A POLYTECHNIC INSTITUTION

School of Computing and Academic Studies

Program: Computer Systems Technology

Option: Bachelor of Technology, Computer Systems

Course Outline

Course Number: *Comp8005*

Course Name: *Network and Security Applications Development*

Start Date: January 8, 2018 **End Date:** April 20, 2018

Total Hours: **Total Weeks:** **Term/Level: 1** **Course Credits: 3**

Hours/Week: 3.75 **Lecture: 1.25** **Lab: 2.5**

Prerequisites:

1. Dip. of Tech in Computer Systems (or equivalent)
2. **Comp 7005 or**
3. **Permission of instructor and Program Head**

Course No.	Course Name	Course No.	Course Name
Comp 7005	*Computer Networks and Protocols*		

ν Course Description:

- This course is designed to provide students with a solid set of practical skills in the area of network and system-level programming on the Linux platform. The design and implementation of IPv4/IPv6 Client-Server applications is covered in-depth. Issues such as modularity and efficiency in the implementation of protocols will be covered. The emphasis will be very much the design and implementation of high-performance, robust, and scalable network applications. Security and private data transmission techniques over public networks are covered. Client-Server applications are designed and implemented using the Secure Sockets Layer (SSL) API. An in-depth coverage of techniques used to design and develop secure code and robust applications will be provided. Students will also be familiarized with the Bluetooth software development techniques.

ν Evaluation

Final Examination:	30%	Comments:
Assignments & Projects:	70%	
TOTAL	100%	

ν Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

1. Implement advanced communications protocols on a multi-processing, multitasking environment.
2. Use the IPV4 and IPv6 socket API calls in the design and implementation of networked applications.
1. Design and implement Client-Server applications over a multi-platform network (e.g. Windows Clients to a UNIX Server).
2. Use high-performance, edge-triggered system calls such as epoll to design and implement high-speed and high-load network applications.
3. Use the Berkeley Sockets API proficiently, including multicasting and raw sockets.
4. Design and implement secure applications using SSL.
5. Design and implement basic Client/Server applications for Bluetooth devices.
6. Use effective debugging techniques using tools such as gdb, gprof, valgrind, strace, ltrace, etc.

Students must have the ability to apply principles of Data Communications discussed in COMP 7005 (or equivalent) and the advanced features of high-level languages such as C/C++, and others in developing specific TCP/IP and UDP/IP communication applications.

The course will be comprised of extensive lectures and lab time. Lectures will cover a broad range of topics, which are required to *apply* the principles of data communications.

- **Verification**

I verify that the content of this course outline is current.

Aman Abdulla | January 2, 2018

Authoring Instructor | Date

I verify that this course outline has been reviewed.

Program Head/Chief Instructor | Date

I verify that this course outline complies with BCIT policy.

Dean/Associate Dean | Date

Note: Should changes be required to the content of this course outline, students will be given reasonable notice.

- **Instructor(s)**

Aman Abdulla	Office Location:	SW2-323	Office Phone:	604-432-8837
	Office Hrs.:		E-mail Address:	aabdulla@milliways.bcit.ca

- **Learning Resources**

Required:

UNIX network programming, Vol. 1, Networking APIs: Sockets and XTI
Prentice Hall
Stevens, Richard W.

Recommended:

Advanced UNIX systems programming

Stevens, Richard, W.

Writing Secure Code, Second Edition
by Michael Howard & David C. LeBlanc

Assignments: Late assignments, lab reports or projects will **not** be accepted for marking. Assignments must be done on an individual basis unless otherwise specified by the instructor.

Makeup Tests, Exams or Quizzes: There will be **no** makeup tests, exams or quizzes. If you miss a test, exam or quiz, you will receive zero marks. Exceptions may be made for **documented** medical reasons or extenuating circumstances. In such a case, it is the responsibility of the student to inform the instructor **immediately**.

Ethics: BCIT assumes that all students attending the Institute will follow a high standard of ethics. Incidents of cheating or plagiarism may, therefore, result in a grade of zero for the assignment, quiz, test, exam, or project for all parties involved and/or expulsion from the course.

Attendance: The attendance policy as outlined in the current BCIT Calendar will be enforced. Attendance will be taken at the beginning of each session. Students not present at that time will be recorded as absent.

Illness: A doctor's note is required for any illness causing you to miss assignments, quizzes, tests, projects, or exam. At the discretion of the instructor, you may complete the work missed or have the work prorated.

Attempts: Students must successfully complete a course within a maximum of three attempts at the course. Students with two attempts in a single course will be allowed to repeat the course only upon special written permission from the Associate Dean. Students who have not successfully completed a course within three attempts will not be eligible to graduate from the appropriate program.

Course Outline Changes: The material or schedule specified in this course outline may be changed by the instructor. If changes are required, they will be announced in class.

