Big Data is an emerging phenomenon. Computing systems today are generating 15 petabytes of new information every day - eight more times than the combined information in all the libraries in the U.S. About 80% of the data generated every day is textual and unstructured data.

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

The three main categories of data analytics are:

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

**Admission requirements**

Prospective students may apply at any time by completing the Graduate Application for Admission found online at apply.mst.edu.

The graduate certificate program is open to all individuals holding a bachelor’s, master’s or Ph.D. degree in areas such as business, social sciences, technology, engineering, or related disciplines. Students must also have the required prerequisites for the courses in the program.

In order to receive a Graduate Certificate, the student must have an average graduate cumulative grade point of 3.0 or better on a 4.0 scale in the certificate courses taken. Students admitted only to the certificate program will have non-degree graduate status but will earn graduate credit for the courses they complete. Students will be given three years to complete the certificate as long as a B or better average is maintained in the courses taken.

If a student completes the four graduate certificate courses with a grade of B or better in each of the courses taken, the student will, upon application, be admitted to the Master of Business Administration or to the Master of Science in Information Science and Technology. The certificate courses taken by students admitted to the program will count toward the student’s MBA or M.S. degree.
**COURSE DESCRIPTIONS**

**REQUIRED COURSES**

**IS&T 5420 Business Analytics and Data Science**
Analysis of large business data sets via statistical summaries, cross-tabulation, correlation, and variance matrices. Techniques in model selection, prediction, and validation utilizing general linear and logistic regression, Bayesian methods, clustering, and visualization. Extensive programming in R is expected.

*Prerequisites: Statistics, Calculus, and Programming Knowledge.*

**IS&T 5450 Introduction to Information Visualization**
Topics include: the visualization development framework, traditional presentations of data, human perception and aesthetics, colorspace theory, visualization algorithms and software, modern visualizations of large data sets. Application of R packages will be emphasized throughout.

*Prerequisites: Statistics, Calculus, and Programming Knowledge.*

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**CORE COURSES (CHOOSE ONE)**

**IS&T 5520 Data Science and Machine Learning with Python**
Examines data science methodologies for scraping, manipulating, transforming, cleaning, visualizing, summarizing, and modeling large-scale data as well as supervised and unsupervised machine learning algorithms applied in various business analytics and data science scenarios. Python libraries such as Pandas, NumPy, Matplotlib, and Scikit-learn are utilized.

*Prerequisites: One of Stat 3111, Stat 3113, Stat 3115, or Stat 3117; one of IS&T 1552, IS&T 1562, Comp Sci 1575; for Graduate Students: knowledge of calculus, statistics, and programming.*

**ERP 5410 Use of Business Intelligence**
This course introduces data-oriented techniques for business intelligence. Topics include Business Intelligence architecture, Business Analytics, and Enterprise Reporting. SAP Business Information Warehouse, Business Objects, or similar tools will be used to access and present data, generate reports, and perform analysis.

*Prerequisites: IS&T 1750 or equivalent.*

**COMP SCI 5204 Regression Analysis**
Simple linear regression, multiple regression, regression diagnostics, multicollinearity, measures of influence and leverage, model selection techniques, polynomial models, regression with autocorrelated errors, introduction to non-linear regression. (Co-listed with Stat 5346)

*Prerequisites: Math 2222 and one of Stat 3111, Stat 3113, Stat 3115, Stat 3117, or Stat 5643.*

**COMP SCI 6304 Cloud and Big Data Management**
Covers facets of cloud computing and big data management, including the study of the architecture of the cloud computing model with respect to virtualization, multi-tenancy, privacy, security, cloud data management and indexing, scheduling and cost analysis; it also includes programming models such as Hadoop and MapReduce, crowdsourcing, and data provenance.

*Prerequisites: A grade of ‘C’ or better in both COMP SCI 5800 and either COMP SCI 5300 or COMP SCI 5402.*

**COMP SCI 5402 Introduction to Data Mining**
The key objectives of this course are two-fold: (1) to teach the fundamental concepts of data mining and (2) to provide extensive hands-on experience in applying the concepts to real-world applications. The core topics to be covered in this course include classification, clustering, association analysis, data preprocessing, and outlier/novelty detection.

