics Management course explores the strategic issues in order, transportation, and distribution management, including the provisioning of finished goods and services to meet planned or actual demand. The course covers in-depth Distribution and Logistics Principles; Customer Fulfillment; Product Lifecycle Management; Distribution and Logistics Processes; Information Systems; Future Trends; as well as, Regulatory and Import/Export Issues.

MIS 699 **Digital Innovation**

IT organizations must be able to leverage new technologies. This course focuses on how organizations can effectively and efficiently assess trends and emerging technologies in data and knowledge management, information networks, and analyzing and developing application systems. Students will learn how to help their organizations define, select, and adopt new information technologies.

MIS 710 Process Innovation and Management

This course focuses on the role of Information Technology (IT) in reengineering and enhancing key business processes. The implications for organizational structures and processes, as the result of increased opportunities to deploy information and streamline business systems, are covered. Cross-listed with: NIS 630

MIS 712 Advanced Business Process Management

The course addresses the techniques and concepts required to map, implement, automate, and evaluate business processes. Focusing on the technical and implementation aspects of Business Process Management, the course leads students from technical process design through the implementation and management of workflows to the structure of process-aware information systems. It discusses the distinction between business processes and business rules and outlines how they can be supported by technology. It details the technical structure of process-aware applications and provides an overview of technology standards that affect BPM systems. Modules on the run-time monitoring of processes and post-execution evaluation techniques complete this course. Prerequisites: MIS 501, MIS 620 Corequisite: MIS 710

MIS 714 Service Innovation

This course leads students through the identification, analysis, definition, and deployment of service opportunities within public and private organizations. Each of these phases is analyzed in detail to encompass the principal activities, methods, tools and techniques applied in the respective phase. Students will learn how to identify appropriate supporting techniques and information technologies for the different phases of the service life cycle, assess the role of technology, and gauge the organizational impact of service-focused operations. The objective of the course is to enable students to identify, implement and evaluate innovative service offerings in their organization.

MIS 722 Research Seminar: Business Process Management & Innovation

The course introduces PhD students to research areas surrounding the design, implementation, and improvement of organizational processes. The process-oriented analysis of organizations serves as a focal point for the integration of business requirements (in form of business processes) with technology capabilities (in form of process support systems). Research topics within the area of process innovation range from organization theory and workplace design to control theory and the formal representation of processes. Students will discuss seminal research papers in the individual course modules and develop a research paper of their own on a topic related to process innovation. Prerequisites: MIS 710 or permission of the instructor

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MIS 730 Integrating Information System Technologies

This course focuses on the issues surrounding the design of an overall Information Technology architecture. The traditional approach in organizations is to segment the problem into four areas - network, hardware, data, and applications. Instead, this course concentrates on the interdependencies among these architectures. In addition, this course will utilize management research on organizational integration and coordination. The student will learn how to design in the large, make appropriate choices about architecture in relationship to overall organization goals, understand the different mechanisms for coordination available, and create a process for establishing and maintaining an ongoing enterprise architecture. Cross-listed with: NIS 633 Prerequisites: MIS 620, MIS 630 MIS 640

MIS 760 Information Technology Strategy (3 - 3 - 0)

The objective of this course is to address the important question, "How does one improve the alignment of business and Information Technology strategies?" The course is designed for advanced graduate students. It provides the student with the most current approaches to deriving business and Information Technology strategies, while ensuring harmony among the organizations. Topics include business strategy, business infrastructure, IT strategy, strategic alignment, methods/metrics for building strategies, and achieving alignment. Cross-listed with: NIS 632 Prerequisites: MIS 750

MIS 800 Special Problems in MIS (MS)

With permission of the instructor. Limit of six credits for the degree of Master of Science. Cross-listed with: MGT 800

MIS 810 Special Topics in Management of Information Systems A participating seminar on topics of current interest and importance in Management of Information Systems.

MIS 900	Thesis in MIS (MS)	(1 to 12)
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For the degree of Master of Science. Six to 12 credits with departmental approval.

Management

MGT 103 Introduction to Entrepreneurial Thinking

Entrepreneurial thinking enables engineers to design value-added products and processes that delights the customer and creates a superior business model. This course teaches students a new way of problem solving, finding unique fit between a real-world problem and a new solution. Learning objectives include, tearning and leadership skills, obtaining information through customer discovery, enhancing presentation skills, and techniques for assessing a new idea; including customer and value analysis, competition analysis, and basic financial analysis. The course is taught in an interactive, immersive and experiential format through a hands-on project and computer simulation. In-class time is focused on active discussions, team activities and project presentations.

MGT 111 Social Psychology and Organizational Behaviour

Using an applied and experiential format, this course exposes students to theory, methods and research in organizational behavior and social psychology. Topics relating to individual differences and group dynamics in organizational settings are stressed. Learning occurs through discussion, group activities, and the completion of assessment instruments. Emphasis is on helping students understand and improve their skills in key areas, including decision-making, leadership, negotiation, and conflict resolution.

MGT 197 **Online Writing Tutorial**

Students who do not pass the written assessment in MGT198 will be required to take MGT197: Online Writing Tutorial for no cost and zero credit. Completion of all the online quizzes in the tutorial is sufficient to obtain a passing grade.

