Curriculum (45 credits)

Business and Management Fundamentals

- Introduction to Statistics for Data Scientists (3 credits)
- Analytics for Competitive Advantage (3 credits)
- Programming and Application Development (3 credits)
- Core Business Course 1 (3 credits)
- Core Business Course 2 (3 credits)

Technical Fundamentals

- Data Management, Databases, and Data Warehousing (3 credits)
- Harvesting Big Data (3 credits)
- Project Management, Leadership, Communications, and Team Dynamics (3 credits)
- Exploratory Data Analytics and Visualization (3 credits)
- Predictive Analytics (3 credits)

Specialty Courses and Capstone Project

- Advanced Issues in Business Analytics (3 credits)
- Data-Driven Experimentation and Measurement (3 credits)
- Modeling and Heuristics for Decision Making and Support (3 credits)
- Special Topics in Analytics (3 credits)
- Capstone Project (3 credits)
COURSE DESCRIPTIONS

Business/Management Fundamentals

- **Analytics for Competitive Advantage** (case- and discussion-based introduction to a variety of analytics-related issues and examples in business, including business value, impact, benefits and limitations, as well as ethical, legal, and privacy issues; use of case studies, examples, guest speakers.)
- **Introduction to Statistics for Data Scientists** (Concepts/principles of business statistics, data analysis and presentation of results. Topics: exploratory data analysis, basic inferential procedures, statistical process control, time series/regression analysis, and analysis of variance. These methods are selected for their relevance to managerial decision making and problem solving.)

Possible Core Business Courses:

- **Business Ethics** (analysis of ethical dilemmas and development of appropriate responses; relationship of ethical management to the law; implications for corporate profitability; managing shareholders vs. managing stakeholders; issues such as protection of the environment, workplace safety, product liability, regulation, and fiduciary obligations.)
- **Financial Accounting** (basic principles of financial accounting, involving the consecution/interpretation of corporate financial statements.)
- **Financial Management** (tools/concepts of financial management. Emphasizes use by financial/non-financial managers to measure creation of value within an organization. Evaluating businesses/business opportunities, identifying financial requirements/sources.)
- **Management and Organizational Behavior** (achieving organizational goals by leading in ways that create motivation, engagement, commitment, positive social interactions, and job performance. Understanding and managing the characteristics of organizations, work groups, and individuals. The role of group dynamics, decision making, cooperation, conflict, and power in leading others.)
- **Managerial Accounting** (cost systems introduced as potential sources of sustainable competitive advantage. Course focuses on designing cost systems to provide manager with accurate, relevant, and timely information. Taught as part of an integrated functional core.)
- **(Managerial) Economics** (how markets work, how positive economic rents (profits) are made, and how strategic behavior affects profits. Four major topical areas include market micro-structure, industrial structure, uncertainty, and incentives and firm governance.)
- **Marketing Management** (management of the marketing function; understanding the basic foundational marketing concepts and skills in strategy development and planning of operational and strategic levels pertaining to product offering decisions, distribution channels, pricing and communication.)
- **Operations Management** (introduction to fundamental operations management principles and concepts. The course takes a strategic view of operations in both a manufacturing and service context and stresses linkages to other functional areas. Many of the cases in the course take an international perspective.)
- **Strategic Management** (introduction to the concepts and techniques used to create and implement a sense of corporate direction; choices about products and markets that involve the integration of different functional areas; positioning a business to increase returns for shareholders and stakeholders; the skills involved in identifying issues, evaluating options, and implementing business plans.)

Technical Fundamentals

- **Programming and Application Development** (fundamentals of structured and object-oriented programming in various application environments, development of web-based and mobile applications, programming for statistical and scientific computation)
- **Data Management, Databases, and Data Warehousing** (fundamentals of database modeling and design, normalization; extract, transform and load; data cubes and setting up a data warehouse; data pre-processing, quality, integration, and stewardship issues; advances in database and storage technologies)
- **Harvesting Big Data** (cloud computing and big data infrastructure; managing big-data, Hadoop, MapReduce; web crawling; data parsing; web data extraction using major application programming interfaces)
- **Project Management of Analytics Projects** (project management of full-stack analytics projects: identifying deliverables and a methodology; gathering requirements (use cases, user stories); estimating and staffing the project; monitoring project status (earned value and visual methods); team roles in an agile project)
• **Building and Managing Teams** (examine individual, group, and organizational aspects of team effectiveness; learn and practice basic skills central to team management; develop appreciation for team leadership function; learn the tools for effective team decision making and conflict management; develop general diagnostic skills for assessment of team issues within and across organizations and national boundaries)

**Specialty Courses**

• **Exploratory Data Analytics and Visualization** (fundamentals of data exploration; detecting relationships and patterns in data; cluster analysis, hierarchical and partition-based clustering techniques; rule induction from data; advances in multi-dimensional data visualization)

• **Predictive Analytics** (fundamentals of predictive modeling and data mining; assessing performance of predictive models; machine learning and statistical classification and prediction; logistic regression; decision trees, random forests; k-nearest neighbor techniques, naïve Bayesian classifiers, neural networks)

• **Advanced Issues in Business Analytics** (analysis of unstructured data, fundamentals of text mining, sentiment analysis; fundamentals of network analysis, mining digital media and social networks, peer effects and social contagion models; personalization technologies and recommender systems)

• **Data-Driven Experimentation and Measurement** (controlled experiments in business settings, experiment design, A/B testing; specialized statistical methodologies; fundamentals of econometrics, instrument variable regression, propensity score matching)

• **Modeling and Heuristics for Decision Making and Support** (fundamentals of decision analysis, optimization, linear and integer programming, risk analysis, heuristics, simulation, decision technologies)

• **Special Topics in Analytics** (topics will vary from year to year. In-depth discussion and analysis of current issues and developments in business analytics; examination of latest analytics frameworks, methodologies, techniques, and applications.)

**Capstone Project**

• **Capstone Project in Analytics** (hands-on, integrative application of the analytics methodologies, techniques, and tools learned throughout the program in the context of a specific analytics problem. Experience with the entire data analytics cycle, starting from business and data understanding as well as data cleaning and integration and ending with the development and presentation of results, interpretations, insights, and recommendations.)