

# Computer Programmer Analyst

Section B.112

9/18/2020

Ontario College Advanced Diploma (3 Years - 6 Semesters ) (2091)

705.759.6700 : 1.800.461.2260 : www.saultcollege.ca : Sault Ste. Marie, ON, Canada



## PROGRAM OVERVIEW

The Computer Programmer Analyst advanced diploma program (2091) is designed for those students who have completed and shown above-average competencies in the Computer Programmer diploma program (2090) and who wish to continue to develop programming analysis skills. The Computer Programmer is four semesters and the Computer Programmer Analyst program provides an additional two semesters or third year of study.

Skills developed in the four-semester Computer Programmer (2090) program will be expanded upon with a third year of study in the Computer Programmer Analyst program (2091). The Computer Programmer Analyst program places an emphasis on developing analytical skills and working on team-based projects. The first semester (of the third year of study) is classroom based where students will learn and apply various technologies including JavaScript, Object Oriented Analysis and Design, PHP, server side java, mobile application development and databases in an application driven team environment. The final semester consists of a 4-month work experience. Students spend approximately 400 hours on-site at a local business or agency within a programming team, gaining valuable practical experience.

Students may have the opportunity to be involved in applied research projects. Please see the `Applied Research Centre` section for more information.

## PROGRAM OUTCOMES

***A graduate of the Computer Programmer Analyst Program at Sault College will reliably demonstrate the ability to:***

1. identify, analyze, design, develop, implement, verify and document the requirements for a computing environment.
2. diagnose, troubleshoot, document and monitor technical problems using appropriate methodologies and tools.
3. analyze, design, implement and maintain secure computing environments.
4. analyze, develop and maintain robust computing system solutions through validation testing and industry best practices.
5. communicate and collaborate with team members and stakeholders to ensure effective working relationships.
6. select and apply strategies for personal and professional development to enhance work performance.
7. apply project management principles and tools when responding to requirements and monitoring projects within a computing environment.
8. adhere to ethical, social media, legal, regulatory and economic requirements and/or principles in the development and management of the computing solutions and systems.
9. investigate emerging trends to respond to technical challenges.
10. gather, analyze and define software system specifications based on functional and non-functional requirements.
11. design, develop, document, implement, maintain and test software systems by using industry standard software development methodologies based on defined specifications and existing

technologies/frameworks.

12. select and apply object-oriented and other design concepts and principles, as well as business requirements, to the software development process.
13. gather requirements and model, design, implement, optimize, and maintain data storage solutions.
14. integrate network communications into software solutions by adhering to protocol standards.

#### Reference

Ministry of Training, Colleges and Universities Computer Programming and Analysis Program Standards (MTCU 60503), November 2018.

## **ADMISSIONS**

### **MINIMUM ACADEMIC REQUIREMENTS**

Completion of the 2-year Computer Programmer Program.

## **CAREER PATHS**

A strong demand for programmer/analyst graduates exists in a number of different businesses and industries both locally and nationally. Graduates may seek employment in a wide range of positions such as: software development, systems analysis and design, user interface design and human factors, web and database design and programming, project management, system and database administration, end user support, management of technology. Potential for career advancement and portability of skills is high.

## **OTHER INFORMATION**

**This program will not be offered in the 2020 / 2021 Academic Calendar Year.**

Please Note: Semesters 1 to 4 are taken in the 2-year Computer Programmer program. Upon successful completion of the Computer Programmer program, students will have the option to enter semester 5 of the Computer Programmer Analyst program. (subject to enrolment)

For more information contact Program Coordinator Bazlur Rasheed at 705.759.2554 ext. 2668 or email [bazlur.rasheed@saultcollege.ca](mailto:bazlur.rasheed@saultcollege.ca)

## **PROGRAM OF STUDY**

### **SEMESTER 1**

CSD105-3 Python  
CSD120-5 Introduction to Web Development  
CSO104-5 Introduction to Operating Systems and LAN  
MTH122-4 Computer Mathematics  
TNY130-3 Technology in Society

