

SEG3102 Software Design and Architecture

(3 hrs lecture, 1.5 hrs tut, 1.5 hrs lab, 3 cr)

An in-depth look at software design. Continuation of the study of design patterns, frameworks and architectures. Survey of current middleware architectures. Design of distributed systems using middleware. Designing for qualities such as performance, safety, security, reusability, reliability, etc. Measuring internal qualities and complexity of software. Evaluation and evolution of designs. Basics of reengineering and reverse engineering. Prerequisite: SEG2105

Course Hours

Day	Time	Room	
Tuesday	14:30 – 17:20	SCR 002	Lecture
Tuesday	11:30 – 12:50	CBY B02	Lab
Wednesday	10:00 – 11:20	CBY B02	Lab
Wednesday	16:00 – 17:20	STM 224	DGD

Instructor

Stéphane S. Somé

Office: STE 5033

Ph: 562-5800 ext 6714

Email: Stephane.Some@uottawa.ca

Office Hours: By appointment

Teaching Assistants

- Siddhant Tiwari (stiwa017@uottawa.ca)
- Akshata Ramesh Rao (arao082@uottawa.ca)
- Cyril Meriam Kennedy (ckenn072@uottawa.ca)
- Matthew Joseph Demczyk (mdemc071@uottawa.ca)

Books

No required text. The course is based on several sources including:

- Humberto Cervantes and Rick Kazman, Designing Software Architectures: A Practical Approach, Addison-Wesley, 2016
- Len Bass, Paul Clements, Rick Kazman, Software Architecture in Practice, Addison Wesley.
- Craig Larman, Applying UML and Patterns An Introduction to Object-Oriented Analysis and Design and the Unified Process, 3rd edition, Prentice Hall, 2006
- Eric Evans, Domain-Driven Design, Tackling Complexity in the Heart of Software, Addison-Wesley, 2004
- Scott Millett, Nick Tune, Patterns, Principles, and Practices of Domain-Driven Design, Wrox, 2015
- Robert C. Martin, Clean Architecture: A Craftsman's Guide to Software Structure and Design, Prentice Hall, 2017

- Sam Newman, Building Microservices, O'Reilly, 2015
- Chris Richardson, Microservices Patterns, Manning, 2019
- Jiawei Han, Micheline Kamber, Jian Pei, Data Mining Concepts and Techniques, Morgan Kaufmann, 2012

Course Learning Outcomes

Upon completion of the course, student will be able to :

- Describe software architecture drivers, architecture concepts the relation between architecture and requirements, and the architecture development process.
- Use a software architecture development process to create architectures from requirements.
- Design and implement software involving middleware and framework technologies.
- Explain the core principles of software design.
- Design software using the Domain Driven Design (DDD) approach.
- Describe a wide variety of architecture styles, design patterns and frameworks.
- Use metrics to measure and assess software designs.

Program Learning Outcomes / Accreditation Standards

This course contributes to the achievement of the following program learning outcomes :

- 1c. Program in two different programming languages
- 4b. Apply a wide variety of design patterns, frameworks and architectures in the design of a variety of types of software
- 4c. Apply principles of software design to the development of software
- 5a. Use multiple programming language and development environments on several different operating system and hardware platforms
- 5c. Use tools and languages for modeling, analysis and generation of software structure
- 5d. Use tools and languages for modeling, analysis and generation of software behaviour
- 5h. Apply a variety of APIs and software libraries to software engineering
- 6a. Work individually on software engineering activities
- 6b. Work in a group on software engineering activities

Evaluations

Quizzes (15%) - Weekly quizzes consisting of questions asked after each module. These quizzes check your progress with the material covered.

Lab Exercises (15%) - Weekly work involving design and implementation tasks related to the labs.

Assignment (10%) - Design and modeling.

Project (25%) - You will work as a team to design and implement a software application from requirements. The project involves deliverables whose deadlines will be communicated.

Final Exam (35%)

Oral Assessment: Any of the evaluations listed above may be replaced in whole or in part by an oral examination at the discretion of the instructor.

Minimum Participation: You will receive **EIN** (equivalent to **F**) as final grade if you do not satisfy the following requirements.

- Submission of 80% of the Labs exercises (with evidence of performed work).
- Submission of the assignment.
- Completion of 80% of the Quizzes.
- 100% completion of the Project deliverables within a Group, and recognition by other team members of an effective contribution.
- Completion of the final exam.

