Master of Science in Business Analytics

2 - Required Professional Development & Career Workshops:

MGMT 7770 Prof. Development Workshop 1/Career Workshops

The PDW sequence is designed to develop the professional skills of students in the MS Programs that are needed to be a successful contributor in a business setting. PDW I follows a framework of Leadership, Followership, and Membership in a professional community. Students will gain practical experience through exposure to experts in specific skill areas, role-play and practice sessions, and exercise completions. The fall semester concentrates on individual skills development in presentation, communication and networking. Additionally, membership in one's professional community will be emphasized through engagement in two activities specific to the student's MS Program. Building on the skills and abilities obtained earlier in your career, this PDW is geared toward a higher level of professionalism inherent in a successful business environment.

MGMT 7780 Prof. Development Workshop 2/Career Workshops

The PDW sequence is designed to develop the professional skills of students in the MS Programs that are needed to be a successful contributor in a business setting. The PDW II will continue to follow a framework of Leadership, Followership and Membership in a professional community. Students will gain practical experience through exposure to experts in specific skill areas, role-play and practice sessions, and exercise completions. The second semester emphasizes developing influence skills, understanding and shaping group dynamics, and navigating organizational politics. Additionally, membership in one's professional community will be emphasized through engagement in four hours of activities specific to the student's M.S. program.

3 - Required Business Core:

MGMT 6100 Statistics for Managerial Decision Making

* Can be waived through waiver test. Must be replaced with Advanced Statistics or analytics class, such as CSCI 6360, ECON 6570, or ISYE 6961. *

This course develops an understanding of concepts in business statistics and focuses on application of concepts in problem-solving situations. In particular, students learn to present and describe data, analyze probability distributions, make statistical inferences based on data samples, and develop basic models for prediction and forecasting.

MGMT 6190 Introduction to Accounting and Financial Management

* Can be waived and replaced with advanced finance such as MGMT6020, MGMT 6510, MGMT 6520, MGMT7760 or an advanced management class by approval. *

This course introduces accounting and financial management to first-semester M.S. students. The interpretation and preparation of basic financial statements such as the balance sheet and income statement are introduced along with relevant regulation and practice. In addition, the course introduces the student to basic financial concepts and techniques such as time value, risk, equilibrium asset pricing models, capital budgeting, cost of capital, and capital structure and discusses their applications in practice.

MGMT 6140 Information Systems for Management

Analyzes the use of information and communications technology to improve performance and to achieve organizational goals. Examines information systems in sales, marketing, finance, and operations. Provides a framework for understanding and evaluating IS contributions to product services and managerial effectiveness. Focuses upon implementation of information technology as a strategic weapon for productivity and competitive advantage. Lectures, case discussion, projects, and technical supplements.

5 – Required Analytics Core:

MGMT 6560 Technology Fundamentals for Analytics

The widespread proliferation of IT-influenced economic activity leaves behind a rich trail of micro-level data, enabling organizations to use analytics and experimentation in both strategy and operations. This course provides a hands-on introduction to the concepts, methods and processes of business analytics. Students will learn how to obtain data and draw business inferences from data by asking the right questions and using the appropriate tools.

MGMT 6460 Advanced Quantitative Methods for Business

This course is designed to provide the student with an understanding of how quantitative models, methods, algorithms, and computational techniques can be used to solve both services and manufacturing enterprise problems. Students will investigate how to apply optimization methods using a hands-on implementation approach.

MGMT 6570 Advanced Data Resource Management

The primary objective of this course is to introduce the multifaceted role of data as a resource of the organization, in three ways. First, it examines the role of data at the operational, tactical, and strategic levels of the organization. Second, it provides students with knowledge and hands on training of technologies that manipulate data, including structured query language (SQL), extraction transformation and loading tools (ETL), data warehousing (DW), online analytical processing (OLAP), and data mining (DM). The course exposes students to big data management techniques. Finally, the course provides students the theory and hands on training to understand the transformation of data to information.

