McGill School of Computer Science

www.cs.mcgill.ca

Course Outline

Course Name:	Introduction to Software Systems COMP-206 Fall 2019
Instructor:	Joseph Vybihal

Contact Information:

Office: ENGMC 323
Office hour: TW 10:00-11:00 or by appointment
Home page: http://www.cs.mcgill.ca/~jvybihal
Course email: cs206@cs.mcgill.ca
Discussions: https://piazza.com/mcgill.ca/fall2019/comp206/home
Prof. Email: jvybihal@cs.mcgill.ca

Course Objectives:

COMP-206 is a 3-credit full semester course in Software Development under the UNIX environment. It is offered in both the fall and winter semesters and is a required course for students in many of our degree programs. It provides a comprehensive introduction to and overview of the C programming language and how to use it with the UNIX environment to build software.

This course focuses on System Application Development, which relates to the integration of differing software, programming languages and environments into a single application. In this light the course also teaches programming in Bash, interfacing with the operating system and interfacing with networking.

COMP 206 sets the stage for follow-on courses COMP-273, COMP-307 and COMP-310, plus others.

This course also gives the student basic Software Management skills in the form of the GNU tool set and Common Code Management techniques.

Course Description:

Comprehensive overview of programming in C, use of system calls and libraries, debugging and testing of code; use of development tools like make and version control systems.

Texts:

Primary Text:

Software Systems ed3; Vybihal & Azar; Kendall/Hunt; ISBN 978-0-7575-9514-1. You can purchase the textbook from here:
https://he.kendallhunt.com/product/software-systems

We will use the textbook in the course.

Supplementary Texts:

- GNU Software; Louksides & Oram; O'Reilly; ISBN 1565921127 (free on web)
- Just Enough Unix; P.K. Anderson; McGraw Hill; ISBN 0697131726
- C Programming Language; Kernighan & Ritchie; Prentice-Hall; ISBN 0131101633

Evaluation:

Assignments	28%	7 Mini-Assignments (4% each)
2 online tests	20%	Online exam. (10% each ~ 1 hour long)
Final Exam	52%	Regular exam. Offered during the regular exam period

You may use your final exam to replace you class test grades (72 %).
The final exam will cover the entire course.

Grading: All software solutions must compile with zero errors and must run to be graded. It does not need to run correctly for grading, but it must run. If your program compiles with errors or does not run at all then you will receive zero points. The grader will not fix your code or look at the source code to give you partial grades.

Late work: You will be notified in advance of assignment due dates. All assignments are due on My Courses at the indicated time and date. Late assignments will lose 5% of its grade per day late. Assignments beyond 2 days late will not be accepted. You may not submit assignments via e-mail without the permission from the instructor.

Additional Work: Students with grades of D, F or J will not be given the opportunity to complete additional work to upgrade their grade.

Supplemental Exam: Check with the university for this opportunity.

Re-grading: Mistakes can occur when grading. Not surprisingly, requests for re-grading always involve those mistakes in which the student received fewer points than they deserved, rather than more points than they deserved. With that in mind: if you wish me to re-grade a question on an exam or assignment, I will do so. I reserve the right to re-grade other questions as well.

Cheating/Collaboration: Collaboration is encouraged but your discussions should be public in the sense that anyone including the professor should be allowed to listen in. Assignments are original works created by the student alone. You are permitted and encouraged to have conversations with other students concerning the contents of the assignments and how to do them, but your work must be original. If two or more assignments are found to be identical (or portions of assignments) then all parties will lose points. This includes the student who permitted their assignment to be copied. This includes written solutions and software source code. The students will be reported to the university plagiarism department.

Communication

My Courses: All official communication, including announcements, lecture material, assignments, grades will be found on My Courses.

Course Discussions: The online free tool, piazza.com, is used as our course discussion board. Please make sure to enroll in the Fall 2019 COMP 206 course on Piazza. Use this as your primary communication medium, since your questions are public and can help other students.

Course Email: This is best for direct communication. Both the TA and professor use this account. Expect a reply in 24 hours or less. Use this email account for questions you do not want other students to see.

Private Email: The professor and TA have private email accounts that you may also use, however these communication channels are for personal queries. For example: if you have a problem with your grade then email the TA who graded you directly, do not email the prof and do not use the course email address.

