Area of Interest: Advanced Technology

Computer Systems Technology - Security

Ontario College Advanced Diploma Program Code: 0156X01FWO

3 Years

Ottawa Campus

Our Program

Further your studies to specialize your IT career in the advancing field of Security.

Graduates of the Computer Systems Technician - Networking Ontario College Diploma program may be interested in furthering their knowledge and skills with this third year of study.

This third-year Computer Systems Technology - Security Ontario College Advanced Diploma program prepares you to perform a critical role in securing the confidentiality, integrity and availability of business-critical data, transactions and network infrastructure.

In this program you develop the theoretical knowledge and hands-on skills to assess, recommend, implement, and troubleshoot various advanced security solutions and countermeasures. Throughout the program, you have access to modern computing facilities that run Windows and Linux/UNIX-based operating systems that support a variety of pre-installed software applications. Algonquin College also offers specialized networking, Cisco and hardware labs.

Learn how to deploy modern security countermeasures against threats to IT infrastructure and how to validate and evaluate security controls.

Discover common techniques used in digital forensics and investigations, and how to participate in the investigation and incident response process. Learn how to design effective corporate policies and IT forensic concepts and tools, and study the legal process and proper evidence gathering procedures.

Graduates of this program may find careers in:

- private industrial government and service sectors
- privately managed security firms
- security audit/penetration consulting firms
- law enforcement agencies and security agencies

There may also be opportunities as:

- a network security specialist
- an IT network security consultant
- a corporate information security manager and officer

SUCCESS FACTORS

This program is well-suited for students who:

- Enjoy solving problems and challenging their minds.
- Have an inquisitive, well-organized and analytical nature.
- Can work effectively independently and with others in a corporate team environment.

- Enjoy analyzing problems of a complex nature and providing solutions.

Employment

Graduates may find employment in a variety of domains in the private, industrial, governmental and service sectors such as: privately managed security firms; security audit/penetration consulting firms; law enforcement agencies (RCMP, OPP, local police forces) and associated security agencies (CSIS, CSE); information technology consulting firms; primary communications carriers and information service providers; and users of information networks, including government organizations; small, medium-sized and large business enterprises; public organizations (financial, healthcare).

Positions in the Information Technology environment may include: corporate information security or security administrator (junior to intermediate level); corporate information security manager/ officer (junior to intermediate level); network security specialist (junior to intermediate level); IT/ network security consultant (junior to intermediate level); IT/network security architect/designer (junior to intermediate level); security auditor/penetration tester (junior to intermediate level); digital forensic analyst/consultant/investigator (junior to intermediate level); IT/network security and compliance analyst/investigator (junior to intermediate level); technical support specialist - security (intermediate level); technical integration sales representative and support (intermediate level).

Learning Outcomes

The graduate has reliably demonstrated the ability to:

- Identify, analyze, design, develop, implement, verify and document the requirements for a computing environment.

- Diagnose, troubleshoot, document and monitor technical problems using appropriate methodologies and tools.

- Analyze, design, implement and maintain secure computing environments.

- Analyze, develop and maintain robust computing system solutions through validation testing and industry best practices.

- Communicate and collaborate with team members and stakeholders to ensure effective working relationship.

- Select and apply strategies for personal and professional development to enhance work performance.

- Apply project management principles and tools when responding to requirements and monitoring projects within a computing environment.

- Adhere to ethical, social media, legal, regulatory and economic requirements and/or principles in the development and management of the computing solutions and systems.

- Investigate emerging trends to respond to technical challenges.

- Analyze, plan, design, implement and administer computer systems and cloud solutions.

- Research, design, deploy, configure, troubleshoot, maintain, upgrade, and decommission computing system infrastructures.

- Select and apply scripting tools and programming languages to automate routine tasks.

- Install, monitor, optimize and administer a database management system in response to specified requirements.

- Design, implement, and administer technical support processes for computing system infrastructures that aligns with industry best practice.

- Implement defence line using security control to effectively detect and respond to various cyber attacks and threats.

