

Area of Interest: Advanced Technology

Computer Programming (Co-op and Non Co-op Version)

Ontario College Diploma

Program Code: 0336X03FPM

2 Years

Pembroke Campus

Our Program

Learn workplace-ready programming languages and practical applications to use wherever your career takes you.

The two-year Computer Programming 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 and learn about programming languages such as Java, JavaScript, COBOL, SQL and PHP. Through the study of object-oriented analysis and design, operating systems and coding in integrated environments, you also learn how to debug, test, and maintain codes.

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

Students also have the option to gain real-world experience through a paid co-operative education (co-op) work term (see Additional Information for more details). Please note that places in the co-op work term are subject to availability and academic eligibility. Please note admission to the co-op program does not guarantee a co-op placement.

Graduates may work in a variety of different fields, as almost all sectors of industry require programming and database skills. Fields may include:

- private and public sectors
- healthcare
- education
- commerce
- science
- finance
- production
- information services
- service industry
- human services

SUCCESS FACTORS

This program is well-suited for students who:

- Enjoy and are adept at strategizing solutions to problems.
- Are life-long learners ready to meet the challenges presented by rapidly changing technology.

- Enjoy working independently and with others as a member of a team
- Are organized in their work and pay attention to detail.

Employment

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.

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.
- Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.

Program of Study

Level: 01	Courses	Hours
CST7116	Introduction to Computer Programming	70.0
CST7118	Computer Essentials	56.0
CST7215	Introduction to Database	70.0
ENL7777	Communications I	42.0
MAT7100	Technical Mathematics for Computer Science	56.0
PRL7532	College and Career Success	42.0
Level: 02	Courses	Hours
CST7102	Operating System Fundamentals (GNU/Linux)	70.0
CST7284	Object Oriented Programming (Java)	70.0

CST7285	Web Programming	56.0
CST7355	Database Systems	56.0
ENL7019	Technical Communication for Engineering Technologies	42.0
GEP1001	Cooperative Education and Job Readiness	18.0
Choose one from equivalencies: Courses		Hours
GED0336	General Education Elective	42.0
Level: 03	Courses	Hours
CST7109	Network Programming	70.0
CST7288	Object Oriented Programming with Design Patterns	70.0
CST7334	Systems Analysis and Design	56.0
CST7335	Mobile Graphical Interface Programming	56.0
Major Elective (1 course)	Courses	Hours
CST7283	Business Programming	56.0
CST7390	Business Intelligence and Data Analytics	56.0
Co-op: 01	Courses	Hours
WKT7002	Work Term I	
Co-op: 02	Courses	Hours
WKT7003	Work Term II	
Level: 04	Courses	Hours
CST7276	Advanced Database Topics	70.0
CST7333	Programming Language Research Project	56.0
CST7337	Software Development Project	28.0
CST7377	Enterprise Application Programming	70.0
Choose one from equivalencies: Courses		Hours
GED0336	General Education Elective	42.0

Fees for the 2023/2024 Academic Year

Tuition and related ancillary fees for this program can be viewed by using the Tuition and Fees Estimator tool at <https://www.algonquincollege.com/fee-estimator> .

Further information on fees can be found by visiting the Registrar's Office website at <https://www.algonquincollege.com/ro> .

Fees are subject to change.

Additional program related expenses include:

- Supplies can be purchased from the campus store.
- For more information visit <https://www.algonquincollege.com/coursematerials> .

Admission Requirements for the 2024/2025 Academic Year

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).