### **SEMESTER 2**

CSA103-4 Business Applications I  
CSD102-5 Programming Using C++  
CSD212-4 Web Scripting Languages  
CSO102-4 Introduction to LINUX  
CST104-4 PC Hardware and Networking

### **SEMESTER 3**

CMM115-3 Communications I  
CSD202-5 Systems Analysis and Design  
CSD203-4 Mobile Applications I  
CSD207-4 Introduction to C#, .NET and Desktop Applications  
CSD210-4 Database Modelling  
CSD211-4 JAVA I  
GEN100-3 Global Citizenship

### **SEMESTER 4**

CMM215-3 Business Communication  
CSD220-4 Database Programming using SQL  
CSD221-4 JAVA II  
CSD223-4 Advanced Web Applications  
CSD331-5 Advanced C# and .Net, Web Applications

#### ***Select one of the following:***

*GEN110: Student Selected General Education*

**Note:** \*This student-selected general education course code indicates a general-education course is taken in this semester. Students will choose from a selection of courses ([details](#)) prior to the semester in which the student-selected general education course is to be taken.

### **SEMESTER 5**

CAR300-5 Applied Research Project  
CSD309-4 Mobile Applications II  
CSD318-4 Project Management  
CSD320-5 Web DBMS  
CSD322-4 Java III

### **SEMESTER 6**

CSE340-15 Work Placement

## **Course Descriptions**

### **Semester 1**

#### **Python (CSD105) (3 credits)**

The Python programming language is a popular and easy-to-learn programming language that allows students to become comfortable with the fundamentals of programming without the troublesome syntax that can be challenging for novices. With the knowledge acquired in this course, students will be able to solve computational problems using the foundational concepts of all programming languages, namely: variables, basic data structures such as tuples, lists, and dictionaries, conditional and looping structures, functions, and basic input and output.

#### **Introduction to Web Development (CSD120) (5 credits)**

A student in this course will learn the fundamentals of creating web sites using modern HTML and CSS. After a brief introduction to the World Wide Web, they will learn the HTML elements that are used in all web pages, including page layout elements, tables, forms, and more modern media elements for video and audio. Students will also learn advanced styling techniques using CSS to give web sites custom layouts and appearances, including responsive design and CSS animation. Throughout the course, accessibility standards to make web sites usable to the widest possible audience will be highlighted.

Students will use modern web browsers, GitHub, and Visual Studio Code to create working web sites.

### **Introduction to Operating Systems and LAN (CSO104) (5 credits)**

This course will introduce students to the use of client and server operating systems. The first portion of this course is dedicated to bringing awareness to students the various types of operating systems, purposes and capabilities. Students will configure, secure and performance-tune a Microsoft Windows 10 Operating System. The topic of Network Operating Systems is then introduced of which students will install and configure a Windows 2019 Server, whereas gaining practical hands-on skills in installation, administration, file permissions, firewalls, DNS Server (Domain Name Service) and Network Printing services. Microsoft Windows 2019 Server and Windows 10 will be the primary learning software operating systems used.

### **Computer Mathematics (MTH122) (4 credits)**

This course presents mathematics needed in computer studies. Emphasis is placed on developing logical thinking skills and an algorithmic approach to problem-solving.

### **Technology in Society (TNY130) (3 credits)**

This course will introduce students to the impact that technological change has on society. Illustrations and examples will be drawn from the students discipline. Potential topics include the social and economic impact of new technology, responsibilities and ethics, privacy, liability and technology-based crime, and emerging trends.

It is designed to provide students from varied programs and backgrounds with a particularly relevant and timely appreciation of the impact technology and technological advances have made on every aspect of society. Technology and its implementation in society have strengths, weaknesses, opportunities and threats. This course investigates the social, legal, and ethical issues the use of technology raises.

## **Semester 2**

### **Business Applications I (CSA103) (4 credits)**

In this course students will learn the basic to intermediate features of Microsoft Excel and Access. Students will learn to develop spreadsheet applications involving formulas and statistical charting as well as learn database concepts in order to develop small functional database systems. Students will be introduced to database design, table structures, forms, queries and reports. In addition, students will be introduced to the basic SQL structure and data mining to generate queries from standard database applications.

### **Programming Using C++ (CSD102) (5 credits)**

The primary focus of this programming course is to develop the student's logical problem-solving skills. At the same time, the student will learn the constructs inherent in all programming languages. To understand the program development process, the following concepts will be discussed: structured programming techniques, pseudocode, algorithm development, syntax, data types/variables, debugging, documentation, conditions, looping, user-defined functions, arrays, pointers, structures, file handling and an introduction to OOP using classes. Problem-solving skills are developed through programming assignments of increasing complexity.

### **Web Scripting Languages (CSD212) (4 credits)**

Students will be writing comprehensive Client-Side web based applications using JavaScript technology. Students will learn JavaScript code that will be cross-browser compatible. The course content will focus on; using JavaScript with well-formed Web pages; work with JavaScript variables and data types and learn how

to use the operations that can perform them; add functions, events, and control structures; use the browser object model; ensuring data that is entered into Web forms is correct before sending to the server; use object oriented programming techniques; manipulate data in strings and arrays.

### **Introduction to LINUX (CSO102) (4 credits)**

This course introduces the student to the Linux Operating system with particular emphasis on command line tools, utilities and shell scripting. The student will learn and apply the various commands and utilities related to file system management, process management, program development and data processing. In addition the student will learn about shell concepts and become proficient in the use of shell features such as command line editing and learn and apply Unix concepts such as pipes and filters. The student will apply the aforementioned utilities and concepts in the writing of shell scripts.

### **PC Hardware and Networking (CST104) (4 credits)**

This course provides an overview of computer hardware and networking. The hardware components of a typical computer system will be studied as well as the system level software such as the operating system and device drivers. The basics of networking will be studied and the student will build a network both wired and wireless and share resources across it. Experiments with network communication encryption will be performed. Topics in mobile and cloud computing will also be covered.

## **Semester 3**

### **Communications I (CMM115) (3 credits)**

This course is designed to help students develop the skills necessary to communicate effectively in their programs and at the college level. Students will think critically to capture the meaning messages and respond appropriately; produce coherent, clear paragraphs; and purposefully research and responsibly integrate credible sources into their own writing. Emphasis is placed on the writing process, from planning to revising, while providing opportunities to explore various modes of communication.

### **Systems Analysis and Design (CSD202) (5 credits)**

In this course we will follow a structured, methodical approach to systems analysis and design. The student will gain a thorough understanding of the System Development Life Cycle (SDLC) through the preparation of deliverables (documents, discussions, coding) at each stage. We will also compare and contrast some of the newer development methodologies such as the modified SDLC, Rapid Application Design (RAD), Object Oriented Analysis and Design (OOA&D), and others.

The most important component of system development will always be communication. Therefore, communication is the key to success in software development and thus oral, written and interpersonal communication skills will be the main focus of this course. Students will work individually, and within a team environment, to develop their analytic/system design skills and prepare a complete system proposal.

### **Mobile Applications I (CSD203) (4 credits)**

This course provides an introduction to mobile application development concepts and tools. Topics include current industry development environments, user interfaces, mobile programming, data storage, debugging and deployment. The student will apply concepts and write applications for mobile devices using a mobile app development environment.

### **Introduction to C#, .NET and Desktop Applications (CSD207) (4 credits)**

This course introduces the student to the C# programming language and the .NET framework. Students will design, develop, test and debug applications demonstrating practical knowledge of C# language constructs and the .NET framework and libraries. Desktop applications including Windows Forms and console based applications will be written in the Visual Studio Integrated Development environment.

?

