

## 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. Some labs use the ML507 demo board in which designs are downloaded and verified.

**Level** – Advanced

**Course Duration** – 2 days

**Price** – \$1200 or 12 Xilinx Training Credits

**Course Part Number** – EMBD33000-10-ILT

**Who Should Attend?** – FPGA design engineers, system architects, and system engineers who are interested in Xilinx embedded systems development flow

#### **Prerequisites**

- Experience in C programming
- *Embedded Systems Development* course or experience with embedded systems design and Xilinx EDK tools
- Some HDL modeling experience
- Basic microprocessor experience and understanding of PowerPC®-processor and MicroBlaze™-processor systems

#### **Software Tools**

- Xilinx ISE® Foundation™ design tools 10.1 with the ISE Simulator
- Embedded Development Kit 10.1 with the Software Development Kit (SDK)

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

- Assemble an advanced embedded system
- Identify the steps involved in integrating a memory controller into an embedded system using the PowerPC® 440 microprocessor
- Apply advanced debugging techniques including the use of the ChipScope™ Pro software and Bus Functional Model (BFM) simulation
- Design a flash memory-based system and boot load from an off-chip flash memory
- Take advantage of the various Virtex®-5 FPGA and PowerPC processor 440 features, including the crossbar and multi-port memory controller
- Integrate an interrupt controller and interrupt handler into your embedded design

## Course Outline

### Day 1

- Embedded Systems Development Review
- **Lab 1:** Building a Complete Embedded System
- External Memory Controllers and File Systems
- **Lab 2:** External Memory Controllers and File Systems
- Debugging Using the ChipScope Pro Analyzer
- **Lab 3:** Debugging Using the ChipScope Pro Analyzer
- Bus Functional Model Simulation

### Day 2

- Interrupts
- Interfacing an Embedded System with FPGA Fabric
- **Lab 4:** Interfacing an Embedded System to the FPGA Fabric
- PowerPC 440 Processor Crossbar
- Multi-Port Memory Controller
- Boot Loader
- **Lab 5:** Boot Loading from Flash Memory

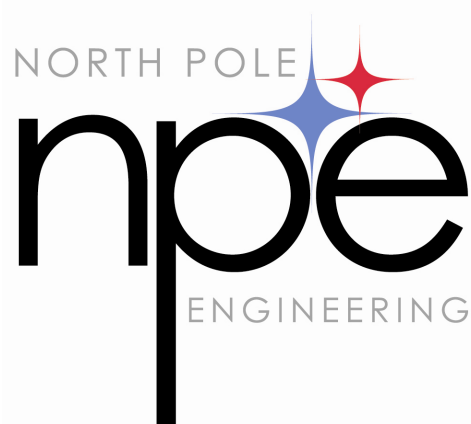
### Lab Descriptions

- **Lab 1:** Building a Complete Embedded System – Develop hardware that incorporates IP cores to interface to push buttons, switches, LEDs, an LCD display, and serial communication. Develop an application that interacts with switches, push buttons, an LCD display, and serial communication. Generate and download a bitstream onto the ML507 demo board.
- **Lab 2:** External Memory Controllers and File Systems – Design a system that includes a DDR2 IP core attached to the memory controller interface port. Develop an application that performs file-related tasks on external memory.
- **Lab 3:** Debugging Using the ChipScope Pro Analyzer – Perform simultaneous hardware and software debugging on stack-related errors with the ChipScope™ Pro Analyzer, SDK Debug perspective, and XMD.
- **Lab 4:** Interfacing an Embedded System to FPGA Fabric – Move data between an embedded system and FPGA fabric via an FSL and a dual-port block RAM. Implement an interrupt controller and an interrupt handler.
- **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.

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