Course Title: COMP9322 Software Service Design and Engineering

Course Summary

Today's modern era permeates with phenomenal growth and advancement across a wide range of areas: from science and technology, to medicine and art, as well the social sciences. Amongst all, the notion of "services" plays a critical role to abstract and make available snippets of innovation, that can thereby be used cross-disciplinary to create bigger, better and more interesting innovations. This course arms students with the knowledge and expertise to "design" and "engineer" services using modern Web technology.

Students will appreciate the importance of the Service Oriented Architecture (SOA) as a way to design an enterprise environment that features cross-platform compatibility, agility and cost-efficiency. In particular, the microservices variant will be taught.

In addition, this course will strengthen students' data modeling expertise, covering topics on enterprise modelling and semantic modelling of both simple and complex structures, and their usage in business analysis. This will also describe the technical standards and technologies that support semantic data modelling.

Course Aims and Learning Outcomes

After completing this course, students will:

- Describe different architectural design approaches and their role in engineering software.
- Apply modelling of services in different settings
- Be competent in designing, managing and documenting APIs.
- Understand techniques for enterprise modelling and semantic modelling of simple and complex structures, as well as their associated technical standards and technologies.

This course forms the three-part series of the Data and API Engineering stream. The concepts taught in this course will provide the foundation and complementary skills for the topics covered in COMP9322 and COMP9323.

Prerequisites and Assumed Knowledge

To take this course, a student must have programmed in a programming language (preferably Python), have learnt how to organize and query the data in relational data model, and have basic knowledge of the workings of the Internet (TCP/IP, sockets, etc.) and Web Technologies (HTML, CSS, JavaScript, XML and AJAX).

Formally, the pre-requisites are: Undergrad - COMP1531 and COMP2041, Postgrad - COMP9021 and COMP9311

Weekly Activities

Schedule of topics, organised by week:

Wk	Lecture	Lab	Assignment
1	**Course Introduction & Service Orientation:** Service, Service Orientation, Service Oriented Architecture, Service Design Principles	--	Reading Assignment: The Death of Big Software
2	**Service Oriented Architectures (SOA):** SOA Benefits + Distributed Information Systems: Layers, Architectures, APIs		
3	**Web Services:** Evolution of the Web Service, Programmable Web, Resource Oriented Architecture, REST	*Lab 1. Accessing and using a simple Web Service*	
4	**Microservices Part 1 Introduction and Analysis:** From Monolithic to Microservices, Event oriented modelling and analysis	*Lab 2. Modelling Using an Event Based Approach*	*Assignment 1. Identify Services in Use Case*
5	**Microservices Part 2 - Synthesizing the Solution:** Communication and Collaboration, Recative Systems, Organizations and Microservices	*Lab 3: Designing a microservice*	
6	**Service Engineering Methodologies:** business analysis fundamentals, enterprise architectures, modelling approaches (e.g. Capsicum) and tools, identifying business concepts (services, data etc.), business-IT alignment.	*Lab 4. Using a business modelling platform*	
7	**Modelling an Enterprise:** presentation of the case study in analytics. Modelling the different elements of the case study.		*Assignment 2. Building a simple business/enterprise architecture for Case Study*
8	**Anzac Day**		

9	**Semantic Modelling Basics and RDF Language:** Concepts and Relationships, Subject-Predicate-Object relations Simple Structures In Semantic Modelling, Classes and Subclasses, Instances, Properties and Attributes **Semantic Technologies**, RDFS, OWL and SPARQL	*Lab 6. Exploring an existing Ontology*	
10	**Complex Structures In Semantic Modelling** Properties, Property chains and Inferencing. Information modelling approaches. Ontologies and ontology engineering.		*Assignment 3. Integrating service and data models in business architecture for case study*
11	**Advanced topics**		
12	**Course Wrap-up & Review**		

Note: Practical exercises will make use of a number of datasets from different areas such as finance, media and economics. From the area of finance, datasets represent financial markets transaction data as well as market indices and measures. In the media space, datasets include wired news, regulatory reports, and social media data like twitter. Economics datasets are varied and include socio-economic indicators, population statistics as well trading information.

Assessment

The assessment consists of the following components:

- Group Assignments (30%): This component assesses the modelling skills related to learning outcomes. Each assignment is designed for students to explore each main technology from the lectures. Labs and assignments are released roughly every two weeks to encourage students to progressively develop their skills.
- Practical Labs (10%): various assessments based on the lab activities.
- Written final exam (60%): individual assessment. This component is going to assess the various facts-and-knowledge level learning outcomes. The exam is a mixture of multiple choice questions and written answer questions.

Resources for Students

There is no formally prescribed textbook for this course. Recommended reading lists will be provided through the online Q/A (online course forum) throughout the semester. However, the following books are highly recommended and relevant for the topics covered in this course:

- SOA: Principles of Service Design, Thomas Erl, 2008, Prentice Hall.
- Web Services: Concepts, Architectures and Applications, Alonso, Casati, Kuno, Machiraju, , Springer 2004
- RESTful Web APIs, Richardson and Amundsen, O'Reilly, 2013

- Web Service Implementation and Composition Techniques by H-Y Paik, A. Lemos, M. Barukh, B. Benatallah and A. Natarajan, Springer, late 2017.
- Building Microservices, Newman, Sam, 2015, O'Reilly Media.
- Reactive Microsystems, Jonas Boner, 2017, Lightbend, Inc.
- DevOps: A Software Architecture's Perspective by L.Bass, I. Weber and L. Zhu, Addison-Wesley, 2016
- Datasets - Practical exercises will make use of a number of datasets from different areas such as finance, media and economics.

Course Evaluation and Development

This course is evaluated each session using the standard UNSW course evaluation system.