Big Data
Emphasis Areas of Study

Online Graduate Certificates for Working Professionals

- Big Data Management and Analytics
- Big Data Management and Security
- Business Analytics & Data Science
- Business Intelligence
- Computational Intelligence
- Information Assurance & Security Officer Essentials
- Information Systems & Cloud Computing
Big Data
Emphasis Areas of Study

Graduate Certificate Programs — A Pathway to a Master’s Degree. Credit earned for a certificate program may be applied toward the corresponding master’s degree. See admissions requirements for more details.

► Big Data Management and Analytics
Department of Computer Science

This is a specialized graduate certificate program to teach practicing computing professionals and graduate students the skills that are necessary for the use and development of big data management, big data analytics, data mining, cloud computing, and business intelligence.

Curriculum*

The following courses are required:
- COMP SCI 5402 Data Mining & Machine Learning
- COMP SCI 6001 Cloud Computing

One of the following courses is required:
- IST 3001 Introduction to Big Data Analytics
- COMP ENG 6330 / ELEC ENG 6340 / SYM ENG 6214 / COMP SCI 6300
- STAT 6329 Clustering Algorithms
- ERP 5410 Use of Business Intelligence
- COMP SCI 6301 Web Data Management and XML
- COMP SCI 6302 Heterogeneous and Mobile Databases

One of the following courses is required:
- COMP SCI 5300 Database Systems
- IST 6444 Essentials of Data Warehouses
- COMP SCI 6402 Advanced Topics in Data Mining
- STAT 5814 Applied Time Series Analysis

► Big Data Management and Security
Department of Computer Science

This specialized graduate certificate program teaches practicing computing professionals and graduate students the skills necessary to securely and efficiently use and develop big data.

Curriculum*

One of the following courses is required:
- COMP SCI 6001 Cloud Computing
- IST 3001 Introduction to Big Data Analytics

One of the following courses is required:
- COMP SCI 5402 Data Mining & Machine Learning
- COMP SCI 6301 Web Data Management and XML
- COMP SCI 6302 Heterogeneous and Mobile Databases

- COMP SCI 6601 Privacy Preserving Data Integration and Analysis
- COMP SCI 6600 Computer Security
- COMP SCI 6605 Advanced Network Security

► Business Analytics and Data Science
Department of Business and Information Technology

Big Data is an emerging phenomenon. Data analytics facilitates realization of objectives by identifying trends, creating predictive models for forecasting, and optimizing business processes for enhanced performance. This graduate certificate program will look at three main categories of analytics: description, predictive and prescriptive.

The following course is required:
- IST 3001 Introduction to Big Data Analytics

One of the following courses is required:
- ERP 5410 Use of Business Intelligence
- COMP SCI 6304 Cloud Computing and Big Data Management
- COMP SCI 5402 Data Mining & Machine Learning
- COMP ENG 6330 Clustering Algorithms
  (Co-listed with ELEC ENG 6340, SYS ENG 6214, COMP SCI 6405 and STAT 6239)
- ERP 5210 Performance Dashboard, Scorecard and Data Visualization
- ERP 5610 Customer Relationship Management in ERP Environment
- ERP 6220 Enterprise Performance Dashboard Prototyping
- BUS 3360 Business Operations
- BUS 6425 Supply Chain and Project Management

Credit earned for a certificate program may be applied toward the corresponding master’s degree. See admissions requirements for more details.
**Business Intelligence**
Department of Business and Information Technology

This graduate certificate program focuses on the technologies that allow an organization to make effective business decisions based on operational data pulled together from many different sources inside an organization. This certificate is for IT professionals, database administrators, business analysts, and any person who would need to understand the technologies behind the capabilities of those technologies.

**Curriculum**

The following two courses are required:
- ERP 5410 Use of Business Intelligence
- IST 6444 / ERP 6444 Essentials of Data Warehouses

Two of the following courses are required:
- ERP 5110 Systems Design and Implementation
- ERP 5210 Strategic Enterprise Management Systems
- ERP 5610 Customer Relationship Management in ERP Environment
- IST 6443 Information Retrieval & Analysis
- IST 6445 Database Marketing or ERP 6220 Strategic Enterprise Management System Configuration

**Computational Intelligence**
Department of Computer Engineering, Department of Computer Science, and Department of Systems Engineering

This graduate certificate program provides practicing engineers the opportunity to develop the necessary skills in the use and development of computational intelligence algorithms based on evolutionary computation, neural networks, fuzzy logic, and complex systems theory. Engineers can also learn how to integrate common sense reasoning with computational intelligence elective courses such as data mining and knowledge discovery.

