ALGONQUIN COLLEGE

2020 / 2021

Program Code:0336X07PAO

Computer Programming

PROGRAM DESCRIPTION

Use leading industry software products to hone your skills.

The two-year Computer Programmer Ontario College Diploma program prepares you for a career in software development. The program also specializes in program development strategies (using object-oriented modelling), database design and database administration.

Use leading industry software products such as Oracle and CASE tools. Learn about programming languages such as Java, COBOL, SQL and PHP. Study object-oriented analysis and design, operating systems and coding in integrated environments, and learn how to debug, test, and maintain codes.

In your final semester, participate in a software development project working with external clients to gain real-world experience in the programming field.

You also have the opportunity to participate in a paid co-op work term that allows you to gain industry contacts and apply your knowledge and skills. See Additional Information for details.

Graduates may work in a variety of different fields, as almost all sectors of industry require programmers. You may be employed as:

* A a software programmer
* A web programmer
* A business programmer
* An application programmer

Graduates may also find opportunities in database design and database administration.

Success Factors

This program is well-suited for students who:

* Enjoy solving problems.
* Are life-long learners ready to meet the challenges presented by rapidly changing technology.
* Take pleasure in providing assistance to others (build computer systems to meet their needs).
* Enjoy working with others as a member of a team.
* Can work independently.
* Are organized in their work and pay attention to detail.

Transfer of Academic Credit (Exemption)

Prior Learning Assessment and Recognition (PLAR)

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ADMISSION REQUIREMENTS

College Eligibility

* Ontario Secondary School Diploma (OSSD) or equivalent. Applicants with an OSSD showing senior English and/or Mathematics courses at the Basic Level, or with Workplace or Open courses, will be tested to determine their eligibility for admission; OR
* Academic and Career Entrance (ACE) certificate; OR
* General Educational Development (GED) certificate; OR
* Mature Student status (19 years of age or older and without a high school diploma at the start of the program). Eligibility may be determined by academic achievement testing for which a fee of $50 (subject to change) will be charged.

FEES AND EXPENSES

Fees for part-time programs are charged on a course-by-course basis and are published on each individual course page. Visit the AC Online courses page for more information.

Further information on fees can be found by visiting the Registrar's Office website.

Fees are subject to change.

Graduation Fee:

Once you have completed all the courses in the program, it is the responsibility of the student to contact the Registrar's Office to obtain a certificate/diploma application. A graduation fee of $22 will be charged when the application is submitted. When your certificate/diploma application has been approved, you will be invited to Spring or Fall Convocation.

Additional program related expenses include:

Books and supplies can be purchased from our college bookstore online.

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LEARNING OUTCOMES

The graduate has reliably demonstrated the ability to:

* Identify, analyze, develop, implement, verify and document the requirements for a computing environment.
* Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools.
* Implement and maintain secure computing environments.
* Implement robust computing system solutions through validation testing that aligns with industry best practices.
* Communicate and collaborate with team members and stakeholders to ensure effective working relationships.
* Select and apply strategies for personal and professional development to enhance work performance.
* Apply project management principles and tools when working on projects within a computing environment.
* Adhere to ethical, legal, and regulatory requirements and/or principles in the development and management of computing solutions and systems.
* Support the analysis and definition of software system specifications based on functional and non-functional requirements.
* Contribute to the development, documentation, implementation, maintenance and testing of software systems by using industry standard software development methodologies based on defined specifications and existing technologies/frameworks.
* Apply one or more programming paradigms such as, object-oriented, structured or functional programming, and design principles, as well as documented requirements, to the software development process.
* Model, design, implement, and maintain basic data storage solutions.
* Contribute to the integration of network communications into software solutions by adhering to protocol standards.
* Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.

EMPLOYMENT OPPORTUNITIES

Graduates may find a variety of employment opportunities as applications programmers and systems analysts who can work independently and as part of a team to analyze, design, code, debug, test, implement and maintain application systems. Training in web programming, business programming, database design and database administration may also present job opportunities in those areas. Employment may be found in organizations of all sizes in both the public and private sectors.

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ADDITIONAL INFORMATION

Program curriculum is reviewed annually to reflect evolving industry standards in the information technology field.

Several courses assist in the preparation for industry standard Java and Oracle certification examinations (CST2355, CST8276, CST8277, CST8284 and CST8288).

PRIOR LEARNING AND RECOGNITION (PLAR)

Students who wish to apply for PLAR need to demonstrate competency at a post-secondary level in all of the course learning requirements. Evidence of learning achievements for PLAR candidates may include a comprehensive

challenge examination and/or completion of a portfolio.

