2025 NCKU AISSM Semiconductor Summer School

Infosheet

July. 23rd - August. 2nd, 2025

AISSM Semiconductor Summer School

The 2025 NCKU AISSM Semiconductor Summer School will offer three specialized courses focused on integrated circuit design, semiconductor manufacturing, and packaging and testing. These courses aim to provide essential, up-to-date knowledge for students aspiring to excel in these fields. This program continues NCKU AISSM's ongoing commitment to fostering international exchange and collaboration in semiconductor education and research, with strong support from industry and government.

In addition to academic learning, participants will have the opportunity to explore Taiwan's rich cultural heritage, enhancing their overall experience. The program is open to international students from NCKU's partner universities and domestic students of NCKU AISSM.

Contents

Course Offering

*The participating students choose one course from this selection based on their subject of interest and background.

Course A: Digital IC Design and Synthesis

Offered by the Program on Integrated Circuit Design

Course Credit: 3, Course Spots: 30

Prerequisite: C or C++ Programming Skills, Logic System Design, Computer Organization

Appropriate level: senior undergraduate and fresh graduate students

Language: Taught in English

Format: In-person

Completion: NCKU transcript and Certificate

Lecturer: Prof. Lih-Yih Chiou

PhD, VLSI and Circuit Design, Purdue University

Dept. Electrical Engineering & Program on Integrated Circuit Design, NCKU

Area: IC Design/Electrical Engineering

Course Description

The next-generation electronic system will have billions of transistors on a chip. To design such a complex system, designers must understand system design issues to cope with this daunting task. The course targets senior undergraduate or fresh graduate students to provide adequate background for designing a moderate-size system and emphasizes the balance between theory and hands-on. Upon completing this course, you shall have a. This course will teach you 1) VLSI system design flow, 2) primary EDA tools, and 3) moderate-size HDL coding.

Course A: Digital IC Design and Synthesis

Offered by the Program on Integrated Circuit Design

Topics and lab work include

1. Verilog Basic
2. Dataflow and Behavioral Modeling
3. Behavioral Modeling
4. Combinational & Sequential Modules
5. Sequential and Parallel Blocks
6. Synthesis Basics and Examples
7. Coding Style
8. Verification and Testing

Course B: Analog IC Design and Layout

Offered by the Program on Integrated Circuit Design

Course Credit: 3, Course Spots: 30

Prerequisite: C or C++ Programming Skills, Logic System Design, Computer Organization

Appropriate level: senior undergraduate and fresh graduate students

Language: Taught in English

Format: In-person

Completion: NCKU transcript and Certificate

Lecturer: Prof. Shuenn-Yuh Lee

PhD, Electrical Engineering, NCKU

Dept. Electrical Engineering & Program on Integrated Circuit Design, NCKU

Area: Implantable telemetry device/Bio-signal (ECG) acquisition system on a chip (SOC)/Low-power circuits for wireless biomedical circuits and systems/Digital system: DSP chip for feature extraction, baseband chip for healthcare system/Wearable device with internet of thing (IOT) system on a chip (SOC)

Course Description:

Analog integrated circuits are integrated circuits that represent continuous signals in electrical form. They are circuits dealing with signals free to vary from zero to full power supply voltage. Analog integrated circuits include operational amplifiers, power management circuits, and sensors. To design such a circuit, designers must understand the device physics, transistor amplifier, differential amplifier, and operational amplifier. The course targets senior undergraduate or fresh graduate students to learn the basic design of analog integrated circuits and simulation. Upon completing this course, you shall learn the following skills: 1. Basic MOS Device Physics, 2. Single-stage amplifier, 3. Frequency response, 4. Operational amplifier.

