

Topics in Wireless Systems Architecture

By Prof. Joseph Cavallaro

August 17 & 18, 9.00 – 14.00 in lecture room TS 127

The goals of this short course are to study design methodologies for application-specific processors for applications particularly in wireless communications. The course will begin with an introduction to FPGA and ASIC design, followed by several case studies of application specific accelerators for MIMO systems. A review of current high level synthesis tools, accelerator architectures, and testbeds will be presented.

Course Contents

The topics covered in this two-day short course include:

- Design methodology for ASIC and FPGA implementations
- FPGA hardware structures and fabrics
- High-level VLSI synthesis and design tools, with CAD algorithm overview for floorplanning, placement, and routing in FPGAs and ASICs.
- Design and analysis of algorithm-specific VLSI processor architectures. Topics include the implementation of pipelined and systolic processor structures. Examples include CORDIC arithmetic and QRD arrays.
- High-level DSP algorithm simulation and code generation using Xilinx System Generator, Catapult-C, and Synfora PICO.
- Techniques for mapping numerical algorithms onto custom processor arrays. including Application Specific Instruction Processors (ASIPs), such as TTA.
- Example architectures: Blackfin, TigerSHARC, XPP, Sandblaster, TI TCI platform, picoArray.
- Graphical processor units and stream processors for algorithm acceleration.
- Heterogeneous DSP-FPGA-ASIC processors for wireless handsets.
- Case studies including MIMO sphere detectors, turbo and LDPC decoders.
- Prototyping using Xilinx System Generator, Xilinx ISE tools and Xilinx FPGAs.
- Wireless testbed architecture and programming including the Rice University WARP testbed.

Registration latest by Tuesday August 11 under: <https://www.webropol.com/P.aspx?id=342554&cid=14036103>

The number of credit points will be defined after the course, but it will most likely amount to 2 cp (max. 3 cp).

The course fee for participants who are not postgraduate students of the University of Oulu is 600 € (VAT 0%) including coffee and lunch on both course days.

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