
Network Programming

Information and Communications Technology

Course Number: CST8109	Co-Requisites: N/A	Pre-Requisites: CST8284
Applicable Program(s): 0336I01CKU - Computer Programmer	AAL: 3	Core/Elective: Core
0336X01FWO - Computer Programmer	3	Core
0336X03FWO - Computer Programmer	3	Core
Prepared by:	Wenjuan Jiang, Professor	
Approved by:	Andrew Pridham, Academic Chair, ICT	
Approval Date:	Thursday, August 23, 2018	
Approved for Academic Year:	2018-2019	
Normative Hours:	75.00	

Course Description

Software programming in today's environment requires detailed knowledge of the underlying network topology, its implementation and programming support functions. Gaining an appreciation and perspective of this technology is imperative to developing good network programming applications. Students explore topics include the basic structure, design and layered communications models, with an emphasis on data communications, TCP/IP protocol suite, socket programming and multi-threading concepts. Labs include practical exercises in basic networking and using socket programming, along with multi-threading, in an environment rich with common networking tools for diagnosing and troubleshooting typical network programming problems.

Relationship to Vocational Learning Outcomes

This course contributes to your program by helping you achieve the following Vocational Learning Outcomes:

0336I01CKU - Computer Programmer

- | | |
|-------|--|
| VLO 1 | Use documented solutions to troubleshoot problems associated with software installation and customization. (T, A,) |
| VLO 4 | Apply knowledge of networking concepts to develop, deploy, and maintain program code. (T, A,) |

- | | |
|-------|--|
| VLO 6 | Use relevant methodologies, policies, and standards to develop secure program code. (T, A,) |
| VLO 8 | Conform to workplace expectations found in information technology (IT) environments. (T, A,) |

0336X01FWO - Computer Programmer

- | | |
|-------|--|
| VLO 1 | Use documented solutions to troubleshoot problems associated with software installation and customization. (T, A,) |
| VLO 2 | Develop, test, document, deploy, and maintain secure program code based on specifications. (T, A,) |
| VLO 4 | Apply knowledge of networking concepts to develop, deploy, and maintain program code. (T, A,) |
| VLO 6 | Use relevant methodologies, policies, and standards to develop secure program code. (T, A,) |
| VLO 8 | Conform to workplace expectations found in information technology (IT) environments. (T, A,) |

0336X03FWO - Computer Programmer

- | | |
|-------|--|
| VLO 1 | Use documented solutions to troubleshoot problems associated with software installation and customization. (T, A,) |
| VLO 2 | Develop, test, document, deploy, and maintain secure program code based on specifications. (T, A,) |
| VLO 4 | Apply knowledge of networking concepts to develop, deploy, and maintain program code. (T, A,) |
| VLO 6 | Use relevant methodologies, policies, and standards to develop secure program code. (T, A,) |
| VLO 8 | Conform to workplace expectations found in information technology (IT) environments. (T, A,) |

Relationship to Essential Employability Skills

This course contributes to your program by helping you achieve the following Essential Employability Skills:

- | | |
|--------|--|
| EES 1 | Communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience. (T, A,) |
| EES 2 | Respond to written, spoken or visual messages in a manner that ensures effective communication. (T, A,) |
| EES 3 | Execute mathematical operations accurately. (T, A,) |
| EES 5 | Use a variety of thinking skills to anticipate and solve problems. (T, A,) |
| EES 8 | Show respect for diverse opinions, values, belief systems and contributions of others. (T, A,) |
| EES 9 | Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals. (T, A,) |
| EES 11 | Take responsibility for one's own actions, decisions and consequences. (T, A,) |

Course Learning Requirements/Embedded Knowledge and Skills

When you have earned credit for this course, you will have demonstrated the ability to:

1.) Properly read, understand, complete and document lab work

Understand the need and demonstrate the ability to properly follow instructions in lab work or assignments

Demonstrate understanding of concepts associated with lab work or assignments by properly completing assigned work in allocated time, and answering any associated questions accurately