MGT 198 Writing Assessment

Written and oral communications training and assessment are conduction in conjunction with a required course in the BS in Business program. Students in this course are automatically enrolled in MGT198: Writing and Assessment Program. This online workshop carries zero credits and will not appear on the student's official transcript.

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MGT 199 Ethics Quiz

The ethics requirement is incorporated into the course work for a required course in the BS in Business program. Students are automatically enrolled into MGT199 - Ethics Workshop at no cost. This workshop carries zero credit and will not appear on the student's official transcript. Completion of all exercises and the survey associated with the Ethics Workshop is sufficient to satisfy the ethics requirement.

MGT 401 **MIS/DBMS/Networks**

This sequence develops the use of industry-standard personal productivity packages to develop reports and information in support of the key decision-making responsibilities of management. Advanced uses of the spreadsheet are developed. including the creation of aneffective business system using the spreadsheet's macro language. More complicated problems are approached using an industry-standard database management system. A course segment presents the integrated systems approach, including the use of local area networks (such as the campus-wide network) to solve complex business problems.

MGT 414 Entrepreneurship Practicum

This capstone course within the Entrepreneurship minor is designed to develop the content and presentation of the technical and business elements of students entrepreneurial business plans. Starting with the technical aspects of the design project, students are led through the components of a complete business plan, with instruction and practice in the writing and presentation of the plan. As a capstone exercise, students complete the course by presenting their business plans in an Elevator Pitch event at which venture capitalists and other investors rate the quality of student presentations and entrepreneurial business ideas.

Principles of Management MGT 458

Managerial decision-making and its impact on society are the central theme; emphasis is on the selection and implementation of corporate goals, measures of corporate performance and concepts of industrial regulations.

MGT 472 Assessment and Financing of Technical Business Opportunities (3 - 3 - 0)

You will be a member of a small learning group in which the dynamics of human behavior are learned through supervised experience. As the group develops, the basic principles of group interaction become apparent to you, as do your own contributions, emotions and motivations. With faculty guidance, and at the group's own initiative, group dynamics and interpersonal interaction on many levels are investigated.

MGT 546 Marketing Strategy

Every firm needs to devise and execute marketing strategies for their offerings to translate into customer value and profits based on an understanding of the consumer and the marketplace. This course is designed to give students an intensive and application-oriented look at how marketing strategy works in the real world. It will include examples and exercises of the role quantitative analysis plays in marketing strategy decisions. The emphasis of this course will be on cases, analysis, real life examples, and presentations.

MGT 548 **Consumer Behavior**

Marketing begins and ends with the consumer. The purpose of this course is to introduce students to the study of consumer behavior. This is an interdisciplinary course that integrates perspectives from marketing, psychology, sociology, anthropology, and economics in order to examine the elements of the consumer decision-making process and to enable formulation of marketing strategies. Students will take the perspective of a marketing manager who needs knowledge of consumer behavior in order to develop, evaluate and implement effective marketing strategies. The course integrates lectures, case analysis, and discussions to focus on the implications of social science concepts for marketing strategy.

MGT 606 Economics for Managers

This course introduces managers to the essence of business economics - the theories, concepts and ideas that form the economist's tool kit encompassing both the microeconomic and macroeconomic environments. Microeconomic topics include demand and supply, elasticity, consumer choice, production, cost, profit maximization, market structure, and game theory while the Macroeconomic topics will be GDP, inflation, unemployment, aggregate demand, aggregate supply, fiscal and monetary policies. In addition the basic concepts in international trade and finance will be discussed.

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MGT 609 Project Management Fundamentals

This course deals with the basic problems of managing a project, defined as a temporary organization built for the purpose of achieving a specific objective. Both operational and conceptual issues will be considered. Operational issues include definition, planning, implementation, control, and evaluation of the project. Conceptual issues include project management vs. hierarchical management, matrix organization, project authority, motivation, and morale. Cases will be used to illustrate problems in project management and how to resolve them. Cross-listed with: PME 609

MGT 610 Strategic Perspectives on Project Management

This course provides a theoretical perspective on project management for a better understanding of project implementation in modern organizations. The course is based on the premise that success in project leadership depends on a proper managerial style and attitude, and not on specific tools for planning and controlling. The course focuses on developing the manager's conceptual thinking and on building "the project manager's mind." The course helps managers see the entire project landscape and the long-term issues that are critical to project success. It will also address the organizational aspects of initiating and running the program. Prerequisites: MGT 609

MGT 611 Project Analytics

Formalized procedures, tools, and techniques used in conceptual and detailed planning of the project. Development of work breakdown structure as the foundation for project cost and project duration. Application of project data in monitoring the project progress and in formulating remedial actions in response to unexpected occurrences. Prerequisites: MGT 609

MGT 612 Leader Development

Project success depends, largely, on the human side.Success in motivating project workers, organizing and leading project teams, communication and sharing information, and conflict resolution, are just a few areas that are critical for project success. However, being primarily technical people, many project managers tend to neglect these "soft" issues, assuming they are less important or that they should be addressed by direct functional managers. The purpose of this course is to increase awareness of project managers to the critical issues of managing people and to present some of the theories and practices of leading project workers and teams.

