

Area of Interest: Advanced Technology

## Cloud Development and Operations (Co-op and Non Co-op Version)

Ontario College Graduate Certificate  
1 Year  
Ottawa Campus

Program Code: 1531X03FWO

### Our Program

**Take your systems administration or application development career to the cloud.**

Build on the information technology management and software development skills that you already have through the Cloud Development and Operations Ontario College Graduate Certificate program. Learn to design, build, and manage secure, scalable, and cost-effective solutions using the latest cloud-native tools. This program prepares you to meet the mounting demand for cloud computing professionals across all industries in both the public and private sectors. You benefit from the experience of faculty as you prepare for industry-recognized certifications in various cloud computing career paths.

Through authentic industry problems from industry advisors, you gain experience choosing between public-cloud, private-cloud, hybrid-cloud, and multi-cloud architectures. Practise migrating legacy applications and their data to new cloud hosted environments. Build highly available solutions that balance security and data privacy needs with time-to-market agility and cost-efficiency. Employing industry best practises, you compose containerized microservices, serverless functions, redundant message queues, and managed cloud database services to create full-stack cloud-native application solutions. Learn to manage infrastructure as code using open source and cloud platform-specific tools to automate many DevOps tasks like continuous integration and continuous delivery (CI/CD) pipelines, performance and compliance monitoring, and security audits.

Build industry relationships while completing an applied project for a real-world client. You integrate the technical knowledge and experience gained throughout the program and demonstrate your leadership and communications skills. Graduates are well prepared to complete recognized industry certifications including:

- AWS Certified Cloud Practitioner
- AWS Certified Solutions Architect
- AWS Certified Developer
- AWS Certified SysOps Administrator
- Microsoft Certified: Azure Fundamentals
- Microsoft Certified: Azure Developer Associate
- Microsoft Certified: Azure Administrator Associate

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.

Cloud computing skills are in-demand across most industry sectors, including retail, transportation, media, gaming, health care, and more. Upon graduation you may find employment in software development, DevOps, or professional services. You may work with small start-ups, established companies or governments of all levels.

## **SUCCESS FACTORS**

This program is well-suited for students who:

- Have prior programming experience.
- Enjoy solving complex problems, with an ability to think critically and outside-the-box.
- Are curious and inquisitive.
- Are well-organized.
- Are comfortable communicating with groups of peers in professional settings.
- Have the ability to professionally lead and collaborate to achieve team deliverables.
- Are able to translate design models to implementation details.
- Value lifelong learning.

## **Employment**

Graduates of the program may pursue opportunities as cloud architects, cloud engineers, DevOps engineers and/or cloud developers.

## **Learning Outcomes**

The graduate has reliably demonstrated the ability to:

- Create an appropriate architectural design to support the client's secure virtual infrastructure and application development needs.
- Select and deploy appropriate cloud environments to support a variety of workloads in a rapidly changing business environment.
- Design and implement highly-available and elastically-scalable solutions within cloud computing platforms to maximize the reliability and resiliency of application services.
- Integrate and automate development and operations processes to enhance business innovation and agility with consistently reliable solutions within an established policy framework.
- Evaluate and integrate industry best practice recommendations into the design and development of secure cloud-based solutions to protect the privacy and integrity of client data.
- Evaluate the full cost implications of various cloud solution options to find an optimal cost/benefit balance for an organization.
- Assess and implement policy monitoring and compliance strategies and tools to ensure all deployed cloud-based solutions adhere to relevant regulatory, governance and legal requirements.
- Apply collaborative project management principles to identify, track and effectively communicate project goals, costs, constraints and deliverables, that support successful project outcomes.
- 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
CST8911	Introduction to Cloud Computing	42.0
CST8912	Cloud Solutions Architecture	56.0
CST8913	Cloud Migration	56.0
CST8914	Accessible By Design	42.0
CST8915	Full-Stack Cloud-Native Development	70.0
CST8916	Remote Data and Real-Time Applications	42.0
GEP1001	Cooperative Education and Job Readiness	18.0
Level: 02	Courses	Hours
CST8917	Serverless Applications	56.0
CST8918	Devops - Infrastructure as Code	42.0
CST8919	Devops - Security and Compliance	42.0
CST8920	Highly Effective Teams	42.0
CST8921	Cloud Industry Trends	42.0
CST8922	Applied Projects	84.0
Co-op: 01	Courses	Hours
WKT0026	Co-Op Work Term	