*Prerequisites: A grade of ‘C’ or better in all of Comp Sci 2300, Comp Sci 2500, and one of Stat 3113, Stat 3115, Stat 3117 or Stat 5643.*

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**STAT 5814 Applied Time Series Analysis**
Introduction to time series modeling of empirical data observed over time. Topics include stationary processes, autocovariance functions, moving average, autoregressive, ARIMA, and GARCH models, spectral analysis, confidence intervals, forecasting, and forecast error.

*Prerequisites: One of Stat 3113, 3115, 3117, 5643 and one of Math 3103, 3108, or 5108.*
**ELECTIVE COURSES (CHOOSE ONE)**

**IS&T 5445 Database Marketing**
Intro to methods and concepts used in database marketing: 1) predictive modeling techniques (e.g., regression, decision trees, cluster analysis) and 2) standard processes for mapping business objectives to data mining goals to produce a deployable marketing model. Metrics like lifetime value of a customer and ROI will be covered.

*Prerequisites:* Statistics understanding, programming understanding, familiarity with spreadsheets.

**IS&T 6443 Information Retrieval and Analysis**
Covers the applications and theoretical foundations of organizing and analyzing information of textual resources. Topics include information storage and retrieval systems, web search engines, text mining, collaborative filtering, recommender systems. Students will also learn the techniques with the use of interactive tools such as SAS.

*Prerequisite:* ERP 5410 or statistics knowledge.

**IS&T 6444 Essentials of Data Warehouses**
This course presents the topic of data warehouses and the value to the organization. It takes the student from the database platform to structuring a data warehouse environment. Focus is placed on simplicity and addressing the user community needs. (Co-listed with ERP 6444)

*Prerequisite:* IS&T 5423 or equivalent relational database experience.

**IS&T 6448 Building the Data Warehouse**
Data modeling and processes needed to populate a data warehouse; tradeoffs among several models and tools; technical issues that are faced, such as security, schemas, Web access, other reporting techniques.

*Prerequisite:* ERP 6444 or IS&T 6444.

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

**ERP 5210 Performance Dashboard, Scorecard & Visualization**
This course will study different performance management systems including dashboards, management cockpit, scorecards, and strategy maps in an organization. SAP’s BW, Business Objects Xcelsius, Crystal Reports, Sybase Unwired Platform will be used to develop the applications.

*Prerequisite:* ERP 2110 or preceded or accompanied by ERP 5110.

**ERP 6220 Data Modeling and Dashboard Prototyping**
Study how to integrate data modeling and visualization prototyping in design and implementation of enterprise decision dashboards for descriptive, predictive, and prescriptive analytics. Assignments and project implementations use SAP HANA & BW, Design Studio, IBM Watson, and SAS Visual Analytics. Semester project prepared.

*Prerequisites:* ERP 5110 and one of ERP 5410, ERP 6444 or IS&T 6444.

**ERP 6610 Adv Customer Relationship Mgt ERP**
The course emphasizes identification (targeting), acquisition, retention, and development (expansion) of (profitable) customers, as well as effective and efficient management of customers, using IT. SAP CRM, SAS BI tools, and mobile application development are used to illustrate concepts in the class. Research paper and presentation required.

*Prerequisite:* ERP 2110 or preceded or accompanied by ERP 5110.

**BUS 6425 Supply Chain and Project Management**
This course covers supply chain management and its critical role in developing and maintaining effective and efficient processes in the organization, including operations and project management processes and principles. MBA core.

*Prerequisite:* Graduate standing.

**Notes:**
1) There is overlap between the course offerings for this graduate certificate and other big data graduate certificates. No course can be used to satisfy the requirement for more than one certificate.
2) Curriculum is subject to change. Please contact the department for up-to-date information on courses. Other courses approved by the department may be substituted for any of the above listed courses on a case-by-case basis. The administrative coordinators must approve the substitution prior to enrolling in the course.