MGT 613 Program Office and Portfolio Management

A comprehensive, all-inclusive description of the Project Management Office (PMO), highlighting features most appropriate and relevantto specific project situations. Motivations for adopting a PMO, such as project performance, project manager competency or the organizational desire to excel. Short-term and long-term functions are identified and discussed. Project evaluation models and PMO implementation guidelines are presented and discussed in detail. Prerequisite: MGT 614 Corequisite: MGT 611

MGT 614 Advanced Project Management

This course deals with advanced problems in project management that were not addressed in previous courses. It also expands on several previously mentioned topics. The course addresses the critical points in project management for the experienced project manager and looks at projects in their broad sense, as seen by top management and from an organizational global perspective. Prerequisite: MGT 609 Corequisite: MGT 610

MGT 616 Healthcare Leadership and Management

This course provides an overview of critical leadership and management applications and strategies unique to the healthcare industry, such as customer/patient analysis, criterion-based performance evaluation and TimeLine mapping. Current field dynamics of healthcare organizations are explored and instruction in essential management accountabilities directly relevant to the industry is presented comprehensively in both theory and practical application.

MGT 617 Project Quality Management

This course provides project managers with the framework, tools and approaches to meet the quality requirements of their projects and their customers, ensuring project success. Cross-listed with: ME 560

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MGT 619 Leading Across Projects

This course focuses on key leadership skills for addressing the complex challenges posed by program management, highlymatrixed environments and cross-national collaborations It's purpose is enhance individuals' abilities to develop others, strategically integrate efforts across groups, and drive change. The concepts presented are theory and research driven so that participants can deepen their conceptual understanding. At the same time, the course calls upon learners to address real-life challenges they face as program and or director level leaders. Each session presents effective techniques and uses experiential exercises or assignments to provide plenty of practice. The course also requires participants to further transfer learning to their workplaces through focused development planning and coaching support. Prerequisites: MGT 609, and MGT 612

MGT 620 Statistical Models

The major portion of the course covers an introduction to the probabilistic and statistical concepts and models used in dayto-day business decision-making. Topics include data analysis, correlational techniques, regression, statistical inference, and forecasting.

MGT 630 Global Business and Markets

There will be a review of probability and statistics as needed and then moves on to regression with a single regressor, multiple regression, the basics of functional form analysis, and the evaluation of regression studies. There will be a focus on using econometrics software in estimating econometrics models learned during the semester and interpreting the results. Cross-listed with: EMT 630 Prerequisites: MGT 699

MGT 635 Managerial Judgment and Decision-Making

Executives make decisions every day in the face of uncertainty. The objective of this course is to help students understand how decisions are made, why they are often less than optimal, and how decision-making can be improved. This course will contrast how managers do make decisions with how they should make decisions, by thinking about how "rational" decision makers should act, by conducting in-class exercises and examining empirical evidence of how individuals do act (often erroneously) in managerial situations. The course will include statistical tools for decision-making, as well as treatment of the psychological factors involved in making decisions. Cross-listed with: EMT 635

MGT 641 Marketing Management

The study of marketing principles from the conceptual, analytical, and managerial points of view. Topics include: strategic planning, market segmentation, product life-cycle, new product development, advertising and selling, pricing, distribution, governmental, and other environmental influences as these factors relate to markets and the business structure.

MGT 650 International Business Management

This course provides students with an exposure to management in the international economic environment: global industries and regional markets, multinational corporations and international economic organizations. Casestudies, business games and presentations illustrate different strategies of firms considering the competitive environment, the national culture, legislation and taxation policy of local governments, and the organizational structure of the firm.

MGT 657 Operations Management

Covers the general area of management of operations, both manufacturing and non-manufacturing. The focus of the course is on productivity and total quality management. Topics include quality control and quality management, systems of inventory control, work and materials scheduling, and process management.

MGT 663 Discovering and Exploiting Entrepreneurial Opportunities

In this course, students will evaluate and create their own prospective business strategies. They will develop an understanding of entrepreneurship and innovation in starting and growing a business venture. Students will be given an opportunity to actually start their own business or create a business in their company by learning how to take advantage of the new order of business opportunities of the information age. This course's main objective is to show students how to identify these opportunities, be able to formulate and evaluate both qualitatively and quantitatively whether the opportunity is worth pursuing, and, of course, how it may be pursued. Actual case studies and experiences will be intertwined with the course content. Cross-listed with: MIS 663

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Technology and Innovation Management MGT 671

Business Law

MGT 664

This course introduces the student to topics in the management of technology and examines the critical role of technology as a strategic resource to enable management to achieve organizational objectives. Topics include entrepreneurship, developing and managing new ventures, managing innovation, the technology life-cycle and technology forecasting, management of research and development (R&D) personnel and projects, evaluation of R&D projects, and integrating technology strategy with the organization's overall business strategy. Prerequisites: MGT 699

