SOC Design Laboratory

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Contents

- **0. SOC overview and ARM integrator**
  - ARM architecture, ARM-based SOC and development tools
- **1. Code development**
  - Compiler, Assembler, Linker, and ARM/Thumb Code inter-working
- **2. Debugging and Evaluation**
  - Debugging, single-step, and breakpoint, instruction simulator (ARMulator), cycle count, timing measurement, profiler, and user's models
- **3. Core peripherals**
  - Software modeling for interrupt controller, counter/timer, reset, and pause controller
- **4. On-chip bus**
  - AHB, APB, bus bridge, arbiter, and VCI interface
- **5. Memory controller**
  - On-chip SRAM, DMA controller, and external memory interface

Contents

- **6. ASIC logic**
  - Acceleration building blocks, FPGA designs and design reuse, generator/configuration
- **7. Standard I/O**
  - GPIO, UART, USB, 1394, keyboard, mouse, button/switch, touch screen, and sensor
- **8. JTAG and multi-ICE**
  - Test access and system debugging
- **9. Case design for term project**
  - JPEG2000

Detail Course Schedule

Week	Date	Content	Speaker	Note
Week1	9/9	Introduction to SOC Design Laboratory	李進福	Objective and outline
Week 2	9/16, 9/18	ARM SOC Architecture	李進福	ARM9 structure
Week 3	9/23, 9/25	ARM Instruction set	李進福	ARM9 structure
Week 4	9/30, 10/2	ARM-Based SOC Design Overview	劉俊男	Laboratory Overview
Week 5	10/7, 10/9	Code Development	劉俊男	Lab1
Week 6	10/14, 10/16	Debugging & Evaluation	劉俊男	Lab2
Week 7	10/21, 10/23	JTAG & Multi-ICE	劉俊男	Lab3
Week 8	10/28, 10/30	Core Peripherals	曾子維	Lab4
Week 9	11/4, 11/6	Standard I/O	劉俊男	Lab5
Week 10	11/11, 11/13	Memory Controller & On-Chip Bus	曾子維/郭曜彰	Lab6
Week 11	11/18	Memory Controller & On-Chip Bus	曾子維/郭曜彰	Lab6
Week 12	11/25, 11/27	ASIC Logic	劉俊男	Lab7
Week 13	12/2, 12/4	ASIC Logic	劉俊男	Lab7
Week 14	12/9, 12/11	JPEG	劉俊男	Case Study
Week 15	12/16, 12/18	JPEG	劉俊男	Case Study
Week 16	12/23, 12/25	JPEG	劉俊男	Case Study
Week 17	12/30	Final Project Presentation		
Week 18	1/6	Final Project Due (Report & Demo)		

Textbook & References

- Textbook
  - **SOC Consortium Course Material**
- References
  - Website: http://www.arm.com
  - ARM Architecture Reference Manual, Second Edition, edited by David Seal: Addison-Wesley: ISBN 0-201-73719-1, (Known as the "ARM ARM". ARM Doc No.: DDI-0100). Also available in PDF form with the ARM Developer Suite (ADS)
  - ARM System-on-Chip Architecture by S.Furber, Addison Wesley Longman: ISBN 0-201-67519-6, Japanese translation available. Book title: ARM Processor.. Publishing company: C Q Publishing Co., Ltd. ISBN4-7898-3351-8
  - Wayne Wolf,"Computers as Components--Principles of Embedded Computing System Design", Morgan Kaufmann Publishers, 2001
  - Reuse Methodology Manual for System-On-A-Chip Designs, 2nd Edition, by Michael Keating, Pierre Bricaud, Kluwer Academic Publishers, 1999
  - Surviving the SOC Revolution - A Guide to Platform-Based Design by Henry Chang et al., Kluwer Academic Publishers, 1999
  - SOC/IP Websites (www.altera.com, www.xilinx.com, www.openmore.com, www.vsa.org , www.icdiy.org, www.eedesign.com, www.eda.org, etc.)

Prerequisite & Grading

- Prerequisite
  - C/Verilog/VHDL programming skills (required)
  - Microprocessor and experiments (required)
  - Computer organization and architecture (required)
  - Cell-based VLSI design (preferred)
- Grading
  - Labs & reports: 70%
  - Final Project: 30%
- Final Project Presentation
  - 13:00-15:00, Tuesday, Dec. 30
- Deadline of final project report
  - 17:00, Tuesday, Jan. 6