Advanced Features and Techniques of Embedded Systems Development

Embedded Hardware 4

EMBD33000-13-ILT (v1.0H)

Course Specification

Course Description

Advanced Features and Techniques of Embedded Systems Development provides embedded systems developers the necessary skills to develop complex embedded systems and enables them to improve their designs by using the tools available in the Embedded Development Kit (EDK). This course also helps developers understand and utilize advanced components of embedded systems design for architecting a complex system.

This course builds on the skills gained in the *Embedded Systems Development course*. Labs provide hands-on experience with the development, verification, debugging, and simulation of an embedded system. Labs use demo boards in which designs are downloaded and verified.

Level – Embedded Hardware 4
Course Duration – 2 days
Price – $1600 or 16 Training Credits
Course Part Number – EMBD33000-13-ILT
Who Should Attend? – FPGA design engineers, system architects, and system engineers who are interested in Xilinx embedded systems development flow

Prerequisites

- *Embedded Systems Development* course or experience with embedded systems design and Xilinx EDK tools
- Basic C programming
- Basic understanding of the MicroBlaze™ processor

Software Tools

- Xilinx ISE® Design Suite: Embedded or System Edition 13.1
- Mentor Graphics ModelSim simulator 6.6d (optional)

Hardware

- Architecture: Spartan®-6 and Virtex®-6 FPGAs*
- Demo board: Spartan-6 FPGA SP605 or Virtex-6 FPGA ML605 board*

* This course focuses on the Spartan-6 and Virtex-6 architectures. Check with your local Authorized Training Provider for the specifics of the in-class lab board or other customizations.

After completing this comprehensive training, you will have the necessary skills to:

- Assemble an advanced embedded system
- Take advantage of the various Virtex and Spartan FPGA and MicroBlaze processor features, including the crossbar, AXI interconnect, and multi-port memory controller
- Apply advanced debugging techniques, including the use of the ChipScope™ tool for debugging an embedded system and HDL system simulation of processor-based designs
- Identify the steps involved in integrating a memory controller into an embedded system using the MicroBlaze processor
- Integrate an interrupt controller and interrupt handler into your embedded design
- Design a Flash memory-based system and boot load from off-chip Flash memory
- Perform HDL-based system simulation with an embedded processor

Course Outline

Day 1

- Embedded Systems Development Review
- **Lab 1:** Building a Complete Embedded System
- Processor Crossbar Interconnect
- Debugging Using the ChipScope Pro Analyzer
- **Lab 2:** Debugging Using the ChipScope Pro Analyzer
- Block RAM Memory Controllers
- External Memory Controllers for Static Memory
- Memory Controllers for Dynamic RAM
- **Lab 3:** Instantiating a DDR Memory Controller

Day 2

- Interrupts
- AXI Streaming Interface
- Advance AXI Concepts
- Advanced Processor and Peripheral Interface Options
- **Lab 4:** Measuring AXI DMA Performance
- Advanced Processor Configurations
- Boot Loader
- **Lab 5:** Boot Loading from Flash Memory
- HDL System Simulation in XPS
- **Lab 6:** Simulating an Embedded Processor System

Lab Descriptions

- **Lab 1:** Building a Complete Embedded System – Develop hardware that incorporates IP cores to interface to push buttons, a rotary switch, LEDs, an LCD display, and serial communication. Use the SDK development tools to create an embedded software application project for the hardware built.
- **Lab 2:** Debugging Using the ChipScope Pro Analyzer – Perform simultaneous hardware and software debugging with the ChipScope™ Pro Analyzer, SDK Debug perspective, and XMD.
- **Lab 3:** Instantiating a DDR Memory Controller – Use XPS to instantiate a DDR memory controller. Explore memory device configurations and proper memory controller clocking procedures.
- **Lab 4:** Measuring AXI DMA Performance – Become familiar with the Embedded Targeted Reference Design (TRD) for the SP605 evaluation board. Add an AXI-based CDMA controller and a custom DMA performance analyzer. Launch the web server application and browse to this hardware platform.
- **Lab 5:** Boot Loading from Flash Memory – Develop an application that is stored in flash memory, load it through a boot loader program, and execute the software from external memory.
- **Lab 6:** Simulating an Embedded Processor System – Set up and perform HDL-based simulation on a design that contains an embedded processor system. Explore the tool flow for performing embedded processor simulation as part of a Project Navigator design in the ISE software.

Register Today

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