Note: This course outline contains important information that may affect your grade. You should retain it throughout the semester, as it will be assumed that you are familiar with the rules specified in this document.

Instructor: Dr. (Ridha) Khedri
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Office hour: Wednesday from 2:30 PM to 3:30 PM in ITB 131.
Lectures: Friday from 1:00 PM to 4:00 PM in room ITB-222.

Calendar Description


Mission

The mission of this course is to give students an understanding of the problem of large system design. We focus on the design of systems that are analyzing large datasets. We also explore the modern component based architectural approach to design, as realized through the so called Model Based Development approach. In particular, we aim at the following learning objectives:

• To be able to discern desirable properties of a software design
• To understand different notions of complexity, at both the component and the system level
• To understand the role of design patterns and be able to illustrate their properties and domains of application
• To understand the role of design in having secure systems
• To understand the specifics of designing systems for big data analytics

Some familiarity with detailed design and software requirements is assumed. The course aims to be generally self-contained.

Upon completion of this course, participants should know and understand

1. Software requirements and its role in determining the architecture design
2. Object Oriented Architecture (OO Analysis and Design)
3. Design Principles and their role in leading to sustainable and dependable system
4. The domain of application of different architectural styles
5. Model Driven Software Development
6. Software Product Families and Feature Modeling
7. Design of systems for data analytics
Upon completion of this course, participants should be able to

- Propose an appropriate architecture and detailed designs for a large system
- Use a Model-Driven Approach to develop a system
- Propose proper feature modelling when a family approach is to be adopted
- Properly document the outcome of each of the stages of the software development process
- Assess a design based on its adherence to the design principles

Course Details

- Software requirements and its role in determining the architecture design
- Architectural Design to Meet Stakeholder Requirements
- Design Principles and their role in leading to sustainable and dependable system
- Data Centered Software Architecture; Hierarchy Architecture; Interaction Oriented Software Architecture; Distributed Architecture; Component-Based Software Architecture; Implicit Asynchronous Communication Software Architecture; Heterogeneous Architecture.
- Modelling Notations: Modelling paradigms, domain-specific notations, meta-modelling, grammars, semantics
- Model Management: Relationships between models, relating heterogeneous models, model operations (e.g., merge, composition, match, slice, diff)
- Model Transformations: Code generation, generative programming, model-to-model transformations, abstraction/refinement, model synthesis, model visualization
- Software Product Families, Product Family Algebra, Aspect Oriented Product Families
- Integrating security into development life cycle
- Design for data analytics

Course Information on Web

You can find the latest version of the course outline, the slides used in class, the material related to the course project, the material needed paper reviews, term projects, and announcements at the course website on Avenue to Learn (https://avenue.cllmcmaster.ca). It is the student’s responsibility to be aware of the information on the course website, and to check regularly for announcements.

Schedule and Notes

Within the two first weeks of the term, the instructor will post on Avenue to Learn a sequence of documents giving details regarding paper presentations, paper reviews, paper presentation evaluations, term projects, and a list of reading material.
Method of Evaluation

Students are expected to read on average three papers each week, in advance of class. Over the course of the term and depending on the size of the class, each student will also present two to three papers in class and will prepare reviews of three to seven additional papers. Finally, there will be a term project defined by the student. Graded reports will be returned during lectures. All reports may not be marked in detail. The marking scheme is as follows:

- Attendance and class participation 15%
- Paper reviews 15%
- Paper Presentations 30%
- Term project 40%

References


Policy Statements

I am eager to support you and help you to have a good learning experience. I would appreciate your suggestions on how the course can be improved, especially since this will be the first time the present version of the course is given, and our teaching methods.

- Significant study and reading outside of class is required.
- Regular class attendance is expected. If you do not attend regularly, it will be reflected in your attendance and class participation grade.
- You are strongly urged to ask questions during class.
- You may want to discuss the exercises with your fellow students. If you do that, you must include a list of all those with whom you discussed the exercise in your final submission and describe what information you received. It is part of your professional responsibility to give credit to all who have contributed to your product.
- Your final submission must be your own work. If it is discovered that you have not written your own solutions, or that you have consulted with people not mentioned in your submission, it will be considered as academic dishonesty.
- The instructor reserves the right to increase by a fixed number of points the final scores.
- The instructor reserves the right to assign extra grades for extra work done by willing students. However, the work subject to extra grades should be advertised during the lectures.
- A remarking request of a deliverable (e.g., review report, presentation report, etc.) is considered by the Teaching Assistant and the instructor only if it is made within the two weeks that follow the return date of the majority of the concerned deliverable.
• No responsibility for loss of deliverables can be assumed by either the instructor or the Teaching Assistants. **Keep copies of your own contributions to the project, your reports, and your email exchanges with the instructor and the teaching assistant.**

• The lectures will not necessarily follow the order in which the topics are presented in the detailed course outline. Regular class attendance is required.

**Official Statements**

**Important warning**

"The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes."

**Disabilities**

Students with disabilities can receive accommodations to assist them in the completion of assignments and exams. Please contact the Centre for Student Development (http://csd.mcmaster.ca) for advice and for arranging assistance. Students are also encouraged to talk to the instructor about this issue.

**Discrimination**

"The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons concerned individuals are reminded that they should contact there Chair, the Sexual Harassment Office of the Human Rights Consultant, as soon as possible."

**Academic Integrity**

"Students are reminded that they should read and comply with the Statements on Academic Ethics and the Senate Resolutions on Academic Dishonesty as found in the Senate Policy Statements distributed at registrations and available in the Senate Office."

"Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g., the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at http://www.mcmaster.ca/senate/academic/ac_integrity.htm. The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g., the submission of work that is not one’s own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations."