

Vanier College
Computer Engineering Technology (243.A0)
Course Descriptions

201-102-VA - Math for Computer Engineering Technology I :

- This course covers the fundamental mathematical concepts and tools adapted to the needs of the CET program. The focus will be on applications to DC electrical circuits and kinematics problems in robotics. Matlab and GeoGebra formal computing systems will be introduced and used in the laboratories.

201-202-VA - Math for Computer Engineering Technology II :

- This course covers the fundamental mathematical concepts and tools adapted to the needs of the CET program. The focus will be on sinusoidal functions, vectors, complex numbers, phasors, matrices and their applications to AC electrical circuits. Matlab and GeoGebra formal computing systems will be introduced and used in the laboratories.

247-105-VA - Circuit Analysis and Simulation I :

- This course introduces students to analog DC circuits, their schematics, and component data sheets. Students will learn the basics of DC electrical circuits and how to apply this knowledge by interpreting circuit diagrams, examining circuits, performing circuit simulations using professional CAD, and solving problems. Students will learn to read data sheets and component diagrams using professional CAD. They will learn how to use various instruments to solve circuit problems, as well as how to write diagnostic reports. Finally, students will also learn how to interpret and process verification results.

247-106-VA - The Profession of Computer Engineering Technology :

- In this course, students will experiment, in a simulated environment, with some of the key tasks of a computer engineering technologist. They will learn about the CET profession and process information in the field by performing the following tasks:
 - Listen to customer requests.
 - Answer questions in a professional manner.
 - Propose solutions and negotiate with the client.
 - Convey technical information in everyday terms.
 - Design a small, stimulating project as a team (objective of the project: to meet a client's request by designing electronic circuits and building a simple prototype).
 - Communicate with clients in a professional and respectful manner.

- At the end of the course, students will present a project they have worked on during the semester, which will require them to integrate these two skills.

247-107-VA - Computer Circuit Fundamentals :

- In this course, students will be introduced to the fundamentals of computer circuits. They will identify the technical data sheets of the components. They design simple numerical systems and corresponding schemes.
- They interpret circuit diagrams, examine circuits, perform circuit simulations, and solve problems using appropriate testing techniques and equipment.
- Students learn to read data sheets and component diagrams using appropriate software. They will also learn how to interpret and process data. In addition, they will develop the ability to write diagnostic reports based on test results.

247-108-VA - Programming Fundamentals :

- In this course, students will be introduced to the fundamentals of programming in an embedded system context. They will learn to identify and define the fundamental concepts of programming. They will also learn how to use programming tools at a basic level (e.g., compilers, interpreters, IDEs, and debuggers). Students will learn how to customize environments, use basic programming languages and their libraries to code, optimize and document programs.

247-205-VA - Circuit Analysis and Simulation II :

- In this course, students will be introduced to analog AC circuits, amplifiers, schematics, and component data sheets. Students will learn the basics of electrical circuits and AC amplifiers and how to apply this knowledge by interpreting circuit diagrams, examining circuits, performing circuit simulations, and solving problems. Students will learn to read data sheets and component diagrams using professional CAD. They will learn how to use various instruments to solve circuit problems, as well as how to write diagnostic reports. Students will also learn how to interpret and process verification results.

247-207-VA - Computational Logic Circuits :

- In this course, students design the logic circuits of modern computers. They will design sequential logic circuits using different technologies. They will diagnose sequential logic circuit problems and write a report. Students will make extensive use of component data sheets.
- Students learn how to design sequential circuits and apply this knowledge by interpreting circuit diagrams, examining circuits, performing circuit simulations, and solving problems using appropriate test techniques and equipment.
- Students will produce a complete report of their work.

247-208-VA - Embedded Systems Programming :

- In this course, students will be introduced to the C programming language and its syntax. They will become familiar with programming, optimizing and modifying C programs in an embedded context. The student will become familiar with the specifications and define appropriate algorithms. Students will use an IDE to analyze and debug structured C programs. They will be introduced to different environments: Linux, Windows and embedded microcontroller. They will document their programs to make them easy to read and maintain.

247-305-VA - Embedded Linux Computer :

- In this course, students will learn how to use the Linux system in an embedded development environment. They will become familiar with a networked embedded Linux system. They will learn how to interface peripherals to an embedded Linux computer. They will become familiar with the specifications of an embedded Linux computer. They will analyze the Linux system and plan its integration and installation. They will integrate drivers and modules into an embedded Linux computer. They will assemble, test, optimize and document the embedded Linux computer. They program, compile, and debug using a chain of development tools.