Understand the need and demonstrate the ability to document completed work in a course prescribed log/journal format, along with any relevant configuration settings and the steps taken to achieve configuration

Understand the need & demonstrate the ability to create detailed documentation of problems encountered, associated researched information gathered about the problem, steps and specifics of solution applied, and final effects of solution

Understand how to deal with and manage multiple overlapping deadlines, and demonstrate the ability to meet these completion deadlines

2.) Use network protocol models to explain the layers of communications in data networks

Explain the importance of data networks and the Internet in supporting business communications and every day activities

Explain how communication works in data networks and the Internet

Explain the role of protocols in networks

Describe the protocols and services provided by the application layer in the OSI and TCP/IP models and describe how this layer operates in various networks

Analyze the operations and features of common application layer protocols such as HTTP, Domain Name System(DNS), Dynamic Host Configuration Protocol (DHCP), Simple Mail Transfer Protocol (SMTP), Telnet, FTP, POP, IMAP, and HTTPS

3.) Properly apply subnet masks and addresses (IPv4 and IPv6) to devices in a network

Describe the importance of addressing and naming schemes at various layers of data networks

Determine specific network addresses given a subnet and mask

Determine the number of usable hosts given network ID and subnet mask

Configure devices in a network using given a network ID and subnet mask

4.) Build a simple Ethernet, IPv4 and IPv6 networks using routers and switches

Explain fundamental Ethernet concepts such as media, services, and operation

Describe how ARP is used in an Ethernet network

Recognize the devices and services that are used to support communications across an Internetwork

Utilize common network utilities to verify small network operations and analyze data traffic

Configure a PC for network use including DHCP addressing, Static addressing, DNS and gateway

Deploy a SOHO network including the use of NAT

5.) Employ basic cabling and network designs to connect devices

- Describe the operation of protocols at the OSI data link layer and explain how they support communications
- Explain the role of physical layer protocols and services in supporting communications across data networks
- Describe the differences between a variety of media types, their benefits and limitations of each type
- Describe the causes of line noise in communication systems
- Describe various modulation schemes
- Explain the difference between synchronous and asynchronous communication
- Be able to convert numbers between binary, decimal and hexadecimal formats

6.) Analyze the operations and feature of the transport and network layer protocols and services

- Describe the functioning of transport layer protocols including the differences between connectionless and connection oriented communications
- Describe the purpose and use of port numbers in the TCP/IP Protocol suite
- Explain in detail how TCP connections are established and torn-down
- Analyze the operations and features of network layer protocols and services and explain the fundamental concepts of routing

7.) Design and implement network applications using sockets

- Describe the concept of Client/Server communication
- Describe sockets, ports and socket-based communication
- Write network applications based on TCP or UDP sockets

8.) Understand and apply multithreading concepts to Client/Server program

- Knowledge of what threads are and how they manage concurrent activities
- Understand thread priorities and scheduling
- Understand thread synchronization
- Apply multithreading into Client/Server program

Learning Resources

Required:

This course is part of the mobile (laptop) program initiative at Algonquin College. Students are required to have a functioning laptop at all lecture and lab classes. Students with laptops that do not meet the requirements listed on the Algonquin College BYOD web page, may experience difficulties in the labs in this course. For the required specifications and further information visit the Algonquin College BYOD web page at <http://www7.algonquincollege.com/byod/prospective/mobile2015-2016/mobile-device-better-comp-sci.htm>

Textbook:

Java How to Program, 11th Edition, by Deitel and Deitel, Published by Pearson Education Inc., ISBN: 978-0-13-474335-6.