Late Policy: all work must be handed online on Virtual Campus and/or Github Classroom by the deadline specified. **Any late submission will result in mark zero (0) unless a justification is provided and accepted by the instructor and/or a special extension was granted before the original deadline.** Note that the submission time as recorded by Virtual Campus or for your latest code check-in is the only one considered.

Information sharing and copyright

All material provided for the course including video recordings, course notes, labs, tutorials, assignments, exams, solutions, are protected by [copyright](#). Copying, digitizing, or publishing on a Web site without the explicit authorization of the instructor is a violation of copyright and is illegal.

Prevention of sexual violence

The University of Ottawa does not tolerate any form of sexual violence. Sexual violence refers to any act of a sexual nature committed without consent, such as rape, sexual harassment or online harassment. The University, as well as student and employee associations, offers a full range of resources and services allowing members of our community to receive information and confidential assistance and providing for a procedure to report an incident or make a complaint. For more information, visit www.uOttawa.ca/sexual-violence-support-and-prevention.

Mental Health

The University of Ottawa and your professors are committed to your wellbeing. The University's core values include preparing students to become leaders and encouraging and enabling them to achieve personal growth and wellness. As such, the Mental Health and Wellness website acts as a central location for information and resources at our University and in the surrounding community. It is also an excellent tool for family members, friends and colleagues who may need to help someone close to them that is studying or working at the University. For more information, visit uottawa.ca/wellness/. For 24/7 support, students can call Good2Talk at +1 (866) 925-5454. Good2Talk is a post-secondary student helpline which provides professional and confidential support for students in Ontario free of charge.

Academic Integrity

Preamble

Academic integrity is a fundamental value at the core of all academic activities. The regulation on academic fraud ([Academic Regulation 1-14](#)) defines the acts that can compromise academic integrity

and outlines the various sanctions and consequences of such acts, and the procedures for handling allegations and setting sanctions. Further information on academic integrity is available on [the website of the Provost and Vice-President, Academic Affairs](#).

Definition

1. Any act by a student that may result in a distorted academic evaluation for that student or another student. Academic fraud includes but is not limited to activities such as:
 - a. plagiarising or cheating in any way;
 - b. submitting work not partially or fully the student's own, excluding properly cited quotations and references. Such work includes assignments, essays, tests, exams, research reports and theses, regardless of whether the work is in written, oral or any other form;
 - c. presenting research data that are forged, falsified or fabricated in any manner;
 - d. attributing a statement of fact or reference to a fabricated source;
 - e. submitting the same work or a significant part of the same piece of work in more than one course, or a thesis or any other piece of work submitted elsewhere without the prior approval of the appropriate professors or academic units;
 - f. falsifying or misrepresenting an academic evaluation, using a forged or altered supporting document or facilitating the use of such a document;
 - g. taking any action aimed at falsifying an academic evaluation.

Sanctions

1. Students who commit or attempt to commit academic fraud, or who are a party to academic fraud, are subject to one or more sanctions ([full list](#)), such as:
 - a. a written warning;
 - b. zero for part of the work in question;
 - c. zero for the work in question;
 - d. zero for the work in question and the loss of additional marks for the course in question;
 - e. zero for the work in question, with a final grade no higher than the passing grade for the course in question;
 - f. an F or NS grade for the course in question.

Student Services

[Academic GPS](#)

The [Academic GPS](#) hub is a one-stop shop for academic support. Whether you're an experienced student or just starting out, you'll find some great resources to help you succeed.

With the [Academic GPS](#), you can:

- chat with a mentor seven days a week;
- register for study groups;
- take part in study methods workshops (note taking, time management, exam preparation, stress management, Academic Integrity Session, etc.);
- book an appointment with a mentor.

Calendar

Note that this is tentative and may be subject to adjustments.

	<i>Lectures</i>	<i>Labs</i>	<i>Tutorials</i>	<i>Project</i>
1	Presentation - Introduction to Design and Architecture			
2	Software Architecture	Angular - introduction		
3	Modules	Angular – Components		
4	Domain Driven Design	Angular Authenticated Routes & Reactive Forms		Deadline for team formation Project start
5	Concurrency View	Angular Persistence & Authentication with Firestore	DDD Strategic Design, Contracts	
6	Services	Spring - introduction, Messaging	DDD Tactical Design, Concepts	Deliverable1
7	Containers/cloud	Spring - persistence, REST	DDD Use Case Realization	
8	Microservice Architecture	GraphQL		Deliverable2
9	Big data architecture	Authentication & Authorization		
10	Tactics			
11	Metrics			
12	Summary			Deliverable3