- 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
CST8182	Networking Fundamentals	70.0
CST8202	Windows Desktop Support	56.0
CST8207	GNU/Linux System Support	70.0
CST8300	Achieving Success in Changing Environments	42.0
ENL1813T	Communications I	42.0
MAT8002	Numeracy and Logic	42.0
Level: 02	**Courses**	**Hours**
CST8200	Windows Domain Administration	70.0
CST8208	PC System Technology	56.0
CST8305	GNU/Linux Server Administration	56.0
CST8315	Routing and Switching Fundamentals	70.0
ENL8720	Technical Communication for Technicians	42.0
Choose one from equivalencies:	**Courses**	**Hours**
GED0156	General Education Elective	42.0
Level: 03	**Courses**	**Hours**
CST8206	Foundation of IT Service Management	42.0
CST8245	Database Management and Interfacing	56.0
CST8246	Network Services Administration	56.0
CST8316	PC Troubleshooting	56.0
CST8342	Windows Enterprise Administration	70.0
CST8371	Introduction to Enterprise Networking	70.0
Level: 04	**Courses**	**Hours**
CST8248	Emerging Technologies	56.0
CST8249	Network Security	70.0
CST8317	Wireless Network Fundamentals	56.0
CST8378	Advanced Enterprise Networking	56.0
Choose one from equivalencies:	**Courses**	**Hours**
GED0150	General Education Elective	42.0

Level: 05	Courses	Hours
CST8601	Securing Routers and Switches	84.0
CST8602	Fundamentals of Penetration Testing	84.0
CST8603	Security Law and Compliance	42.0
CST8604	Information Security Risk Management	42.0
Level: 06	**Courses**	**Hours**
CST8605	Advanced Security Appliances	70.0
CST8606	Fundamentals of Digital Forensics and Discovery	70.0
CST8607	Applied Cryptography	70.0
CST8608	Fundamentals of Cyber Incident Response	56.0
CST8609	Business Continuity and Disaster Recovery	56.0

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:

- Books and supplies cost approximately $260 in Level 05 and $150 in Level 06 and can be purchased at the campus store.

Admission Requirements for the 2024/2025 Academic Year

Program Eligibility

- Successful completion of Algonquin College`s Computer Systems Technician - Networking Ontario College Diploma, with a cumulative GPA of 2.7 or higher.

- Current Algonquin College Computer Systems Technician - Networking students apply to this program through an internal process with the academic department.

- Algonquin College Computer Systems Technician - Networking students that have graduated 2 or more years ago must apply to 0156A Computer System Technician Security - Pathway for Computer Systems Technician through http://www.ontariocolleges.ca/ .

Admission Requirements for 2023/2024 Academic Year

Program Eligibility

- Successful completion of Algonquin College`s Computer Systems Technician program or Computer Systems Technician - Networking program. For direct flow through students, a cumulative GPA of 2.7 or higher is required. Pembroke students will be required to achieve 70% on a pre-admission assessment. Self-directed Cisco CCNA modules are available to assist the students in preparation of the assessment.

- Applicants who are not flowing directly from the Computer Systems Technician (0150X) or Computer Systems Technician -Networking (1560X) program to the Computer Systems

- Applicants who are not flowing directly from the Computer Systems Technician (0150X) or Computer Systems Technician -Networking (1560X) program to the Computer Systems Technology - Security program OR applicants who have not completed a qualifying version of Algonquin`s Computer Systems Technician (0150X) or Computer Systems Technician - Networking (1560X) program but with similar or equivalent knowledge/experience, will be assessed on an individual basis through an Advanced Standing application to the program`s Level 05.

- Applicants should have basic computer skills such as keyboard proficiency, Internet browsing and searching, and the use of an office software suite (word processing, spreadsheets, etc.) prior to the start of the program. The Mobile Learning Center Coach (C102) offers training in these skills if needed.

Note 1:
One of the key criteria for Advanced Standing applicants includes successful completion of CCNAv7 (or newer) training through an accredited Cisco Networking Academic; or successfully passed the CCNA 200-301 certification exam.

Note 2:
New students who wish to apply to this program must first apply to the Computer Systems Technician (0150X) or Computer Systems Technician - Networking (1560X) program through ontariocolleges.ca. During Level 04 of the two-year program, a sign-up process will allow students wishing to pursue the Computer Systems Technology -Security program to apply and be assessed for eligibility to the third year of the program.

Application Information

COMPUTER SYSTEMS TECHNOLOGY - SECURITY
Program Code 0156X01FWO

Current Algonquin College Computer Systems Technician - Networking students apply to this program through an internal process with the academic department.

