School of Computer Science
www.cs.mcgill.ca

Course Name:	Software Development COMP 303 – Winter 2018
Instruction:	Joseph Vybihal Office: ENGMC 323 Email: jvybihal@cs.mcgill.ca Website: MyCourses Office hours: TBD or by appointment
Credits:	3 credits

Course Description: Principles, mechanisms, techniques, and tools for software development, with a focus on software design.

Principles = Separation of concerns, encapsulation, substitutability, interface segregation.
Mechanisms = Exception-handling, serialization, concurrency, synchronization, & reflection.
Techniques = Design patterns, design by contract, unit testing, refactoring.
Tools = Integrated software development environment, automatic testing tools, coverage analyzers and static checkers.

Course Objectives: The student will be able to use the proper terminology when speaking about Principles, Mechanisms, Techniques, and Tools. The student will be able to describe and explain in what context each principle is best expressed, how each mechanism can be implemented, the timely application of each technique, and how each tool's underlying mechanisms function.

Primary learning outcome: The student will be able to look at a problem and determine the best principles, mechanisms, techniques and tools to use.

Secondary learning outcomes: Create a complete object-oriented application based on the principles of object-oriented software development, the structured use of programming language mechanisms, the application of software development techniques, and the use of software engineering tools.

Required Text: Object-oriented Design & Patterns, Cay Horstmann, Wiley, ISBN 0-471-74487-5

Additional Text: https://github.com/prmr/SoftwareDesign (Textbook)
https://github.com/prmr/Solitaire (Sample project)

Evaluation:

Mini Assignments	10%	5 minis
Project	10%	Individual work
Class test 1	20%	~ week 5
Class test 2	20%	~ week 10
Final Exam	40% or 80% plus assignments	
UML Labs x 2	0%	Optional attendance

Course grade is the higher grade between the 40% and 80% final points

Course Prerequisite: COMP-206, COMP-250

Course Co-Requisite: N/A

Tentative Course Schedule

Introduction

MODULE 1 – Well Designed Algorithms
- The concept of being well-designed . . . . . . Mini 1
    - simplicity, optimality, correctness
    - Writing style, commenting as documentation
- Well designed objects
    - Class design, encapsulation and polymorphism
    - Object identity and life-cycle
    - The object model and its properties
    - Generic types
- Well designed specifications . . . . . . Mini 2
    - Extracting solution artifacts from a problem statement
    - Design by contract
        - Interfaces and state validation, the idea of being true

MODULE 2 – Tools That Aid Good Design
- Automatic documentation
    - javadoc
- Unit testing . . . . Mini 3
    - jUnit
    - Software quality checking
    - Analyzing the quality of an interface
- Unified Modeling Language (UML) . . . . . Mini 4
    - Class diagram, sequence diagram, activity diagram &UMLet / JetUML
- Layered solution formation . . . . . . Mini 5
    - Step 0 – Extract solution artifacts from problem statement
    - Step 1 – Write the contract
    - Step 2 – Draw the UML solution algorithm
    - Step 3 – Decide on objects and libraries
    - Step 4 – Write the code with style and using the well-designed concept

MODULE 3 – Design Patterns and Applications . . . . . Project
- Why design patterns and how are they used?
    - Why is it important?
    - The design pattern template (the parts of a design pattern)
    - Layered solution formation revisited
- Design patterns
    - Composite
    - Decorator
    - Iterator
    - Observer & Inheritance-based reuse
    - Strategy
    - Template Method & abstract classes
    - Error handling

MODULE 4 – Advanced Objects and Design Patterns (as time permits)
- GUI design and implementation
- Threads and Synchronization
- Design patterns
    - Visitor, Adaptor, Factory Method, Proxy, Singleton, Command

About Assignments and Class Tests

Assignments are original works created by the student alone. You are permitted 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 receive zero. This includes the student who permitted their assignment to be copied. This includes written solutions and software source code.

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.

Class tests are 1 hour long and take place in class. You are not permitted any material during these tests other than something to write with and something to erase with. You may bring a non-programmable non-internet/network capable calculator.

The course textbook is very important to the course. Students are responsible for the material in the textbook in assignments, tests, and exams. Students are responsible for all the material in the textbook regardless of what was covered during the lecture. Material covered during the lectures and assignments are more important for the student but this does not restrict the use of assigned reading material from appearing in assignments, tests, or exams, even when they were not explicitly covered during lecture time.

About Grading

Points are awarded following this template:

- Program does not compile   .   .   .   .   .   .   No points
- Program runs incorrectly   .   .   .   .   .   .   No points
- Program runs correctly   .   .   .   .   .   .   No points
- Program runs correctly with style OR proper use of design concepts   .   Half points
- Program runs correctly with style AND proper use of design concepts   .   Full points
- Special case:
    - Program run incorrectly but with style and/or proper design   .   Half points

Notice how "program runs correctly" awards zero points and "program run incorrectly but with style and/or proper design" awards half points. This course assumes you know how to program and does not award points based on a running program but on well-designed programs written with good style.

This course will be anal when it comes to well designed and well written source code and algorithms. Please spend time developing those important, but often neglected, skills. Every element of this course attempts to introduce the student to some facet of this concept, writing software that is well designed and in style.

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 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.

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.