Area of Interest: Computers and Technology

**Computer Systems Technology - Security**

Ontario College Advanced Diploma
3 Years
Ottawa Campus

**Academic Year:** 2019/2020
**Program Code:** 0156X01FWO

**Our Program**

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

Graduates of the Computer Systems Technician Ontario College Diploma program may be interesting 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.

**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/consultant/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:

- Analyze and resolve information technology problems through the application of systematic approaches and diagnostic tools.
- Analyze, plan, design, and implement computer systems.
• Analyze, plan, design, and implement networking solutions.
• Install, configure, troubleshoot, monitor, maintain, upgrade, and optimize computer systems.
• Install, configure, troubleshoot, monitor, maintain, upgrade, and optimize networks.
• Use a variety of scripting tools and languages to automate routine tasks.
• Participate in the deployment and administration of databases within a networked environment.
• Plan, develop, and be responsible for data storage to ensure the integrity of information.
• Apply knowledge of security issues to the implementation of information technology solutions.
• Appraise existing security solutions with a view to on-going maintenance, development, and improvement of organizational security.
• Provide efficient and effective technical support to clients in a manner that promotes safe computing practices and reduces the risk of the issue recurring.
• Articulate, defend, and conform to workplace expectations found in information technology (IT) environments.
• Contribute to the successful completion of the project applying the project management principles in use.
• Use a variety of security and forensic tools to contribute in an IT security audit.
• Lead the implementation of organizational policies and procedures related to computer and network security and data integrity.
• 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

<table>
<thead>
<tr>
<th>Level: 01</th>
<th>Courses</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CST8182</td>
<td>Networking Fundamentals</td>
<td>70.0</td>
</tr>
<tr>
<td>CST8202</td>
<td>Windows Operating Systems I</td>
<td>56.0</td>
</tr>
<tr>
<td>CST8207</td>
<td>GNU/Linux Operating Systems I</td>
<td>70.0</td>
</tr>
<tr>
<td>CST8300</td>
<td>Achieving Success in Changing Environments</td>
<td>42.0</td>
</tr>
<tr>
<td>ENL1813T</td>
<td>Communications I</td>
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<tr>
<td>MAT8002</td>
<td>Numeracy and Logic</td>
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<tr>
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<tbody>
<tr>
<td>CST8206</td>
<td>Foundation of IT Service Management</td>
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</tr>
<tr>
<td>CST8208</td>
<td>PC System Technology</td>
<td>56.0</td>
</tr>
<tr>
<td>CST8239</td>
<td>Windows Operating Systems II</td>
<td>56.0</td>
</tr>
<tr>
<td>CST8305</td>
<td>GNU/Linux Operating Systems II</td>
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<tr>
<td>CST8315</td>
<td>Routing and Switching</td>
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Choose one from equivalencies: Courses

<table>
<thead>
<tr>
<th>Courses</th>
<th>Hours</th>
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<tbody>
<tr>
<td>GED0156</td>
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<tr>
<th>Level: 03</th>
<th>Courses</th>
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<tbody>
<tr>
<td>CST8190</td>
<td>PC Troubleshooting</td>
<td>70.0</td>
</tr>
<tr>
<td>CST8213</td>
<td>Network Services Administration</td>
<td>70.0</td>
</tr>
<tr>
<td>CST8242</td>
<td>Windows Operating Systems III</td>
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<tr>
<td>CST8271</td>
<td>Enterprise Internetworks</td>
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Computer Systems Technology - Security

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CST8304</td>
<td>Wireless Network Administration</td>
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**Level: 04 Courses**

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CST8245</td>
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<tr>
<td>CST8247</td>
<td>IT Security Fundamentals</td>
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</tr>
<tr>
<td>CST8248</td>
<td>Emerging Technologies</td>
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<tr>
<td>CST8249</td>
<td>Network Security</td>
<td>70.0</td>
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<tr>
<td>ENL8720</td>
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Choose one from equivalencies:

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**Level: 05 Courses**

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<tr>
<td>CST8601</td>
<td>Securing Routers and Switches</td>
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</tr>
<tr>
<td>CST8602</td>
<td>Fundamentals of Penetration Testing</td>
<td>84.0</td>
</tr>
<tr>
<td>CST8603</td>
<td>Security Law and Compliance</td>
<td>42.0</td>
</tr>
<tr>
<td>CST8604</td>
<td>Information Security Risk Management</td>
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**Level: 06 Courses**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tr>
<td>CST8605</td>
<td>Advanced Security Appliances</td>
<td>70.0</td>
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<tr>
<td>CST8606</td>
<td>Fundamentals of Digital Forensics and Discovery</td>
<td>70.0</td>
</tr>
<tr>
<td>CST8607</td>
<td>Applied Cryptography</td>
<td>70.0</td>
</tr>
<tr>
<td>CST8608</td>
<td>Fundamentals of Cyber Incident Response</td>
<td>56.0</td>
</tr>
<tr>
<td>CST8609</td>
<td>Business Continuity and Disaster Recovery</td>
<td>56.0</td>
</tr>
</tbody>
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**Fees for the 2019/2020 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](https://www.algonquincollege.com/fee-estimator).

