VLSI Education in Taiwan

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VLSI Education Program in Taiwan

- VLSI (SoC) design has become one of the fastest growing industry segments in Taiwan
- The growth creates a strong demand from industry for IC design engineers and supporting human resource in business, management, and patent law
- To meet the demand, the Ministry of Education in Taiwan has initiated the VLSI Education Program since 1997
  - 1st-phase: 1997 - 2001
  - 2nd-phase: 2002 - 2005
  - 3rd-phase: 2006 - 2010
• Core course development and IC design environments at major universities
  – Focused on supporting design/test infrastructure for VLSI core courses
  – Set up VLSI-design-related laboratories and design environment (tools/workstations/tester) at universities
  – Basically a “bottom-up”, distributed fashion for VLSI course development
Second Phase (2002-2005)

- Cultivate large number of high-quality human resources for local IC design industry
  - Enhance existing teaching materials and laboratories
  - Focus on more advanced technology as well as broader scopes
  - Promote well-developed course materials to other universities
  - Cover also VLSI-design-related creativity and patent law courses
  - Promote international activities and collaboration
  - Adopt a “top-down”, centralized approach by running the program based on six technology-oriented, inter-collegiate consortia
Third Phase (2006-2010)

International Activities

**Students**
- Series Course Program
- Multi-disciplinary courses
- Graduate Students’ Forums
- Summer Camps
- Contests

**Professors**
- Academia-Industry Forums
- Teachers’ Forums
- Overseas Courses
- English Textbooks

Embedded System Design
Current Organization

MOE Advisory Office

Advisory Committee

ATP Office

SoC Consortium

ESW consortium
  Partner universities

DAT consortium
  Partner universities

HI consortium
  Partner universities

PAL consortium
  Partner universities
Program Outline

- Advanced SoC Course development and promotion
- International activities: conferences, tutorials, short courses, student summer workshops, lecturer training, international student contest, English textbooks, …
- SoC-related student contests
- Multi-discipline courses: patent law, entrepreneurship, heterogeneous integration, bio-medical electronics.
SoC Course Development and Promotion
Advanced Course Development

• Have developed or developing course and laboratory materials for 100+ courses including
  – Embedded Multi-core System Software
  – Embedded Software Laboratory Modules
  – Embedded Systems and Software Engineering
  – Real-Time Operating Systems
  – Electronic System Level Design (ESL)
  – SoC Design Laboratory
  – Design for Manufacturability
  – Biomedical Integrated Circuits Design
  – Power Electronics
  – Wireless IC Design
  – .......
Course Database

• A database for 100+ advanced SoC and embedded software related courses
• More than 500 users
• 3100+ downloads
• Will feature recorded lecturing sessions for remote webpage access
International Activities
Sponsored International Conferences

  - More than 300 attendees each year
  - More than 100 papers from a dozen plus countries

  - Held in Taiwan three years in a row

- **IEEE SoC Conference (2007)**
  - Held in the USA for the past 13 years
  - Held outside of USA for the first time with 200+ attendees
International PhD Student (IPS) Workshop

- Sharing Ph.D experience on SoC research in a relaxed environment
- Encourage interaction and cooperation among international Ph.D students
IPS Outline (2006, 2007)

- **Program**
  - Oral presentation, innovation contests, hi-tech/cultural visits
- **Visits**
  - TSMC, Quanta, MediaTek, Palace Museum, Long-Shan Temple
- **Attendees**
  - 45 in 2006: Japan 8, Korea 5, Hong Kong 2, Singapore 2
  - 41 in 2007: Japan 5, Korea 1, Hong Kong 4, Singapore 4
Lecturer Training

• Select professors to receive week-long short foreign courses on advanced new topics
• Upon their return, tutorials on these topics will then be given to domestic professors as well as students and engineers.
• During 2004-2007, 15 professors have gone abroad and have held 38 seminars/tutorials
• Most of these courses are given in Europe and USA
Short Courses

- Embedded Programmable System Design
- Real-Time Embedded Linux
- RF Transceivers and Power Amplifiers
- Ultra-Linear High-Efficiency Power Amplifier Design
- Power Management
- Testing High-Performance Data Converters
- Cryptographic Engineering
- EMC and Signal Integrity Design Strategies
- ...
CADathlon at ICCAD

- To promote Taiwanese student visibility in this contest
- Qualifying competition was held and five teams were selected. Their trips to the contest are sponsored by MOE
- In November 2007, within ICCAD, Taiwanese teams won the first place and tied for the second place
English Textbooks

• Three derived from courseware in 2006-2007
Student Contests
Student Contests

• Four contests
  – IC Design (since 1998)
  – Silicon IP (since 1999)
  – CAD Software (since 2000)
  – Embedded Software (since 2003)

• Benefits
  – Elevate student design skills
  – Promote industry participation
  – Enhance research capability
  – Facilitate evaluation during recruiting
Multi-discipline Topics
Multi-discipline Courses

- Hi-Tech Patents: Acquisition and Defense
- Entrepreneurship and Operation for Hi-Tech Businesses
- Bio-medical Electronics
- Heterogeneous Integration
- Wireless Sensor Networks in Remote Health Care
Hi-Tech Patent Course

- Patents are becoming an important part of hi-tech industry
- Engineers need fundamental knowledge in patent filing and legal aspect
- Course materials as well as expert database and lecturer training have been completed

Lecturer Training

Forum
Hi-Tech Entrepreneurship Course

• Given by professors from EECS and business schools. Many with industrial experiences
• Invited talks by senior professionals from the industry on many aspects, e.g., technology, legal, operation, …
• Students from business school and EECS departments work together running mock startups with mentors from the industry
• Some teams have turned into real businesses in incubation centers on campus
Bio-medical Electronics Camps

• Promote biological and medical understanding among the students with IC-design background

• Feature Courses
  – Basic physiology, e.g. neurology, auditory signal processing, visual signal processing.
  – Bio-sensors and technology
  – Implantable bio-medical SoC
  – Bio-medical imaging
  – Innovation contest
Biomedical Electronics Camps

• Held twice in 2007

• Attendance
  – 220+ students from EE, CS, medical schools, bio-medical departments, …
  – 75 professors and industrial professionals
Conclusions

• Successful educational programs have nurtured a large number of capable and skilled engineers for the local SoC industry that has been very prosperous in the past decade.

• Embedded software has been included in the program three years ago and great synergy between EE and CS faculty and students has evolved.

• Will stress on educational aspects that better prepare the students to face the challenges of the future.