## 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.

## Admission Requirements for the 2024/2025 Academic Year

### Program Eligibility

- Ontario College Diploma, Ontario College Advanced Diploma or degree, or equivalent in the areas of information systems (IS), information technology (IT), telecommunications/networking, IT/IS security, computer engineering or equivalent; OR
- Graduate Certificate, Diploma, Advanced Diploma, or Degree from an accredited institution in a non-related field, with minimum three years of relevant practical field experience in an IT/IS or application development position may be considered. These applicants will be assessed individually and will be required to complete an Eligibility Package.
- Eligibility Package submission details can be found on the Algonquin College Additional Admission Requirements website: <https://www.algonquincollege.com/admissionspackages>.
- Applicants with international transcripts must provide proof of the subject specific requirements noted above and may be required to provide proof of language proficiency.

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- IELTS-International English Language Testing Service (Academic) Overall band of 6.5 with a minimum of 6.0 in each band; OR TOEFL-Internet-based (iBT)-overall 88, with a minimum in each component: Reading 22; Listening 22; Speaking 22; Writing 22; OR Duolingo English Test (DET) Overall 120, minimum of 120 in Literacy and no score below 105.

## **Admission Requirements for 2023/2024 Academic Year**

### **Program Eligibility**

- Ontario College Diploma, Ontario College Advanced Diploma or degree, or equivalent in the areas of Information Systems (IS), Information Technology (IT), Telecommunications/Networking, IT/IS Security, Computer Engineering or equivalent; OR,
- Graduate Certificate, Diploma, Advanced Diploma, or Degree from an accredited institution in a non-related field, with minimum three years of relevant practical field experience in an IT/IS or Application Development position may be considered. These applicants will be assessed individually and will be required to complete an Eligibility Package.
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### **Application Information**

#### **CLOUD DEVELOPMENT AND OPERATIONS (CO-OP AND NON CO-OP VERSION) Program Code 1531X03FWO**

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

Applications are available online 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 applying from out-of-country can obtain the International Student Application Form at [http://target=\\_blank](http://target=_blank) or by contacting the Registrar's Office.

For further information on the admissions process, contact:

Registrar's Office  
Algonquin College  
1385 Woodroffe Ave  
Ottawa, ON K2G 1V8  
Telephone: 613-727-0002  
Toll-free: 1-800-565-4723  
TTY: 613-727-7766  
Fax: 613-727-7632

Contact: <https://www.algonquincollege.com/ro>

## 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>.

## Contact Information

### Program Coordinator(s)

- Islam Gomaa, <mailto:CoordCloud@AlgonquinCollege.com>, 613-735-4700

## Course Descriptions

### CST8911 Introduction to Cloud Computing

Start-ups, large enterprises and governments alike are increasingly leveraging cloud computing technology and services to improve agility and accelerate innovation while also lowering costs. By exploring common use-cases, students investigate the benefits, challenges, and core architectural concepts of creating secure and cost-effective cloud-based solutions. Students gain hands-on experience with the leading cloud services providers' core service offerings and cost models by evaluating and deploying simple cloud-based solutions in hosted lab environments.

Prerequisite(s): none

Corequisite(s): none

### CST8912 Cloud Solutions Architecture

Whether migrating existing application workloads to the cloud or building cloud-native solutions, businesses must balance development speed, maintainability and operational performance with governance policies, regulatory requirements, and cost constraints. Students develop a broad understanding of the range of computing, storage, networking and database cloud-infrastructure solution options. Understanding the benefits and limitations of public-cloud, private-cloud, hybrid-cloud and multi-cloud solution designs, students select the appropriate architectural model for given business requirements. After exploring leading vendor best practice recommendations,

students evaluate, design and deploy highly available and scalable solutions using real-world use-case examples.

Prerequisite(s): none

Corerequisite(s):none

### **CST8913 Cloud Migration**

Migrating existing on-premise solutions to managed cloud solutions can be implemented by mirroring the current solution components and transferring the data and application code. The migration process also offers organizations the opportunity to modernize some or all the application components. Students analyze the benefits and costs of both options and then propose the recommended solution. Using industry case-study scenarios, students plan and execute the migration of on-premise solutions to managed cloud solutions.

Prerequisite(s): none

Corerequisite(s):none

### **CST8914 Accessible By Design**

Including accessibility as a core design consideration leads to products and services delivering a better overall user experience and ensuring compliance with regulatory standards. Students apply recommended tactics, software component libraries, and testing tools to consistently create Web Content Accessibility Guidelines (WCAG) and Accessibility for Ontarians with Disabilities Act (AODA) compliant designs. Students hone these skills in the lab by redesigning and rebuilding typical web application components.