Topics include

1. Basic MOS Device Physics and Single-Stage Amplifiers
2. Current Mirrors and Frequency Response
3. Ideal OPAMP and Finite gain and bandwidth effects
4. Basic OPAMP Architecture
5. Fully differential OPAMP and Advance Current Mirror
6. Stability and Frequency Compensation
7. Two-Stage OPAMP and Layout

Lab work

1. Basic MOS Device Physics and Single-Stage Amplifiers
2. Current Mirrors and Frequency Response
3. Ideal OPAMP and Finite gain and bandwidth effects
4. Basic OPAMP Architecture
5. Fully differential OPAMP and Advance Current Mirror
6. Stability and Frequency Compensation7. Two-Stage OPAMP and Layout

Tools include: HSPICE, Technology FileS

Course C

Advanced Semiconductor Manufacturing and Packaging Testing

Jointly offered by the Program on Semiconductor Manufacturing Technology, the Program on Semiconductor Packaging and Testing, and NARLabs Taiwan Semiconductor Research Institute (TSRI)

Course Credit: 3, Course Spots: 30

Appropriate level: senior undergraduate and fresh graduate students of science and engineering background

Language: Taught in English

Format: In-person

Completion: NCKU transcript and Certificate

Lecturer: Prof. Wen-Dung Hsu

Ph.D. of Materials Science and Engineering, University of Florida, Gainesville, USA

Dept. Department of Materials Science and Engineering & Program on Key Materials, NCKU
Area: molecular dynamics simulation/Monte Carlo simulation/first principle simulation/coarse-graining molecular dynamics simulation/nano-materials/carbon based materials/transition metal clusters/nano-tribology/nano-mechanics.

Lecturer: Prof.. Wei-Chen Tu

PhD, Electronics Engineering, National Taiwan University

Dept. Electrical Engineering & Program on Semiconductor Manufacturing Technology, NCKU
Area: Low dimensional materials and devices/Optical and electrical simulation of nanomaterials and nanodevices /Photodetectors/ Solar cells/Nanoscience and nanotechnology/Applications of quantum dots

【Semiconductor Fabrication】

Lecturer: Prof. Ying-Yuan Huang

PhD, Electrical and Computer Engineering, Georgia Institute of Technology

Dept. Electrical Engineering and Institute of Microelectronics &Program on Semiconductor Manufacturing Technology, NCKU
Area: Microelectronics, Electrical Engineering

Course Description

Semiconductor Fabrication delves into the heart of the microelectronics industry, focusing on the manufacturing process of semiconductor devices. This course offers students an essential understanding of the steps involved in the fabrication of semiconductors, including material preparation, chemical/physical vapor deposition, photolithography, etching, and ion implantation. Students will gain insight into the sophisticated processes and innovations that enable the production of ever-smaller and more powerful semiconductor devices.

【Semiconductor-based nanophotonics and their applications】

Lecturer: Prof. Jui-Nung Liu

PhD, Electrical and Computer Engineering, University of Illinois at Urbana-Champaign

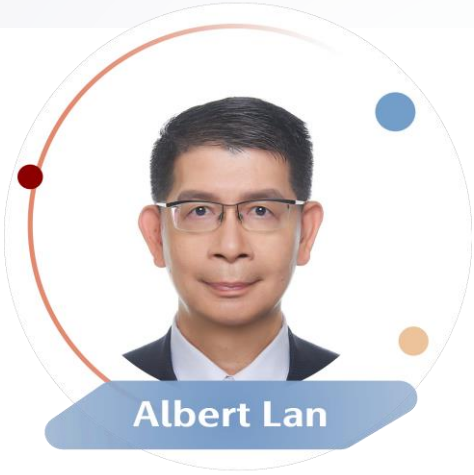
Dept. Electrical Engineering and Institute of Microelectronics &Program on Semiconductor Manufacturing Technology, NCKU

Area: Mid-infrared group-IV photonics/Optical nanocavity/ Surface-enhanced vibrational spectroscopy/Cavity QED

Course Description

Semiconductor Fabrication delves into the heart of the microelectronics industry, focusing on the manufacturing process of semiconductor devices. This course offers students an essential understanding of the steps involved in the fabrication of semiconductors, including material preparation, chemical/physical vapor deposition, photolithography, etching, and ion implantation. Students will gain insight into the sophisticated processes and innovations that enable the production of ever-smaller and more powerful semiconductor devices.

【Worldwide Innovative 3DHI Packaging Technology Trend】



Lecturer: Mr. Albert Lan, Global Sr. Packaging Account TD Head, Applied Materials, USA

Over 30 years of job experience in semiconductor industry, esp. advanced packaging technologies.
Senior Engineering Center Director, 14 years, SPIL
PD, Quality, & Sales, 6 years, Amkor Taiwan

Area: Advanced 3D Heterogeneous Integration Packaging Technology Development

Course Description

- Worldwide Innovative 3DHI Packaging Technology Trend
- Innovative 3DHI Packaging Technology Development Applied in AI/HPC – C2W/ W2W Hybrid Bonding
- Innovative 3DHI Packaging Technology Development Applied in AI/ HPC – FO-PLP and Advanced Substrate

【Applications of Numerical Simulation in the IC Packaging Industry】

Lecturer: Dr. Li-Hsuan (Leo) Shen

Ph.D. Civil Engineering, National Taiwan University

Senior Manager of R&D and IC Packaging Product Manager, Moldex3D (CoreTech System Co., Ltd.)

Area: Computational fluid dynamics, Numerical simulation, Structural analysis for IC packaging applications

Course Description

This course provides an in-depth exploration of the challenges faced in IC packaging, focusing on innovative solutions by applying mechanical theory, material science, and numerical simulation. Participants will gain a conceptual understanding of how these disciplines interact to address and overcome industry-specific difficulties.

【Photolithography and Patterning】

Lecturer: Dr. Nikki Chang

Ph. D. Physics, National Taiwan University. MBA, National Taiwan University

Senior Sale Manager, TSMC Account, Applied Materials Taiwan

Area: DLG & PDC

Course Description

- Basic lithography technology
- Advance lithography technology
- Q&A

【Latest Innovations and Challenges of Semiconductor Technology for 3nm Node and Beyond】

Lecturer: Dr. Samuel Chiu

PhD, Materials Science and Engineering, University of California, Los Angeles (UCLA)

Senior Technical Director, Applied Materials Taiwan

Area: Semiconductor fabrication flow and integration/ Plasma and thermal applications in semiconductor process technology/ Materials and Failure Analysis tools and applications/ Quality Assurance and Supplier Chain Engineering/ Large Scale product and project management.

Course Description

Moore's Law described in 1965 will celebrate its 60th anniversary in 2025. It successfully predicted the economical benefits by continuous semiconductor scaling. We observed its amazing achievements in the past that had dramatically changed the way we lived. The recent explosive growth of Artificial Intelligence (AI), Machine Learning and AR/VR (Artificial Reality, Virtual Reality) require even more advanced semiconductor technology. Taiwan plays a critical role as hub of semiconductor R&D and manufacturing powerhouse to fulfill the needs.

In this presentation, the latest innovation of semiconductor process to drive the success of advanced technology nodes will be described, including FinFET, lithography, and advanced films/etch integration.

Furthermore, the future challenges and opportunities beyond 3nm nodes to keep Moore's Law alive, such as Gate-All-Around (GAA) structure, backside power rails, and chiplet heterogeneous integration will also be presented.

【Corporate Courses of Taiwan Applied Materials】

Lecturer: Mr. Goran Liu

MS, Mechanical Engineering, National Cheng Kung University

Senior Technical Manager, Moldex3D (CoreTech System Co., Ltd.)

【Semiconductor Manufacturing and Advanced Equipment】 at TSRI

Lecturer: Dr. Ming-Tao Lee

PhD, Department of Materials Science and Engineering, National Chiao Tung University

Associate Researcher, National Applied Research Laboratories Taiwan Semiconductor Research Institute

Area: Resistive Random Access Memory, Semiconductor BEOL process, Gas sensor, ISFET pH sensor

Lecturer: Dr. Pei-ling Li

PhD, Aeronautics and Astronautics, NCKU

Associate Research Fellow, Taiwan Semiconductor Research Institute

Area: Electronic packaging, Semiconductor Processing

Lecturer: Mr. Yuming Yeh, PhD candidate, Institute of Microelectronics Engineering, NCKU

Assistant Researcher, Taiwan Semiconductor Research Institute

Area: Semiconductor Manufacturing Technology, Packaging technology

Lecturer: Mr. WU TUNG-CHING, Master, Chemistry, National Chung Hsing University

Assistant Engineer, Taiwan Semiconductor Research Institute

Area: Advanced Heterogeneous Integration process / Dry Etch process of thin film

Course Description

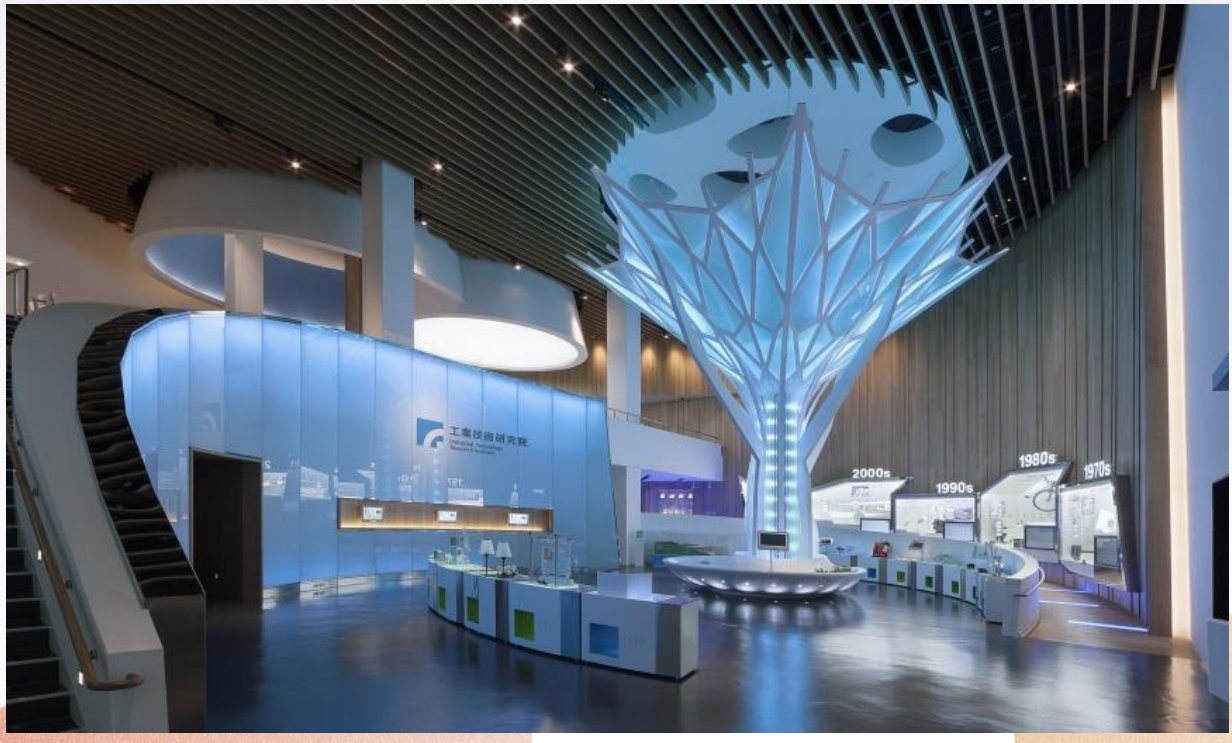
- Facility
- Lithography Process
- Etching Process
- Thin Film Deposition Process
- Wafer Thinning Process
- Bonding Process

【Institute Visit -TSMC Museum of Innovation】

The TSMC Museum of Innovation encompasses three exhibition galleries: "A World of Innovation", "Unleashing Innovation", and "Dr. Morris Chang, TSMC Founder". Through interactive technology, digital content, and historical documents we will learn about the pervasiveness of ICs in our daily lives and about their continued advancement. In addition, we will learn how ICs are making our lives more fulfilling and how they are driving technology beyond our imagination. We will also learn how TSMC contributes to global IC innovation and to Taiwan's economy.