Program Eligibility

- English, Grade 12 (ENG4C or equivalent).
- Mathematics, (Grade 12 MCT4C) or (Grade 11 MCR3U) or equivalent; or (Grade 12 MAP4C with a grade of 80% or higher) or (Grade 11 MCF3M with a grade of 70% or higher).
- Applicants with international transcripts must provide proof of the subject-specific requirements noted above and may be required to provide proof of language proficiency. Domestic applicants with international transcripts must be evaluated through the International Credential Assessment Service of Canada (ICAS) or World Education Services (WES).
- IELTS-International English Language Testing Service (Academic) Overall band of 6.0 with a minimum of 5.5 in each band; OR TOEFL-Internet-based (iBT) Overall 80, with a minimum of 20 in each component: Reading 20; Listening 20; Speaking 20; Writing 20; OR Duolingo English Test (DET) Overall 110, minimum of 110 in Literacy and no score below 95.

Should the number of qualified applicants exceed the number of available places, applicants will be selected on the basis of their proficiency in English and mathematics.

Refresher/upgrading courses are available through our Academic Upgrading department, AC Online, and through local school boards.

Note: Applicants should have basic computer skills such as keyboard proficiency, Internet browsing and searching, and proficiency with an office software suite (word processing, spreadsheets, etc.) prior to the start of the program. Training in these skills is available to students via the Student Learning Centre Coaching Lab in C260. While programming experience is not a requirement to enter the program, aptitude for programming is necessary and would include strong language, problem solving and logic skills. This is often demonstrated by skill and enjoyment in solving word problems in math.

Admission Requirements for 2023/2024 Academic Year

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).

Program Eligibility

- English, Grade 12 (ENG4C or equivalent).
- Mathematics, (Grade 12 MCT4C) or (Grade 11 MCR3U) or equivalent; or (Grade 12 MAP4C with a grade of 80% or higher) or (Grade 11 MCF3M with a grade of 70% or higher).
- Applicants with international transcripts must provide proof of the subject-specific requirements noted above and may be required to provide proof of language proficiency. Domestic applicants with international transcripts must be evaluated through the International Credential Assessment Service of Canada (ICAS) or World Education Services (WES).
- IELTS-International English Language Testing Service (Academic) overall band of 6.0 with a minimum of 5.5 in each band; OR TOEFL-Internet-based (iBT) Overall 80, with a minimum of 20 in each component: Reading 20; Listening 20; Speaking 20; Writing 20.

Should the number of qualified applicants exceed the number of available places, applicants will be selected on the basis of their proficiency in English and mathematics.

Refresher/upgrading courses are available through Academic Upgrading courses, AC Online and through local school boards.

Note:

Applicants should have basic computer skills such as keyboard proficiency, Internet browsing and searching, and proficiency with an office software suite (word processing, spreadsheets, etc.) prior to the start of the program. Training in these skills is available to students via the Student Learning Centre Coaching Lab in C260.

While programming experience is not a requirement to enter the program, aptitude for programming is necessary and would include strong language, problem-solving and logic skills. This is often demonstrated by skill and enjoyment in solving word problems in math.

Application Information**COMPUTER PROGRAMMING (CO-OP AND NON CO-OP VERSION)**
Program Code 0336X03FPM

Applications to full-time day programs must be submitted with official transcripts showing completion of the academic admission requirements through:

ontariocolleges.ca
60 Corporate Court
Guelph, Ontario N1G 5J3
1-888-892-2228

Students currently enrolled in an Ontario secondary school should notify their Guidance Office prior to their online application at <http://www.ontariocolleges.ca/>.

Applications for Fall Term and Winter Term admission received by February 1 will be given equal consideration. Applications received after February 1 will be processed on a first-come, first-served basis as long as places are available.

International applicants please visit this link for application process information:
<https://algonquincollege.force.com/myACint/>.

For further information on the admissions process, contact:

Registrar's Office
Algonquin College in the Ottawa Valley
1 College Way
Pembroke, ON K8A 0C8
Local: 613-735-4700
Toll-free: 1-800-565-4723
TTY: 1-866-620-3845
Fax: 613-735-4739
<https://www.algonquincollege.com/pembroke>

Additional Information

CO-OP INFORMATION:

All applicants apply directly to the co-op version of this program through <http://www.ontariocolleges.ca/> or our International Application Portal. Applicants not wishing to pursue the co-op version will have the opportunity to opt-out after being admitted to the program but prior to the first co-op work term.

