Data Science Certificate

The Data Science certificate is designed to provide a high-quality education in Data Science in addition to any degree at Western. The certificate requires 3.0 modular courses, which can overlap (be double counted) with the main courses for the main module.

   The Data Science Certificate has undergone some important revisions this year. While the courses require that the student develops a certain level of Mathematics and Programming skills, the committee has worked hard to make this opportunity accessible to students from all backgrounds. That being said, students with very little technical background may need to take a few more than the required 1.0 credits of first -year courses to succeed in the program.

For students without Vectors and Calculus (MCV4u) in High-school, we recommend 1.0 courses from:
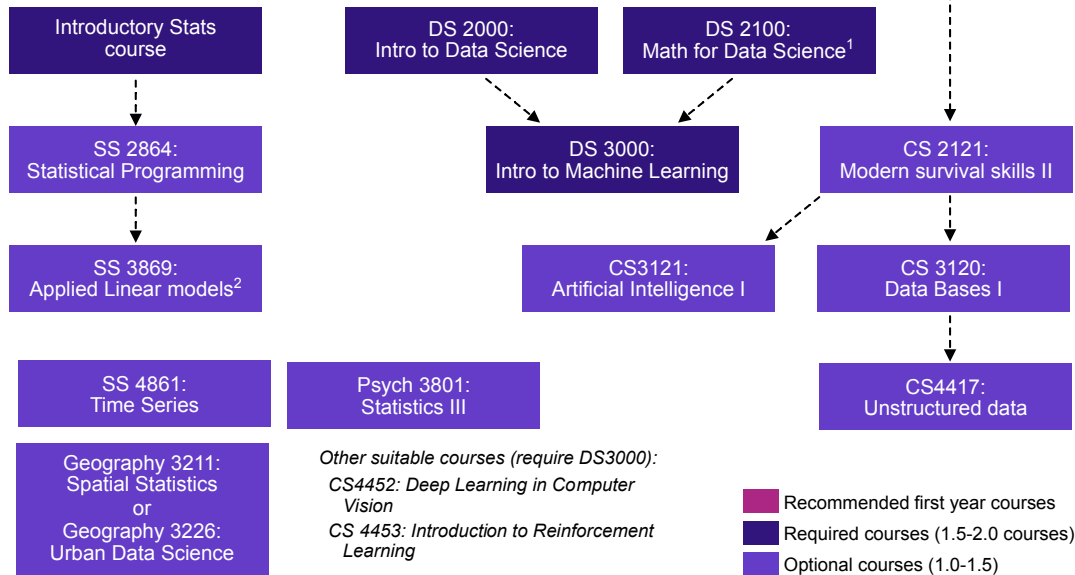
Additional good foundation:

For students without programming experience we highly recommend:

MA 1225: Methods of Calculus

MA 1228: Methods of finite Mathematics

MA 1229: Methods of Matrix Algebra

DS 1000: Principles of Data Science

CS 1026: CS Fundamentals I

Introductory Stats course

DS 2000: Intro to Data Science

DS 2100: Math for Data Science[1]

SS 2864: Statistical Programming

DS 3000: Intro to Machine Learning

CS 2121: Modern survival skills II

SS 3869: Applied Linear models[2]

CS3121: Artificial Intelligence I

CS 3120: Data Bases I

SS 4861: Time Series

Psych 3801: Statistics III

CS4417: Unstructured data

Geography 3211: Spatial Statistics or Geography 3226: Urban Data Science

Other suitable courses (require DS3000):
  CS4452: Deep Learning in Computer Vision
  CS 4453: Introduction to Reinforcement Learning

Legend:
- ■ Recommended first year courses
- ■ Required courses (1.5-2.0 courses)
- ■ Optional courses (1.0-1.5)
- --→ Prerequisite - check calendar for details

1. Can be skipped if student has taken MA1600 and CA1000

2. As long as SS3869 is not offered, students can get special permission to take SS3859 (Regression) with SS2864, DS2000, and DS2100 (or MA1600) as pre-requisites (>60%). Please email stats-inquiry@uwo.ca for special permission requests.

For students that have not taken Vectors and Calculus (MCV4U) in High School, we recommend to take two courses from Mathematic 1225, Mathematics 1228, Mathematics 1229, and Data Science 1000. For all students (unless they already have strong programming skills), we recommend taking Computer Science 1026 (or Computer Science 2120).

   The first 0.5 credit of the certificate comes from an introductory statistics course, which is part of most modules. The core of the certificate is Data Science 2000, followed by Data Science 3000. If the student does not have Calculus 1000 and Mathematics 1600 from their first-year background, then Data Science 2100 provides the required mathematical background. For the last 1.0 (or 1.5) credits, students can pick from a number of optional courses, some of which may overlap with advanced data science courses in their program.