MGMT 6790 Business Analytics Capstone

This course provides students with an opportunity to work on real business analytics problems with a company. Students work in small consultant teams with a client and adviser(s) to develop solutions that will be put to use by the client to achieve significant business benefits. Student teams develop their analysis and recommendations and complete the project with the delivery of a final report and presentation to the client senior management.

And <u>one</u> of the three following classes (you can still take the other two as electives):

CSCI 6390 Data Mining

This course will provide an introductory survey of the main topics in data mining and knowledge discovery in databases (KDD), including classification, clustering, association rules, sequence mining, similarity search, deviation detection, and so on. Emphasis will be on the algorithmic and system issues in KDD, as well as on applications such as Web mining, multimedia mining, bioinformatics, geographical information systems, etc. Students cannot receive credit for both CSCI 4390 and CSCI 6390.

MGMT 6160 Applied Analytics and Predictive Modeling

Business analytics enables organizations to leverage large volumes of data in order to make more informed decisions. It encompasses a range of approaches to integrating, organizing, and applying data in various settings. This course develops an understanding of concepts in business analytics and data manipulation. In particular, through hands-on experience with a range of techniques students will learn to work with large data sets, analyze trends and segments and develop models for prediction and forecasting. This course is part of the Masters program in Business Analytics and builds on foundations learned in the Fall semester.

ITWS 6600 Data Analytics

The world at-large is confronted with increasingly larger and complex sets of structured/unstructured information; from cyber and human sources. Traditional enterprises are moving toward analytics-driven approaches for core business functions. Data and information analytics extends analysis (descriptive models of data) by using data mining and machine learning methods, with optimization and validation, to recommend action or guide and communicate decision-making. Thus, analytics is an entire methodology rather then individual analyses or analysis steps.

2 Electives:

Fall Courses

CSCI 6100 Machine Learning from Data

Introduction to the theory, algorithms, and applications of machine learning (supervised, reinforcement, and unsupervised) from data: What is learning? Is learning feasible? How can we do it? How can we do it well? The course offers a mix of theory, technique, and application with additional selected topics chosen from Pattern Recognition, Decision Trees, Neural Networks, RBF's, Bayesian Learning, PAC Learning, Support Vector Machines, Gaussian processes, and Hidden Markov Models. Students cannot receive credit for both CSCI 4100 and CSCI 6100.

CSCI 6250 Frontiers of Network Science

This course will offer an introduction to network science and a review of current research in this area. Classes will interchangeably present chapters from the textbook and related current research. The emphasis will be on the mathematical background of network science: graphs and networks; random networks and various types of scale-free networks; network properties such as assortativity, mobility, robustness, social networks, and communities; and dynamics of spreading in networks. Students cannot receive credit for both CSCI 4250 and CSCI 6250.

CSCI 6390 Data Mining

This course will provide an introductory survey of the main topics in data mining and knowledge discovery in databases (KDD), including classification, clustering, association rules, sequence mining, similarity search, deviation detection, and so on. Emphasis will be on the algorithmic and system issues in KDD, as well as on applications such as Web mining, multimedia mining, bioinformatics, geographical information systems, etc. Students cannot receive credit for both CSCI 4390 and CSCI 6390.

CSCI 6962 Natural Language Processing

This course will introduce state-of-the-art Natural Language Processing (NLP) methods in the last decade. The instructor will cover 15 popular research topics, and select the best-cited and most up-to-date papers for each topic, along with some popular machine learning methods for NLP. The instructor will present a deep survey for each topic. In addition, some practical experiments (implementation of a method or applying some machine learning toolkits to solve a problem) will be conducted based on a series of powerful platforms and techniques. The assignments will involve linguistics, math, and careful thinking. At the end of the course each student should be able to gain enough background to understand the fundamental NLP techniques.