AC ONLINE ACADEMIC PLANNER

The Academic Planner provides registered part-time students in AC Online the ability to declare into a program of study. The Academic Planner outlines successfully completed courses to date, as well as courses that need to be completed in order to meet graduation requirements. It is therefore, essential that all part-time students in AC Online declare to their program of study, allowing administrators to plan course offerings. This tool is available on ACSIS.

PROGRAM PROGRESSION

As per policy AA39: Program Progression and Graduation Requirements when students are admitted to a program, they are assigned to the Program of Study that aligns with their start date. If a student takes a break for two or more consecutive terms the Program of Study is reset to align with the current version (when studies are resumed).

For more information, please contact AC Online 613-727-4723 ext. 3330 or online@algonquincollege.com.

PROGRAM OF STUDY

Normative Hours
are the number of hours usually required to complete the learning objectives of a course and represent the relative value of a course in a program of study. Normative hours may vary from the actual hours of instruction. Hours listed in the Program of Study are normative hours.

Prerequisites and corequisites
Students in the School of Part-time Studies are expected to have either completed the stated prerequisite course(s) or possess the equivalent knowledge prior to enroling in a course. Students are also expected to register in the relevant corequisite(s). Prerequisites and Corequisites are indicated in the course descriptions (where applicable).

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Level	Course Code	Course Name	Hours
Series: 01			
	CST8101	Computer Essentials	56.0
	CST8101	Computer Essentials	56.0
	CST8116	Introduction to Computer Programming	70.0
	CST8116	Introduction to Computer Programming	70.0
	CST8215	Introduction to Database	70.0
	CST8215	Introduction to Database	70.0
	CST8300	Achieving Success in Changing Environments	42.0
	CST8300	Achieving Success in Changing Environments	42.0
	ENL1813T	Communications I	42.0
	MAT8001C	Technical Mathematics for Computer Science	56.0
	MAT8001C	Technical Mathematics for Computer Science	56.0
Series: 02			
	CST2355	Database Systems	56.0
	CST2355	Database Systems	56.0
	CST8102	Operating System Fundamentals (Gnu/Linux)	70.0
	CST8102	Operating System Fundamentals (Gnu/Linux)	70.0
	CST8284	Object Oriented Programming (Java)	70.0
	CST8284	Object Oriented Programming (Java)	70.0
	CST8285	Web Programming	56.0
	CST8285	Web Programming	56.0
	ENL2019T	Technical Communication for Engineering Technologies	42.0
	ENL2019T	Technical Communication for Engineering Technologies	42.0
Choose one from equivalencies:			
	GED0336	General Education Elective	42.0
	GED0336	General Education Elective	42.0

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Level	Course Code	Course Name	Hours
Series: 03			
	CST2234	Systems Analysis and Design	56.0
	CST2234	Systems Analysis and Design	56.0
	CST2335	Mobile Graphical Interface Programming	56.0
	CST2335	Mobile Graphical Interface Programming	56.0
	CST8109	Network Programming	70.0
	CST8109	Network Programming	70.0
	CST8288	Object Oriented Programming with Design Patterns	56.0
	CST8288	Object Oriented Programming with Design Patterns	56.0
Elective: choose 1			
	CST8283	Business Programming	56.0
	CST8283	Business Programming	56.0
	CST8390	Business Intelligence and Data Analytics	56.0
	CST8390	Business Intelligence and Data Analytics	56.0
Series: 04			
	CST8276	Advanced Database Topics	56.0
	CST8276	Advanced Database Topics	56.0
	CST8277	Enterprise Application Programming	56.0
	CST8277	Enterprise Application Programming	56.0
	CST8333	Programming Language Research Project	56.0
	CST8333	Programming Language Research Project	56.0
	CST8334	Software Development Project	56.0
	CST8334	Software Development Project	56.0

CST8101 COMPUTER ESSENTIALS
The essentials of computer software, hardware, and laptop management form the foundation for building further technical programming skills. Learn to configure your laptop environment, basic PC and troubleshoot problems. Create backups, install virus protection, and manage files through a basic understanding of the Windows Operating System. Install and configure the Windows Operating System, and a virtual machine environment. Explore computer organization including basic numerical systems, functional hardware and software components needed to run programs.

CST8116 INTRODUCTION TO COMPUTER PROGRAMMING
Students receive an introduction to computer programming with emphasis on problem analysis and design, using algorithms, pseudocode, flowcharts, UML class diagrams and testing, with the Java programming language used as a means to implement problem

solution designs. Instruction in the Java programming language is provided including an introduction to object oriented programming, sequential structure, selection structures, repetition structures, variables, constants, methods, constructors, one-dimensional arrays, classes, objects, encapsulation, abstraction, inputs, outputs, coding conventions and documentation. Theory is reinforced with application by means of practical laboratory assessments.

