



Computer Information Systems Technology Diploma – CIST Program Outline

PROGRAM IMPLEMENTATION DATE: September 2024
OUTLINE EFFECTIVE DATE: September 2024
PROGRAM OUTLINE REVIEW DATE: March 2029

GENERAL PROGRAM DESCRIPTION:

The goal of this program is to prepare students for a career as a computer systems technologist. Computer systems technologists solve computer-related issues for businesses, government agencies, utilities, law enforcement agencies, health services providers, educational institutions and more. Graduates from this program can choose to specialize in areas including programming, software design, data communications, security and web design.

Program Information: This 2-year full-time program provides the knowledge, skills, and training required to prepare students for a career as a Computer Systems Technologist.

Delivery: This program is delivered hybrid (includes both face-to-face and online components).

COTR Credits: 60

Hours for this program: 1200

Year 1

Typical Structure of Instructional Hours:

Instructional Activity	Duration
Lecture Hours	275
Seminars / Tutorials	
Laboratory / Studio Hours	325
Practicum / Field Experience Hours	
Other Contact Hours	
Total	600

Practicum Hours (if applicable):

Type of Practicum	Duration
On-the-job Experience	N/A
Formal Work Experience	N/A
Other	N/A
Total	

Year 2

Typical Structure of Instructional Hours:

Instructional Activity	Duration
Lecture Hours	275
Seminars / Tutorials	
Laboratory / Studio Hours	325
Practicum / Field Experience Hours	
Other Contact Hours-capstone project	
Total	600

Practicum Hours (if applicable):

Type of Practicum	Duration
On-the-job Experience	N/A
Formal Work Experience	N/A
Other	N/A
Total	

Program Outline Author or Contact:

Joy Brown, Department Head

Signature

APPROVAL SIGNATURES:

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EDCO

Valid from: September 2024 – March 2029

Education Council Approval Date

PROGRAM PREREQUISITES AND TRANSFER CREDIT:

Admission Requirements:

- Minimum 60% in either English Studies 12, English First Peoples 12, ENGL 090 or equivalent (refer to Course Equivalency information on the College Website)
- Minimum 60% in either Foundations of Mathematics 11, Pre-Calculus 11, or Computer Science 11, MATH 080 or equivalent

Basic computer literacy skills are expected, including Windows operating system and file management skills, the ability to use word processing software, and the ability to communicate, research, exchange and download files using web browsing and email software.

For students for whom English is a second language, students must meet the College's English Language proficiency requirements.

PROGRAM LEARNING OUTCOMES

Upon successful completion of this program, graduates will be able to:

- design, analyze, and develop complex software application systems for PC, Web, and Mobile devices
- design, analyze, develop, debug, and optimize web and mobile applications written in popular programming languages such as Python, JavaScript, Java, C++ and C#
- develop and design interactive web pages/mobile apps with multimedia components
- install and configure basic computer hardware and software
- collaborate efficiently in a typical software project team working with popular project development tools and current development frameworks
- work in large and small teams as an effective team member
- learn new tools and technologies independently following the latest trends in software and hardware

Flexible Assessment (FA):

Credit can be awarded for this course through FA

Yes

No

Learners may request formal recognition for flexible assessment at the College of the Rockies through one or more of the following processes: External Evaluation, Worksite Assessment, Demonstration, Standardized Test, Self-assessment, Interview, Products/Portfolio, Challenge Exam. Contact an Education Advisor for more information.

Transfer Credit: For transfer information within British Columbia, Alberta and other institutions, please visit <http://www.cotr.bc.ca/Transfer>.

The College will engage with other BC Institutions offering related programming with the goal of creating reciprocal transfer options for students.