ISYE 6961 Data Analytics Research Lab

This course focuses on applied data analytics research on real-world open problems. Students will conduct a semester long, team based, hands-on data analytics project. A data set will be selected at the start of the semester from a collection of projects supplied by on- and/or off-campus clients. The client will provide project and data set background and assist in objective setting. Alternatively, a student and/or team may bring a data set and problem with them. This is expected to be useful for graduate students with their advisor and/or research collaborators being the clients. Students will actively engage in the process of transforming knowledge to data, gaining experience applying data analytic methods learned in prior courses.   Students will also be instructed in the process of project objective setting, planning, and management. They will conduct their project based on goals agreed upon with the project client, and a workflow they develop to attain these goals. Students will be guided via classroom demonstrations and individualized team coaching by the instructors in the employment of visualization, analytics and modeling methods. The demonstrations will be done in the R data analytics environment and will involve the use of R routines, external packages, script building and the use of pre-built scripts provided by the instructors. An R 'boot camp' will be held at the beginning of the semester to get those unfamiliar with the environment started. Students will be encouraged to use R, but this will not be required.

ECON 6560 Introduction to Econometrics - Mon. & Thurs. 12-1:50pm

This course is an introduction to econometric data analysis. The statistical methods covered enable analysis of relationships between variables in data, with special attention to identification of true causal effects. Topics covered include linear and simple nonlinear regression models, internal and external validity, methods for panel data and binary dependent variables, instrumental variables methods, use of experimental and quasi-experimental data, and basic time series methods. The course includes hands-on data analysis and report writing.

MGMT 7030 Strategy, Technology and Competition - Fri. 3-5:50pm

This course covers the fundamentals of business and corporate strategy, integrating these concepts into an environment of technological change, competition, and entrepreneurship. The course includes the following areas of emphasis: concepts of strategy, industry environment, resources and capabilities of the firm, organization and systems of the firm, the dynamics of competitive advantage, strategic alternative analysis, and strategies in different contexts. The course uses business cases and a project to enrich the theoretical concepts.

STSS 4962 Critical Data Mapping

MGMT 6020 Financial Management I

The purpose of this course is to develop a working understanding of the major investment and financial decisions of the firm. Emphasis will be placed upon identifying and solving the problems commonly faced by financial managers. The course presents the needed theory and develops financial problem solving skills through individualized problem solving, structured case analysis, and industry and company analysis using Internet sources.

MGMT6510 Financial Computation

This course introduces computational techniques for financial analysis, with foci on risk, hedging and portfolio techniques, fixed income instruments, and derivatives analysis. The course covers computational techniques for portfolio optimization, plain vanilla and exotic derivatives valuation and replication, along with interest rate and fixed income instruments. This course will introduce numerical analysis, interpolation, Monte Carlo and finite difference methods, lattices, linear and dynamic programming, optimization and MATLAB, all in a financial computational context.

MGMT 6520 Financial Modeling

This course introduces quantitative analysis for financial markets and instruments. The course covers applications of linear math to hedging and valuation, applications of calculus to valuation and risk analysis, introduces differential equations and their applications to hedging and valuation and introduces stochastic processes in a financial markets context. Course coverage will also extend to portfolio analysis and standard equilibrium asset pricing models.

MGMT 7760 Risk Management - Thurs. 6-8:50pm

Overview of risk management and the concept and measurement of risk; types of risks (market, credit, liquidity, operational, business, strategic). Concepts, tools, and instruments available for risk management. Specific issues related with managing specific risk types — market, credit, interest rates, liquidity, risk and operational risk. Securitization, asset-liability management. Concepts underlying insurance and role of insurance for risk management.

Spring Courses

CSCI 6370 Data and Society

Data and Society provides a broad overview of how society is leveraging and responding to the social, organizational, policy, and technical opportunities and challenges of a data-driven world. Course themes focus on various aspects of the data ecosystem, data and

innovation, and data and the broader community. Data and Society is a communication-intensive course. Assignments build writing, presentation, and critical thinking and assessment skills, all of which are important for professional success. This is a communication-intensive course.

