



“What abilities make a data scientist successful? Think of him or her as a hybrid of data hacker, analyst, communicator, and trusted adviser. The combination is extremely powerful - and rare.”\*

\* Data Scientist: The Sexiest Job of the 21st Century, Davenport, Thomas H., Patil, D. J., Harvard Business Review, Oct2012, Vol. 90 Issue 10, p70-76.

## At Ottawa University

The Bachelor of Science in Data Science & Technology is a modern program designed to prepare students for entry into almost every sector of the workforce as science-driven data analysts or data managers, as well as for acceptance into related graduate programs. Upon degree completion, students will be versed in how to learn from data to gain useful insight and make predictions. They will also be prepared to formulate context-relevant questions and hypotheses to drive data scientific research.

Curriculum includes significant coursework in the liberal arts; basic and advanced computer programming and development; network administration and architecture; basic and advanced database principles, programming and development; security across the database, network and enterprise; and a capstone course requiring the application of cumulative program knowledge and skills.

## Careers

Because Data Science is an emerging field, graduates could find themselves applying for positions with a range of titles in addition to data scientist, including business analyst, data analyst, database administrator, systems analyst, business systems consultant, statistician, data engineer, and more. The increasing demand for data analysis will allow data scientists to find jobs across a range of industries and often within core management. They advise executives, product and project managers on the implications of the data for products, processes and decisions. Currently, the greatest demand for data scientists is in finance, health care, and social networking.

## Education and Qualifications

A bachelor's degree in data science is required for jobs with related titles, such as data administrator, while a master's degree may be required for higher-level roles, such as statistician or data director. Continuing education is critical for data scientists in order to keep up with changes in technology, research and analysis methods, and industry demands.

# Undergraduate Data Science & Technology

## Foundation Courses

**ACC 20364** Accounting for Business Operations

**ECO 20163** Macroeconomics

**ECO 20263** Microeconomics

**MAT 10643** College Algebra

OR

**MAT 20043** Discrete Mathematics

OR

**MAT 20143** Business Mathematics

**OAD 30763** Business Statistics

OR

**MAT 20044** Introduction to Statistics

**OAD 31664** Business Ethics

*MAT 20043 is recommended to fulfill foundation requirement.*

## Required Major Courses

### **DST 20000** Network Architecture

A study of the TCP/IP and Network Architecture. Students will learn how processors work, with coverage of network architectures as well as basics of computer networks and the different protocol layers used for communication. Attention will be paid to the concepts and fundamental principles that have contributed to modern network designs and implementation using TCP/IP. Topics to be addressed in this course are IP, ARP, RARP, and ICMP protocols; IP routing; TCP protocol, TCP/IP next-generation; OSI network protocols and standards; and client/server networking and applications.

Prerequisite: ITS 20263 – Introduction to Networking

### **DST 20003** Network Security

Principles of computer systems and network security. Topics include network attacks and defenses, botnet, malware, social engineering attacks, privacy, and digital rights management. Techniques for achieving security in multi-user computer systems and distributed computer systems; cryptography: secret-key, public-key, digital signatures; authentication and identification schemes; intrusion detection: viruses; firewalls; and risk assessment.

Prerequisite: ITS 20263 – Introduction to Networking

### **DST 30000** Lean Six Sigma

Understanding of Lean Six Sigma concepts and its methodologies with the goal of improved project management skills, problem solving, and more effective cross functionality. The course focuses on defining a problem and implementing solutions that are linked to the underlying root causes and delivering improvements that are efficient, cost effective, consistent, reliable, and sustainable.

Prerequisite: MAT 20044 – Introduction to Probability and Statistics or OAD 30763 Business Statistics.

### **DST 30003** Data Mining

Introduction of the major quantitative models designed for competitive advantage, and system forecasting in today's complex and increasingly large data-gathering business environment. This course is useful for multiple disciplines, including marketing, finance, and health care. Topics include statistical quality control, exponential smoothing, and seasonally adjusted trend analysis. Emphasis is placed on a general understanding of theory, mechanics, application potential, available software packages, and templates.

Prerequisite: MAT 20044 – Introduction to Probability and Statistics or OAD 30763 Business Statistics.

### **DST 30006** Cyber Security

Exploration of advanced topics in cyber security. Students will be exposed to a wide spectrum of security activities, methods, methodologies, and procedures, with emphasis on practical aspects of Information Security. Topics include security principles, threats, attacks, security models, security policies, an overview of authentication, encryption, and certifications, security detection, business risk analysis, protection of information assets, examination of pre- and post-incident procedures, and an overview of the information security evaluation.

Prerequisite: DST 20003 – Network Security

### **DST 30009** Data Visualization

An exposure to visual representation methods and techniques that facilitate the understanding of complex data. Students will be able to present a visual interpretation of data, and improve comprehension, communication, and decision making. The course covers how the human visual system processes and perceives images, good design practices for visualization, how to use existing tools to make visualizations, collecting data from web sites with Python, and programming interactive web-based visualizations.

Prerequisites: ITS 16163 – Introduction to Computer Programming

### **DST 40000** Information Forensics

A study of detection techniques to fight cyber-crime. This course combines business acumen and technology skills for recognizing and mitigating vulnerabilities. Students will address methods to properly conduct a computer and/or network forensics investigation, including digital evidence collection and evaluation and legal issues involved in network forensics. Technical topics covered include detailed analysis of hard disks, files systems (including FAT, NTFS and EXT) and removable storage media, mechanisms for detecting hidden information, and the hands-on use of powerful forensic analysis tools.

Prerequisite: ITS 30044 – Advanced Database Systems

### **DST 49000** Seminar in Applied Information Science

An opportunity for students to use a number of common statistical analysis models in health services research. Emphasis is placed on a conceptual understanding of appropriate modeling techniques and the use of statistical software packages. The course also focuses on the application of methods to health services research questions, with an emphasis on regression design and interpretation. Prerequisites: DST 30000 – Lean Six Sigma, DST 30006 – Cyber Security, DST 30009 – Data Visualization

### **ITS 16163** Introduction to Computer Programming

A broad overview of programming techniques, programming rules, basic I/O techniques and programming methods. A variety of programming languages will be introduced, including but not limited to Visual Basic, SQL Reporting, and Object Oriented Programming.

### **ITS 20163** Introduction to Databases

Basic knowledge of how to collect, organize, and analyze data. An introduction to the concepts of querying, updating, and administration of databases. Topics covered include normalization, table structures, table relationships, and data integrity.

### **ITS 20263** Introduction to Networking

Identify basic networking concepts; Distinguish between network transmission types and connectivity devices; Understand TCP/IP components; Demonstrate knowledge of network hardware, cabling and operating systems.

### **ITS 30044** Advanced Database Systems

Covers advanced techniques of data and information. Topics include processing and optimization of queries, transactions, backup and recovery, self-tuning database systems, and data mining. Prerequisite: ITS 20163 – Introduction to Databases.

### **ITS 47003** Ethical Hacking and Intrusion Detection

Course explores penetration-testing tools and techniques used to protect computer and cyber security. Topics include discovering vulnerabilities, detecting intrusion, networking security issues, and protecting data from potential intruders.

### **MAT 21044** Calculus I

First in a series of three courses that offers an intuitive approach to the major concepts and techniques of single-variable calculus. Topics include limits, continuity, derivatives of elementary functions and their application, extrema, optimization, elementary integration applications, the Fundamental Theorem of Calculus, and l'Hospital's rule.

Prerequisite: A "C" or better in MAT 11143 – Precalculus or consent of instructor.