Admission Requirements

Completion of the first-year requirements of any Major or Honours Specialization module, including 1.0 courses from Mathematics, Calculus, or Applied Mathematics at the 1000-level (with a minimum grade of 60%). Data Science 1000A/B or the former Statistical Sciences 1024A/B (either with a minimum grade of 60%) can be used to fulfil 0.5 of these requirements. The Certificate cannot be combined with a Minor, Major, Specialization, or Honours Specialization in Statistics, Actuarial Science, Computer Science, or Data Science.

Module/Program Information

Program

3.0 courses:

0.5 course from the Introductory Statistics Course List.

0.5 or 1.0 course from: Data Science 2000A/B, Data Science 2100A.

0.5 course: Data Science 3000A/B (or former Computer Science 4414A/B, the former Statistical Sciences 3850F/G, the former Software Engineering 4460A/B).

1.0 or 1.5 courses from: Computer Science 3120A/B, Computer Science 3121A/B, Computer Science 4417A/B, Statistical Sciences 2864A/B, Statistical Sciences 3869A/B, Statistical Sciences 4861A/B, Psychology 3801F/G, one of (Geography 3211A/B or Geography 3226A/B), or equivalent courses subject to the approval of the Department.

Examples of how the Certificate fits into various degree programs
BMOS degree + Certificate in Data Science
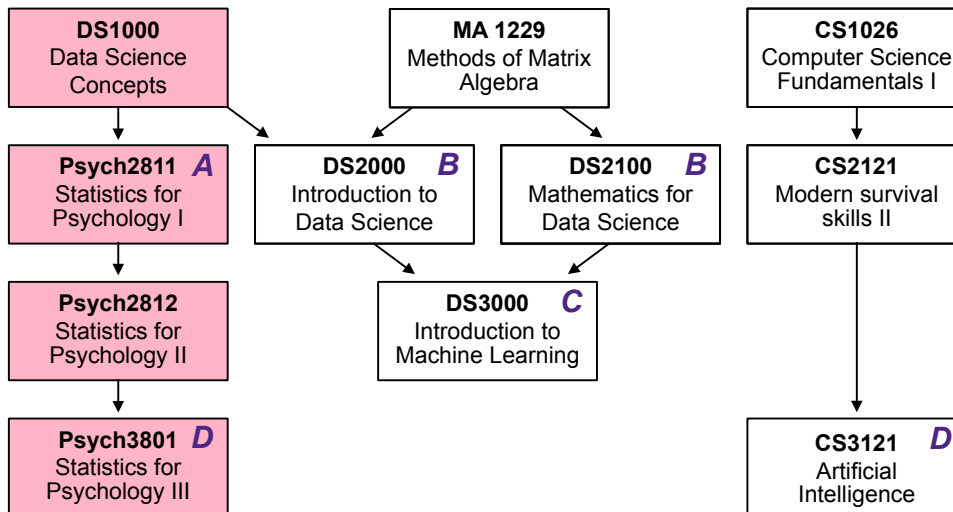
MA 1225 Methods of Calculus	**MA 1228** Methods of finite Math

CS1026 Computer Science Fundamentals I

MOS2242 *A* Statistics

DS2000 *B* Introduction to Data Science

DS2100 *B* Mathematics for Data Science

CS2121 Modern survival skills II

DS3000 *C* Introduction to Machine Learning

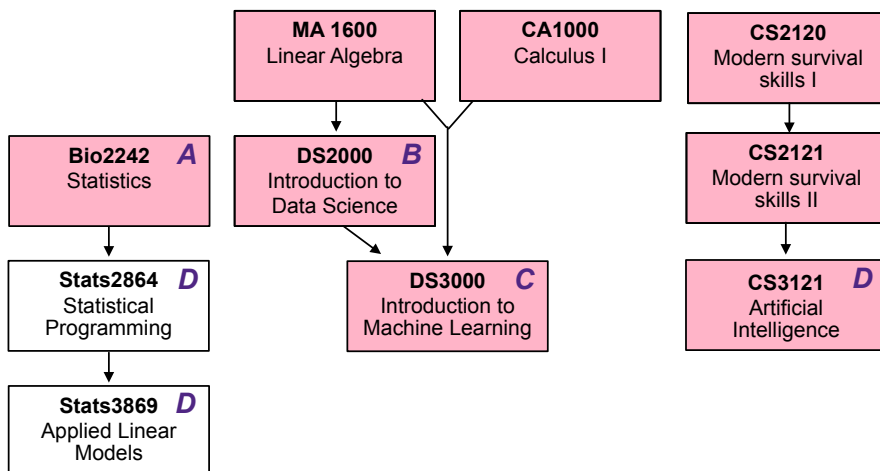**CS3120** *D* Data Bases for Informatics

