

## Course Description

This course is designed to bring FPGA designers up to speed on developing embedded systems using the Vivado® Design Suite. The features and capabilities of both the Zynq® All Programmable System on a Chip (SoC) and the MicroBlaze™ soft processor are covered in lectures and labs, in addition to general embedded concepts, tools, and techniques. The hands-on labs provide students with experience designing, expanding, and modifying an embedded system, including adding and simulating a custom AXI-based peripheral using bus functional model (BFM) simulation.

The Xilinx Zynq All Programmable SoC enables a new level of system design capabilities over previous embedded technologies and this is highlighted throughout the course.

**Level** – Embedded Hardware 3

**Course Duration** – 2 days

**Price** – \$1400 or 14 Xilinx Training Credits

**Course Part Number** – EMBD21000-ILT

**Who Should Attend?** – Engineers who are interested in developing embedded systems with the Xilinx Zynq All Programmable SoC or MicroBlaze soft processor core

#### Prerequisites

- FPGA design experience
- Completion of the *Essentials of FPGA Design* course or equivalent knowledge of Xilinx Vivado® software implementation tools
- Basic understanding of C programming
- Basic understanding of microprocessors
- Some HDL modeling experience

#### Software Tools

- Vivado Design or System Edition 2014.3

#### Hardware

- Architecture: Zynq-7000 All Programmable SoC and 7 series FPGAs\*
- Demo board: Zynq-7000 All Programmable SoC ZC702 or ZedBoard or Kintex®-7 FPGA KC705 board\*

\* This course focuses on the Zynq All Programmable SoC and 7 series FPGA architectures. Check with North Pole Engineering, Inc., for specifics of the in-class lab board or other customizations. ZedBoard and/or KC705 card provided in class use for in person training. ZedBoards, KC705, or ZC702 cards are also available for purchase from North Pole Engineering as part of this training for additional fee on the same invoice. Contact North Pole Engineering for more information.

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

- Describe the various tools that encompass a Xilinx embedded design
- Rapidly architect an embedded system containing a MicroBlaze™ or Cortex™-A9 processor using the Vivado IP Integrator and Customization Wizard
- Develop software applications utilizing the Eclipse-based Software Development Kit (SDK)
- Create and integrate an IP-based processing system component in the Vivado Design Suite
- Design and add a custom AXI interface-based peripheral to the embedded processing system
- Simulate a custom AXI interface-based peripheral using a bus functional model (BFM)

## Course Outline

### Day 1

- Embedded Design Overview
- IP Integrator and the PS Configuration Wizard

- **Lab 1:** Hardware Construction Using the Vivado IP Integrator
- Software Development Using SDK
- **Lab 2:** Adding and Downloading Software
- Introduction to AXI
- Interrupts
- Adding Hardware to an Embedded System
- **Lab 3:** Adding IP to a Hardware Design

### Day 2

- MicroBlaze Processor Basics
- Cortex-A9 Processor Basics
- Designing a Custom AXI Peripheral
- Using the Create and Package IP Wizard to Build a Custom AXI Peripheral
- **Lab 4:** Building Custom AXI IP for an Embedded System
- Bus Functional Model Simulation
- **Lab 5:** BFM Simulation - AXI Peripheral
- Managing Embedded System Design Projects
- **Lab 6:** Integrating a Custom Peripheral

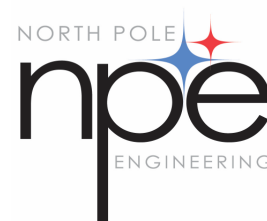
## Lab Descriptions

- **Lab 1:** Hardware Construction Using the Vivado IP Integrator – Create a project using the IP integrator to develop a basic hardware system and generate a series of netlists for the embedded design.
- **Lab 2:** Adding and Downloading Software – Continuing from a completed hardware system, begin software development using the SDK tools to create a software BSP and sample application. Download and run the application.
- **Lab 3:** Adding IP to a Hardware Design – Add IP to an existing processing system. Configure the device and download the application.
- **Lab 4:** Building Custom AXI IP for an Embedded System – Add a custom AXI peripheral to the Vivado IP catalog using the Create and Package IP Wizard.
- **Lab 5:** BFM Simulation – AXI Peripheral – Test custom IP via bus functional model (BFM) simulation.
- **Lab 6:** Integrating a Custom Peripheral – Add the custom IP created in Lab 4 to an existing processor system.

## Register Today

NPE, Inc. delivers public and private courses in locations throughout the central US region; including Iowa, Illinois, Kansas, Minnesota, Missouri, North Dakota, South Dakota and Wisconsin.

Visit [www.npe-inc.com/training](http://www.npe-inc.com/training), for full course schedule and training information.



You must have your tuition payment information available when you enroll. We accept credit cards (Visa, MasterCard, or American Express) as well as purchase orders and Xilinx training credits.