Program Matrix

Year 1

Term 1 (Fall)	CREDITS
CIST 101 Computer Systems Administration	4
CIST 102 Introduction to Programming	4
CIST 103 Website Development	3
CIST 104 Introduction to Database Management Systems (DBMS)	4

Term 2 (Winter)	
CIST 105 Introduction to Data Communication and Networking	3
CIST 106 Programming in C++	3
CIST 107 Introduction to Internet Programming and Web Applications	3
CIST 108 Software Analysis and Design	3
CIST 109 Windows Programming	3

Year 2

Term 3 (Fall)	
CIST 201 Introduction to Client-Server Computing	3
CIST 202 User Interface Design	2
CIST 203 Algorithm Analysis and Data Structures	3
CIST 204 Windows Interactive Application Programming	3
CIST 205 Introduction to Cloud Computing	3

Term 4 (Winter)	
CIST 206 Introduction to Computer Security	3
CIST 207 Advanced Internet Programming and Web Applications	3
CIST 208 Mathematics for Programmers	2
CIST 209 IT Development Project	4
CIST 210 Career Path Search	1
CIST 211 Emerging Technologies	3
Total	60

COURSE GRADE:

Course grades are assigned as follows:

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Mark (Percent)	≥ 90	89-85	84-80	79-76	75-72	71-68	67-64	63-60	59-55		< 55

COURSE DESCRIPTIONS:

CIST 101 Computer Systems Administration

This course introduces students to the computer (PC) as a system, both hardware and software. Students learn PC hardware and peripheral components: their role, how to connect, install, configure, and troubleshoot issues. This also includes basic safety and operational procedures. For software, students will gain knowledge of the fundamentals of Operating Systems (OS). They will acquire the skills needed to install and configure desktop computers and other devices in a business environment. Topics include OS architecture, file and disk management, BIOS and UEFI, multi-boot, virtual machines, software installation/removal, performance tuning, backing up and protecting data, and troubleshooting. The basics of networking, security, virus protection, and firewalls are also covered. Students will be introduced to the basics of other major OS such as Linux and Apple's iOS. Theoretical knowledge will cover the Microsoft 70-698 Installing and Configuring Windows 10 course.

CIST 102 Introduction to Programming

This is an introductory course on programming. Learners will develop problem-solving skills through the use of detailed algorithms and be introduced to structured and object oriented design techniques. The course content includes standard program syntax, variable types, operators, input/output statements, decision and loop control structures, methods, encapsulation, instantiating and using objects. The course is taught in Python to keep the focus on programming language-neutral.

CIST 103 Website Development

This course covers the fundamentals of website development and design using Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), and JavaScript. Students will learn how to create structured websites using HTML; how to use the most up to date CSS styles to create responsive, visually-interesting pages and captivating graphical designs; and how to implement client-side script using basic concepts in JavaScript to access Document Object Model (DOM) elements, to validate web forms, and to perform site management.

CIST 104 Introduction to Database Management Systems (DBMS)

In this course students will learn how to manage SQL database systems, including performing basic database administration. Students will learn how to configure a database to support different applications and to perform tasks such as creating users and database schema, applying constraints, setting up access control, assigning memory, defining storage structures and manipulating data. Since database administration does not end after the database is created, students will learn the importance of backup and recovery strategy. Students will become familiar with fundamental concepts in the field such as transnational operations, ACID property, backup and redundancy, data integrity, various database roles (database admin, database programmer, database designer), database normal forms, join operations, and how to perform queries.

CIST 105 Introduction to Data Communication and Networking

In this course learners will study the fundamentals of computer networking, protocols, components, major networking technologies and systems of modern networks, and will be able to configure, manage, and troubleshoot modern networks.

The topics include TCP/IP protocol suite, multiplexing/switching techniques, basic error detection and correction, elementary data link protocols, flow control and an introduction to routing and congestion control issues, multiple access protocols, networking and internetworking devices, LANs and WANs.

This course presents content required in the objectives of the CompTIA Network+ certification exam. Basics of Cloud computing and network security will be presented as well.

CIST 106 Programming in C++

This is an intense hands-on course on the most popular system and app development language: C++. Students (equipped with the basics of programming from CIST 1105) go on to cover the basics of C++ and its powerful features. Topics include classes, object life cycle, memory management and smart pointers, program execution life-cycle, an introduction to the Standard Template Library (STL), the basics of exception handling, and finally the basics of threads and processes in C++.