**Curriculum**

The following course is required:
- COMP ENG 5310 / ELEC ENG 5310 / SYS ENG 5211 Computational Intelligence

Select one course from the following:
- COMP SCI 5400 Introduction to Artificial Intelligence
- COMP SCI 5401 Evolutionary Computing
- COMP SCI 6400 Advanced Topics in Artificial Intelligence
- COMP SCI 6401 Advanced Evolutionary Computing
- SYS ENG 6215 / COMP ENG 6320 / ELEC ENG 6360 Adaptive Critic Designs
- COMP SCI 6402 / SYS ENG 6216 / COMP ENG 6302 Advanced Topics in Data Mining
- ELEC ENG 5320 Neural Networks for Control
- SYS ENG 5212 / ELEC ENG 5370 Introduction to Neural Networks and Applications
- MECH ENG 6447 / COMP ENG 6310 / ENG MGT 6410 / AERO ENG 6447 / COMP SCI 6202 Markov Decision Processes
- SYS ENG 6213 Advanced Neural Networks

**Information Assurance & Security Officer Essentials**
Department of Computer Science and Department of Electrical and Computer Engineering

Protecting information systems is key to protecting the nation’s critical infrastructures. Only through diligence and a well-trained work force will we be able to adequately defend the nation’s vital information resources. (continued)

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*NOTE: Each of these certificates consists of four courses. Students will be responsible for prerequisite knowledge as determined by course instructors and listed in the Graduate Catalog. 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.*
The Information Assurance & Security Officer Essentials graduate certificate program satisfies the 4011 and 4014 standards.

**Curriculum**
Select four courses from the following:
- COMP SCI 4700 Intellectual Property of Computer Scientists
- COMP SCI 5601 Security Operations & Program Management
- COMP ENG 5420 Trustworthy, Survivable Computer Networks
- COMP ENG 6510 / SYS ENG 6322 Network-Centric Systems Reliability & Security
- COMP SCI 6605 Advanced Network Security

**Information Systems & Cloud Computing**
Department of Computer Science
This graduate certificate program is tailored toward working professionals who want to expand their knowledge of advanced data management technologies. Cloud computing, object-oriented database structure, data mining, and mobile database systems form the core of study.

**Curriculum**
The following courses are required:
- COMP SCI 5402 Data Mining & Machine Learning
- COMP SCI 6001 Cloud Computing
- COMP SCI 6302 Heterogeneous and Mobile Databases

One of the following courses is required:
- COMP SCI 5300 Database Systems
- COMP SCI 6402 Data Mining & Knowledge Discovery
- COMP SCI 6601 Privacy Preserving Data Integration and Analysis

Missouri S&T is Certified by the National Security Agency (NSA) Committee on National Security Systems (CNSS) for National Standards 4011 (National Training Standard for Information Systems Security (INFOSEC) Professionals) and 4014E (Information Assurance Training Standard for Information Systems Security Officers (ISSO)).

**Admissions Requirements**
Graduate certificate programs are open to all individuals who hold a bachelor’s, master’s or Ph.D. degree and who have a minimum of 12 months of post-BS professional employment experience. Students must satisfy the prerequisites for any course they take in a program. A student who completes a graduate certificate program with grades of “B” or better in all four courses, may be admitted into the corresponding master’s degree program without having to take the GRE. Check with department for details.

**Course Delivery**
Unless otherwise noted, courses are delivered over the Internet via live streaming video, with live collaboration software, archived class recordings, and Blackboard learning management system. Classes are archived online for review and easy access.

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**Quick Facts**

1. **Academic Quality**
   A Top 20 STEM Research University *(Academic Analytics)*
   STEM refers to science, technology, engineering and mathematics. Online courses are the same as those taught on the Missouri S&T campus.

2. **World-Class Faculty**
   Majority of Missouri S&T faculty hold PhDs and are experts in their field.

3. **Personal Service**
   We provide our students with great customer service. At Missouri S&T, you’re a name not a number.

4. **Nationally Ranked Online Graduate Programs**
   Missouri S&T has 15 online master’s degree programs ranked among the best in the country. Programs include computer science, information science and technology, the MBA and 12 engineering disciplines. *(U.S. News & World Report 2014)*.

5. **Return on Investment**
   One of the nation’s top 100 public universities that “combine outstanding education with economic value.” *(Kiplinger’s Best Value in Public Colleges 2014)*.

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**Contact Information**

**ACADEMIC DEPARTMENTS**

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**ADMISSIONS**

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