Post Baccalaureate Diploma in Artificial Intelligence

The Program

The Post-Baccalaureate diploma in Artificial Intelligence (AI) is a 2-year credential for individuals who have graduated from an undergraduate degree in any field and have introductory experience with computer programing. The diploma is comprised of 48 credits taken usually over 4 semesters and has roughly the fundamental Computer Science courses required of the Advanced Major in Computer Science while also focusing on AI related courses.

Artificial Intelligence is a burgeoning field affected by rapid progress and development. Technological advances that rely on artificial intelligence systems are numerous and include applications such as self-driving automobiles, medical diagnosis, computer-assisted translation tools, speech recognition, biometrics, entertainment, and a wide variety of classification and predictive technologies. AI is recognized as having immense social, technological, and ethical implications for society. The proposed diploma will allow graduates to either begin or advance their career in computing-related fields and provide them with a depth of knowledge in the highly sought-after field of artificial intelligence.

Graduates are prepared for entry into the workplace or into graduate programs, such as StFX's new Master of Applied Computer Science.

Admissions Requirements

- Four-year Bachelor's degree in a discipline that is not Computer Science, or equivalent
- One course (3-credits minimum) in any computer programming language
- Students must have completed a university-level statistics course prior to beginning semester 3 of the program. Students who have not taken a statistics course as part of their undergraduate degree can complete the course while at StFX

Proof of English language competency is required for applicants whose first language is not English or whose normal language of instruction has been other than English. The StFX English Language admission standard requires an IELTS score of 6.5 with no band below 6 or TOEFL 90.

The program is not intended for students who have significant undergraduate courses in Computer Science. Those students will likely be better positioned to complete at second degree (e.g. Major, Adv Major, or Honours in CS) or to enroll in the Master of Applied Computer Science at StFX.

Program Structure

Students in the Post-Baccalaureate Diploma will take an intensive series of existing undergraduate courses. The program consists of 48 credits in Computer Science, with most credits clustered around the field of Artificial Intelligence. The program offers students options to explore CS topics of their choice.

Dept.	Course Code	Course Title	# of Credits
Term 1 – Fall			
Required Course(s)			
CSCI	162	Programming and Data Structures	3 Credits
CSCI	223	Data Science	3 Credits
CSCI	225	Health Analytics	3 Credits
CSCI	277	Discrete Structures	3 Credits
		TOTAL	*12 Credits*
Term 2 – Winter			
Required Course(s)			
CSCI	215	Social Issues	3 Credits
CSCI	255	Advanced Data Structures	3 Credits
CSCI	263	Computer Organization	3 Credits
CSCI	350	Biomedical Computation	3 Credits
		TOTAL	*12 Credits*
Term 3 – Fall			
Required Course(s)			
CSCI	340	Evolutionary Computation	3 Credits
CSCI	495	Artificial Intelligence	3 Credits
CSCI	444	Machine Learning	3 Credits
Elective Courses			
2XX/3XX/4XX MSCS elective			3 Credits
		TOTAL	*12 Credits*
Term 4 – Winter			
Required Course(s)			
CSCI	485	Software Design	3 Credits
CSCI	275	Database Management Systems	3 Credits
Complete two courses (6cr) from the following list:			
CSCI	455	Parallel and Distributed Computing	3 Credits
CSCI	527	Big Data	3 Credits
CSCI	345	Computer Graphics	3 Credits
CSCI	364	Mobile Application Development	3 Credits
		TOTAL	*12 Credits*
			Program Total: 48 credits

Calendar Course Descriptions

Semester 1

162 Programming and Data Structures
Continuing from the material in CSCI 161, this course covers memory management and data abstraction via classes and objects, and introduces the linear data structures lists, stacks, and queues. Structured programming is encouraged via modular development. Credit will be granted for only one of CSCI 162 and INFO 256. Prerequisite: CSCI 125 or 161 or ENGR 147. Three credits and a two-hour lab.

223 Introduction to Data Science
The course will provide students with the basic understanding of the theory and practice of data science and its applications in different real-world domains. Student will also gain practical skills in handling structured and unstructured data, analyzing and visualizing data, data mining, as well as gain hands-on experience of software tools and apply the basic techniques to their own different scientific, engineering and business applications. Prerequisite: One of CSCI 125, 128, 161 or 225. Three credits.

225 Coding for Health Analytics
Technological development has transformed modern healthcare. The large amounts of health data currently acquired and analyzed has the potential to positively affect a patient's quality of life. This interdisciplinary course focuses on developing practical coding skills used in the healthcare domain, a rapidly growing field of computing that can have a beneficial impact on patient care and public health. Suitable for students from a variety of backgrounds planning a career involving health-related data. Open to students in all degree programs. Prerequisite: CSCI 128 or CSCI 125 or CSCI 161 or with permission of department chair. Three credits.

277 Discrete Structures
An introduction to sets, binary relations and operations; induction and recursion; partially ordered sets; simple combinations; truth tables; Boolean algebras and elementary group theory, with applications to logic networks, trees and languages; binary coding theory and finite-state machines. Cross-listed as MATH 277. Prerequisites: MATH 101, 102 or 107 or 127 or 122 or CSCI 162. Three credits.

