Advanced Features and Techniques of Embedded Systems Design

Embedded Hardware 4

EMBD33000-14-ILT (v1.0H)

Course Specification

Course Description

Advanced Features and Techniques of Embedded Systems Design 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 in the Zynq™ EPP or Microblaze™ soft processor.

This course builds on the skills gained in the *Embedded Systems Design* course. Labs provide hands-on experience with developing, debugging, and simulating an embedded system. Utilizing memory resources and implementing high-performance DMA are also covered. 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 – EMBD33000-14-ILT

Who Should Attend? – Hardware, firmware, and system design 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
- Working knowledge of the Zynq EPP or Microblaze processor

Software Tools

- Xilinx ISE® Design Suite: Embedded or System Edition 14.1

Hardware

- Architecture: Zynq-7000 EPP and 7 series, Spartan®-6, and Virtex®-6 FPGAs*
- Demo board: Zynq-7000 EPP ZC702 or Spartan-6 FPGA SP605 demo board*

* This course focuses on the Zynq-7000 EPP, 7 series, Spartan-6, and Virtex-6 architectures. Check with Hardent 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 features of Zynq EPP and Microblaze processors, including the AXI interconnect and various memory controllers
- Apply advanced debugging techniques, including the use of the ChipScope™ tool for debugging an embedded processor-based system design
- Discuss the features and components of the Zynq processing system (PS)
- Integrate a DDRx memory controller into an embedded system based on the MicroBlaze processor
- Utilize programmable logic (PL) block RAM to extend the memory resources available to the PL for the Cortex™-A9 processor
- Integrate an interrupt controller and interrupt handler into your embedded design
- Describe the make up of a multi-processor system and the various scenarios available using Cortex-A9 and MicroBlaze processors
- 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
- Zynq EPP Processing System Overview
- Debugging Using the ChipScope Pro Analyzer
- **Lab 2:** Debugging Using the ChipScope Pro Analyzer
- Block RAM and Memory Controllers
- External Memory Controllers for Static Memory
- Memory Controllers for Dynamic RAM
- **Lab 3:** Extending Memory Resources

Day 2

- Interrupts
- AXI Streaming Interface
- System Data Movement: Low Latency and High Bandwidth
- Advanced Processor and Peripheral Interface Options
- **Lab 4:** High-Performance DMA
- Advanced Processor Configurations
- Software Boot and PL Configuration
- **Lab 5:** Boot Loading from Flash Memory
- HDL System Simulation with an Embedded Processor
- **Lab 6:** Simulating an Embedded Processing 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 (GDB), and XMD.
- **Lab 3:** Extending Memory Resources – Use XPS to extend the memory resources for the Cortex-A9 or Microblaze processors.
- **Lab 4:** High-Performance DMA – Apply advanced PL design techniques for adding and connecting custom peripherals that access DDRx memory.
- **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 a software application from external memory.
- **Lab 6:** Simulating an Embedded Processing System – Set up and perform HDL-based simulation on a design that contains an embedded processor system. Explore the tool flow for performing embedded processing simulation, including hardware co-simulation.

Register Today

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