The course introduces students to the fundamental concepts and legal principles that they can expect to encounter in various roles as managers/professionals in public and private companies, consultants and/or entrepreneurs, together with the ethical criteria, moral values and social norms in the environments they will face. The course will cover the American judicial system, international law in a global economy, ethics and business decision making, and different forms of business structure, contracts, business torts, products liability, insurance, employment law, criminal law and the recent Dodd-Frank

MGT 672 Realizing Value from Intellectual Property

Wall Street Reform & Consumer Protection Act. Cross-listed with: EMT 664

This course examines the valuation, patenting, and licensing of early-stage technology as a means to exploit innovation. By understanding technology to be a negotiable asset for the firm, we take a fundamentally different approach than venture capital models, which focus on the enterprise, rather than the commercialization of technology itself. Accordingly, we study the economics and theory of intellectual property; valuation of intangible assets; IP agreements and protection regimes; negotiations and trading techniques; and licensing and litigation strategies. Prerequisites: MGT 671

MGT 673 **Global Innovation Mangement**

This course is focused on the globalization paradigm and its effects on the management of innovation. It is an interdisciplinary course, which analyzes the different managerial areas of strategy, organization, technology, and market as integrated with the innovation process in a global context. The underlying theories and models are explored to understand how the innovation process is affected by local, national, and global influences; what cultural and organizational drivers are at work; and how to manage commercialization of new products on a life-cycle basis, in a diverse and ever-changing global market. Case studies will be used to support the theoretical constructs and reinforce learning. Prerequisites: MGT 671

MGT 675 New Product and Service Innovation

This course provides students with the most current theories of innovation when organizations create new tangible products and intangible services. From team and organizational processes, to the evolving portfolio, the innovating enterprise competes on the basis of change. By building upon material covered in Technology Innovation Management (MGT 671), this course will deepen students' knowledge of the innovation process in the enterprise and will pay special attention to service industries. The course will be taught with lectures and real-world cases. Upon completion, students will have enhanced their knowledge of the innovative enterprise and increased their practical skills for careers in technology management. Prerequisites: MGT 671

MGT 677 **Emerging Technologies**

This course discusses emerging technologies, how they evolve, how to identify them, and the effect of international, political, social, economic, and cultural factors on them. Topics covered in the course include accuracy of past technology forecasts, how to improve them, international perspectives on emerging technologies, future customer trends, and forecasting methodologies such as monitoring, expert opinion, trend analysis, and scenario construction. Emerging technologies will be examined through student company examples, invited speakers, and videos. Cross-listed with: EMT 677

MGT 681 Pharmaceutical Industry New Drug Development

This course provides an overview of the drug and biologics development process from discovery through regulatory approval. Special attention is given to the roles, functions, and importance of the various disciplines involved in the R&D process, their interactions with each other, and the strategic management of these functions. Attention will also be given to key technologies used throughout the R&D process. The economics of pharmaceutical R&D, as well as trends in licensing, outsourcing, and partnerships will be covered. The student will gain an understanding of R&D strategy and the relationship between R&D and sales, marketing, and manufacturing.

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MGT 682 Pharmaceutical Industry Marketing and Sales

This course addresses the business issues, management activities and technologies pertaining to the management of the modern pharmaceutical supply chain. This includes all components of the drug development life cycle starting from the sourcing of materials needed to support pharmaceutical R&D, and ending with the distribution of drugs to retail pharmacies and physicians. The course focuses on the organizational, management and information technology issues and considerations related to the logistics-related activities of the pharmaceutical industry which are comprised of sales, marketing and supply chain management related functions.

MGT 686 Pharmaceutical Industry Trends and Issues

The course will provide an overall look at IT in the pharmaceutical industry, its structure, and trends and issues which have driven it, are affecting it now, and are likely to change it in the future. This course will focus on the business forces shaping the pharmaceutical industry. In addition, this course will use management research on the integration of IT with the business. The student will learn how to evaluate important business trends and how IT can be used to support business success. Topics include a pharmaceutical industry overview, regulatory compliance, new drug development, manufacturing and logistics, product marketing, the role of IT in the pharmaceutical industry, company strategies, e-pharma, and 21st century pharmaceutical-market future trends. Cross-listed with: MIS 671

MGT 687 Pharmaceutical Industry Supply Chain

This course focuses on the issues surrounding supply chain design, planning, and execution for the pharmaceutical and biotech industries from drug discovery to delivery. This course will use research on information systems, optimization, e-business, and decision-support technologies and lessons learned from their effective use in global supply chain management for manufacturing and distribution in the process industries. Students will learn how to evaluate global supply chain issues from the perspectives of various stakeholders in relationship to overall organization and societal goals. They will further understand the different mechanisms for collaboration and create a process for establishing and maintaining an effective global SCM solution architecture. Topics include good manufacturing practice and regulations, advanced planning and scheduling, global competition, mergers and acquisitions, innovation, new tools and partnerships, effective global supply chain management, and qualifying for a global supply chain manager position. Cross-listed with: MIS 673

MGT 689 Organizational Behavior and Design

This course exposes students to the macro and micro aspects of organizational behavior and theory that are essential to technology management. The macro aspects will focus on structural contingency theory as an approach to effective organizational design. The micro aspects will focus on leadership, teams, and individual behavior (e.g., motivation, job attitudes). Specific issues and problems which are covered include: the relationship of the organization with the external environment, the influence of the organization's strategies, culture, size, and production technology on the organization's design, and strategies for managing organizational processes such as teams, conflict, power/politics and organizational change. Current topics, that are key to technology management (e.g., virtual teams), will be stressed.