CS4417 *D* Unstructured Data
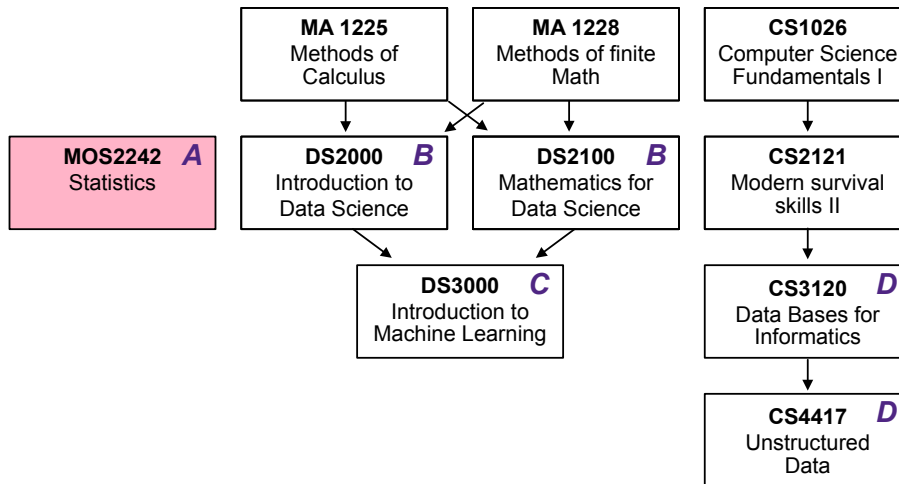
This Management of Organisational studies student took 2 math courses and CS1026 in the first year. In the second year the student covered the required Stats course for the BMOS program, Data Science 2100A and Data Science 2000B. These provided the prerequisites to successfully complete Data Science 3000. The student then decided that unstructured data would be a good skill to have and took CS2121, CS3120 and finally CS4417 to achieve this goal.

HSp in Psychology (BSc) + Certificate in Data Science

DS1000 Data Science Concepts

MA 1229 Methods of Matrix Algebra

CS1026 Computer Science Fundamentals I

Psych2811 *A* Statistics for Psychology I

DS2000 *B* Introduction to Data Science

DS2100 *B* Mathematics for Data Science

CS2121 Modern survival skills II

Psych2812 Statistics for Psychology II

DS3000 *C* Introduction to Machine Learning

Psych3801 *D* Statistics for Psychology III

CS3121 *D* Artificial Intelligence

This is an example of a Psychology Honours Specialization program student. Without having had Vectors and Calculus (MCV4U) in high-school, this student took DS1000, MA1229, and CS1026 in the first year. The student progressed through Stats I – III in the Psychology program, from which they could count 1.0 credits. With DS2000, DS2100 and DS3000 the student completed also the core Data Science curriculum. Finally the student decided to take CS3121 (Artificial intelligence) after widening their programming skills with CS2121.

Medical Bioinformatics + Certificate in Data Science

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                    ┌──────────────┐  ┌──────────────┐   ┌──────────────┐
                    │   MA 1600    │  │   CA1000     │   │   CS2120     │
                    │Linear Algebra│  │  Calculus I  │   │Modern survival│
                    │              │  │              │   │   skills I   │
                    └──────┬───────┘  └──────┬───────┘   └──────┬───────┘
                           │                 │                  │
  ┌──────────────┐    ┌────▼─────────┐       │           ┌──────▼───────┐
  │  Bio2242   A │    │  DS2000    B │       │           │   CS2121     │
  │  Statistics  │    │Introduction to       │           │Modern survival│
  │              │    │ Data Science │       │           │   skills II  │
  └──────┬───────┘    └──────┬───────┘       │           └──────┬───────┘
         │                   │               │                  │
  ┌──────▼───────┐    ┌──────▼───────────────▼┐          ┌──────▼───────┐
  │ Stats2864  D │    │  DS3000          C    │          │  CS3121    D │
  │  Statistical │    │ Introduction to       │          │  Artificial  │
  │ Programming  │    │Machine Learning       │          │ Intelligence │
  └──────┬───────┘    └───────────────────────┘          └──────────────┘
         │
  ┌──────▼───────┐
  │ Stats3869  D │
  │Applied Linear│
  │    Models    │
  └──────────────┘
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This student in the Medical Science program (Medical Bioinformatics) took the required CA1000 MA1600 in the first year, and therefore skipped DS2100. In the second year the required Statistics Course (Bio2242), DS2000 and CS2121 was added. Finally three more advanced 0.5 courses (SS2864, SS3869, and CS3121) completed the certificate.