

First Annual Advanced CMOS Technology School (ACTS) – Summer 2017, is a Success in Beijing

- Milin Zhang, Co-Chair of ACTS

The first Advanced CMOS Technology School (ACTS) – Summer 2017 was held from 23 July to 4 August 2017. ACTS was a joint activity supported by the IEEE Circuit and System Society (CASS) and the IEEE Solid-State Circuits Society (SSCS). ACTS summer 2017 was sponsored by Synopsys China, Beijing IC Park and CASS summer school project. The summer school invited leading academic researchers and industry experts, who presented lectures on topics covering process technology, EDA skill, and design skills. These activities were great examples of high-level continuous education for junior engineers, academic teachers, and students. ACTS also illustrated the collaboration between societies, the local chapter leaders, and industry leaders. This summer school was first suggested by Dr. Zhihua Wang, and then supported by volunteers from both SSCS and CASS. The local industry companies, Synopsys China and Beijing IC Park, provided financial support. This two-week long summer school was hosted and organized by the CASS Beijing Chapter, SSCS Beijing Chapter, and SSCS Tsinghua Student Chapter. The co-chairs of ACTS were Dr. Milin Zhang, Dr. Hanjun Jiang and Dr. Liyuan Liu. The student chapter members took care of the itinerary planning for the speaker, preparation of tutorial handouts, and overall organization of the attendees. A summary of each day's events was posted on WeChat and the organizers created a discussion group for the attendees, so they could keep in touch after the conclusion of the summer school. ACTS has received good publicity and has been reported in various media outlets, including Xinhua News, one of the most popular news channels in China.



Fig.1. A group photo of the summer school attendees, the organization committee members, Prof. Zhihua Wang, and several of the invited speakers: Dr. Jan Van der Spiegel, Dr. Rakesh Kumar, and Dr. Cor Claeys.

On 23 July, an opening ceremony for invited guest and sponsors were held. Dr. Jan Van der Spiegel, professor at the University of Pennsylvania, Aiguang Ren, Director at Ministry of Industry and Information Technology of China, Guangming Su, from State Administration of Foreign Experts Affairs China, Dr. Shaojun Wei, Dr. Zhihua Wang, professor at Tsinghua University, Qun Ge China

Country Manager at Synopsys, Jun Miao Chairman at Beijing IC park are invited and spoke at the ACTS opening ceremony.

On 24 July, the first official day of the summer school, Dr. Van der Spiegel spoke to the audience about the importance of the IEEE. He encouraged the attendees to join the society. Dr. Van der Spiegel also gave a keynote speech, “Integrated Circuits: Past, Present and the Road Ahead – the best is still to come”. He started his speech with a review of key milestones of the semiconductor industry in the past 70 years that have changed the world and will continue to change the world at an even faster pace. He reviewed how inexpensive low-power transistors have opened the door to many new applications and how they’ve enabled the IC revolution.



Fig.2. The general Co-Chair of ACTS Dr. Milin Zhang (right), thanked Dr. Van der Spiegel (left)

Dr. Van der Spiegel discussed the challenges of current CMOS devices and the new technologies on the horizon. He claimed that the revolution has just started and that the best is still to come. He suggested that circuit designers need to be able to work in a multidisciplinary environment and adopt to new technologies. He also shared his opinion on the future of the IC industry of China and told the audience that he believes that under the great support from the government, and the great effort from all the smart engineers and aspiring engineers, the future is very promising.

Leading Experts Presented on ACTS – Summer 2017

Ten leading experts presented at ACTS 2017, including one IEEE Life Fellow, seven IEEE Fellows and two IEEE Senior Members. Six hours' worth of lectures were given to the audience daily, covering topics such as process technology, simulation, and design skills.

On 24 July, IEEE Life Fellow, President & CEO of TCX Technology Connexions, Dr. Rakesh Kumar gave a lecture entitled “Semiconductor Innovation - A Continuum of Opportunities”. Dr. Kumar talked about the booming semiconductor industry, innovation, and entrepreneurship. He offered guidelines for researchers interested in starting their own company.