Appointments: Please email me directly to book at appointment outside office hours.

Office Hours: I have posted office hours. Come to those times without appointment.

After lecture: Some optional time will be available just after class to ask questions. I do not guarantee the length of this time since other constraints may interfere.

```
CommunicationAlgorithm() :
     if (public) piazza(); // all will benefit
     else if (about marks) emailTAPrivately();
     else if (medical or special) emailProfPrivately();
     else courseEmailAccount();
```

Your TA	Each student is assigned a single TA who will be "their" TA for the entire course. This TA will be responsible for grading your assignments and this TA will hold weekly tutorials for their assigned group, which you can attend <u>optionally</u>.

Regardless, you can attend <u>any</u> TA office hour for help.

The table below identifies which TA you have been assigned to. The full details about all the TA s of this course can be found in myCourses.

Your TA will contact you to determine the best time to hold the weekly tutorial. It might happen that a common time is <u>impossible</u> to find. In that case, the TA will find a tutorial time that maximizes the number of attending students. <u>Do not worry if you cannot attend</u>. These tutorials are optional, and the work is posted on myCourses, so you can do them on your own and then go to any TA office hour for help.

Tentative TA Group by Student Last Name

Last Name of Student	TA Name	TA Email Address
A – CH ……….…… (74)	Olamilekan Fadahunsi (2)	olamilekan.fadahunsi@mail.mcgill.ca
CI – DUA ……….… (35)	Tzu-Yang (Ben) Yu	tzu-yang.yu@mail.mcgill.ca
DUB – GI ……….… (37)	Yash Patel	yash.patel@mail.mcgill.ca
GO – HS ……….…. (36)	Anirudha Jitani	anirudha.jitani@mail.mcgill.ca
HU – KH ……….…. (37)	Vishal Vijay Kumar Jain	vishal.jain@mail.mcgill.ca
KI – LIANG ...…… (36)	Haylee Luu (U)	ngoc.luu2@mail.mcgill.ca
LIAO – MA ……... (38)	Ayrin Ahia-Tabibi	airin.ahia-tabibi@mail.mcgill.ca
MC – O ……….…… (36)	Ridwan Kurmally (U)	ridwan.kurmally@mail.mcgill.ca
P – R …………….... (36)	Farimah Ramezan Poursafaei	farimah.ramezanpoursafaei@mail.mcgill.ca
S – STIN …….......... (36)	Reem Madkour (U)	reem.madkour@mail.mcgill.ca
STIX – VIV ………. (36)	Mustafain Khan (U)	mustafain.khan@mail.mcgill.ca
VUL – XI ………..... (34)	Rajae Faraj (U)	rajae.faraj@mail.mcgill.ca
XU – Zhang I …..…. (33)	Yanis Hattab (U)	yanis.hattab@mail.mcgill.ca
Zhang J, ZZ ………. (24)	Jianing Xu (U)	jianing.xu@mail.mcgill.ca

