CEGEP VANIER COLLEGE
Faculty of Science and Technology
Computer Science Technology Department

Course Title	: Networks	**Teacher**	: Djohara Benyamina
Course Number	: 420-421-VA	**Office**	: K316
Pre-requisite	: 420-321-VA	**E-mail**	: through MIO
Semester	: Fall 2023	**Phone**	**:** 744-7500/7760
Section	: 00001 && 00002	**Office Hours**	: By appointment
Ponderation	: 2 - 3– 2 (Class-Lab-Homework)		
Schedule	: as per advertised on LEA		

Course Description: This course primarily focuses on switched networks (wired and wireless) with hands-on setup and operation of local area networks (LANs). The fundamentals and concepts of routed networks will be introduced to prepare students for careers in network operations and the later *Advanced Networks* course. This course will introduce the basics of computer networks to students through a study of layered models of computer networks and applications. Upon completion of the course, the student should be able to take part in the design, implementation, and maintenance of a typical local computer network.

COURSE ROLE IN THE PROGRAM

- This course introduces students to computer network concepts, communication components, and services needed for future courses such as Advanced Networks, Web Services, IoT, and Ethical Hacking, largely contributing to the creation of well-rounded alumni at the end of students' program of studies.
- This is the first course approaching computer networks in this Program and it builds a foundation for a successful career of programmers, Web application developers, and software engineering future specialists.
- It introduces our students to the fundamental technology concepts by providing essential networks skills and critical thinking abilities that will allow them to easily adapt to different job situations and troubleshooting problems.

COMPETENCIES RELATED TO THE COURSE
Competency **00Q5 – Deploy a local computer network** is covered comprehensively in this course.

COURSE LEVEL LEARNING OUTCOME
Based on a request, students should be able to identify Computer network equipment, analyze network services to be installed, connect, and configure the interconnected devices to deploy a functional wired, and/or wireless Local Area Networks (LANs) by respecting plans, procedures, and standards.

KEY LEARNING OUTCOMES
The students will design and deploy a LAN (wired and/or wireless) by following measurable actions:

- Define the LAN's characteristics, services, and devices.
- Connect network devices by selecting the appropriate cables.
- Set-up and configure the interconnected devices by applying concepts and complying with standards.
- Define the LAN's architecture diagram by identifying components parts and services, and their relationships.
- Enable the local network and apply strict test plans to guarantee network functionality and to assess LAN's configuration.
- Maintain Network functionality by using the appropriate tools to troubleshoot a connectivity problem.
- Install services and shared resources.
- Assign valid IP addresses to network devices.
- Configure a wireless network.
- Define network vulnerabilities and correct configuration of security tools .

TENTATIVE COURSE CONTENT

1. An introduction to networking: Network components and models.
2. How computers find each other on networks (OSI model).
3. How data is transported over networks (Transport and Internet layer).
4. Routers and routing algorithms.
5. Network Segmentation: Subnetting and Supernetting.
6. Understand data link layer protocols.
7. Network Cabling.
8. Wireless Networks.
9. Network Security Management.

TEACHING METHODOLOGY:

The course will use the following means to develop and evaluate the above competencies:

1. Two-hours lecture where the concepts are introduced and illustrated.
2. lab periods where students apply their knowledge by working on Labs and assignments; students will follow instructions to learn-by-doing new topics and work through exercises given in class.
3. End of chapter activities, Hands-on, assignments and final project.
4. Three written exams, to examine students' knowledge about the course material.

Text Book: **Network+ Guide to Networks** 7th Edition, by Jill West, Tamara Dean, Jean Andrews, CompTia, Cengage Learning, 2016, ISBN: 978-1-305-09094-1.

Bibliography: Computer Networks by Andrew S. Tanenbaum, Nick Feamster and David J. Wetherall, 2021, ISBN13:978-0-13-676402-1

Additional expenses - An external drive with an installed version of Windows OS is needed to access the course material and do the labs in D245.

- All students should have access to **Mindtap**. You can get the textbook directly from Cengage website as a bundle with an access card to Mindtap. You can also get only the access card with an online version of the textbook by following the link   https://www.nelsonbrain.com/shop/isbn/9781305658943
- How to access the course along with the course key will be provided in class during the first week.