Prerequisite(s): none

Corerequisite(s):none

### **CST8915 Full-Stack Cloud-Native Development**

For software start-ups and larger organizations creating brand new applications, a cloud-native solution often offers the shortest time to deliver and the most flexibility in scaling up to meet growing demand. Students build full-stack solutions that combine custom code components with popular managed cloud services such as databases, usage analytics, and identity and access management. In the lab, students utilize software development kits (SDKs) and component libraries to compose applications with containerized microservice designs following the test-driven design (TDD) methodology.

Prerequisite(s): none

Corerequisite(s):none

### **CST8916 Remote Data and Real-Time Applications**

Applications that receive data from the internet of things (IoT) or have mobile clients often have additional architectural requirements to handle real-time updates and inconsistent network connectivity. Students select and implement application connectivity standards such as REST, GraphQL, and WebSockets to connect remote sensors and mobile application clients with cloud-hosted application services and databases. Students use industry use-case examples to build offline-ready and real-time application components in hands-on labs.

Prerequisite(s): none

Corerequisite(s):none

### **CST8917 Serverless Applications**

The evolution of managed cloud services continues to remove layers of complexity in infrastructure management. Serverless computing, also known as hosted functions, allows event-driven decoupled application component designs resulting in a high level of component reuse and lower operating costs. Students identify appropriate use-cases for integrating serverless functions into larger solution architectures. Guided lab scenarios give students hands-on practice with designing and implementing serverless application components.



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

**CST8918 Devops - Infrastructure as Code**

In the cloud computing model, all traditional infrastructure elements, such as servers, networks and firewalls, are virtualized. These components are defined in code and can then be deployed or decommissioned on-demand. Without systematic controls and policy enforcement mechanisms, this flexibility can result in inconsistent performance and wasted resources. Students employ industry-standard tools to manage both application code and the virtualized deployment environment. Industry best practice recommendations guide lab scenarios for automating the continuous integration and continuous deployment (CI/CD) of application code and automating infrastructure management tasks such as auto-scaling, container orchestration, and data extract-load-transform (ETL) tasks.

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

**CST8919 Devops - Security and Compliance**

Moving data and applications out of a self-hosted datacentre to a managed cloud provider raises many security and privacy concerns. Students implement robust security policies and the monitoring and compliance tools required to ensure those policies are correctly followed. Students use a combination of open source and cloud vendor-specific tools during lab simulations to design, deploy and test various security and governance scenarios.

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

**CST8920 Highly Effective Teams**

Effective teams are a collection of skilled contributors, each of whom often has a particular area of specialization. Efficient communication among all contributors is a critical success factor in any project. It becomes even more impactful with large, geographically dispersed or cross-organizational teams. Students produce and present common project artifacts such as user stories, design specifications, and implementation plans. Through interactive review labs, students facilitate team discussions, prioritize activities, and create technical communications products related to their applied projects.

Prerequisite(s): none  
Corerequisite(s):CST8922

**CST8921 Cloud Industry Trends**

With the rapid rate of innovation in cloud computing, keeping pace with the latest technological developments, best practices, and managed solutions is a never-ending task. Students explore current relevant industry trends, such as software development and testing techniques, SDKs and APIs, laws concerning data storage and privacy, new hardware virtualization technologies, data analytics solutions, Internet of Things (IoT), artificial intelligence, or cybersecurity. Students investigate and present innovative technologies and techniques relevant to the cloud computing industry.

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

**CST8922 Applied Projects**

Integration of theory and practice in the context of a real-world industry project reinforces learning for students while affording industry partners a low-risk opportunity to explore innovative solutions. Working in teams, students experience the analysis, design, implementation, testing, and deployment phases of a cloud computing solution. Essential topics from throughout the program of study contribute to the successful completion of this capstone project. Faculty advisors facilitate

student teams to demonstrate their skills throughout the applied project. Student teams make a technical presentation to their faculty advisors and industry client partners.

Prerequisite(s): none  
Corerequisite(s):CST8920

### **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

### **WKT0026 Co-Op Work Term**

This optional co-op placement provides students with experiential opportunities within the field. Students gain entry-level positions that involve a variety of activities allowing application of principles and concepts developed during previous study.

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