ITWS 6600 Data Analytics

The world at-large is confronted with increasingly larger and complex sets of structured/unstructured information; from cyber and human sources. Traditional enterprises are moving toward analytics-driven approaches for core business functions. Data and information analytics extends analysis (descriptive models of data) by using data mining and machine learning methods, with optimization and validation, to recommend action or guide and communicate decision-making. Thus, analytics is an entire methodology rather then individual analyses or analysis steps

MGMT 6160 Applied Analytics and Predictive Modeling

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MGMT 7760 Risk Management

Overview of risk management and the concept and measurement of risk; types of risks (market, credit, liquidity, operational, business, strategic). Concepts, tools, and instruments available for risk management. Specific issues related with managing specific risk types — market, credit, interest-rates, liquidity, risk and operational risk. Securitization, asset-liability management. Concepts underlying insurance and role of insurance for risk management.

MGMT 6400 Financial Econometric Modeling

This course addresses financial modeling as an empirical activity. Several key issues and assumptions of finance are addressed through empirical modeling. Topics may include asset pricing, event studies, exchange rate movements, term structure of interest rates, and international linkages among financial markets. Computers are used extensively both in and out of class.

MGMT 6350 Supply Chain Analytics

This is a hands on course where students learn a mix of theoretical and practical tools and use them to solve a variety of supply chain problems, both analytically and numerically. Time series, Markov chain, optimal control, linear programming, statistical analysis, and other mathematical tools are used to examine data to understand supply, demand and inventory levels and develop insights for managerial recommendations.

MGMT 6720 Internet Marketing

Technology is a vital link in how modern corporations identify, acquire, transact with, and keep their customers. This course provides an introduction to both the technology infrastructure most relevant to the customer relationship as well as marketing issues that

result from the application of computers and communication networks. Topics include issues related to social media, search, online advertising, blogging, customer relationship management, online market segmentation, and marketing of IT products.

MGMT 6962 Marketing Analytics

With the development of technology, the amount of available information that can help organizations make decisions grows exponentially over the past decades. These information could be structured data such as online transaction data or highly unstructured data such as blogs, tweets and video clips. With the abundant data, firms can extract customer purchasing pattern, identify potential market and forecast sales trends, gain competitive advantage and create substantial value for the company. This class introduces some fundamental statistical models which are very effective in explaining and predicting marketing patterns using new forms of information emerging from the technology advances. These models can significantly improve the decisions by practitioners as they also offer intuitively sounds descriptions on various observed data patterns. Meanwhile, as more and more firms adopt sophisticated toolkit to conduct business analysis (Excel toolkit, SPSS and etc.), understanding these statistical models can become an essential part of regular business. The contents we covered in this course will be helpful for managers to get the greatest business value in today's data intensive business environment. We will also apply these statistical models to real marketing problems using real marketing data. Students are expected to finish a final project by applying techniques covered in this class on a real world dataset. This is because the core of developing the quantitative skills in this class is through hands-on exercises. This project is designed to enhance students' understanding of the concepts introduced in this class, and to allow students to have the opportunity to absorb the skills rather than just get exposed to them.

MGMT 6020 Financial Management I

The purpose of this course is to develop a working understanding of the major investment and financial decisions of the firm. Emphasis will be placed upon identifying and solving the problems commonly faced by financial managers. The course presents the needed theory and develops financial problem solving skills through individualized problem solving, structured case analysis, and industry and company analysis using Internet sources.

Summer Courses

COMM 6880 Interactive Data Visualization

MGMT 7030 Strategy, Technology and Competition

This course covers the fundamentals of business and corporate strategy, integrating these concepts into an environment of technological change, competition, and entrepreneurship. The course includes the following areas of emphasis: concepts of strategy, industry environment, resources and capabilities of the firm, organization and systems of the firm, the dynamics of competitive advantage, strategic alternative analysis, and strategies in different contexts. The course uses business cases and a project to enrich the theoretical concepts.