CST8215 INTRODUCTION TO DATABASE
Students learn the fundamentals of Relational Databases design using Entity Relation diagrams, and use SQL to create, modify and query a database. Students design and create databases that are maintainable, secure and adaptable to change in business requirements, using Normalization. Students are able to compare and appreciate a Database Management System (DBMS) and its components with legacy systems.

CST8300 ACHIEVING SUCCESS IN CHANGING ENVIRONMENTS
Rapid changes in technology have created personal and employment choices that challenge each of us to find our place as contributing citizens in the emerging society. Life in the 21st century presents significant opportunities, but it also creates potential hazards and ethical problems that demand responsible solutions. Students explore the possibilities ahead, assess their own aptitudes and strengths, and apply critical thinking and decision-making tools to help resolve some of the important issues in our complex society with its competing interests.

ENL1813T COMMUNICATIONS I
Communication remains an essential skill sought by employers, regardless of discipline or field of study. Using a practical, vocation-oriented approach, students focus on meeting the requirements of effective communication. Through a combination of lectures, exercises, and independent learning, students practise writing, speaking, reading, listening, locating and documenting information and using technology to communicate professionally. Students develop and strengthen communication skills that contribute to success in both educational and workplace environments.

MAT8001C TECHNICAL MATHEMATICS FOR COMPUTER SCIENCE
The study of algebraic and transcendental functions is an essential prerequisite to Calculus. Students manipulate algebraic expressions, solve algebraic equations and linear systems and learn the properties of and graph algebraic and transcendental functions. Students investigate computer number systems in addition to Boolean algebra and logic to help solve problems involving computer systems. Students also study the addition and subtraction of vectors using vector components. Delivered in a modular format, this course is equivalent to the completion of all of the following math modules MAT8100 - A, B, C, D, E, F, H, and L.

CST2355 DATABASE SYSTEMS
Students acquire practical experience using market-leading object-relational database management systems like Oracle and MySQL. Students obtain hands-on experience with advanced engineering modeling tools along with SQL, SQL scripts and programming with Oracle's PL/SQL blocks. Database concepts covered include advanced SQL, case structures, rollup and cube operations, metadata manipulation, data storage and retrieval, security and transaction control and data warehousing. Open source database software is also explored.
Prerequisite(s): CST8215

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CST8102 OPERATING SYSTEM FUNDAMENTALS (GNU/LINUX)
Learn the basic concepts and components of Operating Systems (OS), and how they function and interact with hardware and software components. Explore the details of operating system structures, process management, storage management, installation, configuration, and administration both in theory and through practical assignments based on the GNU/Linux operating system. Lab exercises are designed to demonstrate how to implement the theory by developing skills using the powerful GNU/Linux command-line tools and utilities.
Prerequisite(s): CST8101

CST8284 OBJECT ORIENTED PROGRAMMING (JAVA)
Learn object oriented programming methodology using the Java programming language. Object oriented concepts, such as encapsulation, inheritance, abstraction and polymorphism are covered and reinforced with practical applications.
Prerequisite(s): CST8116 or CST8110

CST8285 WEB PROGRAMMING
Learn the basics of web programming, website design and implementation. JavaScript, HTML5, and PHP are used to explore web-based solutions to problems of increasing interactivity and complexity. Lectures are reinforced by practical assignments that encourage students to construct and maintain their own websites.
Prerequisite(s): CST8116 or CST8110

ENL2019T TECHNICAL COMMUNICATION FOR ENGINEERING TECHNOLOGIES
The ability to communicate effectively in a technically-oriented interdisciplinary workplace is a foundational skill in an innovation-driven economy. Students are exposed to exercises and assignments designed to foster independent and collaborative critical thinking, research, writing, visual communication and presentation skills related to technical topics.
Prerequisite(s): ENL1813T

GED0336 GENERAL EDUCATION ELECTIVE
Students choose one course, from a group of general education electives, which meets one of the following four requirements: Arts in Society, Civic Life, Social and Cultural Understanding, and Science and Technology.
Equivalents: ARC9001 or DSN2001 or ENV0002 or FAM1218 or GED1896 or GED5002 or GED5004 or GED5005 or GED5006 or GED5009 or GED5300 or GED6022 or GEN1957 or GEN2000 or GEN2007 or HIS0001 or HIS2000 or HOS2228 or LIB1982 or MGT7330 or MVM8800 or PSI0003 or RAD2001 or GED5003