Optional Reference Book:

Introduction to Networks Companion Guide, Cisco Press, ISBN-13: 978-1-58713-316-9

Java Network Programming and Distributed Computing, by David Reilly & Michael Reilly, ISBN: 0-201-71037-4

Introduction to Network Lab Manual, Cisco Press, ISBN-13: 978-1-58713-312-1

Cisco Packet Tracer

Packet Tracer(PT) is comprehensive networking technology teaching and learning software with powerful simulation, visualization, authoring, assessment, and collaboration capabilities. Packet Tracer makes both teaching and learning easier, students can create their own virtual "network worlds" for exploration, experimentation, and explanation of networking concepts and technologies. Packet Tracer is available for download from the Cisco Academy Website

USB Memory Stick

You are advised to have one USB memory stick at hand to hold any PC configuration information that you may wish to preserve between lab sessions. Connectivity to the College network (and your N: drive) is not always possible from the lab.

Lab Notebook

While the lab activities will in large part be done on pre-formatted worksheets, you will be expected to have and maintain a lab notebook to record anything you may need to repeat or recall in the future. Some lab exercises will instruct you to record certain things in your lab notebook for future reference in follow-on labs. If you are involved in a troubleshoot exercise, the lab book will be particularly valuable for recording troubleshooting steps as you go along. Doing this helps you keep track of what you've done and prevents you from "going around in circles" trying to fix something.

Learning Activities

Samples of learning activities include:**1. Reading and fully understanding the prescribed theory materials:**

Cisco curriculum (as found in the hardcopy or online textbook) acts as the foundation for the course knowledge set.

Assigned reading from a provided reading list will guide you through the text.

End of chapter questions in the book and in the online curriculum are used to test your recall and understanding.

Online chapter quizzes are used to evaluate your knowledge, as well as give you feedback as to which parts of the chapter require further emphasis and review.

2. Attending lectures that make use of and supplement the text material:

Lectures will indicate key points and clarify what is important for term tests, final exam and other evaluations.

3. Completing assigned homework to supplement lecture & lab material:

These are designed to encourage creative thinking around a topic area, and to help develop your ability to analyze situations and solve problems.

4. Completing prescribed lab work:

Lab attendance involves group work (usually in pairs), possibly on dedicated PC hardware, and is therefore mandatory.

No special allowances are made for those who choose not to attend classes or labs and, as a result, get critically behind in the course. Extra consultation and tutoring assistance is only available to those who are actively participating and still having difficulty.

Lab exercises will guide you through configurations, test procedures, and other activities to familiarize yourself with networking.

Your added value to an enterprise will ultimately be found in your ability to design, implement, modify, test and troubleshoot applications of networking technology. These activities are complex and require procedures that are primarily innovations stemming from an analysis. Lab exercises requiring you to come up with solutions to problems begin your growth in this ability.

Evaluation/Earning Credit

The following list provides evidence of this course's learning achievements and the outcomes they validate:

Quiz(zes)/Test(s) (35%)

Validates Outcomes: CLR 2, CLR 3, CLR 6, CLR 7, CLR 8, EES 2, EES 3, EES 5, EES 11

Final Exam (30%)

Validates Outcomes: CLR 2, CLR 3, CLR 6, CLR 7, CLR 8, EES 2, EES 3, EES 5

Lab Activity(ies) (20%)

Validates Outcomes: CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, CLR 7, CLR 8, EES 1, EES 2, EES 5, EES 8, EES 9

Demonstration(s) of Skill (15%)

Validates Outcomes: CLR 1, CLR 3, CLR 4, CLR 5, CLR 7, CLR 8, EES 2, EES 5, EES 8

Students are expected to meet evaluation and completion deadlines as stated in course outline and course section information documents. In circumstances where evaluation and/or completion deadlines are missed or student performance has been affected by a temporary or permanent disability (including mental health), interim or retroactive accommodations may be considered. In such instances, please consult your course faculty member. For other situations where deferral of evaluations may be warranted, please refer to college policy AA21.

