# ME2100

## Embedded System Design (ARM9™) Courseware

dream CATCHER
*~Complete Resources for Lecturers~*

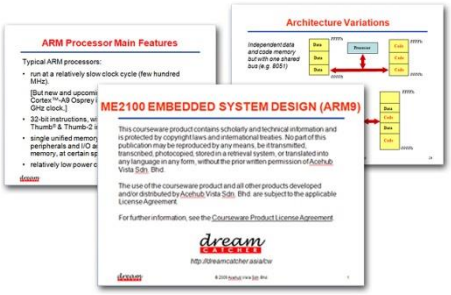
KEYSIGHT TECHNOLOGIES
Solutions Partner
Extending our solutions to meet your needs

### Teaching slides

- Editable Microsoft® PowerPoint® slides
- Covers 45 hours of teaching

### Training kit

- Embedded ARM9 development board
- Lab sheets & model answers
- Problem-based assignments
- Covers 24 hours of labs




| Target university subject | Target year of study | Prerequisite(s) |
|---|---|---|
| Embedded System Design | Final year undergraduate or postgraduate | Introduction to Microcontroller and Microprocessor Systems |

**The ME2100 serves as a ready-to-teach package in 32-bit ARM®-based processor system design, programming, and applications. This is a lecturer resource consisting of teaching slides, training kits, lab sheets, and problem-based assignments.**

## Designed to impart knowledge in

- ARM processor fundamentals
- ARM hardware architecture
- ARM instruction set and programming
- Typical ARM applications
- Mixed signal oscilloscope usage
- GNU-based ARM toolchain software usage

## Benefits of the ME2100 courseware

- The embedded ARM9 development board comes with various on-board I/O interfaces, allowing students to work on typical ARM-based projects and assignments.
- A complete GNU-based ARM toolchain software is used, allowing you to build a typical ARM-based project on the Windows®-based platform, which includes code development, compilation, and debugging.
- Sample source codes are included, providing you with a useful reference to speed up the development of various practical applications.
- Lab sheets are specially designed to allow students to gain exposure on ARM-based design tools.
- An industry-grade mixed signal oscilloscope, used for signal validation, enhances students' understanding of ARM operations.

# Teaching Slides

More than 400 editable Microsoft PowerPoint teaching slides, covering 45 hours of teaching for one full semester are provided. The slides cover the following topics:

- Introduction to ARM Processors
- ARM Processor Programmer Model
- ARM Instruction Set
- Overview of Thumb® Instruction Set
- ARM Exceptions Handling and Vectored Interrupt Controller
- Efficient Embedded Programming
- ARM Memory System
- ARM AMBA Bus
- Introduction to the Embedded Operating System