MGT 695 Leading Creative Collaboration

Innovative organizations are led by people who relentlessly nurture creative collaborations. These leaders stimulate imagination, teach others how to turn imagination into creativity, and build group structures and processes to enable people to turn creative ideas into innovations that drive business results. This course builds individual awareness of creativity and collaboration skills while increasing the student's capacity for both. It teaches the science behind techniques, tools, interpersonal skills, leadership skills, organizational strategies, and environmental designs that increase group effectiveness. The overall goal is to strengthen the student's ability to lead others to address meaningful problems and possibilities wherever they may be found. Cross-listed with: EMT 695

MGT 696 Human-Centered Design Thinking

This course deals with the theory and methods associated with design thinking, a problem-solving protocol that spurs innovation and solves complex problems. Design thinking involves a unique form of inquiry which goes well beyond product and service design. Students will develop an appreciation for design and develop skills for studying design systems. These concepts and methods have wide applicability as they can be used to design organizations of people, information structures, compensation systems as well as the entire consumer experience. Applying these approaches can often create entirely new systems that are more useful and usable. The logic of this approach can sometimes solve "wicked problems" which have defied previous solutions. Cross-listed with: EMT 696

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MGT 699 Strategic Management

An interdisciplinary course which examines the elements of, and the framework for, developing and implementing organizational strategy and policy in competitive environments. The course analyzes management problems both from a technical-economic perspective and from a behavioral perspective. Topics treated include: assessment of organizational strengths and weaknesses, threats, and opportunities; sources of competitive advantage; organizational structure and strategic planning; and leadership, organizational development, and total quality management. The case method of instruction is used extensively in this course. Prerequisites: MGT 600

MGT 700 Econometrics

An introduction to the science of designing statistical models of economic processes. Students will be required to build and estimate a number of models during the term. Topics include: regression theory, statistical difficulties in regression analysis, advanced topics in single-equation regression, models of qualitative choice (such as, probit, logit), and simultaneous equation estimation. Prerequisites: MGT 503

MGT 701 MGT Co-Op Education Project

This course is for MGT graduate students who are on Co-Op assignment.

MGT 702 **Curricular Practical Training**

This course involves an educationally relevant, practical assignment that augments the academic content of the student's program. Students engage in a project in a company project related to the focus of their academic program. The project is conducted under the supervision of a faculty advisor and an industry mentor. During the semester, the student must submit written progress reports and at the end of the semester, a detailed written report that describes his/her activities and knowledge gained during that semester. This is a one-credit course that may be repeated up to a total of three credits. With approval of the Program Director and faculty supervisor, students may also take this course for three credits in one semester.

MGT 711 PhD Seminar in Entrepreneurship Theory

This course is a Ph.D. seminar course in entrepreneurship. Research on the performance of entrepreneurial new ventures will be analyzed from a theoretical perspective. Relevant studies will be drawn from the economics, management science, and strategic management literatures dealing with entrepreneurship. Emphasis will be placed on the strategic management and competitive environments of new ventures in their early development stages, and topics will be discussed in relation to theoretical concepts in technology and innovation management.

MGT 718 Multivariate Analysis

Experimental design, statistical estimation, and hypothesis testing from multivariate distributions. Topics covered will include regression models, multivariate analysis of variance, canonical correlations, classification procedures, and factor analysis. Computer applications of these techniques will be examined. Cross-listed with: SYS 718

MGT 719 **Research Design**

Research philosophy, ethics, and methodology will be discussed. Each student will, under the guidance of the instructor, formulate a problem, search the literature, and develop a research design. In addition, the student will examine and criticize research reports with special emphasis on the statement of the problem, the sampling and measuring techniques that are used, and the analyses and interpretation of the data. Emphasis is on applying research methodology to real-world organizational problems.

MGT 721 Qualitative Research Methods

This course is designed to develop the doctoral student's knowledge about a range of qualitative research approaches currently used to conduct management research. Methodological readings authored by social scientists and management researchers on ontological and epistemological assumptions underlying positivist, interpretive, and critical approaches will be examined. Empirical research published in leading journals using case study, action research, ethnography, grounded theory, and other methods will be assessed based on established criteria with the goal of preparing students to conduct and evaluate qualitative research. Students will acquire skills in qualitative research design, data generation, and data analysis techniques through readings, written critiques, and seminar discussions, as well as participation in a qualitative research study. Prerequisites: MGT 719

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MGT 730 Design and Analysis of Experiments

This course starts with the design and analysis of one factor analysis of variance. Methods of testing specific questions using planned comparisons are stressed. Models with two or more factors are considered with detailed instruction on the analysis of interactions. Repeated-measures designs are also covered, as well as designs with random and fixed factors. Prerequisites: MGT 620

MGT 734 Design Science Research Seminar

In this graduate Ph.D. seminar, we will actively explore design science. We will read the existing literature and write our own papers. As part of this, we will run simulations and design new mechanisms and interfaces. The end result of the course will be the production of models: simulations that represent social and technical phenomena - and a paper, authored individually or jointly, suitable for publication.