Further information on fees can be found by visiting the Registrar`s Office site at [https://www.algonquincollege.com/ro](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.

For a complete list of program-related incidental fees, please visit our web site at [https://www.algonquincollege.com/sat/program/computer-systems-technician/](https://www.algonquincollege.com/sat/program/computer-systems-technician/).

**Admission Requirements for the 2020/2021 Academic Year**

**Program Eligibility**

- Successful completion of Algonquin`s Computer Systems Technician (0150X01FWO) program requirements. For direct flow through students, a cumulative GPA of 2.7 or higher is required.

- Applicants who are not flowing directly from the Computer Systems Technician (0150X01FWO) program to the Computer Systems Technology - Security program OR applicants who have not completed a qualifying version of Algonquin`s Computer Systems Technician (0150X01FWO) 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: CCNA Explorer training (recent version) through Cisco accredited institution; or CCNA Certification version 640-801 or better.

• **Note 2:** New students who wish to apply to this program must first apply to the Computer Systems Technician (0150X01FWO) 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.

**Admission Requirements for 2019/2020 Academic Year**

**Program Eligibility**

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**Application Information**

**COMPUTER SYSTEMS TECHNOLOGY - SECURITY**  
Program Code 0156X01FWO  
(Additional Year to the Computer Systems Technician Program)

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/](http://www.ontariocolleges.ca/). A $95 fee applies.

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 [https://algomonkincincollege.force.com/myACint/](https://algomonkincincollege.force.com/myACint/) or by contacting the Registrar`s Office.

For further information on the admissions process, contact:
Additional Information

Programs at Algonquin College are Bring Your Own Device (BYOD). To see the BYOD requirements for your program, please visit: https://www7.algonquincollege.com/byod/.

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

For more information, please email coordcst@algonquincollege.com or visit https://www2.algonquincollege.com/sat.

Course Descriptions

CST8182 Networking Fundamentals

The foundational knowledge of computer networking and LAN/WAN communications is introduced. Students are also introduced to the terminology and concepts related to the implementation and operation of computer networks. Topics include basic network design, layered communications models, IP addressing and subnetting, and industry standards for network media, and protocols with an emphasis on the TCP/IP protocol suite and Ethernet. Concepts from the Cisco Network Academy Introduction to Networks curriculum and from the CompTIA Network+ certification are also included.

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

CST8190 PC Troubleshooting

Emphasis is placed on problem analysis methodology and techniques for finding, identifying, and correcting hardware, operating systems and software problems. Mean time between failures (MTBF) and mean time to repair (MTTR) concepts are illustrated along with statistical analysis of historical support data in order to establish or revise preventive and corrective maintenance (PM and CM) schedules. Course content emphasizes symptoms, faults and solutions to problems found in PC-based desktop, server and laptop systems. Practical experience is gained by using common industry troubleshooting tools and utility software to resolve common problems. Labs are designed to test students troubleshooting skills using a series of computer systems with pre-set problems.

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

CST8202 Windows Operating Systems I

An introduction to the Windows operating systems is provided. Students learn to use some of the core basic commands and perform common system setup and management tasks that are commonly carried out by computer professionals. Typical tasks covered include, but are not limited to, installing and configuring operating systems, installing device drivers, batch files and windows scripting, command-line environment, troubleshooting the boot process, and customizing and personalizing the operating environment.

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

CST8206 Foundation of IT Service Management
An introduction to the basic understanding and concepts of IT Service Management as described in the IT Infrastructure Library (ITIL) is provided. Students gain knowledge of the ITIL terminology, structure, and best practices for service management. This knowledge is required for participation in an ITIL compliant organization as part of a service team. A basic overview of the relationship between the ITIL, COBIT and ISO2000 standards is also represented.

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

CST8207 GNU/Linux Operating Systems I

Students learn the basic concepts, features and commands of the GNU/Linux operating system and utilities, the world's most well-known Free/Libre Open Source Software (FLOSS) project and the underlying technology supporting Google, Facebook and Android smart phones. Students examine the power of the GNU/Linux command line and the basics of shell scripting and task automation. Students perform file system searches, full-text searches, and data-mine system log files to generate analyses of system status and intrusion attempts. Students also customize their shell programming environment to simplify repetitive tasks and support system administration functions.