Semester 2

215 Social Issues in the Information Age
This course exposes students to the various impacts of technology on modern society with the goal of further developing their critical thinking and their ability to make informed decisions in this rapidly changing information age. Topics covered include privacy and security, biotechnology, cybercrime, genetic engineering, artificial intelligence, digitization and intellectual property, ethical issues in computing. Other topics and/or their emphasis may vary by semester. Students from every background will benefit from this course. Three credits.

255 Advanced Data Structures
This course provides a deep investigation of foundational data structures and algorithms. Criteria for selecting appropriate data structures and algorithms for a given problem are presented. General problem solving is emphasized throughout the course. Specific topics include stacks, queues, lists, trees, searching, sorting, traversals, recursion, graphs, hashing, and complexity analysis. Prerequisite: CSCI 162. Three credits and a two-hour lab.

263 Computer Organization
This course covers basic computer arithmetic, architectures, and instruction sets; in-depth study of the central processing unit, memory and input/output organization; and microprogramming and interfacing. Credit will be granted for only one of CSCI 263 or INFO 225. Prerequisite: CSCI 162. Three credits and a two-hour lab.

350 Biomedical Computation
Technological development has transformed modern biomedical data analysis. The large amounts of biomedical data currently acquired has the potential to have real world positive impacts, however, the underlying nature of the data presents major challenges for computational biomedical analysis techniques. This course focuses on advanced technologies applied to biomedical computation, a rapidly growing field with tremendous potential for having a beneficial impact on patient care and public health. Three credits.

Semester 3

340 Evolutionary Computation
Evolutionary computation is a family of powerful optimization algorithms often used to find solutions to computationally intractable problems. The study of these algorithms and their application to problems is a large research area within computer science. Course topics include combinatorial optimization, genetic algorithms, particle swarm optimization, search space analysis, multi-objective optimization, and neuroevolution. Research practices and technical writing will be emphasized for course assignments/projects.

495 Artificial Intelligence
An introduction to the core concepts of artificial intelligence, including state space, heuristic search techniques, knowledge representation, logical inference, uncertain reasoning, and machine learning. Specific methods covered include neural networks, genetic algorithms, and reinforcement learning. Prerequisites: CSCI 255, 263, 277. Three credits.

444 Machine Learning
This course covers modern technologies in computational machine learning. Validation of machine learning algorithms will be taught alongside computational design considerations for the creation of reliable and robust machine learning models. Machine learning techniques will be taught in detail from a computational technology perspective, including decision trees, bootstrapping, bagging, super learners, AdaBoost, artificial & convolutional neural networks and methods for minimizing error on unseen data. Classical learning techniques will also be presented. Prerequisites: CSCI 161, STAT 224 or 231 or 101 or permission of department chair. Three credits.

Semester 4

485 Software Design
The course covers techniques for the design and management of large software projects, including structured programming, debugging, and testing methodologies. Examples of large systems will be provided and a programming project will be completed. Prerequisite: CSCI 162; 483 is recommended. Three credits.

275 Database Management Systems
An introduction to the theory and practice associated with the design and implementation of databases. Topics include database models (relational model in detail), design, normalization, transactions, SQL, and a DBMS (Oracle). Credit will be granted for only one of CSCI 275, BSAD 384 or INFO 275. Prerequisite: CSCI 162. Three credits and a two-hour lab.

455 Parallel and Distributed Computing
Introduces parallel programming techniques as a natural extension to sequential programming. Students will learn techniques of message-passing parallel programming; study problem-specific algorithms in both non-numeric and numeric domains. Topics will include: numeric algorithms; image processing and searching; optimization. Prerequisites: CSCI 263; 375 recommended. Three credits and a two-hour lab.

527 Big Data
The emphasis of this course is to introduce big data technology. Course topics include reliable and big data storage, efficient big data processing and analytics, and important Spark APIs. Students will gain abilities to design highly scalable systems that can store, process, and analyze a big volume of unstructured and/or semi-structured data in batch mode and/or real time. Three credits.

345 Computer Graphics
Covers fundamental mathematical, algorithmic, and representational issues in computer graphics. Topics include graphics programming, geometrical objects and transformations, 2-D and 3-D data description, manipulation, viewing projections, clipping, shading and animation. Prerequisites: MATH 253; CSCI 255. Three credits and a two-hour lab.

364 Mobile Application Development
A mobile application (mobile app) is a software application designed to run on smartphones, tablet and other mobile devices. The android mobile platform has become one of the most popular mobile platforms used by millions around the world. This course introduces application development for the Android OS that can run on mobile devices. The course covers the Android system, the Android development tools, Activity Lifecycle, User Interfaces in Android, and Android application development that uses SMS, databases, location tracking, and/or multimedia. Credit will be granted for only one of CSCI 364 or CSCI 471. Prerequisite: CSCI 162 or INFO 256.