



Syllabus

ALaRI

Master of Engineering in Embedded Systems Design

University of Lugano

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SPECIFICATION LANGUAGES

Instructors:

Rudy Lauwereins and Marc Engels

Rudy Lauwereins

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Dates of the course

First Quarter, September-December, 36 hours

Marc Engels

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Dates of the course

First Quarter, September-December, 36 hours

Overview of the course

This course introduces the basic specification models that are used to describe the functionality of embedded systems. The covered models range from data stream processing, over control and event handling to models targeted at efficient simulation.

Next, it discusses how these specification models can be used to make a design flow that refines an initial specification down to an implementation. This will be illustrated with interactive exercises in a C++ design environment.

Syllabus of the course:

1. Specification models (6 hours lectures + 7 hours project work)
 - 1.1 System-level specification models:
 - State-oriented models.
 - Activity-oriented models.
 - Structure-oriented models.
 - Data-oriented models.
 - Hybrid models.
 - 1.2 Implementation specification models: finite state machines with datapaths
2. Model based design flow (5 hours lectures, 5 hours exercises)
 - 2.1 Algorithmic modelling with dataflow.
 - 2.2 Fixed point refinement.
 - 2.3 Architectural modelling with FSM/D.

3. Project work (15 hours).

Detailed program of the course:

Monday, November 26

9:00-12:00 Course: Specification models (Rudy Lauwereins)
14:00-17:00 Exercises: System specification (Rudy Lauwereins)

Tuesday, November 27

9:00-12:00 Course: Specification models (Rudy Lauwereins)
14:00-15:30 Course: Design flow - Dataflow (Marc Engels)
15:30-17:00 Exercises: Design Flow - Dataflow (Marc Engels, Erik Watzeels)

Wednesday, November 28

9:00-11:00 Course: Design Flow - Fixed point refinement (Marc Engels)
11:00-13:00 Exercises: Design Flow - Fixed point refinement (Marc Engels, Erik Watzeels)
14:00-15:30 Course: Design Flow - FSDM model (Marc Engels)
15:30-17:00 Exercises: Design Flow - FSDM model (Marc Engels, Erik Watzeels)
17:00-18:00 Introduction to project work (Marc Engels)

Thursday, November 29

9:00-10:00 Question and Answers on project (Marc Engels)
10:00-13:00 Free project work
14:00-15:00 Question and Answers on project (Marc Engels)
15:00-17:00 Free Project work

Friday, November 30

9:00-13:00 Free Project work
14:00-17:00 Evaluation: Presentation and demonstration of project work (Marc Engels)

Notes of the instructor

Rudy Lauwereins

Rudy Lauwereins obtained his PhD in Electrical Engineering from the University of Leuven, Belgium, where he was appointed in 1993 as a Professor in the Faculty of Engineering. In 1998, he acted as Advisor to the team that won the Northern European section of the Texas Instruments DSP Solutions Challenge and last year, he was elected by students as the best teacher of the engineering faculty's Master's curriculum.

As Vice-President of the DESICS Division, IMEC's System Design Center of 125 researchers, Professor Lauwereins aims to develop IMEC's leading R&D activity in embedded ICT Systems Design, currently focused on the development of architectures, methods and tools that will create the smart networked devices needed for true ambient multimedia.

Professor Lauwereins has authored and co-authored more than 240 publications in international journals and conference proceedings. At ALaRI Dr. Lauwereins teaches Specification Languages together with Dr. Engels.

Marc Engels

Marc Engels is currently preparing a technology roadmap and business plan for a new company in fixed wireless access. The company will focus on sub 11 GHz systems that operate under non line-of-sight conditions. Technologies involved are Orthogonal Frequency Division Multiplexing (OFDM), Turbo coding and Space division multiple access (SDMA).

Before, Marc Engels was the director of the wireless department at IMEC, focused on the implementation of telecommunication systems on a chip. For these systems, he overlooked research on the DSP processing, the mixed-signal RF front-end and the software protocols.

He was also active in design methods and tools for implementing multi-disciplinary systems. Under his supervision, several systems have been realized, including a 54 Mbps WLAN terminal, a GPS-GLONASS receiver, a DECT-GSM dual mode phone, a cable modem, etc.

Previously, Marc performed research at the Katholieke Universiteit Leuven, Belgium, Stanford University, CA, USA, and the Royal Military School, Brussels, Belgium. Marc Engels received the engineering degree (1988) and the Ph.D. (1993), both from the Katholieke Universiteit Leuven, Belgium.

Marc Engels is an active member of the KVIV telecommunications society and URSI, secretary of the IEEE Benelux chapter on vehicular technology and telecommunications and vice-president of SITEL. He was also an associated editor of IEEE transactions on VLSI in 1999-2000.