Students will write applications that build on concepts and language constructs developed in this and other courses including structured programming techniques, basic language syntax, data types, file I/O, variable scope, arrays, collection classes, references, sequence, selection, repetition and object oriented programming techniques such as encapsulation, inheritance, polymorphism and UML syntax.

?

This is a lab oriented course with emphasis on practical hands on exercises. ?Students will be introduced to and gain practical knowledge in the use of git, git clients and cloud based repositories.

#### **Database Modelling (CSD210) (4 credits)**

This course will introduce students to database design and implementation. Students will learn to analyze and model an end-user's data environment using Entity-Relationship Diagrams and normalization techniques. Database models will be physically implemented using a relational DBMS and SQL (Structured Query Language). To understand the database development process, the following concepts will be discussed: data integrity, entities, attributes, relationships, cardinalities, primary and foreign keys, normalization, conceptual modeling, logical modeling, physical modeling.

#### **JAVA I (CSD211) (4 credits)**

This course provides an introduction to software engineering using the Java programming language. The student will apply knowledge of program structure and programming constructs such as selection, looping and data structures, to the writing of programs.

In addition the concepts of objects and classes, inheritance and polymorphism will be introduced and applied in the writing of programs. The course continues with an introduction to GUI programming with an emphasis on event driven programming and concludes with exception handling and binary I/O.

Programs will be written using the Netbeans IDE in the Windows Operating System environment.

#### **Global Citizenship (GEN100) (3 credits)**

The world we are living in is one in which local, national and international issues are interwoven, and the need for us to understand the impact these issues can have on our lives has never been greater! Using a socio-cultural, political and environmental lens, students will view how the world is changing and how to become active agents of change from the local to international level. Important issues such as social injustice, poverty, environmental protection, resource scarcity, sustainability, and health will be addressed. Global citizenship is an opportunity to `Be the Change`. This course meets the Civic Life and Social and Cultural Understanding General Education themes.

### **Semester 4**

#### **Business Communication (CMM215) (3 credits)**

This course provides employment-related theory and practice in those written and oral reporting skills typical of a modern business or institution. The principles of writing are taught through the writing process.

#### **Database Programming using SQL (CSD220) (4 credits)**

This course is a continuation of Database Design and Implementation I, where more advanced design and implementation of systems will be completed. A major focus of the course is on the physical implementation and manipulation of databases. More advanced SQL (Structured Query Language) will be used for processing and managing relational databases. The DBMS platform that will be used is MySQL. Database design/modelling will be revisited to ensure the student has grasped the major concepts taught

in the previous course. The course will also extend the concepts of database management to include such topics as managing multi-user databases and data warehouse design.

### **JAVA II (CSD221) (4 credits)**

This course introduces students to the concepts of Object-Oriented Programming and applies them in practical problem-solving exercises. The course presently uses the Java programming language and the Netbeans IDE as the development environment. This course builds on the skills developed in previous courses, in Java, C++ and Python.

### **Advanced Web Applications (CSD223) (4 credits)**

The Advanced Web Applications courses uses the content taught in previous courses that delivered the XHTML, as well as the introduction to JavaScript course as a foundation to the every expanding web application technology that fuels everything from personal computing, to corporate applications required to meet the world business needs. This course will focus on two popular areas of web application development: Advanced JavaScript, and JQuery. Students will be collaborating in small groups, as well as polish their presentation skills.

### **Advanced C# and .Net, Web Applications (CSD331) (5 credits)**

This is the second course in C# and introduces Web Application development using the C# and .NET development environment. In addition to building on concepts introduced in the first course, this course will develop skills in the use of various technologies including, databases (ADO.Net), Web development using ASP.Net, Web forms, MVC (Model-View-Controller ), Web application deployment, LINQ and other technologies. Develop and publish Web apps to Azure (cloud based services). Use Azure services such MSSQL and MySQL databases to create cloud based database Web Applications.

Advanced Object oriented programming techniques will be discussed in this course and build on the concepts developed in another concurrently delivered OOP course.