The main goal of this course is for students to become fully familiar with the landscape of programming with C++ and to be comfortable using its common and modern features as well as to have the confidence to debug, optimize, and restructure existing code in a general application development context.

CIST 107 Introduction to Internet Programming and Web Applications

In this course students learn how to design and develop a software application that works through browsers or the internet. Students will learn about various web application development technologies, and how to create a web application using a modern MVC (Model-View-Controller) framework which communicates with an Apache server. In a small team of 2-4, students will build a robust Representational State Transfer (REST)ful webapp back-end to complement their chosen projects. The team will collaborate using a shared Git repository and Gitflow workflow.

CIST 108 Software Analysis and Design

In this course students are exposed to the pillars of the Software Development Life Cycle (SDLC). Students explore and apply the concepts required to analyze, design, create, install and document a systems project through individual and team exercises. Learners will be exposed to key project management concepts and practices.

Using Object Oriented Design (OOD), students learn how to identify classes and build the domain model. Additionally, learners are introduced to an industry standard modeling graphical language: Unified Modeling Language (UML). Students learn the features of various Software Development Life Cycle (SDLC) patterns such as the Agile iterative model and the WaterFall model. Learners will learn the key players and stakeholders in a typical project and their roles. Various testing types such as unit testing, feature testing, regression testing, user acceptance testing, smoke test, and functional testing are also introduced.

CIST 109 Windows Programming

In this course students will become familiar with the basics of Windows in general and specifically Windows 10 capabilities from a developer's point of view. Students learn to develop applications with Windows 32 Bit (Win32) Application Programming Interface (API) using C or C# programming language. Later they will learn how to integrate Win32 calls into C# by creating unmanaged C# applications. Topics include Windows messaging, input from keyboard and mouse, timers, menus and resources, dialog boxes, clipboard, graphics, threading, accessing the microphone and speakers, and working with dynamic link libraries.

CIST 201 Introduction to Client-Server Computing

In this course students are introduced to the fundamentals of developing a distributed computer system based on the client/server paradigm. The challenges, the tools and techniques, and various characteristics of mobile vs desktop environments with respect to the Client-Server application model are analyzed. Students will develop distributed applications using sockets, datagrams, pipes and FIFO buffers, using low-level tools such as C++ or windows API (Application Programming Interface) such as COM (Common Object Model), RPC (Remote Procedure Call), and various web technologies, based on the experience and preferences of the instructor.

The goal for this course is to make students aware, through hands-on work, of the challenges of a networked application, such as performance, delays, reliability, scalability, and security issues.

CIST 202 User Interface Design

This hands-on course is an introduction to User experience/User Interface (UX/UI) for websites, mobile applications, and information systems. Students will plan and create a small website or a UI-centric mobile app following UI/UX best practices, analyzing website requirements and user interaction. Using those requirements and following usability guidelines, learners will design a site that works well on both desktop and mobile devices applying responsive web design. Students will choose and create appropriate media for website content.

CIST 203 Algorithm Analysis and Data Structures

Students learn the fundamentals of algorithm design and analysis through hands-on practice with various popular algorithms and data structures used in software development. Students learn how to analyze the time and space complexity of an algorithm and learn how to test and choose the right solution for a non-trivial programming problem. The emphasis is on developing practical skills as well as the conceptual mastery of efficient algorithm selection. Important data structures covered in this course include: Arrays and Vectors, Trees and Graphs. Popular algorithms and design strategies covered include: Recursion vs Iteration, Divide and Conquer, Greedy Techniques and basic sorting algorithms.

CIST 204 Windows Interactive Application Programming

In this hands-on course students will build upon their previous generic programming courses to build graphical user interfaces and design Windows application software. The Windows platform is the predominant OS (Operating System) and it has a complex ecosystem for developing advanced GUI (Graphical User Interface)-based applications. Students will program with C# using .NET framework, XAML (eXtensible Application Markup Language), and Windows Forms to build industry standard GUI-rich applications with interesting and sophisticated backends.