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

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

Contact Information

Program Coordinator(s)

- Robert Vachon, mailto:vachonb@algonquincollege.com , 613-727-4723

Course Descriptions

CST8182 Networking Fundamentals

The modern world is connected and networking technologies form the foundation of data communication. Students describe the architecture, topology, protocols, components and models of the Internet and other computer networks. Based on the OSI and TCP layered models students examine the function of protocols and services at each layer of the TCP/IP protocol suite. Students design an IP addressing scheme for simple LAN topologies and apply the design to a simple network built using routers and switches.

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

CST8200 Windows Domain Administration

Microsoft Windows Server is an enterprise-level operating system that supports the computing requirements of a modern business. Students manage an MS Windows domain network with Active Directory and Group Policies. Students explore different server roles and domain configurations, install MS Windows server domain controllers, setup centralized management with Active Directory and Group Policies and automate system administration tasks using PowerShell. In addition, students explore virtualization concepts supported by MS Windows.

Prerequisite(s): CST8202
Corerequisite(s):none

CST8202 Windows Desktop Support

Microsoft Windows desktop is a commonly implemented desktop operating system in industry. Students prepare a MS Windows client system for participation in a Windows-based network. Through a combination of theory and hands-on lab, students install and configure the operating environment of a Windows desktop operating system, manage resources by applying common security principles, automate tasks using PowerShell and troubleshoot common error conditions.

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

CST8206 Foundation of IT Service Management

Technical customer support is an essential business service, and knowledge of IT Service Management, as described in the IT Infrastructure Library (ITIL), is required to work in an ITIL compliant organization as part of a service team. Students explain common structures and explore best practices of service management with a focus on ITIL. In addition, students practice soft skills, such as effective listening and communication to establish professional relationships with customers that have IT related issues and requests.

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

CST8207 GNU/Linux System Support

GNU/Linux is an open-source operating system that operates on a variety of computing devices such as mobile devices, server systems and supercomputers. Students apply the basic concepts, features and commands to setup, configure and manage a stand-alone GNU/Linux operating system. Students explore the flexibility of the GNU/Linux command line, the use of simple utilities to perform increasingly complex management tasks and the basics of shell scripting to simplify repetitive tasks.

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

CST8208 PC System Technology

Computer technology is built upon hardware, which requires regular maintenance as well as periodic upgrading and repair. Students work with PC hardware technologies in laptops, desktops and servers. Students explain the functionality and interaction of computer components and peripherals and identify standards of system components to ensure compatibility. In the hands-on lab students assemble PCs, and install and configure PC components.

Prerequisite(s): CST8202
Corerequisite(s):none

CST8245 Database Management and Interfacing

Data as a business asset requires the implementation of data storage and management technologies. Students explain the theoretical concepts of relational database systems, practice database server setup and management, design a database based on business requirements and manipulate data using SQL. In addition, students apply programming principles to build a management interface for a relational database using Python.

Prerequisite(s): CST8305
Corerequisite(s):none

CST8246 Network Services Administration

The client-server model, an essential part of network computing, enables client systems to use services, such as email or web services, over the Internet. Students configure essential network services based on the client-server model: students setup and maintain common client-server services by installing the server, establishing network connectivity and configuring the service protocol to support connections from multiple clients. Students are expected to research and troubleshoot failed connections, system errors and service errors. Fundamental problem-solving methodologies, independent research and teamwork are complementary course components.

Prerequisite(s): CST8305
Corerequisite(s):none

CST8248 Emerging Technologies

Computing solutions are currently migrating from an onsite IT department to a cloud service provider. Students examine current and emerging technologies in the context of cloud-based computing, apply virtualization concepts and work with virtualization technologies to support the shift from the traditional on premise IT infrastructure to cloud infrastructure. Students also get hands on experience researching and troubleshooting real world computing issues.

Prerequisite(s): CST8246 and CST8342 and CST8371
Corerequisite(s):none

CST8249 Network Security

The objective of network security is to maintain access to network resources for legitimate users and is an integral part of network administration. Students describe the guiding principles and practical applications of information technology security, such as the goals of computer security, common threats and counter measures. Further, students analyze network monitoring data for security threats, implement network security technologies on several operating system platforms and examine incident response handling processes.

Prerequisite(s): CST8245 and CST8246 and CST8342 and CST8371
Corerequisite(s):none

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.

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

CST8305 GNU/Linux Server Administration

The GNU/Linux operating system, known for its flexibility and stability, is implemented as a server solution in a variety of business establishments. Students configure and administer a GNU/Linux

server system by setting up and networking the operating system, managing a multi-user environment and configuring essential system services. As an integral part of server administration students troubleshoot common system and service errors, apply hardening principles to secure the system and write scripts to perform routine management functions.

