

# Data Analytics

## Master of Science in Data Analytics

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The M.S. in Data Analytics aims at providing an interdisciplinary approach to data analytics that covers both the foundational mathematical knowledge of data science and the computational methods and tools for preprocessing, interpreting, analyzing, representing, and visualizing data sets. **The degree is offered in both on-campus and online\* formats.** Applications are accepted each spring and fall semester. The Data Analytics program may, at its own discretion, accept new students in the summer semester, and consider accepting students under conditional admission, thereby allowing students to take classes at UIS to complete the program's entrance requirements. Upon the completion of all entrance requirements, the student will be fully admitted.

**\* F1- students must have completed a course in data structures and algorithms to be considered for admission to the master's degree program.**

**\*\* Admissions to the online program will not be granted to international students residing outside of the U.S.**

## Entrance Requirements

The student must have completed a Bachelor's degree with a minimum undergraduate GPA of 3.0 on a 4.0 scale and all prerequisites (p. 1) to be fully admitted. Students who have not completed all prerequisites (p. 1) can be admitted conditionally to take classes at UIS to complete the entrance requirements. The prerequisite courses must be completed with a minimum grade of B-.

**\* F1- students must have completed a course in data structures and algorithms to be considered for admission to the master's degree program.**

**\*\* Admissions to the online program will not be granted to international students residing outside of the U.S.**

## Degree Requirements

Students must complete 28 required credit hours (p. ) and eight elective credit hours (p. ) to earn the Data Analytics degree while maintaining a minimum GPA of 3.0 on a scale of 4.0 as listed below.

### Prerequisites

CSC 225	Computer Programming Concepts I
CSC 275	Computer Programming Concepts II
CSC 302	Discrete Structures
CSC 385	Data Structures and Algorithms
DAT 332	Matrix Analysis and Numerical Optimization
	or MAT 332 Linear Algebra
MAT 115	Calculus I
	or MAT 113 Business Calculus
MAT 121	Applied Statistics

## Required Courses (28 hours)

DAT/CSC 472	Introduction to Database Systems
DAT 502	Introduction to Statistical Computation
DAT 530	Advanced Statistical Methods
DAT/CSC 532	Introduction to Machine Learning
DAT/CSC 533	Data Mining
DAT/CSC 534	Big Data Analytics
DAT 554	Data Analytics Capstone <sup>1</sup>

## Electives (choose two)

DAT 444	Operations Research Methods
	or MAT 444 Operations Research Methods
DAT 570/ CSC 535	Advanced Topics in Data Analytics (Deep Learning)
CSC 561	NoSQL Databases
CSC 562	Data Visualization
CSC 572	Advanced Database Concepts

<sup>1</sup> The capstone project will draw upon the knowledge and skills learned throughout the entire curriculum and will ask students to apply the appropriate methods and tools for data analysis in a real-world organizational setting. The capstone course provides the opportunity to exercise different techniques for data storage, preprocessing, integration and analysis covered throughout the M.S. in Data Analytics curriculum in order to address business challenges. The students must provide a well-written report and an oral presentation to effectively communicate their findings.

## Advising

On acceptance, students are assigned their academic advisor. Before registering for the first time, the student should discuss an appropriate course of study with the academic advisor.

## Grading Policy

Students must earn a grade of B- or better in all courses that apply toward the degree, and a cumulative 3.0 grade point average is required to graduate. In addition, graduate students who do not maintain a 3.0 grade point average will be placed on academic probation according to campus policy. Graduate students enrolled in 400-level courses should expect more stringent grading standards and/or additional assignments. Courses taken on a CR/NC basis will not count toward the degree.

**NOTE:** Students also should refer to the campus policy on Grades Acceptable Toward Master's Degrees section of this catalog.

## Transfer Courses

Students are allowed to transfer a maximum of eight graduate semester hours with a grade of B or better. They will be evaluated on a case-by-case basis and approved by Student Petition form. Transfer students will be required to take a minimum of 28 credit hours of Data Analytics core and elective course work at UIS.

## The Curriculum

Students must complete 28 required credit hours (p. ) and eight elective credit hours (p. ) to earn the Data Analytics degree while maintaining a minimum GPA of 3.0 on a scale of 4.0 as listed below.

## Required Courses (28 hours)

DAT/CSC 472 Introduction to Database Systems

DAT 502 Introduction to Statistical Computation

DAT 530 Advanced Statistical Methods

DAT/CSC 532 Introduction to Machine Learning

DAT/CSC 533 Data Mining

DAT/CSC 534 Big Data Analytics

DAT 554 Data Analytics Capstone <sup>1</sup>

## Electives (choose two courses)

DAT 444 Operations Research Methods

or MAT 444 Operations Research Methods

DAT 570/  
CSC 535 Advanced Topics in Data Analytics (Deep Learning)

CSC 561 NoSQL Databases

CSC 562 Data Visualization

CSC 572 Advanced Database Concepts

<sup>1</sup> The capstone project will draw upon the knowledge and skills learned throughout the entire curriculum and will ask students to apply the appropriate methods and tools for data analysis in a real-world organizational setting. The capstone course provides the opportunity to exercise different techniques for data storage, preprocessing, integration and analysis covered throughout the M.S. in Data Analytics curriculum in order to address business challenges. The students must provide a well-written report and an oral presentation to effectively communicate their findings.

## Courses

### DAT 332. Matrix Analysis and Numerical Optimization. 4 Hours.

This course is an introduction to matrices and numerical optimization with applications in engineering and science. Topics include Algebra of matrices and systems of linear algebraic equations, rank, inverse, eigenvalues, eigenvectors, vector spaces, subspaces, basis, independence, orthogonal projection, determinant, linear programming and other numerical methods. Course Information: Prerequisites: MAT 115 or MAT 113 or equivalent.

