CO4207 Generative Development

Credits: *15*   **Convenor:** *Dr J O Ringert*   **Semester:** *2nd* 2nd

Prerequisites: *Desirable: UML, Java, Eclipse*

Lectures:	*20*	hours		
Surgeries:	*9*	hours	**Independent Study:**	*105* hours
Laboratories:	*16*	hours		

Assessment: *Coursework: 100%*

Subject Knowledge

Aims   The functionality and size of software systems grow in time. This requires more adequate methods for system development. This module covers the main principles and techniques of generative development. It focuses on system modelling and code generation. The module also covers the foundations of aspect-oriented programming (AOP).

Learning Outcomes   At the end of this course, successful students will be able to: demonstrate a knowledge of the main approaches for automating software development; explain concepts of aspect-oriented programming and apply them; explain concepts of software product line development and apply them.

Methods   Class sessions together with course notes, textbooks, printed solutions, and some additional handouts and web support.

Assessment   Assessed individual and group coursework assignments, in-class tests.

Skills

Aims   To teach students abstraction and higher-level modelling skills and to provide the basic skills required to use generative development methods. In particular model-driven development techniques and aspect-oriented programming.

Learning Outcomes   At the end of this course, successful students will be able to: critically evaluate the role of modelling and code generation in software development; use UML and OCL for designing views of software systems; check the consistency of the UML design of an application; use techniques for model-driven development.

Methods   Class sessions together with worksheets and practical programming experience.

Assessment   Assessed individual and group coursework assignments, in-class tests.

Explanation of Prerequisites   Basic knowledge of UML and Java is desirable.

Module Description   Software engineering is a very dynamically developing discipline. There are new specification, modelling and programming languages, new tools and paradigms for development of software systems. To the most promising new ideas in recent years are:

- *UML* for modelling of software systems

- *Generative methods* for code generation

- *Aspect-oriented programming* for compositional development of complex systems

- *Model-driven development* for software system development, e.g., OMG's Model-Driven Architecture (MDA) initiative.

Syllabus

The course will provide a broad picture of new developments in the area of modelling and code generation. It will teach methods of proper system modelling using UML diagrams, methodical system development from UML model to implementation using generative methods, the principles of Aspect Oriented Programming and MDA. In this course we will use state of the art software tools.

Reading List

[B]   Thomas Stahl, Markus Völter, *Model-Driven Software Development,* John Wiley and Sons. 2006.

[B]   Perdita Stevens, *Using UML : Software Engineering With Objects and Components,* Addison Wesley. Second edition. 2005.

[B]   Jos Warmer, Anneke Kleppe, *The Object Constraint Language: Getting Your Models Ready for MDA,* Second Edition. Addison-Wesley. 2003.

[B]   Joseph D. Gradecki, Nicholas Lesiecki, *Mastering AspectJ: Aspect-Oriented Programming in Java,* Wiley, 2003.

[C]   Frank Budinsky; David Steinberg; Ed Merks; Raymond Ellersick; Timothy J. Grose, *Eclipse Modeling Framework: A Developer's Guide,* Addison Wesley Professional. 2003.

[C]   Martin Fowler,*UML Distilled,*Third Edition. Addison-Wesley. 2004.

[C]   K. Czarnecki, U. Eisenecker, *Generative Programming,* Addison-Wesley, 2000.

[C]   David S. Frankel, *Model Driven Architecture,* Wiley, 2003.

[C]   B. Bruegge, A. Dutoit, *Object-Oriented Software Engineering: Conquering Complex and Changing Systems,* Prentice Hall, 2003.

Resources   Study guide, worksheets, lecture rooms with data projector, computer lab access, handouts.

Module Evaluation   Course questionnaires, course review.