COURSE EVALUATION PROCEDURES AND GRADING SCHEME:

Hands-on labs, quizzes, assignments	35%
Theory Exam 1	15% (approx. week5)
Theory Exam 2	15% (approx. week10)
Theory Exam 3	15% (approx. week15)
Final Project	20%

The exact date of exams will be announced on Omnivox one week in advance.

1. In order to pass the course, students must submit all assignments, do the quizzes, obtain an overall passing grade of 60% and **on the average of all exams' marks, 60% on the average of assignments**, **and at least 60% in the group project.** Failure to do so will result in a final mark to be the average of the marks for the written theory exams and the project only. As a rule, no make-up exam will be given.
2. Assignments should be handed in/submitted on time. Ten percent (10%) per day will be deducted from late assignments. Assignments more than **five calendar days late** will not be accepted.
3. There are no surprise quizzes, students will be notified at least two days prior the date of the quiz.
4. Students handing in medical notes that are found to be fraudulent will face severe sanctions as stated in the Student Code of Discipline. The Professional unsuitability policy could also be used to sanction the student.

FINAL PROJECT (Learning Integration Assessment-20%)

Deliverable 1 (5%-Due on Week 13): From given requirements for equipment to be interconnected in a Local Area Network including a Wireless network component, students design a local network solution including IP addressing scheme to create separate network segments.

Deliverable 2 (10%-Due on Week 15): Implementation:

- Students will connect different network components including printer, laptops (Wi-Fi), workstations on Ethernet, some server(s), and mobile phone(s). They will install network services, set-up the network configuration, and apply a strict test plan to make it a fully functional and secure LAN, respecting the end-user requirements.
- Configure shared devices (e.g., printers).
- Set up a correct IP address scheme and static IP addresses for key services.
- Set up the wireless network segment respecting security requirements (MAC filtering, etc.).
- Set up a service that will be visible outside the LAN (for example a simple web service accessible from the internet using NAT or port forwarding).
- Configure a Cisco router to run a routing protocol and verify if the route is correctly propagated from one LAN to the other.
- Cisco Packet Tracer (or GNS3) will be used to provide the ability to emulate multiple local networks in class.

Deliverable 3 (5%- Due on Week 15): Students will deliver a final report detailing each step involved in the design and the deployment of the local network. Students will document their test plans including security testing procedures. Students will also document steps that they took in troubleshooting the network.

LIA Evaluation Criteria

- Correct physical and logical design of network devices given the requirements.
- Proper set-up and description of the role for each network device.
- Correct configuration for router(s).
- Proper set-up of network services (printing, sharing resources, etc.)
- Creation and setting-up the service that will be visible outside the LAN (for example a Web service).
- Comply with international standardization provided by OSI reference model.
- Clear and comprehensive documentation.
- Create a test plan that covers uses cases described in the requirements.
- Following correctly the test plan.

Student Proficiency in the Language of Instruction Statement (SPLI)
The written report as part of the LIA will be subject to evaluation under the SPLI policy.

ATTENDANCE REQUIREMENTS:

1. Students are responsible for all course material, information covered during the class and lab even if they are absent. It is student's responsibility to be aware of anything discussed in class that is considered being important for the course.
2. Attendance at lectures and labs is strongly recommended. Usually, in-class work and some short assignments are done and submitted by the end of the class
3. The textbook will be followed closely. Each student must have access to the eTextbook or bring his/her textbook to class and lab.

COLLEGE POLICIES & PROCEDURES

- It is your responsibility to be aware of the various policies and procedures governing your rights and obligations while you are attending Vanier College.
- It is the student's responsibility to be familiar with and adhere to all Vanier College Policies and potential modifications due to the COVID-19 situation. A summary of the course-level policies that apply in this and all other Vanier courses can be found under "Course-Level Policies" in Important Vanier Links on Omnivox, or by following this link: http://www.vaniercollege.qc.ca/psi/course-level-policies/.
- Complete policies can be found on the Vanier College website, under Policies.
- Your attention is drawn in particular to the following policies: policies on academic complaints; cheating and plagiarism; religious holy day absences; student misconduct in the classroom; and student rights and responsibilities that are stated in IPESA Policy (Section 5.1).

Lab Policies

During the lab periods, you are expected to work on your assignments. It is not permitted to use the internet during lab periods outside the scope of the lab. Anyone caught playing games, installing, or using illegal software in the lab may be subject to a fine.

