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, microservices variant will be taught and serverless computing will be introduced. Also students will learn about cognitive services and how conversational Bots can be used to allow natural interactions between Humans and services.

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 is part of a three-part series of the Data and API Engineering stream alongside COMP9321 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

Teaching Strategies

- Lectures: introduce concepts, show examples
- Tutorials: discussion of the lecture material and doing the activities to enforce learning by doing.
- Online Quizzes: revision of the concepts introduced in Lectures and tutorials.
- Labs: perform practical exercises
- Assignments: solve significant problems (individual assignments)

Weekly Activities

Schedule of topics, organised by week:

Wk	Lecture	Tutorial	Lab	Assignment
1	**Course Introduction & Service Orientation:** Service, Service Orientation, Service Oriented Architecture, Service Design Principles, SOA Benefits	*No tutorial*		Reading Assignment
2	**Web Services (Part1):** Evolution of the Web Service, Programmable Web, Resource Oriented Architecture, REST API design	*Accessing and using a simple Web Service, Documenting REST API with Swagger* Postaman for API testing)		
3	**Web Services(Part2):** Evolution of services, from Monolithic to Microservices, serverless computing (AWS Lambda)	*Building a simple Microservice using Python*	*Lab 1.*	
4	**Cognitive Services Part1:** introduction, Chatbots, concepts, design	*Introduction to some tools and building a simple rule-base Bot*	*Lab 2.*	*Assignment 1. released*
5	**Cognitive Services Part2: machine learning C**hatbot development and tooling	*Building a simple smart Bot*	*Lab 3:*	
6	**Service Engineering Methodologies:** business		*Lab 4. Exploring an existing Ontology*	*Assignment 1 deadline*

	analysis fundamentals, enterprise architectures, modelling approaches (e.g. Capsicum) and tools, identifying business concepts (services, data etc.), business-IT alignment.		*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. released*
8	**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			
9	**Complex Structures In Semantic Modelling** Properties, Property chains and Inferencing. Information modelling approaches. Ontologies and ontology engineering. (suggest doing Celonis tool)	*Introducing the tool may be on user level*		
10	**Course Wrap-up & Review**			*Deadline assignment 2*

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 of the following components:

- Quizzes (10%): this component help in the revision of the concepts introduced in Lectures and tutorials.
- Assignments (30%): This component assesses the modelling skills related to learning outcomes. Students are given a major case study involving building an information

system for an organisation. Each successive assignment consist of modelling a specific part of the organisation.
- Practical Labs (10%): various assessments based on the lab activities.
- Written final exam (50%): 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.