Fig.3. Rakesh Kumar

On 25 July, Dr. Cor Claeys, IEEE Fellow, ECS (Electrochemical Society) Fellow, Professor of KU Leuven & imec, gave a lecture entitled “Advanced Material and Device Aspects for Future CMOS Technologies”. Dr. Claeys discussed challenges of key process modules used in advanced device processing. He also introduced the advantages and challenges of the Ge Technology.



Fig.4. Cor Claeys

On 26 July, IEEE Fellow, Chief Architect and Fellow at Synopsys, Dr. Yervant Zorian gave a lecture on “Trends & Solutions for Test & Reliability in Advanced Technologies”. Dr. Zorian discussed

hierarchical tests and testing related IEEE standards.



Fig.5. Yervant Zorian

On 27 July, IEEE Senior Member and Texas Instruments Fellow, Alan Hastings gave a lecture on “The Art of Analog Layout”. Hastings introduced basic steps in fabrication and talked about important issues in layout, such as mismatch and latchup.



Fig.6. Alan Hasting

On 28 July, IEEE Fellow and Vice President of Taiwan Semiconductor Manufacturing Company (TSMC), Dr. Kevin Zhang gave a speech, entitled “Design Challenges on Nano-Scale COMS”. He overviewed the current technology landscape and discussed new design challenges. Afterwards, four of Dr. Zhang’s colleagues introduced TSMC’s 16nm technology in detail.



Fig.7. Kevin Zhang

On 31 July, IEEE Fellow and Professor at University of California Riverside, Dr. Albert Wang gave a lecture, entitled “How to Design Electrostatic Discharge (ESD) Protection as an Integrated Circuits (IC) Designer”. Dr. Wang introduced every aspect of ESD from standards and ESD protection circuits to failure analysis and technology influence. He also discussed on ESD protection for Radio Frequency (RF) and High Voltage (HV).



Fig.8. Albert Wang

On 1 August, IEEE Senior Member, Professor of Hiroshima University, Dr. Minoru Fujishima gave a lecture on “Ultimate High-Speed Wireless Link”. Dr. Fujishima introduced the advantage of terahertz. He also discussed some considerations for high-frequency complementary metal-oxide-semiconductor (CMOS) design. Then, Dr. Ruibing Dong, assistant to Dr. Fujishima, introduced CMOS Ultra-Wideband(UWB) transceiver design in detail.



Fig.9. Minoru Fujishima

On 2 August, IEEE Fellow, Professor of KAIST, Dr. Hoi-Jun Yoo gave his lecture entitled “Mobile Embedded DNN (Deep Neural Network) and AI (Artificial Intelligence) System on Chip (SoCs)”. Dr. Yoo introduced some key points in Mobile/Embedded Deep Neural Network Processor design. He also gave a number of demonstrations of SoC projects done in his research group.



Fig.10. Hoi-Jun Yoo

On 3 August, IEEE Fellow, Professor of University of Macau, R&D Director of Synopsys, Dr. Seng-Pan U gave a talk on “Integrated Analog Front-End Design for Mobile and Multimedia SoC”. Dr. U introduced AFE design for communication SoCs and audio codec system. He also discussed ADC design.



Fig.11. Seng-Pan U

On 4 August, IEEE Senior Member, Assistant General Manager of Mediatek, Dr. Alice Wang, gave a lecture entitled “Low Power for Mobile Computing”. She introduced some techniques for power optimization and pointed out future development directions and opportunities for central processing unit (CPU) design.



Fig.12. Alice Wang

The summer school attendees were very engaged and asked many questions during the lectures. The discussion usually continued to lunch break and after the sessions ended. In addition to academic questions, experts interacted with the audience from many aspect. A few students spoke to Dr. Kumar about their own ideas on innovation and entrepreneurship. Students asked Alan Hastings for a signature on his well-known book, “The Art of Analog Layout”. The students found the speakers experiences on PhD study, career paths, research topics, and personal anecdotes very interesting. On the last day of the program, Dr. Wang organized a leadership training activity, named “Can you achieve \$10B?”. She emphasized that effective communication is vital in maximizing performance.



Fig.13. Dr. Alice Wang hosts a leadership training activity, named “Can you achieve \$10B?”