MGT 735 Economic Foundations of Management Research

This course focuses on developing theoretical knowledge and understanding of economic concepts related to decisionmaking, consumer behavior, and competitive strategy. It introduces the methods and techniques for analyzing economic activities. It aims to improve the understanding of managerial decision-making processes by presenting analytic tools by examining the principal theories of decision-making and strategic behavior.

MGT 753 Theory in Management Research

This course introduces students to the relevant management and organizational theories used in management research, including their origins, substance and significance to the effective conduct of research. In addition, students are expected to develop the capacity to identify and apply theories to the study of specific management phenomena.

MGT 769 Colloguia Series Research Seminar

This course is designed to provide doctoral students with an in-depth knowledge about the research process in technology management and related disciplines. The course content includes assigned readings about conducting academic research in general, as well as assigned readings related to public Howe School research colloquium presentations by different guest speakers during the course of the semester. Students will prepare for the presentation by reading the assigned papers and writing up a set of questions to be posed during the discussion with the presenter, which will take place after the presentation. Each semester there will be six or seven guest speakers who will formally present their research during the first hour of the seminar. After the talk, guest speakers will discuss issues related to conducting research with doctoral students. In the weeks without guest speakers, students discuss assigned readings related to conducting academic research with other class members.

MGT 786 Social Network Analysis Research Seminar

This course addresses concepts and theories of social networks and social network analysis. Core concepts include representations and models of networks, basic descriptive statistics at the individual and network level, and standard models of network formation. The course also covers more advanced topics in network theory, including community detection, processes over networks such as contagion and influence, and models of dynamic networks.

MGT 787 Statistical Learning and Analytics Research Seminar

The significant amount of corporate information available requires a systematic and analytical approach to select the most important information and anticipate major events. Statistical learning algorithms facilitate this process understanding, modeling and forecasting the behavior of major corporate variables.

MGT 798 Integration and Application of Technology Management (3 - 3 - 0)

This is the capstone course for the program. It is designed to integrate the knowledge developed in the other courses via a business simulation in which teams of students compete in running their companies in a complex simulated environment. The course includes lectures and workshops that demonstrate theory and techniques of cross-functional decision making in the management of technology. Individuals and teams will be observed and assessment feedback will be given. Cross-listed with: EMT 798 Prerequisites: MGT 600, and MGT 623, and MGT 641, and MGT 657, and MGT 699

MGT 800 Special Problems in Management (MS)

With permission of the instructor. Limit of six credits for the degree of Master of Science. Cross-listed with: MIS 800

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MGT 801 Special Problems in Mangement (PhD)

With permission of the instructor. Limit of six credits for the degree of Doctor of Philosophy.

MGT 802 Project Management Examination

This will test the project management knowledge of students who have completed approved training programs in project management. Upon successful completion, (graded pass/fail) students will be awarded 12 credits toward the Master of Science in management with a Project Management concentration. The 9 credits cannot be used toward the Project Management Graduate Certificate of Special Study and are not transferable to other institutions.

MGT 803 **Project Management Examination**

This will test the project management knowledge of students from AT&T, Lucent Technologies and Verizon who have completed company-sponsored project management courses. Upon successful completion, (graded pass/fail) students will be awarded three credits towards a Master of Science degree. The examination is normally given twice each year.

MGT 810 Special Topics in Management

A participating seminar on topics of current interest and importance in Management.

MGT 898 Written Communications

Written and oral communications training and assessment are conducted in this online workshop which carries zero credit and will not appear on the student's official transcript. All full-time graduate students are required to take MGT898. To this end, students in certain required graduate courses are automatically enrolled in MGT 898. Students who do not pass the written assessment will be required to take MGT 897: Online Writing Tutorial.

MGT 899 Ethics Quiz

All graduate students in the School of Business must participate in an online ethics workshop in order to graduate. The ethics requirement is part of the course work for MGT 609 - Introduction to Project Management. Students who are enrolled in MGT 609 are automatically enrolled in MGT 899 - Ethics Workshop at no cost. This workshop carries zero credit and will not appear on the student's official transcript. Completion of all exercises associated with the Ethics Workshop is sufficient to satisfy the ethics requirement. This course is required for all students who enrolled in the fall semester 2010 or later.

MGT 900	Thesis in Management (MS)	(1 to 12)
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For the degree of Master of Science. Hours and credits to be arranged.

MGT 960 Research in Management (PhD)

Original research leading to a doctoral dissertation. Hours and credits to be arranged.

MIS 702 Curricular Practical Training

This course involves an educationally relevant, practical assignment that augments the academic content of the student's program. Students engage in a project in a company project related to the focus of their academic program. The project is conducted under the supervision of a faculty advisor and an industry mentor. During the semester, the student must submit written progress reports and at the end of the semester, a detailed written report that describes his/her activities and knowledge gained during that semester. This is a one-credit course that may be repeated up to a total of three credits. With approval of the Program Director and faculty supervisor, students may also take this course for three credits in one semester.