247-306-VA - Introduction to PCB Design and Prototyping :

- In this course, students will use CAD tools to create schematics and PCBs to produce a fully functional prototype based on user needs. As a team, they will plan, design and produce a project in a collaborative environment. They will meet customer requirements by following a development process that involves the production of electronic prototypes and the creation of an initial PCB for testing. They will support the manufacturing process by producing PCB manufacturing files, parts list and BOM. They will assemble the finished system using the appropriate laboratory tools and techniques, making all internal and external connections. They will then prepare the delivery, with all the appropriate documentation.

247-307-VA - Microcontroller and Microprocessor Systems :

- In this course, students will be introduced to microcontroller and microprocessor systems. They will identify the main processing units of a computer system and integrate them with other peripheral devices. They will learn how to diagnose a problem affecting a circuit containing a microcontroller or microprocessor.
- Students will analyze the architecture of microprocessors. They will learn to program in assembly language using a specific architecture. They will learn how to use C in a microcontroller environment. They will be introduced to memory, timers, input/output, and interrupts.

247-308-VA - Advanced Embedded Systems Programming :

- This course allows students to master the language constructs presented in the Embedded Systems Programming course and introduces the advanced topics of the C language and its syntax in an embedded system context. It also introduces the student to C++ and OOP. A design method will be introduced. Students will become familiar with the specifications and define the appropriate algorithms. Students will use an IDE to analyze and debug programs. Students will write programs to solve typical engineering problems. They will improve their skills in problem analysis, problem logic development, design and implementation of programs that can be applied to a wide variety of programming problems. They will document their programs to make them easy to read and maintain.

247-405-VA - Circuits and Embedded Systems :

- In this course, students will become familiar with more complex integrated analog circuit devices in a digital environment. They will learn about sensors, noise, amplifiers, basic power components, the application of filters and power supplies. Students will use a variety of analog and digital simulation tools. They will design, troubleshoot and bench test a variety of circuits containing analog and digital systems consisting of microcontrollers and digital processors. They will learn a serial bus protocol that interfaces between an analog circuit and a microcontroller circuit.

247-406-VA - Project Planning and Design :

- In this course, students will plan and design a project. They will analyze the customer's specifications, research information and evaluate possible solutions. They will plan and design a complete project within a collaborative team in order to meet the client's request. They will assemble the system using the appropriate tools and instruments and test their prototype. They will install the software. Students write a technical report and technical presentation that effectively communicate the details of a specific project.

247-409-VA - Network Fundamentals :

- In this course, students will learn the basic concepts of networking and the various problems related to it.
- They will be introduced to the basic theoretical concepts of OSI layered models. Students will be introduced to different network topologies and architectures.
- They will learn how to test a network, diagnose hardware and software problems using measuring instruments and diagnostic and simulation software. They will learn how to correctly record useful information on networks.

247-410-VA - Telecommunications :

- Students will learn how analog and digital signals are transmitted over wired and wireless media. They will learn the different modulation techniques, the frequency spectrum of the signals and the requirements of the medium for correct transmission. Students will perform measurements using standard techniques. They will learn about telecommunications systems and technologies commonly used in computer engineering technology, including wireless LANs (IEEE 802.11), PAN networks (802.15, e.g. Bluetooth, Zigbee, and Digimesh). They will install software components related to telecommunication systems.

247-506-VA - Product Development I :

- In this course, students will go through all the stages of project planning necessary for product development. They will choose the technological features and components according to a customer's request. They will interpret product specifications, diagrams, assembly plans and drawings. They will research, analyze and present possible solutions to a fictitious client. Students will assess the feasibility of possible solutions. They will also order all the parts and components needed to complete their project and then perform preliminary tests on a breadboard. They will perform preliminary tests of the operation of the software.
- They will specify the necessary security and protection measures when developing a product. Students will describe all the necessary steps and determine an effective work strategy when developing a new product.
- They will write a report on the product to be developed.
- Students will design and produce a real prototype of their product as part of Product Development II the following semester.
- In this course and in Product Development II, students will also validate and correct their design if necessary.

247-509-VA - Network Systems Design :

- In this course, students will be exposed to the theoretical and practical aspects of networks.
- They will review the basic theoretical concepts of OSI layered models.
- They will perform practical work on the network, transport, data link and physical layers.
- They will design a network using routers and switches. They will troubleshoot routers and network switches.
- They will program, manage, and troubleshoot network devices and systems.