Co-operative education (Co-op) allows students to integrate their classroom learning with a real-world experience through paid work terms. Two academic terms prior to the cooperative education work term, students are required to actively participate in and successfully complete the self-directed co-op course, readiness activities and workshops.

Students must actively conduct a guided, self-directed job search and are responsible for securing approved program-related paid co-op employment. Students compete for co-op positions alongside students from Algonquin College and other Canadian and international colleges and universities. Algonquin College's Co-op Department provides assistance in developing co-op job opportunities and guides the overall process, but does not guarantee that a student will obtain employment in a co-op work term. Co-op students may be required to relocate to take part in the co-op employment opportunities available in their industry and must cover all associated expenses; e.g., travel, work permits, visa applications, accommodation and all other incurred expenses.

Co-op work terms are typically 14 weeks in duration and are completed during a term when students are not taking courses. For more information on your program's co-op level(s), visit the courses tab on your program's webpage.

International students enrolled in a co-op program are required by Immigration, Refugees and Citizenship Canada (IRCC) to have a valid Co-op/Internship Work Permit prior to commencing their work term. Without this document International students are not legally eligible to engage in work in Canada that is part of an academic program. The Co-op/Internship Work Permit does not authorize international students to work outside the requirements of their academic program.

For more information on co-op programs, the co-op work/study schedule, as well as general and program-specific co-op eligibility criteria, please visit <https://www.algonquincollege.com/coop> .

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 (CST7355, CST7276, CST7377, CST7284 and CST7288).

Contact Information**Program Coordinator(s)**

- Matthew Neadow, <mailto:neadowm@algonquincollege.com> , 613-735-4700, ext. 2715

Course Descriptions**CST7102 Operating System Fundamentals (GNU/Linux)**

Operating systems form the backbone of information technology systems coordinating the interaction between hardware and software. Students explore the basic concepts and components of Operating Systems (OS), and how they function and interact with hardware and software components. Students examine 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 work is designed to implement the theory by developing skills using the powerful GNU/Linux command-line tools and utilities.

Prerequisite(s): CST7116 and CST7118
Corerequisite(s):none

CST7109 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): CST7116 and MAT7100
Corerequisite(s):none

CST7116 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.

Prerequisite(s): none
Corerequisite(s):none

CST7118 Computer Essentials

Maintaining a computer, using operating system and productivity software, and expressing related environmental and sustainability concerns, is an important part of working with Information Technology. Students explain computer hardware, and use operating system software to maintain, utilize, and secure a computer. Students practice the use of spreadsheet software to solve problems, use formulas, and visualize data with charts. Students discuss computer hardware and software with regards to financial and environmental sustainability. Theory is reinforced with application by means of practical laboratory assessments, including using virtualization software to install guest operating systems onto a host computer.

Prerequisite(s): none
Corerequisite(s):none

CST7215 Introduction to Database

Databases are used to store data and are a core component of many information technology systems. Students learn the fundamentals of relational databases design using Entity Relation Diagrams (ERDs), and use Structured Query Language (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 become familiar with the functions of a Database Management System (DBMS) and its components in comparison with legacy systems and alternative information storage mechanisms.

Prerequisite(s): none
Corerequisite(s):none

CST7276 Advanced Database Topics

Database administration is an important role, in particular for deployed information technology systems. Teams and individuals explore advanced database topics including 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): CST7109 and CST7355
Corerequisite(s):none

CST7283 Business Programming

Information systems built using the COBOL programming language support important institutions such as government services and the banking sectors. Students 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. Students examine interactive, file-based, and database processing of data related to business problems. Arrays, indexed files, database access and sub-programs are explored.