No video or audio recordings or photographs may be made in class without specific prior permission of the instructor.

CHEATING & PLAGIARISM

Cheating and Plagiarism is not tolerated. It is important to refer to the college's Policy, also note the following:

● 4.1.1 The penalty for plagiarism or cheating is a grade of zero for that course work or assignment without the possibility of revising that course work or assignment or preparing an alternate assignment.

● 3.3 a) Anyone who knowingly permits his or her work to be copied is considered to be as guilty as the cheater. Thus, students must not share their labs, assignments or exam work with other students before confirming with the teacher.

PROFESSIONALISM

Students are expected to conduct themselves in a professional manner while in class. Students are to remove headphones and to turn off cell phones, iPods, MP3/4 players, pagers, etc. during all labs and theory classes. Students who are consistently late for class (lab, theory) may be refused entry.

Tentative Schedule - Fall 23

Week#	Lecture Topics	Lab Activities
1	**Course Outline Presentation Introduction to Networks** • Network models and components • Best practices for safety when working with networks and computers.	Identifying LAN Components • Install shared resource services (Peer to Peer network: set a workgroup and share a printer) • Install ftp server
2	**ISO Reference Model**. • Components and Standards	Role. Architectural types of LAN. Domain of application. • Network infrastructure: discover devices on a network using Nmap or ZenMap (The graphical version of Nmap) • Use Wireshark application to capture and analyze a packet and detect protocols and encapsulations within a packet. • Homework
3	**Application and Presentation layers** • DHCP service • Web service (IIS and Apache) • DNS service • Encryption, Tunneling and VPN,…	Hands-on lab: DHCP and DNS Commands
4	**Transport Layer** • TCP and UDP protocols • Ports and sockets	Lab using Wireshark • Use Wireshark to learn the 3- way hand-shaking of the TCP/IP protocol • Internet sharing and NAT/PAT concept **Quiz1**
5	**Test1**	Continue working on hands-on projects
6	**Network Layer** • TCP/IP core protocols: TCP, UDP, IPv4, IPv6, ICMP, IGMP, ARP • Standards IPv4, IPV6. • Routers, protocols, gateway. • Routing Table. • Tools to troubleshoot a routing problem	• Simulation with Wireshark to study different protocols and metrics. • Print the routing table • add a static Route to a routing table • delete a route from the table • MTU black hole

7	**Network Layer Cont.** • TCP/IP core protocols: TCP, UDP, IPv4, IPv6, ICMP, IGMP, ARP • Standards IPv4, IPV6. • Routers, protocols, gateway. • Routing Table. • Tools to troubleshoot a routing problem	• Simulation with routing using an emulator such as Cisco Packet Tracer or GNS3 • Homework **Quiz2**
8	**IP Addressing** part1 • IP V4 and IPV6, Subnet Mask, • Network segmentation, • Subnet, • Supernet.	• Exercises with IP addresses, mask, etc. • Exercises with subnetting and supernetting (application).
9	**IP Addressing** part2 • IP V4 and IPV6, Subnet Mask, • Network segmentation, • Subnet, • Supernet .	• Exercises with IP addresses, mask, etc. • Exercises with subnetting and supernetting (application). • Homework **Quiz3**
10	**Data Link Layer** • Frame components, • Functions, • Standards. **Test2**	• Use Wireshark application to capture and analyze a packet and detect protocols and encapsulations within a packet to analyze a frame
11	**Physical layer** • Communication Media (coaxial, twisted pair, optical), • Physical layer components, • Standards.	• Hands-on terminating a crossover and/or a straight cable using tools to terminate a twisted-pair cable with an RJ-45 connector and verify that the resulting cable can transmit and receive data using a cable tester. • Homework **Quiz4**
12	**Analyzing a LAN**. • Network infrastructure, documentation and diagrams:	**<u>Final Project</u>** https://weblandesigner.aut.ac.nz/index.php?fuseaction=modelling.wired
13	**Wireless networks**	• Set up and configure a wireless network
14	**Network security** • Vulnerabilities and attacks • Correct configuration of security tools	• Install and use Sandboxie, configure Windows and Linux firewall and Windows defender.
15	**Test3**	**<u>Project presentation</u>**