247-510-VA - Mechatronic and Robotic Systems :

- In this course, students learn how to troubleshoot, debug, and optimize mechatronic and robotic systems.
- They will perform preventive maintenance routines, set up measuring instruments and test sets to automate troubleshooting of mechatronic and robotic systems.
- They will identify anomalies, diagnose, repair, and replace robotics and mechatronics components.
- Students will work with robotics and mechatronics elements such as motors, controllers, encoders, and mechanical structures. Students will also analyze the performance of the system to improve it. Students will write reports.

247-511-VA - Microcontroller Applications :

- In this course, students learn how to design, implement, and troubleshoot an embedded system based on a microcontroller. They will learn advanced debugging and troubleshooting methods (trace, data capture). Students will optimize their code. They will learn how to configure advanced devices using manufacturers' datasheets. They will learn advanced programming techniques (state machine, cooperative multitasking).
- This course will use almost exclusively C/C++ with a few exceptions.

247-512-VA - Digital Systems Design Using HDL :

- In this course, students will learn how to design, simulate, and construct combinatorial and sequential logic circuits. They will learn how to use relevant CAD tools and design technologies used in the industry today. They will design projects by implementing a representative collection of combinatorial and sequential circuits using the same tools used in the industry.
- They will learn about the timing problems faced by fast digital signals. Students will program using HDL (Hardware Description Language). Students will implement hierarchical design; they will simulate waveforms, prepare the assignment of pins and the different components of the circuits on a PLD chip. They will design on a specific FPGA/CPLD board using an IDE.

247-606-VA - Product Development II :

- In this course, students will continue the development of a product already started in Product Development I. They will identify and interpret product specifications. They will develop and validate their product.
- They will draw the schematic of the product circuit (for example, components, multilayer and routing). The student will design and produce a more complex printed circuit board. They will validate and correct their PCB design using the appropriate tools. Students will perform surface welds.
- This course is a "Carrier Course" designed to guide the student in the process of developing the CET Program Summary Events. Using the concepts learned in previous courses, as well as those learned in the sixth semester of the program, the student will combine their knowledge to produce a detailed report and presentation of a project as required by the department.
- This report and subsequent presentation will constitute the student's overall assessment, in accordance with Vanier College's policy on global assessments.
- "Product Development II" will address the development of a comprehensive evaluation report and presentation using conventional product development and project management techniques. The course theory will cover the tools, techniques and approach you will use to develop an overall assessment report and presentation. Students will develop a timeline to stay on track and will be assessed on their ability to do so, as well as the quality of the documentation generated.
- The project will develop a product that includes the following comprehensive aspects:
 - Product planning and design methods.
 - Development of detailed schematic diagrams from the manufacturers' data sheets of a complete system.
 - Development of a PCB for a product.
 - Troubleshooting a product.
 - Prototyping a product.
 - Produce all product development documentation.
 - Program microprocessors and modify microprocessor programs.
 - Integrate, diagnose, optimize, and write a procedure on a computer engineering system.
 - Interpretation of schematics.

247-607-VA - Computerized Systems Optimization :

- In this course, students will modify and optimize the hardware and software of computerized systems.
- They will analyze, modify, and optimize an existing system using a simulator, debugger, and test bench.
- Students will check that the system is working properly and develop it.
- They will write reports on all changes and optimizations made to the system.

247-609-VA - Networked Embedded Systems :

- In this course, students will learn the concepts of networking embedded systems. They will learn how to install, optimize and write procedures on different types of networks and buses: LAN, CAN bus and LIN bus. They will also learn how to integrate IoT into an embedded network system. They will learn how to program and integrate databases and web pages into an embedded network system.

247-610-VA – Internship:

- Students will learn how to communicate in the workplace. They will learn the different professions of the world of work (technician, engineer,). They will learn to work as a team. Students will prepare their CV and interview.
- In internship, they will be in a framework conducive to professional communication: listening to customer requests and answering questions in a professional manner. They will be in a conducive environment to propose solutions and negotiate with customers. In internships, students will transmit technical information in everyday terms. They will learn to practice their communication methods in an environment conducive to effective communication and respect for others.

247-611-VA - Embedded Operating Systems :

- In this course, students become familiar with programming, optimization, and program modification of an operating system in an embedded context. Students will also become familiar with the embedded operating system and its terminology. They will learn the different components, abstractions and functions of an OS. Then they will identify, analyze, modify and optimize programs, processes, tasks, modules and drivers. They will use the appropriate compiler, IDE, and debugging tools. Students will test the operating system. They will use the programming languages appropriate to the operating system. They will plan and comment on their work.

Source :

<https://www.vaniercollege.qc.ca/computer-engineering-technology/course-description/>