Course Outline

Course Name:	Computer Systems Lab COMP-308 Winter 2017
Instructor:	Joseph Vybihal

Contact Information:

Office:	ENGMC 323
Office Hours:	Monday 13:30-11:30 & Thursday 11:00-12:00 (or by appointment)
Email:	Use the My Courses email tool or jvybihal@cs.mcgill.ca

Course Objectives:

After conducting meetings with corporations like EA Games and Artificial Mind & Motion it was decided that students from McGill Computer Science were missing hands on experience with real hardware and low-level assembly. COMP 308 was developed to address these two needs. The application area selected for students to experiment on is modern computer graphics cards.

This course serves to fill two purposes. For students who are interested in hardware, this course takes the theoretical and simulator assembler knowledge from COMP 273 and solidifies their understanding of hardware by building a real graphics card assembler programs. This requires intimate knowledge of the hardware and operating system. For students who are in the Games Option, this will provide them the deep understanding of graphics cards that is looked for by gaming companies. The course will also explore CG and C, which are skills in demand by gaming companies.

Primary learning outcome: To get a clear understanding of how real hardware functions, specifically computer memory, the CPU and graphics cards. To be able to write drivers and software at the assembler level.

Secondary learning outcomes: To write C code that interfaces with hardware directly. To write in a special graphics card scripting language called CG. Serves as a introduction to a graphics course.

Course Description: Digital circuitry and programming interface of peripheral circuit boards (cards), e.g., graphics cards, introduction to tools and libraries that interact with the card; performance issues.

Texts:

Primary Texts: No textbook.

Evaluation:

Assignments	60%	3 Assignments
Mini Project	30%	Team of two or on your own
Lab attendance	10%	5 of 8 (but you should do all eight)

You will be notified in advance of assignment due dates. All assignments are due on MyCourses 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 of the instructor.

Students are responsible for all materials for the tests and exams, whether or not 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.

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.

Course Requirements: CS Students: COMP-273 (prerequisite)
                          ECSE Students: ECSE-323 or COMP-273 (prerequisite)

This course assumes you are familiar with C, Windows and Unix/Linux.

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.

Every chapter should be read twice. The first reading should be done prior to attending class and the second reading should be done after the class discussion of the chapter. The questions at the back of each chapter follow directly from the reading. Students should be able to answer these questions after a thorough reading of the material.

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/conted-students/exams/regulations/
Students are required to present their I.D. Card (with photo) for entrance to their examination.

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

Assignments Pickup: All assignments are submitted to and picked-up from Web CT.

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.

Computing Resources: Trottier 3rd floor.

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 Continuing Education students:
   http://www.mcgill.ca/conted-students/services/

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

Detailed Course Outline: (TENTATIVE)

WEEK	TOPIC	DETAILS	TA LAB	WORK
Operating Systems, Memory and Graphics Cards				
1	Introduction, Operating Systems and Graphics Cards	About the course, Computer modes: Real & Protected, Memory architecture: Mapped, Emulation (Windows OS), Intel Memory and CPU Architecture	Lab 1: Command-line, DOSEMU/DOSBOX, Debug (turbo assembler) and place dot on screen.	
Low-level Programming				
2	INTEL Assembly 1	Windows command-line assembler, Intel assembly language instructions	Lab 2: Print letter on screen using Debug	Ass#1 – Command-Line Assembler & C program with debug.
3	INTEL Assembly 2	Compilers and Assemblers, Addressing modes, Segment offsets	Lab 3: TASM & TLINK – Hello World in assembler	
4	Graphics Cards 1	Interrupts, addresses and video modes, SVGA Architecture (NVIDIA)	No Lab: But INTEL memory and Functions handout	Ass#2 – Assembler Programming + stack parameters – useful library
5	Graphics Cards 2	Video banks, video modes, and interrupts	Lab 4: Graphics video modes	
6	General DOT and LINE	Drawing points and lines, Video banks	Lab 5: Dot & Line code in a single bank, simple scene	Ass#3 – General pixel and line program.
7	General TRIANGLE	Drawing triangles		
8	General FILL	About filling shapes		Ass#4 – General fill triangle program.
C Programming and Hardware Interfaces				
9	C and Assembler	Writing assembler in C, and conio.h	Lab 6: Inline assembly + graphics, conio.h, debug C code.	
10	C and OpenGL	Graphics libraries	Lab 7: OpenGL example Also Simple Draw from http://www.math.ucsd.edu/~sbuss/MathCG/OpenGLsoft/	Ass#5 – C, OpenGL and CG + calling assembler program from C (bonus)
CG				
11	Introduction to CG	Interfacing OpenGL with CG	Lab 8: Review http://http.developer.nvidia.com/CgTutorial/cg_tutorial_chapter01.html	
12	CG Programming	Graphics processing		

How the class will be conducted:

- Each lecture will be 45 minutes long (sometimes 30 minutes long)
  - Lectures only address the main point of the class
  - Additional important points are present as notes at the end of the lecture slides and as links to external resources
- The course has 8 labs that are 30 minutes long lead by the TA.
  - Students must attend a minimum of 5 labs. Attendance is taken and points are awarded.
- Together, the lecture and lab time make up the entire weekly lecture portion of this 1 credit course
  - The remaining 1-credit-based time goes towards assignments and study
- The course does not have any tests or exams