Prerequisite(s): CST8207
Corerequisite(s):none

CST8315 Routing and Switching Fundamentals

A fundamental concept of networking is to connect network segments. Students implement switched networks based on industry standard design and protocols, and connect using simple routing configurations. To improve the robustness of switched network setups, students apply security controls and provide redundancy at the data-link layer. In addition, students configure a small wireless network.

Prerequisite(s): CST8182
Corerequisite(s):none

CST8316 PC Troubleshooting

A problem solving methodology is the foundation for effectively troubleshooting computing problems to support IT infrastructures. Students develop a systematic approach to troubleshooting hardware, operating systems and software problems. To identify and correct symptoms and faults found in PC-based systems, students apply problem analysis, methodology and techniques and investigate industry troubleshooting tools and utility software. In addition, students explore preventive and corrective measures in order to increase system reliability and minimize downtime. Labs are designed to test students troubleshooting skills using a series of computer systems with pre-set problems.

Prerequisite(s): CST8208
Corerequisite(s):none

CST8317 Wireless Network Fundamentals

Wireless networks enable enterprises to expand their network access beyond a wired infrastructure. Students describe the fundamentals of the 802.11 wireless protocol family, features and functions of wireless LAN components, and WLAN design and WLAN security and design issues. In the practical course component, students install, configure, and troubleshoot wireless LAN hardware peripherals and implement Wi-Fi authentication protocols.

Prerequisite(s): CST8371 or MAT8002
Corerequisite(s):none

CST8342 Windows Enterprise Administration

Modern enterprise-level IT solutions include on-site network service administration, as well as cloud integration. To optimize the management of enterprise-level MS Windows networks, students configure multi-master domain environments, setup MS Windows server roles, build virtualization solutions and examine Azure, Microsoft's public cloud computing platform. In addition, students implement email, an essential business communication tool, with MS Exchange mail server.

Prerequisite(s): CST8200
Corerequisite(s):none

CST8371 Introduction to Enterprise Networking

Network scalability features are an integral part of Enterprise network administration. Students configure dynamic routing protocols, develop scalable addressing schemes using network address translation (NAT) and IPv6 and assess redundant network designs. In addition, students continue to develop strategies to enhance network security with a practical focus on traffic filtering. Lastly, students explore network monitoring tools and techniques.

Prerequisite(s): CST8315
Corerequisite(s):none

CST8378 Advanced Enterprise Networking

Enterprise campus networks continue to evolve and scale to provide vital services to all users. Local area networks (LANs) and wide area network (WANs) connectivity must converge quickly and experience minimal downtime. In this course, students learn about technologies and features to improve the operation of an enterprise network. Students configure and optimize a redundant Layer 2 and 3 switched enterprise campus network infrastructure. Students implement advanced IPv4 and IPv6 OSPF features to improve routing performance and configure WAN connectivity using Multi-Protocol - Border Gateway Protocol (MP-BGP). Finally, they learn how Quality of Service (QoS) is deployed in an enterprise network and explore evolving technologies including network virtualization and network programmability.

Prerequisite(s): CST8371 or CST8271
Corerequisite(s):none

CST8601 Securing Routers and Switches

Securing routers and switches along with their associated networks, how to recognize threats, and vulnerabilities to networks and how to implement basic mitigation measures are explored. Topics covered include security threats facing modern network infrastructures, securing routers, implementing basic AAA, using ACLs to mitigate router and network threats, implementing secure management and reporting, mitigating common Layer 2 attacks, implementing firewall features, IDS/IPS and VPN features. This course is based on material from the Cisco Networking Academy - Network Security course.

Prerequisite(s): CST8249
Corerequisite(s):none

CST8602 Fundamentals of Penetration Testing

Students are exposed to applied skills and practical techniques required for penetration testing when used to evaluate corporate security processes and procedures. Students gain concrete knowledge of penetration testing concepts, ethics and ground rules; planning for penetration testing projects; applicable Security Audit standards (e.g. OSSTMM); requirements for successful penetration testing; how to conduct effective vulnerability audits using Threat / Risk Assessment; researching exploits and associated security solutions for identified vulnerabilities; and preparing Penetration Testing / Vulnerability Assessment reports. Common security audit tools and exploitation frameworks are used in practical penetration testing exercises to help reinforce the theory. The course borrows from EC-Council Certified Ethical Hacker (CEH), SANS' GIAC Certified Penetration Tester (GPEN) and ISC2 Certified Information System Security Professional (CISSP) certification materials.