【Institute Visit -Industrial Technology Research Institute】

ITRI is a world-leading applied technology research institute with more than 6,000 outstanding employees. Its mission is to drive industrial development, create economic value, and enhance social well-being through technology R&D. Founded in 1973, it pioneered in IC development and started to nurture new tech ventures and deliver its R&D results to industries. ITRI has set up and incubated companies such as TSMC, UMC, Taiwan Mask Corp., Epistar Corp., Mirle Automation Corp., and Taiwan Biomaterial Co.



【Cultural Tour - Taipei 101】

This is an extracurricular option open for sign-up by students across different courses. An extra charge applies, and there are limited to 30 spots.

With this one-day trip to Taipei, we aim to provide the program students with a refreshing outing experience, allowing them to visit several iconic landmarks and cultural hotspots in Taipei.

Our itinerary includes

- Take a tour of the Office of the President, a symbol of Taiwan's governance and history
- Marvel at Taipei 101, one of the world's tallest skyscrapers, and enjoy panoramic views
- Explore the historic Longshan Temple, a spiritual and cultural gem
- Enjoy Michelin Star 鼎泰豐小籠包
- Travel by High-Speed Rail Train

for the participants to gain insights into Taiwan’s political, modern, and traditional heritage.

Important Dates

Application

Early Bird: By March 31st, 2025 (Mon)

Application Deadline: April 20th, 2025 (Sun) (Confirmation Letter will be sent within seven working days after the registration information is reviewed and confirmed.)

Admission

Admission Letter: May 2nd, 2025 (Sun) (Fri)

*Apply for a visa to Taiwan based on this document

Payment Deadline: May 18th, 2025 (Sun)

Pre-Arrival Notification: May 30th, 2025 (Fri)

Course Period

- 7/22 (Tue): arrival in Tainan
- 7/23 (Wed) morning: Opening Ceremony and Commencement of Classes
- 7/26 (Sat): Cultural Tour-Taipei 101 (optional)
- 7/28 (Mon): Institute Visit to Hsinchu of Course C
- 8/2 (Sat) afternoon: Group Presentation and Closing Ceremony

Completion

Certificate: August 2nd, 2025 (Sat)

Transcript: September 1st, 2025 (Mon)

Fees Schedule

Applicants	Application Fee	Program Fee	Total Fee	Application Period
Early Bird International Students from a partner university	USD 200	USD 1,310	USD 1,510	By Mar 31, 2025
Early Bird International Students from a non-partner university		USD 2,184	USD 2,384	
International Students from a partner university		USD 1,638	USD 1,838	By April 20, 2025
International Students from a non-partner university		USD 2,730	USD 2,930	

Cultural Tour	**USD 200**

Special Rates for Strategic Partner University with Nomination

Nomination Deadline: March 15th, 2025

Nominated Students			
Application Fee	Program Fee	Total Fee	Application Period
USD 200	USD 500	USD 700	By April 20, 2025

NCKU AISSM offers 4 seats with nominations at special rates for each strategic partner university by invitation.

Notes

1. The application fee is not refundable.
2. The program fee includes tuition, orientation, activities, and accident insurance of at least NT$1,000,000, valid for the entire program period.
   The program fee doesn't include: meals and the accommodation.
3. The program fee is refundable with different proportions depending on the time of cancellation by the applicants. (Details announced on the program website)
4. The accommodation fee is NOT included. The participants will be responsible for their housing. Recommended off-campus housing is listed below:

- Rolling Pin Homestay
- Small Island Homestay
- My My Homestays
- Journey Hostel
- 66 south
- Boléro Homestay
- Old Man Captain
- Roaders Hotel
- Academy Hotel

*More accommodation options are available in Tainan City through various hotel websites. Participants are advised to book their accommodation early, as summer is a high season for visitors.

Program Manager

Kacie Liu 劉芝晴

Academy of Innovative Semiconductor and Sustainable Manufacturing, NCKU

https://ais2m.ncku.edu.tw/

Tel: +886-6-2757575 ext.35000-105

E-Mail: kacieliu@gs.ncku.edu.tw

國立成功大學
National Cheng Kung University

X

智慧半導體及永續製造學院
Academy of Innovative Semiconductor and Sustainable Manufacturing

2025 NCKU AISSM

SEMICONDUCTOR SUMMER SCHOOL

Official WEBSITE