CST2234 SYSTEMS ANALYSIS AND DESIGN
Guided by industry standard software engineering methodologies, students gain hands-on experience with case studies used to develop systems from inception through elaboration, construction and transition phases. Object-oriented design, modeling tools and techniques are used to produce system specifications. Project management principles are also used within team developed projects. Software methodologies discussed include the systems development life cycle (SDLC), agile approach, rational unified process (RUP)and rapid application development (RAD).
Prerequisite(s): CST2355 and ENL2019T
Corequisite(s): CST8288

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CST2335 MOBILE GRAPHICAL INTERFACE PROGRAMMING
Students explore graphical user interface programming in a mobile Android environment. Students learn how to program applications using the latest Android development tools. Topics include application architecture, interface design, network communication, and database integration.
Prerequisite(s): CST8215 and CST8284

CST8109 NETWORK PROGRAMMING
Software programming in today's environment requires detailed knowledge of the underlying network topology, its implementation and programming support functions. Gaining an appreciation and perspective of this technology is imperative to developing good network programming applications. Students explore topics including the basic structure, design and layered communications models, with an emphasis on data communications, TCP/IP protocol suite, socket programming and multi-threading concepts. Labs include practical exercises in basic networking and using socket programming, along with multi-threading, in an environment rich with common networking tools for diagnosing and troubleshooting typical network programming problems.
Prerequisite(s): CST8284 and MAT8001C

CST8288 OBJECT ORIENTED PROGRAMMING WITH DESIGN PATTERNS
Implement the best practices of object oriented program development with software design patterns. Apply UML program specifications in the Java programming language. Use embedded SQL through JDBC for developing and using "data access objects". Course topics include refactoring, domain modelling, JDBC and multithreaded servlet programming. Students develop proficiency in creating, testing, debugging, deploying and documenting programs and servlets through practical application.
Prerequisite(s): CST8215 and CST8284
Corequisite(s): CST2234

CST8283 BUSINESS PROGRAMMING
Create COBOL programs in a business environment using structured methodology in the latest visual programming environment. Topics include: output design; logic design tools; structured, top-down and modular coding; testing and debugging; and documentation. The programs include interactive, file-based, and database processing of data related to business problems. Arrays, indexed files, database access and sub-programs are included.
Prerequisite(s): CST8132 or CST8284

CST8390 BUSINESS INTELLIGENCE AND DATA ANALYTICS
Business Intelligence (BI) can be broadly defined as a set of applications, infrastructure, and best practices that integrate and transform raw data into actionable information used for planning, monitoring and analyzing processes. The foundation underlying this process is the Data Analytics that explore the data, identify the relationships and patterns in a meaningful way. Students examine the components and best practices of Business Intelligence technology, and how it guides operational to strategic business decisions in the context of real-world applications. Data analytics techniques are used to derive insight using statistical software.
Prerequisite(s): CST8132 or CST8215 AND CST8284 AND CST8285 AND MAT8001C or CST8238

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CST8276 ADVANCED DATABASE TOPICS
Teams and individuals explore advanced database topics: database administration (using Oracle), data governance, globalization, security and advances in database technology. Topic coverage includes business intelligence, data warehouses, data visualization, big data, NoSQL and graph databases. Database administration tasks requiring knowledge of database architecture are examined: relational vs. non-relational models, security, performance, database distribution, database sharing, backup and recovery.
Prerequisite(s): CST2355 AND CST8109

CST8277 ENTERPRISE APPLICATION PROGRAMMING
With a focus on the IT Enterprise, students are introduced to the application enterprise environment using and extending the technologies learned in previous courses. Topics studied may include the Java enterprise environment (JEE), the Microsoft .NET environment, Enterprise Android programming, cloud computing, security and the corporate database repository.
Prerequisite(s): CST8102 AND CST8109 AND CST8288

CST8333 PROGRAMMING LANGUAGE RESEARCH PROJECT
Learning a new programming language or framework on your own is a challenge faced by programmers on the job as part of their career. Students explore this process of self-study by applying project planning, applied research, testing, and implementation of basic and advanced concepts appropriate to the language or framework under study. Students develop major milestones and deliverables culminating in a project and reflective summary submission.
Prerequisite(s): CST8288

CST8334 SOFTWARE DEVELOPMENT PROJECT
Following the agile software engineering methodology, teams work with clients to analyze business needs, determine computer system requirements, model system designs, build prototypes, test code and deliver final products. In some cases, the industry contacts are supplied through the Algonquin College office of Applied Research and Innovation. Project management techniques are used to monitor progress and organize tasks. Outside of in-class requirements, teams must participate in interviews, technical reviews, presentations and the preparation of technical reports. The culmination of the course is a final presentation and technical review, followed by the delivery of the finished product.
Prerequisite(s): CST2234 and CST2335 and CST8109 and CST8285 and CST8288 and ENL2019T