Labs: Lab attendance is mandatory. Lab exercises are due at the end of the lab period.

I.D. Required in Examination Centres: Effective December 2000, in order to write exams, students will be required to produce photo-identification at examination centres. Photo I.D. must be placed on the desk before an exam will be issued to the student. The I.D. must remain in view on the desk while writing the exam, for inspection by invigilators. Students should bring a BCIT OneCard or alternatively two pieces of identification, one of which must be government photo I.D. such as a driver's licence. Please see BCIT Policy #5300, Formal Invigilation Procedures.

Computer Use Policy: BCIT has an Institute-wide policy (#3501) pertaining to information technology and services and to the resources available in support of the Institute mission. Computer Systems Technology students are expected to exercise the highest degree of professionalism and ethical behaviour related to information technology. Violations of BCIT Policy #3501 will result in disciplinary action which may include suspension or expulsion of students. Also refer to the Computer Systems Technology Student Conduct Guidelines.

- **Assignment Details:** Will be provided in class

Schedule

Topic Number	Outcome/Material Covered
1**	**Advanced System Programming:** • Interprocess Communications (IPC) Facilities • Multiple Processes • Multithreading and thread synchronization
3	**The TCP/IP Protocol Suite:** • IPv4 and IPv6 Socket-Level Interface • FSM Implementation • Raw Sockets Programming • Multicasting Applications and Design
4	**Advanced TCP/IP Topics** • Synchronous and Asynchronous I/O Techniques • I/O Multiplexing using *select* and *epoll* • Out-of-Band Data • TCP Client Alternatives • TCP Iterative and Concurrent Servers • TCP Pre-forked and Pre-threaded Severs • Raw Sockets Programming • Multicasting Applications and Design • Socket Control Operations using *ioctl*
5	**Secure Systems and Private Data Transmission using SSL** • Client/Server Implementation • Simple I/O Handling • Multiplexed I/O
6	**Debugging Concepts:** • GNU Debugger (gdb) • Tracing Program Actions – mtrace, strace, ltrace • Memory debugging - Valgrind
7	**Bluetooth Programming Techniques** • Protocol specification and overview • Bluetooth Transport Layer (RFCOMM, L2CAP) • Software development using the BlueZ stack • Understanding low-level calls (HCI)

*Topics may be omitted, replaced or added at the discretion of the instructor.

** These are review topics and it is the student's responsibility to ensure they have the necessary background.

- Notes will be posted on my Web server which you may access using the following URL:http://milliways.bcit.ca/c8005/

■ Information for Students

By attending this course and receiving this course outline, you have been made aware of the following policies. Please follow the links provided as each student is responsible for reading and complying with these policies.

The following statements are in accordance with the *BCIT Student Regulations Policy 5002*. To review the full policy, please refer to http://www.bcit.ca/files/pdf/policies/5002.pdf.

Attendance/Illness:
In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with his/her instructor or Program Head or Chief Instructor, indicating the reason for the absence. Prolonged illness of three or more consecutive days must have a BCIT medical certificate sent to the department. Excessive absence may result in failure or immediate withdrawal from the course or program.

Academic Misconduct:
Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited and will be handled in accordance with the *Violations of Standards of Conduct* section of Policy 5002.

The School of Computing and Academic Studies expects the highest level of professional conduct and ethical behaviour from all students enrolled in part time studies courses and programs. All students are reminded of the BCIT policy related to the *Responsible Use of Information Technology*. Read the full policy here: http://www.bcit.ca/files/pdf/policies/3501.pdf.

The Computing and IT knowledge and skills acquired by students in the course of their studies confers upon them, as with all professionals, a special responsibility to use their knowledge in a responsible, professional and ethical manner. Further, given that misuse of computer facilities at BCIT can have significant legal and/or economic impacts, upon evidence of any such misconduct, the School may recommend immediate suspension, even for first offences.

Attempts:
Students must successfully complete a course within a maximum of three attempts at the course. Students with two attempts in a single course will be allowed to repeat the course only upon special written permission from the Associate Dean. Students who have not successfully completed a course within three attempts will not be eligible to graduate from their respective program.

Accommodation:
Any student who may require accommodation from BCIT because of a physical or mental disability should refer to BCIT's Policy on Accommodation for Students with Disabilities (http://www.bcit.ca/files/pdf/policies/4501.pdf), and contact BCIT's Disability Resource Centre (SW1-2300, 604-451-6963, http://www.bcit.ca/drc/) at the earliest possible time. Requests for accommodation must be made to the Disability Resource Centre, and should not be made to a course instructor or Program area.

Any student who needs special assistance in the event of a medical emergency or building evacuation (either because of a disability or for any other reason) should also promptly inform their course instructor(s) and the Disability Resource Centre of their personal circumstances.