CO4217 Agile Cloud Automation

Credits: *15* **Convenor:** *Dr A. Boronat* **Semester:** *1st*

Prerequisites: *Desirable: UML, Java, Eclipse*

Assessment: *Coursework: 100%*

Lectures:	*8*	*hours*	**Class Tests:**	*2*	*hours*
Surgeries:	*8*	*hours*	**Private Study:**	*86.5*	*hours*
Laboratories:	*8*	*hours*			

Subject Knowledge

Aims This module introduces students to concepts, techniques and technologies for developing cloud-based systems using domain-specific languages (DSLs), NoSQL technology and agile practices. In particular, it will familiarise students with NoSQL principles, with techniques for specifying DSLs and modelling environments, and with designing and developing interoperable infrastructure for heterogeneous software ecosystems using agile practices.

Learning Outcomes At the end of this module, successful students will be able to: demonstrate understanding of NoSQL principles and technology; discuss issues and solution approaches for questions of scalability and consistency; explain agile principles and practices for developing cloud systems; demonstrate a systematic understanding of the specification of DSLs using formal meta-languages; explain and employ the relation between their surface characterization and semantics for verification purposes; apply model transformations for the effective design and implementation of meta-data environments in heterogeneous software ecosystems; defend a critical awareness of state-of-the-art model-driven principles, standards and practices and their relevance to software engineering and to cloud-based computing.

Methods Lectures, surgeries, laboratory sessions, recommended reading, worksheets, web support.

Assessment Formative coursework; assessed coursework; mini project; short technical essay.

Skills

Aims To teach students modelling and problem-solving skills.

Learning Outcomes At the end of this module, successful students will be able to: solve abstract and concrete problems (both routine seen, and simple unseen), including modelling aspects; write concise, clear statements of technical knowledge.

Methods Lectures, surgeries, laboratory sessions, recommended reading, worksheets, web support.

Assessment Formative coursework; assessed coursework; mini project; short technical essay.

Explanation of Prerequisites

Basic knowledge of UML and some programming experience with Eclipse and Java will be helpful.

Course Description

Cloud-based software system development involves a wide range of languages and notations, from high-level business modelling languages to low-level scripting languages, with many different abstraction facilities. Domain-specific languages (DSLs) help close this implementation gap by combining the most advantageous aspects of both business experts and developers, potentially improving software interoperability and quality, and increasing productivity and ROI in software development processes. As a result, there is a wide choice of languages both for implementing business logic − such as the number of DSLs built atop JavaScript that are born on a weekly basis − and for persisting big data in a scalable manner − such as the wide range of persistence platforms under the NoSQL umbrella. Hence, becoming polyglot in a cloud-based age is a invaluable skill for managers and developers.

In *Agile Cloud Automation*, we will discuss an outline of approaches and technologies for the agile development

of cloud-based systems.

Detailed Syllabus In detail, the module will cover the following topics (to be updated):

Introduction to principles, standards and practices regarding the specification of DSLs using agile practices.

Introduction to NoSQL principles, including consistency and scalability concerns, using MongoDB.

Specification of the infrastructure of a DSL by using OMG standards, including MOF and UML profiles.

Specification of the superstructure of a DSL by using formal languages and compiler generation technology.

Model transformations and their role in heterogeneous software ecosystems and in big data scenarios.

Reading List

[A] Marco Brambilla, Jordi Cabot, and Manuel Wimmer, *Model-Driven Software Engineering in Practice,*Morgan & Claypool Publishers, 2012, ISBN-13 9781608458820.

[A] Pramod J. Sadalage, and Martin Fowler, *NoSQL distilled: a brief guide to the emerging world of polygot persistence,*Addison-Wesley, 2012, ISBN-13 9780321826626.

[B] Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman., *Compilers : principles, techniques, and tools,* Pearson, second edition, 2006, ISBN-13 9780321491695, 9780321547989.

[B] Martin Fowler, *Domain-specific languages,* Addison-Wesley, 2011, ISBN-13 9780132107549.

[B] Markus Voelter and Sebastian Benz and Christian Dietrich and Birgit Engelmann and Mats Helander and Lennart C. L. Kats and Eelco Visser and Guido Wachsmuth, *DSL Engineering - Designing, Implementing and Using Domain-Specific Languages,* dslbook.org, 2013, ISBN-13 9781481218580.

[C] Frank Budinsky; David Steinberg; Ed Merks; Raymond Ellersick; Timothy J. Grose, *Eclipse Modeling Framework: A Developer's Guide,* Addison Wesley Professional, 2009, ISBN-13 9780321331885.

Resources Course notes, module web page, study guide, worksheets, lecture rooms with data projectors, the Eclipse platform (Modeling Package), laboratories with PCs and demonstrators.

Module Evaluation Course questionnaires, course review.