541 students and 15 TA units = 36.07 students per TA

Tentative Course Schedule
3 Lectures per Week

LECTURE DESCRIPTION	CLASS WORK
Unit 1 – Course Introduction	
LECTURE 1 – INTRODUCTION TO SOFTWARE SYSTEMS Introduction to the course. What is this course about? Importance of Systems and command-line development.	Course outline Textbook: Chapter 1
Unit 2 – The Unix Environment	
LECTUER 2 – THE UNIX/LINUX OPERATING SYSTEM The story of Unix. The architecture of Unix OS. Getting access to the SOCS Linux servers. SFTP and SSH clients, logging in, file transfer, working from home and school	Textbook: Section 2.0
LECTURE 3 – THE SHELL The OS shell environment. The command-line prompt. Home vs root. Basic commands: ls, cd, mkdir, rmdir, cp, mv, cat, more, man, logout, paths.	Lab A – Get account & Command line Textbook: Sections 2.1-2.2
LECTURE 4 – REGULAR EXPRESSIONS AND WILD CARDS Command-line commands that use wild cards and regular expressions. Using indirection. Using grep.	Mini 1 given out – linux & commands Textbook: Sections 2.2-2.3
LECTURE 5 – VIM & DEVELOPER TECHNIQUES Non-GUI editors and their importance. Common developer techniques: directory structures, procedures, commands: chmod, tar, zip, backups.	Textbook: Sections 2.2-2.3
Unit 3 – Bash Programming	
LECTURE 6 – INTRODUCTION TO BASH SCRIPTING What is BASH programming? When to use BASH programing? Examples of simple Bash programs.	Lab B – VIM Textbook: Section 2.4 Example 1
LECTUER 7 – BASH EXPRESSIONS Variables (bash, shell, session), math expressions, and I/O.	Textbook: Section 2.4 Example 2
LECTURE 8 – BASH CONTROL STRUCTURES Conditions, iteration, and functions.	Mini 2 given out – bash script Textbook: Section 2.4 Examples 3 – 4
LECTURE 9 – BASH DEVELOPER TECHNIQUES Bash as an aid to developers, development environment initialization, standardizing operations (archiving and backups, etc.)	Lab C – Bash programming
LECTURE 10 – SESSIONS AND BASH SCIPTS The Session. Session memory. Customization. System vs session scripts.	
LECTURE 11 – TEST #1	TEST #1 – lectures 1 to 9
Unit 4 – C Programming	
LECTURE 12 – INTRODUCTION TO THE C LANGUAGE The story of C. Why C? Children of C. Hello World example with puts() and getc(), GCC basics, compiling, running, errors. Bash compiling scripts.	Mini 3 given out – session script Textbook: Section 3.0 Example 1
LECTURE 13 – DATA AND CONTROL STRUCTURES IN C Types, variables, expressions, conditions and iteration.	Lab D – C compiling and programs Textbook: Section 3.0 Example 2 & 4
LECTURE 14 – STDIO.H and STDLIB.H getchar, putchar, puts, printf, scanf, sprintf, sscanf. I/O issues and data validation. STDIN, STDOUT and STDERR.	Textbook: Section 3.0 Example 3, 3.1
LECTURE 15 – ARRAYS AND STRINGS Array, strings, static & invariant data, writable data, array addressing.	Textbook: Section 3.0 Example 5
LECTURE 16 – POINTERS, STRINGS, AND STRING.H Pointer referencing and de-referencing. Example: make string.h functions using pointer referencing.	Lab E – C arrays and I/O Mini 4 given out – C program Textbook: Section 3.0 Example 6
LECTURE 17 – FUNCTIONS AND SCOPE Function syntax, scope rules. Call-by-value and call-by-reference.	
LECTURE 18 – STRUCT AND UNION Struct and Union syntax. Array of struct.	Textbook: Section 3.0 Example 7
LECTURE 19 – DYNAMIC MEMORY Dynamic arrays, dynamic structs, linked lists.	Lab F – Pointers and functions Textbook: Section 3.0 Example 8
LECTURE 20 – SEQUENTIAL TEXT FILES The file concept. Streams. Text and CSV files.	Mini 5 given out – large C program

LECTURE 21 – TEST #2	TEST #2
Unit 5 – Basic Software Development Techniques	
LECTURE 22 – MODULAR PROGRAMMING C object files, compiler performance, team programming basics, about large projects. The extern expression. The Pre-processor.	Lab G – Struct & Dynamic memory Textbook: Section 3.0 Example 9, 4.0
LECTURE 23 – GNU TOOLS The makefile. The profiler. The GDB.	Textbook: Section 4.1
LECTURE 24 – REPOSITORIES What is a repository? Ways to use repositories. Using git. More team programming basics. Branching.	Textbook: Section 4.1
Unit 6 – Systems Programming	
LECTURE 25 – INTRODUCTION TO SYSTEMS time.h, Bit-wise operations. Bash to C parameter passing. Void * referencing. About machines.	Lab H – makefile & git Textbook: Section 3.0 Example 6
LECTURE 26 – CONCURRENT PROGRAMS Shell memory-based communication, ampersand operator, ps, kill, and pwd.	Mini 6 given out – large C program Textbook: Section 4.2
LECTURE 27 – INTER PROCESS COMMUNICATION What is a process. C process creation: system and fork. Producer Consumer problem.	Textbook: Section 4.2
LECTURE 28 – BLOCK FILES AND RANDOM FILES Sequential Block, Random and Binary files (fread, fwrite, fseek).	Lab I – fork()
LECTURE 29 – NETWORKS AND WEBSITES Basic network architecture & the SOCS web server.	Textbook: Sections 5.0 – 5.1
LECTURE 30 – INTER PROCESS COMMUNICATION WITH CGI Using CGI to communicate with C using the Internet.	Mini 7 given out Textbook: Sections 5.2-5.4
LECTURE 31 – MORE CGI and C	Lab J – CGI Textbook: Sections 5.5-5.7
Unit 7 – If Time Permits…	
LECTURE 32 – VOID * AND FUNCTION *	
LECTURE 33 – SIGNAL HANDELING	
LECTURE 34 – SOCKET COMMUNICATION	
LECTURE 35 – ASSEMBLER WITH C	
Unit 8 – Final Exam Review	
LECTURE 36 – FINAL EXAM REVIEW	FINAL EXAM REVIEW