Quantitative Finance

QF 101 **Quantitative Finance** This is the 1st Spine Course in the Quantitative Finance program. The course objective is to introduce students to the basics of business, finance, and the capital markets as a foundation for subsequent Spine Courses. There is no pre-requisite, and no prior knowledge of business or finance topics is assumed.

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of simple valuation metrics. Third, students will examine the more prominent types of business models in the financial industry, including commercial banks, investment banks, asset managers and other financial service companies. Prerequisites: QF 101

Basic Financial Tools

QF 102

QF 103 Introduction to Financial Tools and Technology

The course will introduce students to the Bloomberg terminal, from technical analysis to fundamental analysis. Students will also learn how to retrieve historical data from Bloomberg and analyze that data in the SAS statistical program. The course arms the students with skill-sets typically learned on the job.

methods of creating and managing investment portfolios. This involves understanding basic concepts of portfolio construction, integrating investment decisions across multiple positions and asset categories. A Secondary objective is to expand the student's familiarity with the sources and formats of the standard financial reports prepared by public companies in the United States, and to allow students to gain experience in accessing and using publicly available financial information. In addition, students will continue to gain experience with the use of real-time market information on traded securities and the application

QF 104 Data Management in R

Objective of this course is to provide students with formal training on various advanced skills in R, students will be pre-loaded with these skills prior to entering the workplace. After taking this course, students will be able to understand 1) advanced R, 2) how to read/write financial data to/from SQL and noSQL databases, 3) basic regression techniques, and 4) how to construct and run off-the-shelf machine learning algorithms. This lab session will employ a lecture followed by in-class exercises based on material from the lecture.

QF 112 **Statistics**

This course provides students with an understanding of the use of statistical methods as applied to business problems, in general, and to marketing research applications in particular. Topics include: descriptive statistics; probability theory, discrete and continuous probability distributions; sampling theory and sampling distributions; interval estimation; hypothesis testing; statistical inference about means, proportions, and variances; tests of goodness-of-fit and independence; analysis of variance and experimental design; simple and multiple regression; correlation analysis.

QF 197 **Online Writing Tutorial**

Students who do not pass the written assessment in QF198 will be required to take QF197: Online Writing Tutorial for no cost and zero credit. Completion of all the online quizzes in the tutorial is sufficient to obtain a passing grade.

QF 198 Writing Assessment

Written and oral communications training and assessment are conduction in conjunction with a required course in the BS in Business program. Students in this course are automatically enrolled in QF198: Writing and Assessment Program. This online workshop carries zero credits and will not appear on the student's official transcript.

QF 199 Ethics Quiz

The ethics requirement is incorporated into the course work for a required course in the BS in Business program. Students are automatically enrolled into QF199 - Ethics Workshop at no cost. This workshop carries zero credit and will not appear on the student's official transcript. Completion of all exercises and the survey associated with the Ethics Workshop is sufficient to satisfy the ethics requirement.

QF 200 **Financial Ecomometrics**

Econometrics, literally "economic measurement," is a branch of economics that attempts to quantify theoretical relationships. This course will have both a theoretical and applied econometrics components. There will be a focus on using econometrics software in estimating econometrics models learned during the semester and interpreting the results. There will be a review of probability and statistics as needed and then moves on to regression with a single regressor, multiple regression, the basics of functional form analysis, and the evaluation of regression studies. There will be a focus on using econometrics software in estimating econometrics models learned during the semester and interpreting the results. Prerequisites: BT 221 or MA 221 or QF 112

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(3 - 3 - 1)This is the 2nd Spine Course in the Quantitative Finance program. The course objective is to familiarize students with the

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QF 202 **Financial Time Series**

Students will study the application of quantitative methods to the field of finance, including investment theory and risk management. Among topics covered will be regression analysis, building asset/business cash flow models of a business, sensitivity analysis, value at risk (VAR) models, probability transition matrices and stochastic difference equations (SDE's). Prerequisite: QF 200

QF 301 Advanced Time Series Analytics and Maching Learning

This course will cover the main topics of the analysis of time series to evaluate risk and return of the main products of capital markets (equity, fixed income, and derivatives). Students will work with historical databases, conduct their own analysis, and test trading strategies based on the techniques reviewed during the class. Prerequisites: QF 202, QF 112, and MA 331 or MGT 620

QF 302 Financial Market Microstructure and Trading

This course will offer students an understanding of the main micro-structural features of financial markets, and the opportunity to test and practice different trading strategies. The course concentrates on the operations of exchanges, trading systems and broker/dealer intermediaries. Students will have a high level view of the trading decision process, market structure design, and market structure regulation. The course is based on computer simulations that recreate a trading environment and the typical challenges faced by professional traders.

QF 401 Senior Design I

Senior Design Project is a two-semester experience beginning with QF401 and progressing to QF 402. The goal of the course is to provide you with basic skills for successfully performing high-quality research in finance and to help you choose a research topic to work on. The course will include both formal training sessions, on various aspects of research in finance, and an actual research project completed by students. This course is designed to better prepare students for their transition into the professional work environment by completing a project, which allows students to put into practice concepts they have learned during their studies at Stevens. In many cases, the project will include doing research on a relevant finance topic.