Prerequisite(s): CST7116
Corerequisite(s):none

CST7284 Object Oriented Programming (Java)

Working in the field of information technology as a programmer requires a firm understanding of Object-Oriented Programming (OOP) concepts. Students explore 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. Students explore the basics of data structures and algorithms as well as basic Graphical User Interface (GUI) programming.

Prerequisite(s): CST7116
Corerequisite(s):none

CST7285 Web Programming

The World Wide Web (WWW) has become an integrated part of everyday life. Students develop basic skills 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): CST7116
Corerequisite(s):none

CST7288 Object Oriented Programming with Design Patterns

Design patterns are programming architecture solutions to common challenges faced in software implementation. Students implement best practices of object-oriented program development with software design patterns. Students also apply Unified Modeling Language (UML) program specifications in the Java programming language. SQL through JDBC technology is used embedded 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): CST7215 and CST7284
Corerequisite(s):none

CST7333 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): CST7288
Corerequisite(s):none

CST7334 Systems Analysis and Design

Complex information technology systems require extensive planning 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): CST7355 and ENL7019

Corequisite(s): none

CST7335 Mobile Graphical Interface Programming

Mobile devices play an instrumental part of everyday life, thus requiring knowledge of mobile graphical user interface development. 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): CST7215 and CST7284

Corequisite(s): none

CST7337 Software Development Project

Industry recognizes the value of graduates possessing real-world software development experience. 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. Project management techniques are used to monitor progress and organize tasks. Students 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): none

Corequisite(s): none

CST7355 Database Systems

Database systems can automate data processing tasks as well as tie into the security of information technology 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

Prerequisite(s): CST7215

Corequisite(s): none

CST7377 Enterprise Application Programming

Enterprise applications connect clients to services that are based on data stored in database management systems. With a focus on the IT Enterprise, students examine the application enterprise environment using and extending the technologies learned in previous courses. Students examine the commonly used enterprise systems development technologies such as Java/Jakarta Enterprise Edition, cloud computing, security and the corporate database repository.

Prerequisite(s): CST7102 and CST7109 and CST7288

Corequisite(s): none

CST7390 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 BI 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 to provide insight into patterns and trends not immediately obvious in the raw data.

Prerequisite(s): CST7116 and CST7215 and CST7285 and MAT7100 or CST7238
Corerequisite(s):none

ENL7019 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): ENL7777
Corerequisite(s):none

ENL7777 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.

Prerequisite(s): none
Corerequisite(s):none

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.

Prerequisite(s): none
Corerequisite(s):none

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.

Prerequisite(s): none
Corerequisite(s):none

GEP1001 Cooperative Education and Job Readiness

Students are guided through a series of activities that prepare them to conduct a professional job search and succeed in the workplace. Through a detailed orientation students learn the cooperative education program policies and procedures related to searching and securing a work term opportunity. Students identify their strengths and transferable skills and participate in workshop-style sessions that focus on cover letter and resume development, interview techniques and job search strategies. Students learn how to navigate a web-based resource centre, which is used to post employment and cooperative education job opportunities. Students reflect on workplace success, ethics and responsibilities.

Prerequisite(s): none
Corerequisite(s):none

MAT7100 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, and L.

Prerequisite(s): none
Corerequisite(s):none

PRL7532 College and Career Success

Students develop and expand their abilities as lifelong learners. These abilities are essential to students as they take their place in college, community, family and working life. Course content includes awareness of self as a learner and study of learning, motivation and problem-solving theories. Important throughout are attitudes which help students to deal with a complex, changing world. Teaching/learning methods include classroom discussion and exercises, reflective journals to monitor, evaluate and guide the student's development, as well as lectures.

Prerequisite(s): none
Corerequisite(s):none

WKT7002 Work Term I

Students compete a cooperative work term, and submit a written report which documents the location of employment and the duties performed.

Prerequisite(s): none
Corerequisite(s):none

WKT7003 Work Term II

Students compete a cooperative work term, and submit a written report which documents the location of employment and the duties performed.

Prerequisite(s): none
Corerequisite(s):none