It is important that student use modern programming constructs and well-known patterns such as classes and objects, interfaces, observers, abstract factories in their projects in this course.

CIST 205 Introduction to Cloud Computing

In this course, learners gain a wider knowledge and deeper understanding of installing, configuring, and managing cloud infrastructure for an organization. Students are introduced to the cloud as a platform to acquire and use various resources which are traditionally used on a local hardware. This includes: cloud deployment models, cloud platform architectures, cloud computing platforms and comparative analysis. Cloud computing is comprised of virtual machine instances, load balancers, auto scaling groups, snapshots, and cloud networking. Students gain experience working with virtual private clouds (VPC), cloud storage and content delivery through cloud-hosted databases. Cloud security models are also covered including user identity, access management, and resource security. This course is a mixture of lecture and hands-on, with students practicing in the lab using services from various cloud providers such as Microsoft, VMWare, Google, and Amazon.

CIST 206 Introduction to Computer Security

In this course students will learn the fundamentals of computer security. Students learn the principles of computer and information security in general, and become familiar with the fundamentals of designing a secure system both from a hardware and software point of view.

Students will become familiar with security policies, the principles of cryptography, the basics of authentication, data protection concepts, how access control systems work, and software security. In general, learners will become familiar with the principles, practices, and analysis of developing secure software systems. Additionally, students will learn to recognize several areas of security attacks, examine current security measures and evaluate techniques to enhance existing measures.

CIST 207 Advanced Internet Programming and Web Applications

In this course students will learn about advanced web technologies which provide the possibility of building fully dynamic web-centric applications. This is an intensive, hands-on, project-based, team-oriented course in which students in a team of 2-4 become familiar with "full stack" web development. This course introduces new database models such as NoSQL or MongoDB in the context of developing an end-to-end web application development using MVC architecture.

The technologies used focus on a current modern stack, such as MEAN (MongoDB, Express.js, AngularJS), LAMP (Linux, Apache, MySQL, Python), and others. This course requires students to learn to program in Javascript in various environments. By the end of this course, students will be able to participate in the development of secure data-driven business web applications in various domains.

CIST 208 Mathematics for Programmers

This course deals with discrete mathematics, probability and statistics. Topics include the basics of Boolean logic, introduction to vector and matrix algebra, set theory, counting, and selected topics in combinatorics such as Graph theory and Coding theory. This results in students having basic familiarity with data distribution, probability of a situation out of all possible outcomes, and how basic statistical modeling, analysis, and computations are performed for real-life applications.

CIST 209 IT Development Project

This is a group project course which will expose students to all aspects of project development. Students work in a team of 3 to 6 to design, develop, manage, and deliver an IT software application project to an external (real or simulated) client.

Students will study and employ the practical and theoretical concepts obtained in the first year systems analysis and design courses by building an IT system. Learners will work as part of a development team on an IT problem for an external industry client. The project will include the production and demonstration of the functioning components of the system for each release within deadlines set out in the project management documentation. Students will present the final product to the client.

Students will also practice project management, documentation, meeting and presentation skills. As a contributor to a computer system development project, learners will prepare for and participate in project meetings, prepare project management documentation, adapt project management processes as required, manage progress using project management techniques and manage storage of project documentation.

CIST 210 Career Path Search

In this course students will prepare a career path portfolio based on their accumulated skills, qualifications, demo apps, and accomplishments. Students will revise their resume and cover letter to target an IT job posting. In a simulated job interview, students will answer behavioral questions and demonstrate the use of a career path portfolio.

CIST 211 Emerging Technologies

In this course students will study new and emerging technologies, and will examine how these technologies can change existing markets and development environments. Students will gain experience in working with software and/or hardware that can be classified as part of the emerging technology paradigm. This may include cloud computing, machine learning, virtualization technologies, or simulation technologies.