QF 402 Senior Design II

Senior Design Project is a two-semester experience beginning with QF401 and progressing to QF 402. The goal of the course is to provide you with basic skills for successfully performing high-quality research in finance and to help you choose a research topic to work on. The course will include both formal training sessions, on various aspects of research in finance, and an actual research project completed by students. This course is designed to better prepare students for their transition into the professional work environment by completing a project, which allows students to put into practice concepts they have learned during their studies at Stevens. In many cases, the project will include doing research on a relevant finance topic.

QF 427 Investment Practicum I

The Stevens Investment Practicum is a student managed investment fund (SMIF) staffed by enrolled students and advised by faculty/staff advisory committee. The practicum is intended to be an advanced course for QF and BT and possibly other students considering the pursuit of an investment management career. Prerequisite: BT 321

QF 428 Investment Practicum II

The Stevens Investment Practicum is a student managed investment fund (SMIF) staffed by enrolled students and advised by faculty/staff advisory committee. The practicum is intended to be an advanced course for QF and BT and possibly other students considering the pursuit of an investment management career. Prerequisites: BT 321, and QF 427

QF 430 Introduction to Derivatives

This is a course on the fundamentals of financial derivatives, covering the basic properties and the pricing fundamentals of futures, options and swaps. It also explores trading and hedging strategies involving financial derivatives. Finally, time permitting special topics such as exotic options and credit derivatives are explored. The course provides the foundation of financial derivatives and lays the ground for a rigorous risk management course and other advanced quantitative courses, such as stochastic finance. It also provides students with some of the knowledge required for the CME competition and the CFA examination. Prerequisites: BT 425

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TM 550 Introduction to Telecommunications Concepts

This course sets the foundation for courses that are to follow, covering concepts and major technologies of the telecommunications industry. Telecommunications regulations, end-to-end service, and historical events are stressed. This course is open to Telecommunications majors only and is intended for students with a minimal telecommunications background.

TM 584 Wireless Systems Security

Wireless systems and their unique vulnerabilities to attack; system security issues in the context of wireless systems, including satellite, terrestrial microwave, military tactical communications, public safety, cellular, and wireless LAN networks; security topics: confidentiality/privacy, integrity, availability, and control of fraudulent usage of networks. Issues addressed include jamming, interception, and means to avoid them. Case studies and student projects are an important component of the course. Cross-listed with: NIS 584, EE 584

Wireless Networking: Architecture, Protocols and Standards TM 586 (3 - 0 - 0)

This course addresses the fundamentals of wireless networking, including architectures, protocols, and standards. It describes concepts, technology, and applications of wireless networking as used in current and next-generation wireless networks. It explains the engineering aspects of network functions and designs. Issues such as mobility management, wireless enterprise networks, GSM, network signaling, WAP, mobile IP, and 3G systems are covered. Cross-listed with: EE 586, NIS 586

TM 601 Principles of Applied Telecommunications Technology

This comprehensive course provides an introduction to voice and data networking. The course begins with an overview of sample wide-area and local-area network architectures and provides an introductory discussion on the role and importance of the TCP/IP protocol architecture. The relationship between bandwidth, passband, signaling rate, and data rate is then presented and examined. Different signaling techniques are compared, the operations of selected analog and digital modulation techniques are examined, and PCM and related techniques to digitally encode analog information are studied. We describe the operation of cyclic redundancy codes in error detection and discuss the importance of channel coding rate and coding gain in system operation. The function and service of data link protocols in network architecture is examined. Both frequency and time division multiplexing are described and their operation is compared. The course concludes with an examination of mobile wireless networks. Prerequisite: Knowledge of fundamental algebraic problem solving is a must.

TM 605 Probability for Telecommunications Managers

This course provides a background in probability and stochastic processes necessary for the analysis of telecommunications systems. Topics include: axioms of probability, combinatorial methods, discrete and continuous random variables, expectation, Poisson processes, birth-death processes, and Markov processes. Cross-listed with: NIS 505

580

Network and Communication Management and Services

Calculus for Telecommunications Managers TM 500

The goal of this course is to provide students with the background in calculus necessary for the telecommunications curriculum. Topics covered include review of algebra, coordinates in the plane and functions, differentiation, series, geometric series and exponential series, elements of counting, illustrations of the material on discrete distributions, z-transform, integration of simple functions, integrals over the entire line and basic probability densities. The eleven topics listed can be expanded or contracted depending on how students react to the material. E.g. the topic of functions of two variables can be changed by emphasizing discrete functions and their relationship to joint distributions. Some topics (e.g. coordinates in the plane and functions) may require two sessions. However, it is planned to cover the entire material in 13 sessions.

price out derivative instruments learned throughout the quantitative finance curriculum. Prerequisite: CS385

QF 465 C++ for Finance

(3 - 3 - 0)C++ is the main program used in the financial industry because of its efficiency and object oriented structure that facilitates the development of specialized financial libraries. The course will extend the students' knowledge base, learned in QF365, and move them further into C++ object oriented programming through the use of design patterns and expose them how to

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