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

CST8208 PC System Technology

Focus is on recent, current and emerging PC hardware technologies for desktop and laptop PCs. Course content includes how computers work and the interaction between core PC components and peripheral devices. Students learn about form factors and standards of components, buses and ports to ensure compatibility within systems. Students explore PC customization, performance and optimization, system cooling and data storage, with emphasis on installing, configuring and troubleshooting PC components.

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

CST8213 Network Services Administration

Students learn the concepts and skills required to set up, administer and secure essential network services on a GNU/Linux server platform. Services covered include at a minimum: DNS, email and web services. Students obtain practical experience by performing installation and configuration of these services in lab. Problem solving, research and teamwork are complementary course components.

Prerequisite(s): CST8177
Corerequisite(s): none

CST8239 Windows Operating Systems II

Building on previous experience with Windows Operating Systems, students explore the capabilities of Windows Server family. Topics include manual and automated installation, Microsoft DNS implementation, domain controllers using Active Directory, Group Policy, Terminal Services, Windows Server security and the Windows Distributed File System (DFS). This practical component allows students to install and configure Windows O/S with Active Directory and practise typical system administration tasks.

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

CST8242 Windows Operating Systems III

Expanding on previous experience with the Windows Server O/S, students focus on how to install, deploy, configure, administer and integrate key network services on a Windows Server. Services covered include MS Exchange server, MS IIS web server, Active Directory/DHCP and Active DNS.
Students learn about the participation of network services in an Active Directory environment, the integration of network services with DNS/DHCP, the challenges of network service administration in an enterprise environment as well as performance and security concerns.

Prerequisite(s): CST8239  
Corequisite(s): none

**CST8245 Advanced Scripting**

Based on previous scripting knowledge and experience, students will apply programming principles using Python to build a management interface for a relational database. In addition, students will learn about the theoretical concepts of relational database systems, practice database creation and management and manipulate data using SQL.

Prerequisite(s): CST8213 and CST8242  
Corequisite(s): none

**CST8247 IT Security Fundamentals**

This course focuses on the principles and practical application of information technology security. This includes: discussions about security policies, practice implementing policies using hardware and software devices, and evaluation of existing security controls. A variety of operating environments will be examined.

Prerequisite(s): CST8213 and CST8242  
Corequisite(s): none

**CST8248 Emerging Technologies**

The only thing constant in Information Technology is change. Students will be introduced to current and future emerging technologies, such as Cloud Computing Technologies, and learn about their implementations as well as their possible impact.

Prerequisite(s): CST8213 and CST8242 and CST8271  
Corequisite(s): none

**CST8249 Network Security**

Students are introduced to the goals of IT security, common threats and counter measures, including firewalls, Intrusion Prevention Systems (IPS) and virtual private networks. Core skills required to start working in a Security Operations Center (SOC) are covered.

Prerequisite(s): CST8271  
Corequisite(s): none

**CST8271 Enterprise Internetworks**

Students extend their knowledge of the architecture, components, configuration, operation, maintenance, and troubleshooting of routers and switches. The course completes the coverage of Cisco CCENT certification topics and introduces design, configuration, troubleshooting, and management considerations for larger and more complex LAN environments.

Prerequisite(s): CST8270  
Corequisite(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
Computer Systems Technology - Security

important issues in our complex society with its competing interests.

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

CST8304 Wireless Network Administration

The fundamentals of the 802.11 wireless protocols are covered. Beginning with a comprehensive view of the electromagnetic spectrum and how it relates to wireless networks, students explore such topics as: 802.11 protocol family; features and functions of wireless LAN components; WLAN design; WLAN security and design issues; setup, installation, configuration, and troubleshooting of wireless LAN hardware peripherals; and Wi-Fi authentication protocols.

Prerequisite(s): CST8270
Corerequisite(s): none

CST8305 GNU/Linux Operating Systems II

Focus is placed on the administration of a GNU/Linux stand-alone server connected to the network. Students learn how to perform and use essential administrative tasks and tools; user account creation and management; installation and customization of a GNU/Linux operating system; management and troubleshooting of the boot process; process and services management. Students use scripting languages to accomplish administrative tasks.

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

CST8315 Routing and Switching

Students learn about the architecture, components and operations of routers and switches in a small network. Students configure and troubleshoot routers and switches for basic connectivity.

Prerequisite(s): CST8182
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 program CCNA Security curriculum and may assist students in writing the certification exam.

Prerequisite(s): CST8278 or 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 re-enforce 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): CST8230 or CST8247
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

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

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

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

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): CST8230 or CST8247

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 practice 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