### DAT 444. Operations Research Methods. 4 Hours.

Quantitative methods necessary for analysis, modeling, and decision making. Topics include linear programming, transportation model, network models, decision theory, games theory, PERT-CPM, inventory models, and queueing theory. Additional topics may be chosen from integer linear programming, system simulation, and nonlinear programming.

### DAT 472. Introduction to Database Systems. 4 Hours.

Examine of file organizations and file access methods, as well as data redundancy. Studies various data models including relational, heretical, network, and object-oriented. Emphasis given to the relational data model SQL, the data definition and manipulation language for relational databases, is described, including database security. Course Information: Course is restricted to MS CSC majors and MS DAT majors only. Prerequisites: CSC 275. Same as CSC 472.

### DAT 502. Introduction to Statistical Computation. 4 Hours.

Explore the use of various statistical software packages, such as SAS, SPSS, and R. Topics will be selected from construction of data set, descriptive analysis, regression analysis, analysis of design experiment, multivariate analysis, categorical data analysis, discriminant analysis, cluster analysis, and presentation of data in graphic forms. Course Information: Prerequisites: CSC 225 or equivalent and MAT 121 or equivalent.

### DAT 530. Advanced Statistical Methods. 4 Hours.

Topics include multiple linear regression, statistical inferences for regression model, diagnostics and remedies for multicollinearity, outlier and influential cases, model selection, logistic regression, multivariate analysis, categorical data analysis, discriminant analysis, cluster analysis. Course Information: Prerequisites: MAT 121 or equivalent.

### DAT 532. Introduction to Machine Learning. 4 Hours.

Machine learning explores the design and the study of algorithms that can learn from data or experience, improve their performance, and make predictions. The course provides an overview of many concepts, techniques, and algorithms in machine learning, including supervised learning, unsupervised learning, reinforcement learning, and neural networks. Course information: Same as CSC 532. Prerequisites: CSC 385.

### DAT 533. Data Mining. 4 Hours.

This course teaches advanced techniques for discovering hidden patterns in the rapidly growing data generated by businesses, science, web, and other sources. Focus is on the key tasks of data mining, including data preparation, classification, clustering, association rule mining, and evaluation. Course Information: Course is restricted to MS CSC majors and MS DAT majors only. Prerequisites: CSC 385. Same as CSC 533.

### DAT 534. Big Data Analytics. 4 Hours.

This course teaches concepts and techniques in managing and analyzing large data sets. Focus is on big data management, storage solutions, query processing, analytics, and big data applications. Topics include: introduction to Hadoop and YARN, MapReduce, Apache Spark, Big Data Warehousing with Hive and Spark SQL, large scale recommender systems and Large Scale Clustering and Classification. Course information: Same as CSC 534. Prerequisites: CSC 385, CSC 472, CSC 533.

### DAT 554. Data Analytics Capstone. 4 Hours.

This is a practicum course that allows students to apply the appropriate methods and tools for data analysis in a real-world organizational setting. The capstone course provides the opportunity to exercise different techniques for data storage, preprocessing, integration and analysis covered throughout the Master of Data Analytics curriculum in order to address challenges from different areas. Course Information: Prerequisites: DAT 552 and DAT 553.

### DAT 555. Data Analytics Capstone Continuing Enrollment. 0 Hours.

This course is required for DAT students who took but have not completed Capstone course DAT 554. Students must register for DAT 555 for zero credit hour (one billable hour) in all subsequent semesters until DAT 554 is completed. Course Information: Restricted to DAT majors.

**DAT 565. Advanced Database Concepts. 4 Hours.**

Study of the implementation of relational database management systems. Topics include database design algorithms, query implementation, execution and optimization, transaction processing, concurrency control, recovery, distributed query processing, and database security. One of the following advanced database topics will also be discussed: deductive databases, parallel databases, knowledge discovery/data mining, data warehousing. Course Information: Course is restricted to MS CSC majors and MS DAT majors only. Prerequisites: CSC 472. Same as CSC 572.

**DAT 566. NoSQL Databases. 4 Hours.**

Traditional data management techniques (schema-driven databases) do not meet the need to manage the varying storage techniques and technologies used for today's data. NoSQL (Not only SQL) databases have emerged as a means of managing distributed, high-volume, complex data. This course will use a hands-on laboratory approach to explore the different types of NoSQL Databases. Course Information: Course is restricted to MS CSC majors and MS DAT majors only. Prerequisites: CSC 385 and CSC 472. Same as CSC 561.

**DAT 568. Web Analytics. 4 Hours.**

This course focuses on the algorithm and techniques for automatic discovery of useful patterns from the structure, usage, and content of web resources. Topics include: link analysis, search, social network analysis, structures data extraction, information integration, opinion mining and sentiment analysis, web usage mining, and unstructured text processing. Course Information: Prerequisites: CSC 573.

**DAT 569. Data Visualization. 4 Hours.**

This course is designed to help students acquire the knowledge and skills to analyze information and, more importantly, to draw conclusions from analysis. This course is not about using advanced mathematics to solve problems. It's about learning to use computer technology, especially visualization (graphs, histograms, pie charts), to look at and understand data in a more intuitive and visual manner. Course information: Course is restricted to MS CSC majors and MS DAT majors only. Prerequisites: CSC 385. Same as CSC 562.

**DAT 570. Advanced Topics in Data Analytics. 4 Hours.**

Topics and prerequisites vary. Students may refer to the course schedule for topics and prerequisites. Restricted to Graduate Students, Data Analytics majors or Computer Science majors.