Prior Learning Assessment and Recognition

Students who wish to apply for prior learning assessment and recognition (PLAR) need to demonstrate competency at a post-secondary level in all of the course learning requirements outlined above. Evidence of learning achievement for PLAR candidates includes:

- Challenge Exam

- Performance Test

Grade Scheme

Final Grade	Mark Equivalent	Numeric Value	Final Grade	Mark Equivalent	Numeric Value
A+	90% - 100%	4.0	A	85% - 89%	3.8
A-	80% - 84%	3.6	B+	77% - 79%	3.3
B	73% - 76%	3.0	B-	70% - 72%	2.7
C+	67% - 69%	2.3	C	63% - 66%	2.0
C-	60% - 62%	1.7	D+	57% - 59%	1.4
D	53% - 56%	1.2	D-	50% - 52%	1.0
F	0% - 49%	0	FSP	0	0

Other Information

Students are required to respect the confidentiality of employer, client and/or patient information, interactions, and practices that occur either on Algonquin College premises, or at an affiliated clinical/field/co-op placement site. Concerns regarding clients, patients, and/or employer practices are to be brought to the attention of the program coordinator, or designated field/clinical/co-op placement supervisor so that they may be resolved collaboratively. Such concerns are not to be raised publically either verbally, in writing, or in electronic forums. These matters are to be addressed through established program communication pathways.

Course Related Information

Assessment of student learning will be done by means of class and online tests and quizzes, final exam, laboratory assignments and a lab test.

Laboratory attendance is compulsory, and absence from three or more laboratory sessions without the prior consent of the professor will result in a final grade of "F". Students are responsible for keeping a record of the number of laboratory sessions they have missed. Professors will not inform students of an impending failure because of missed laboratory sessions.

All laboratory assignments must be successfully completed in order to obtain course credit. Late assignments will be penalized and receive a mark of zero, but they must still be completed. Any missed evaluation points will result in a grade of "0". In the case of a documented emergency the professor, in consultation with the Chair, will determine how the marks will be made up and/or final grade adjusted.

The Information and Communications Technology Department requires that all course assignments (homework exercises, laboratory work, projects, etc) be submitted by students using a standard which could be specific to one

or more courses. Professors will ensure, at the beginning of the term, that students are advised of the exact details of these course specific submission requirements. Professors will also post them online alongside the course outline. Student submissions that do not meet the course published submission standards may not be marked, and may incur a penalty of up to 100% of the submission mark.

All students are required to write the final exam. There are no provisions for “making up” a missed final exam. If, as a result of being off-track in your program or some unforeseen circumstance, you note that there is a scheduling conflict in your final exam schedule, it is your responsibility to alert your course professor no later than one week before final exams start, to allow for any special arrangements.

In order to pass the credit course, students must achieve a minimum contribution of:

32.5% from an average of invigilated tests/exams (items #1 and #2 combined)

17.5% from an average of practical work (items #3 and #4 combined)

Department Related Information

STUDENT ACADEMIC RESPONSIBILITIES

Each student is responsible for:

- Knowing the due dates for marked out-of-class assignments.
- Attending all classes and knowing the dates of in-class marked assignments and exercises.
- Maintaining a folder of all work done in the course during the semester for validation claims in cases of disagreement with faculty.
- Keeping both paper and electronic copies of all assignments, marked and unmarked, in case papers are lost or go missing.
- Regularly checking both Blackboard announcements as well as one's Algonquin e-mail account for important messages from both professors and college administration.
- Participating in on-line and classroom exercises and activities as required.
- Retaining course outlines for possible future use to support applications for transfer of credit to other educational institutions.

Harassment/Discrimination/Violence will not be tolerated. Any form of harassment (sexual, racial, gender or disability-related), discrimination (direct or indirect), or violence, whether involving a professor and a student or amongst students, will not be tolerated on the college premises. Action taken will start with a formal warning and proceed to the full disciplinary actions as outlined in Algonquin College Policies - HR22 and SA07.

Harassment means one or a series of vexatious comment(s) (whether done verbally or through electronic means), or conduct related to one or more of the prohibited grounds that is known or ought reasonably to be known to be unwelcome/unwanted, offensive, intimidating, derogatory or hostile. This may include, but is not limited to: gestures, remarks, jokes, taunting, innuendo, display of offensive materials, offensive graffiti, threats, verbal or physical assault, stalking, slurs, shunning or exclusion related to the prohibited grounds.