# Training Kit

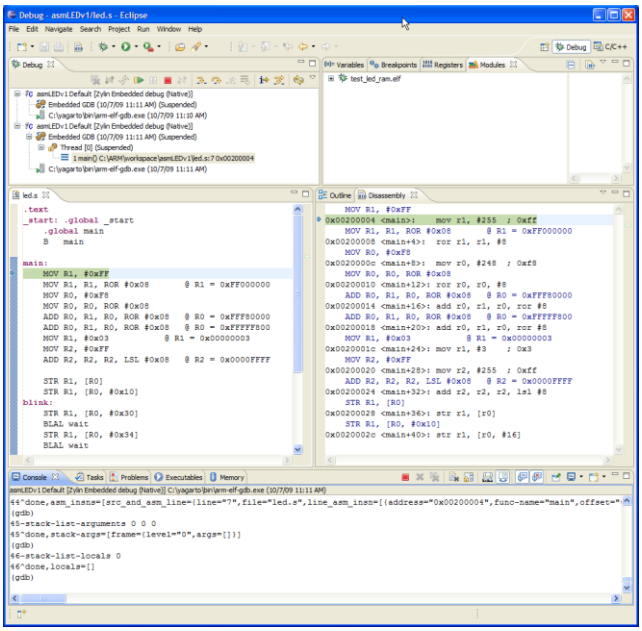
## Embedded ARM9 development board

The embedded ARM9 development board contains an ARM920T-based 32-bit microcontroller, with 200 MIPS at 180 MHz memory management unit, 16 Kbyte data cache, 16 Kbyte instruction cache, and an in-circuit emulator. The on-board memory includes 32 MB of SDRAM, 2 MB of parallel flash memory, and 2 MB of serial flash memory. I/O peripherals include a USB host and device interface, Ethernet 10/100 Base-T interface, RS232 serial port, SD card interface, and 7-segment displays.


## Open Source ARM Tool-chain

The courseware uses an open source GNU-based ARM tool-chain software for code entry, compilation, and debugging. The code development tool-chain consists of the GNU ARM cross compiler, GDB debugger, the industry-standard Eclipse IDE, and a JTAG module compatible with the OpenOCD (Open On-Chip Debugger) system. The complete setup allows you to develop code on the Windows-based platform, and perform real-time debugging by single-stepping the code through a JTAG interface.

Note: A PC with Windows XP®, Windows Vista® or Windows 7® (32-bit processor only ) is required to run the ARM tool-chain.



## Accessories

The following accessories are provided with the training kit.

| Item | Quantity |
|---|---|
| Power adapter, 5 Vdc, 2 A | 1 |
| Type A-to-Type B USB cable, 1.5 m | 2 |
| LAN cable, 1.5 m | 1 |

## Lab sheets

The training kit includes 8 lab sheets in editable Microsoft Word format. Each lab requires 3 hours to complete. Model answers are provided with all lab sheets. The required training kit hardware and recommended instrument for the labs are listed below.

| Lab Sheet | Hardware Kit | Optional Item |
|---|---|---|
| | Embedded ARM9 Development Board | Mixed Signal Oscilloscope |
| Eclipse IDE for the Embedded ARM9 Development Board | √ | |
| Assembly Programming for ARM | √ | |
| Introduction to C Programming for ARM | √ | √ |
| Peripheral Control using ARM | √ | √ |
| Interrupt Exceptions Programming | √ | √ |
| Timer Programming | √ | √ |
| Serial Port Programming | √ | √ |

## Problem-based assignments

The problem-based assignments below allow students to enhance their problem-solving skills.

- Traffic Light Control System
- Multifunction Alarm Clock Design

## Instruments

The recommended instrument from Keysight Technologies, which is to be purchased separately, is listed below.

| Instrument | Model[1] |
|---|---|
| Mixed Signal Oscilloscope | MSOX3012A Mixed Signal Oscilloscope[2]: 100 MHz, 2 analog & 16 digital channels |

[1] The instrument shown is recommended, but may be replaced by other models with equivalent performance.
- 100 MHz, 2 analog & 16 digital channels

[2] These instruments are also the recommended models for ME1100, ME1120, ME2000, ME2200, ME2300, ME3000, ME3100 and ME3200.

## Training Kit Hardware Specifications

| | Min | Typical | Max |
|---|---|---|---|
| **Embedded ARM9 Development Board** | | | |
| Input voltage | 4.6 V | 5 V | 5.4 V |
| Input current | 60 mA | | 100 mA |
| **General** | | | |
| Warranty | | | 1 year |
| EMC designed to | | | IEC61326-1:2005 / EN61326-1:2006<br>· CISPR11:2003/EN55011:2007<br>· IEC 61000-4-3:2002 / EN 61000-4-3:2002 |

## Ordering Information

| Description | Package | Product Number |
|---|---|---|
| Teaching Slides | 1 user license | ME2100-100 |
| Training Kit | 1 unit | ME2100-200 |
| Teaching Slides + Training Kit | 1 user license + 1 unit | ME2100-300 |
| Instruments | where applicable | Purchase separately from Keysight or its distributor |