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

CST8603 Security Law and Compliance

Students gain insight into legal and regulatory issues related to information technology and security by discussing and contrasting the Criminal Code of Canada, selected federal statutes, privacy laws, and international trends in cyber law all with a focus on electronically stored and transmitted information. Issues of compliance to laws and regulations are also explored. Students are also guided through the process of and encouraged to complete a police background check and a confidential security clearance.

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

CST8604 Information Security Risk Management

Students acquire the skills necessary to develop processes for protecting against economic loss

owing to disruptions of business activities due to natural disasters or cyber-attacks. Topics include roles and responsibilities of IT Security professionals in relation to risk management; the importance of making concurrent business and security decisions; managing risks in order to minimize impacts to business; risk assessment tools; cost-benefit analysis for security solutions; quantifying risks vs. threats; and using effective and enforceable policies as a tool to effect change in an organization.

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

CST8605 Advanced Security Appliances

The proper design and implementation of common security appliances in the overall security solution are examined. Topics include advanced firewall/IDS/IPS rules and management, integrating IPS and firewall capabilities, centralized logging and analysis, active alert systems, smart security appliances, along with NAC and 802.1x mechanisms. Industry standard appliances are explored through the hands-on portion of the course.

Prerequisite(s): CST8601
Corerequisite(s):none

CST8606 Fundamentals of Digital Forensics and Discovery

Students develop skills in digital forensic techniques and tools for investigations of cyber-crimes or corporate policy violations. Topics include file system structures of O/S, hash database comparisons, full and partial file recovery and analysis, forensic methodology and techniques, evidence acquisition and handling, interacting with law enforcement and forensic best practices. Forensic lab environments, tools and equipment are also explored.

Prerequisite(s): CST8602
Corerequisite(s):none

CST8607 Applied Cryptography

Students explore concepts and tools related to data security and integrity using mechanisms, such as authentication, access control, cryptographic systems and secure communications. Topics include cryptographic algorithms and protocols, security protocols, encryption technologies (e.g. IPSec, VPNs, SSL, Digital Signatures), Public Key Infrastructure (PKI), Trusted Computing concepts, authentication and non-repudiation mechanisms, steganography data and transaction integrity.

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

CST8608 Fundamentals of Cyber Incident Response

Students are introduced to incident handling tasks and critical-thinking skills required for Incident Responders, allowing insight into the typical work that incident responders may perform. Also provided is an overview of the incident handling arena; Computer Security Incident Response Team (CSIRT) services and their inter-relationships with other departments, agencies and organizations; and the nature of incident response activities. Interactive instruction, in-class practical exercises using case studies and mock events and role playing are integrated. The course also relies on having basic knowledge and skills related to Penetration Testing, Security Audits and Digital Forensics.

Prerequisite(s): CST8603 and CST8604
Corerequisite(s):none

CST8609 Business Continuity and Disaster Recovery

Students participate in the planning and implementation of mechanisms designed to safeguard enterprises from serious disruption to normal business activities, whether it is due to a disaster or other disruption to essential services. Topics include Business Recovery Planning vs. Disaster Recovery Planning; operational risk / vulnerability assessment and analysis; disaster recovery;

business continuity planning strategies and techniques; implementation of plans and policies to support for recovery; and cost-benefit analysis of security safeguards.

Prerequisite(s): CST8603 and CST8604
Corerequisite(s):none

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.

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

ENL8720 Technical Communication for Technicians

Clear, concise and detailed communication is essential for technical workplaces. Students plan and execute a variety of formal and informal visual, oral and written communication tasks. Exercises and activities foster confidence and competence in workplace communication.

Prerequisite(s): ENL1813T
Corerequisite(s):none

GED0150 General Education Elective

Students choose one course, from a group of general education electives, which meets one of the following four theme requirements: Arts in Society, Civic Life, Social and Cultural Understanding, and Science and Technology.

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

GED0156 General Education Elective

Students choose one course, from a group of general education electives, which meets one of the following four theme requirements: Arts in Society, Civic Life, Social and Cultural Understanding, and Science and Technology.

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

MAT8002 Numeracy and Logic

Students acquire the knowledge to work with numerical systems and internal machine representations, binary/hex/octal/decimal math, Boolean logic and truth tables. Students examine introductory level statistical methods and basic probability rules.

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