For further information, a copy of the official policy statement can be obtained from the Student Association.

Violation of the Copyright Act

General – The Copyright Act makes it an offence to reproduce or distribute, in whatever format, any part of a publication without the prior written permission of the publisher. For complete details, see the Government of Canada website at <http://laws.justice.gc.ca/en/C-42> . Make sure you give it due consideration, before deciding not to purchase a textbook or material required for your course.

Software Piracy - The Copyright Act has been updated to include software products. Be sure to carefully read the licensing agreement of any product you purchase or download, and understand the terms and conditions covering its use, installation and distribution (where applicable). Any infringement of licensing agreement makes you liable under the law.

Disruptive Behaviour is any conduct, or threatened conduct, that is disruptive to the learning process or that interferes with the well being of other members of the College community. It will not be tolerated. Members of the College community, both students and staff, have the right to learn and work in a secure and productive environment. The College will make every effort to protect that right. Incidents of disruptive behaviour must be reported in writing to the departmental Chair as quickly as possible. The Chair will hold a hearing to review available information and determine any sanctions that will be imposed. Disciplinary hearings can result in penalties ranging from a written warning to expulsion.

For further details, consult the Algonquin College Policies AA32, SA07 and IT01 in your Instaguide.

College Related Information

Email

Algonquin College provides all full-time students with an e-mail account. This is the address that will be used when the College, your professors, or your fellow students communicate important information about your program or course events. It is your responsibility to ensure that you know how to send and receive e-mail using your Algonquin account and to check it regularly.

Students with Disabilities

If you are a student with a disability, you are strongly encouraged to make an appointment at the Centre for Accessible Learning to identify your needs. Ideally, this should be done within the first month of your program, so that a Letter of Accommodation (LOA) can be provided to your professors. If you are a returning student, please ensure that professors are given a copy of your LOA each semester.

Retroactive Accommodations

Students are expected to meet evaluation and completion deadlines as stated in course outline and course section information documents. In circumstances where evaluation and/or completion deadlines are missed or student performance has been affected by a temporary or permanent disability (including mental health), interim or retroactive accommodations may be considered. In such instances, please consult your course faculty member. For

other situations where deferral of evaluations may be warranted, please refer to college policy AA21.

Academic Integrity & Plagiarism

Adherence to acceptable standards of academic honesty is an important aspect of the learning process at Algonquin College. Academic work submitted by a student is evaluated on the assumption that the work presented by the student is his or her own, unless designated otherwise. For further details consult Algonquin College Policies AA18: Academic Dishonesty and Discipline and AA20: Plagiarism

Student Course Feedback

It is Algonquin College's policy to give students the opportunity to share their course experience by completing a student course feedback survey for each course they take. For further details consult Algonquin College Policy AA25: Student Course Feedback

Use of Electronic Devices in Class

With the proliferation of small, personal electronic devices used for communications and data storage, Algonquin College believes there is a need to address their use during classes and examinations. During classes, the use of such devices is disruptive and disrespectful to others. During examinations, the use of such devices may facilitate cheating. For further details consult Algonquin College Policy AA32: Use of Electronic Devices in Class

Transfer of Credit

It is the student's responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.

Note: It is the student's responsibility to refer to the Algonquin College Policies website for the most current information at <http://www.algonquincollege.com/policies/>

Legend

Terms

- ALO: Aboriginal Learning Outcome
- Apprenticeship LO: Apprenticeship Learning Outcome
- CLR: Course Learning Requirement
- DPLO: Degree Program Learning Outcome
- EES: Essential Employability Skill
- EOP: Element of Performance
- GELO: General Education Learning Outcome
- LO: Learning Outcome
- PC: Program Competency
- PLA: Prior Learning Assessment
- PLAR: Prior Learning Assessment and Recognition
- VLO: Vocational Learning Outcome

Assessment Levels

- T: Taught

- A: Assessed
- CP: Culminating Performance