CS6321 Model-Based Software Development

Dr. John Herbert
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Lectures: Weds 9-11am, WGB G13
Labs TBC: Weds 4-6pm (from week 3/4)

Canvas site

Module Objective:
To introduce students to model-based software development, and in particular the use of the Universal Modeling Language (UML), and its real-time extensions.

Module Content:
The most important diagrammatic elements of the Universal Modeling Language (UML) notation and their roles in software system modelling.
A UML based software development process.
Special notation and tools for using UML in reactive real-time applications.

Underlying Concept:

Modelling as a means of conveying best practice development of software-based systems

Emphasis on:
Software design patterns
Architectural models
Modelling non-functional properties

Plus State-of-the-art Topics, e.g.: Global Distributed systems; Cloud-based systems; Big data architectures; SOA, Microservices; Serverless; DevOps

Background Reading List:

The following lists some resources that are relevant to the course. Some topics will be based on a stated textbook, and more reading recommendations will be given when appropriate during the course. Additional material will be online or made available as handouts if required.

General Software Engineering textbooks:
Software Engineering, *Ian Sommerville,* Addison-Wesley

UML, Software Design Patterns:

Applying UML and Patterns, An Introduction to Object-oriented Analysis and Design, *Craig Larman*

Practical Object-Oriented Design with UML*, M. Priestley*

The Unified Modeling Language User Guide, *G. Booch, J. Rumbaugh, and I. Jacobson (Reference text)*

UML Statecharts, UML Real Time:

Statecharts: A Visual Formalism for Complex Systems, *D. Harel, Sci. Comput. Programming 8 (1987), 231-274 (on-line)*
Real-time UML, *Douglass*

Software Architectures, non-functional properties:

Software Architecture in Practice, Bass, Clements & Kazman,
Software Engineering Institute, Carnegie Mellon, 2012.

Designing Software Architectures, A Practical Approach, Cervantes & Kazman,
Software Engineering Institute, Carnegie Mellon, 2016.

State-of-the-art System Design Topics

Various online resources, pdfs and handouts

Credit Weighting: 5
Semester(s): Semester 1.
No. of Students: Min 5.
Pre-requisite(s): None
Co-requisite(s): None

Teaching Method(s): 24 x 1hr(s) Lectures; 10 x 1hr(s) Practicals (Laboratory Sessions).

Module Co-ordinator: Dr John Herbert, Department of Computer Science.
Lecturer(s): Dr John Herbert, Department of Computer Science.

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Learning Outcomes: On successful completion of this module, students should be able to:

- Use the various UML diagrams
- Rewrite the UML for modelling different stages and aspects of systems
- Follow a full software development cycle using a UML-based process
- Use a standard commercial UML tool to develop software
- Use the extensions of UML for developing reactive real-time systems.

Assessment: Total Marks 100: Continuous Assessment 100 marks (1 x Mid-Term Examination 40 marks, 1 x End of Module Examination 40 marks; 2 x in-class assignments, 10 marks each).
Compulsory Elements: Continuous Assessment.

Penalties (for late submission of Course/Project Work etc.): Work which is submitted late shall be assigned a mark of zero (or a Fail Judgement in the case of Pass/Fail modules).
Pass Standard and any Special Requirements for Passing Module: 40%.
Formal Written Examination: No Formal Written Examination.
Requirements for Supplemental Examination: 1 x 1.5 hr(s) paper(s) (corresponding to Mid-Term Examination and End of Module Examination) to be taken in Autumn 2020. Marks in passed element(s) of Continuous Assessment are carried forward, Failed element(s) of Continuous Assessment must be repeated (as specified by the Module Coordinator).