



**Course Name:** Software Architecture  
 COMP-529 Fall 2016 – 4 credits

**Instructor:** Joseph Vybihal

**Contact Information:** Office: ENGMC 323  
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**Course Objectives:** Large software projects differ greatly from small software projects. They are more complex and are constructed using multiple programmers and tools. The possibility of coding errors and having design errors are huge in small software projects but become exponential as the project increases in size and complexity. A disciplined approach following well-formed software engineering principals in architecture, design and documentation will give you the skills to properly construct and manage large software projects.

**Primary learning outcomes:** to understand foundational concepts like: views, perspectives, components, connectors, architectures, patterns, etc. To understand current architectural styles like layered, service-oriented, message-based, etc. To incorporate in your designs important software principles like design change, modularity, reuse, traceability, etc. To be able to analyze the architecture of another software system documenting it in a clear and concise manner. To be able to build your own principled architected software system.

**Secondary learning outcome:** To be able to describe and explain recent research developments in the field of software architecture.

**Course Description:** Development, analysis and maintenance of software architectures, with special focus on modular decomposition and reverse engineering.

**Texts:** **Resources:**  
 - Clements et al, Documenting Software Architectures: Views and Beyond, Addison-Wesley  
 - Bass, Clements, Kazam, Software Architecture in Practice, Assision-Wesley  
 - Brown and Wilson, The Architecture of Open Source Applications, 2012  
 - Vogel et al, Software Architecture: A Comprehensive Framework and Guide for Practitioners Springer

All the above resources are available online through the McGill network.

**Evaluation:**

Assignments	20 %	3 Assignments (forward & reverse engineering case study, principles)
Project		
- Reverse engineering case study & paper writing		
- Team paper part 1	20 %	First draft paper submission
- Team paper part 2	20 %	Final paper submission
- Presentation	5 %	Last 2 weeks of class (based on team paper part 2)
Late Midterm Exam	35 %	TBD (in class - tentative)

**Project** The Team Paper (parts 1 and 2) and Presentation make up the gradable portions of the group project. Your project will be to reverse engineer and document a large Open Source project. You will identify, describe, and criticize the architecture.

# Summary Course Outline

Tentative Schedule			
WEEK	TOPIC	READINGS	WORK HANDED OUT
<b>Introduction to Software Architecture</b>			
1	Introduction to Software Architecture <ul style="list-style-type: none"> <li>- Lecture 1               <ul style="list-style-type: none"> <li>o Introduction to COMP 529</li> <li>o The bridge, Styles, Attributes, Guidelines</li> </ul> </li> <li>- Lecture 2               <ul style="list-style-type: none"> <li>o Energy minimization</li> <li>o Forwards &amp; Reverse engineering</li> </ul> </li> </ul>		
2	Software Architecture Design Space <ul style="list-style-type: none"> <li>- Lecture 3: Types of software structure</li> <li>- Lecture 4               <ul style="list-style-type: none"> <li>o Software elements and connectors</li> <li>o Agile architectural design</li> </ul> </li> </ul>		Assignment #1
3	Models, Paradigms and Documentation <ul style="list-style-type: none"> <li>- Lecture 5               <ul style="list-style-type: none"> <li>o Paradigms &amp; How to model software</li> <li>o Modeling with UML and ADL</li> </ul> </li> <li>- Lecture 6               <ul style="list-style-type: none"> <li>o Capturing the full model</li> <li>o Reverse vs forward engineering</li> </ul> </li> </ul>		UML Review Lab(s)
<b>Architectures</b>			
4	Introduction - Object vs. Component Architectures <ul style="list-style-type: none"> <li>- Lecture 7: OO vs Module Architectural Designs</li> <li>- Lecture 8: Component-based Architectural Designs</li> </ul>		Assignment #2
5	Data-based Style <ul style="list-style-type: none"> <li>- Lecture 9: Data Flow Architectures</li> <li>- Lecture 10: Data-Centered Architectures</li> </ul>		
6	Hierarchical Style <ul style="list-style-type: none"> <li>- Lecture 11: Primary-secondary based architectures</li> <li>- Lecture 12: Layered-based architectures</li> </ul>		Assignment #3
7	Communication Style <ul style="list-style-type: none"> <li>- Lecture 13: Asynchronous Communication</li> <li>- Lecture 14: Interaction-Oriented Architectures</li> </ul>		
8	Distributed Style <ul style="list-style-type: none"> <li>- Lecture 15: Simple architectures</li> <li>- Lecture 16: Broker-based architectures</li> </ul>		Project handout – Paper 1
9	Architectural issues <ul style="list-style-type: none"> <li>- Lecture 17: Security-based Architectures</li> <li>- Lecture 18: Heterogeneous Architectures</li> </ul>		
10	Product Line Engineering <ul style="list-style-type: none"> <li>- Lecture 19: About product line development</li> <li>- Lecture 20: About product line methodologies</li> </ul>		Paper 2
11	Late Midterm Exam		Exam
<b>Presentations</b>			
12	Student presentations		Presentation
13	Student presentations		Presentation

# General Course Information

## Examination and Grading:

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 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.

### *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.

**Course Requirements:** COMP-303 or COMP-304

**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 lecture 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](http://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 renseignements, veuillez consulter le site [www.mcgill.ca/integrity](http://www.mcgill.ca/integrity)).

**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.

**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.

**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.

**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 3<sup>rd</sup> 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 students: <http://www.mcgill.ca/student-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.