General Course Information

Course Requirements: The pre-requisite for this course is COMP-202 or COMP-250.

Right to submit in English or French written work that is to be graded

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

Classroom Rules: All electronic devices (cell phones and beepers) must be turned off or left on silent mode during class time.

Assignments Pickup: All assignments are submitted to and picked-up from My Courses.

Computing Resources: Trottier 3rd floor.

Examinations and Grading:

Students are responsible for all materials for the tests and exams, whether it is covered in class. Exams will be a combination of all types of questions based on all sources, and students may be required to integrate theoretical concepts from the text to substantiate their arguments.

No make-up tests or make-up assignments are allowed in this course. A supplemental exam is possible for 50% of the grade (to replace your final exam).

If you are not satisfied with the grading of an assignment or mid-term test, you may request a review within 7 days of return. Indicate in writing or during a meeting with the instructor where and why you feel the marks are unjustified and give it back to your instructor for re-grading. Note that the entire assignment or mid-term test will be re-graded and your grade can go up or down (or stay the same) accordingly.

Calculators
Only non-programmable, no-tape, noiseless calculators are permitted. Calculators capable of storing text are not permitted in tests and examinations.

Dictionaries
Dictionaries are not permitted, but translation dictionaries are.

Handheld Devices
Handheld devices capable of storing text and having calculator functionality (e.g. Palm, etc.) are not permitted.

Additional Information: The course slides are not meant as a complete set of notes or a substitute for a textbook, but simply constitute the focus of the lecture. Important gaps are left in the slides that are filled in during class, thus **l**ecture attendance should be considered essential.

The material covered in the classroom will be used to supplement textbook readings.

Academic Integrity: *Code of Student Conduct*

McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see *www.mcgill.ca/integrity* for more information).

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples reseignements, veuillez consulter le site *www.mcgill.ca/integrity*).

Final Exam Policy:

Regulations
Students should not make other commitments during the final exam period. Vacation plans do not constitute valid grounds for the deferral or the rescheduling of examinations. See the Centre Calendar for the regulations governing Examinations:
http://www.mcgill.ca/student-records/exams/regulations/
Students are required to present their I.D. Card (with photo) for entrance to their examination.

Conflicts
If you are unable to write your final examination due to scheduling conflicts, you must submit a Final Exam Conflict Form with supporting documentation at least **one month** before the start of the final examination period. Late submissions will not be accepted. For details, see
http://www.mcgill.ca/student-records/exams/conflicts/

Exam Timetable
Examination schedules are posted at the Centre and on the following page approximately 6-8 weeks before the examination period commences
http://www.mcgill.ca/student-records/exams/
The Centre cannot provide examination dates over the telephone.

Email Policy:

E-mail is one of the official means of communication between McGill University and its students. As with all official University communications, it is the student's responsibility to ensure that time-critical e-mail is accessed, read, and acted upon in a timely fashion. If a student chooses to forward University e-mail to another e-mail mailbox, it is that student's responsibility to ensure that the alternate account is viable.

Please note that to protect the privacy of the students, the University will only reply to the students on their McGill e-mail account.

Students Rights and Responsibilities:
Regulations and policies governing students at McGill University can be downloaded from the website:
http://www.mcgill.ca/deanofstudents/rights/

Students Services and Resources:
Various services and resources, such as email access, walksafe, library access, etc., are available to students:
http://www.mcgill.ca/stundet-records

Minerva for Students: http://www.mcgill.ca/minerva-students/

Note: In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.