Students will develop Web applications using the Visual Studio IDE supporting Create, Read, Update and Delete (CRUD) operations on a database. This is a lab oriented course with heavy emphasis on databases and Web client and server technologies.

### **Student Selected General Education (GEN110) (3 credits)**

For Transfer Credit Purposes only.

## **Semester 5**

### **Applied Research Project (CAR300) (5 credits)**

This course is linked to the colleges Applied Research Centre that brings together Sault Colleges faculty, staff and students and local and regional enterprises to participate in applied research projects that provide real-world solutions to real-world problems, enabling them to create or improve products and services and compete in the global marketplace.

Applied research deals with solving real-world problems that usually have direct commercial application. In applied research, activities such as prototype development, feasibility studies, clinical trials, technical consultation and problem solving are often involved.

Working on Applied Research Projects will lead the students to help; solve technical problems, adapt new technologies for the marketplace, develop prototypes and new or improved products and processes, enhance products, processes, and / or services, test/evaluate and perform proof of concept study, undergo incremental and larger-scale innovation.

All learning styles will be addressed by having the students learn by using manuals; instructor feedback, industry partner representatives to guide the project; small group work; as well as online research.

### **Mobile Applications II (CSD309) (4 credits)**

This course explores software development for wireless devices. Students will become familiar with the processes involved in creating, testing, debugging and deploying applications that will run on Android based mobile phones and tablets. Software development will occur using java in the Eclipse IDE. Applications will be written that explore the building of user interfaces, deal with persistence of data, send emails, implement a simple game and interact generally with the device. The written applications will be deployed to mobile device emulators and to various hardware devices, logistics permitting.

### **Project Management (CSD318) (4 credits)**

This course provides a comprehensive overview of Project Management from an Information Technology perspective. The student will study and apply project management techniques from the various Project Management knowledge areas including project integration, scope, time, cost, quality, human resource, communications, risk and procurement management. The student will acquire practical skills in using various tools used in Project Management by applying knowledge learned in case studies and in the aforementioned areas.

### **Web DBMS (CSD320) (5 credits)**

This course will broaden the students knowledge of database implementations. The focus will be to use their previous database skills and experiences and apply them to database driven web sites. A combination of technologies will be examined and used throughout the course to expose students to the alternatives that exist in web-based database applications.

The course covers the concepts and practical aspects of creating a web site and web database processing. It will also acquaint students with relational database concepts, SQL, HTML and more importantly how they relate to creating a database driven web site. Students will be expected to create and manage a web server (Apache).

They will be required to code and work with the scripting language, PHP(the PHP Hypertext Preprocessor), in the creation of server-side scripts.

The ultimate goal of the course is the creation and implementation of a soundly designed database that is integrated in a realistic and well-designed web site. The students will be expected to work together as team members in developing a fully integrated website.

### **Java III (CSD322) (4 credits)**

This course continues application development in Java with an emphasis in web application development. Various technologies and application frameworks will be introduced. Students will write applications using the JSF2 framework. Students will develop the ability to write form based CRUD (Create, Read, Update and Delete) applications, persisting data to a database backend using each of the aforementioned technologies. Applications will be written using the Netbeans IDE and the MySQL database.

## **Semester 6**

### **Work Placement (CSE340) (15 credits)**

This course consists of on-the-job work experience designed for all third year Computer Studies students who have met the program requirements. The focus of the work experience is to provide students with

hands-on computer experience in a company, or government agency that performs job functions relevant to the students course of study.

The placement gives the student the opportunity to apply their academic backgrounds and abilities, as well as broaden their knowledge base through additional job duties performed at their placements in a practical computing environment. The students perform their duties in a well supervised atmosphere, adhering to the companys policies and procedures, and hours of operation.

The computer work placements are unpaid, however, many students go on to secure a full time position or contract position with their work placement employers. Others obtain valuable letters of reference, and are able to add their new experiences gained from work placement to their resumes. The course becomes a stepping stone for the student, taking them from the academic computer curriculum, to preparing them for the real world computer job market.