NCKU AISSM Summer School

The Essentials of Semiconductor Technology and Supply Chains

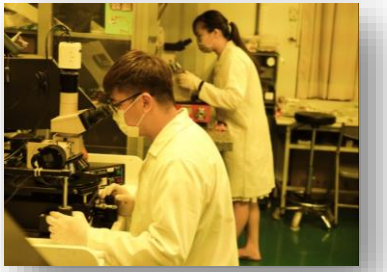
Aug. 18th - Aug. 25th, 2023

NCKU Academy of Innovative Semiconductor and Sustainable Manufacturing

Leading Next-Generation Technology

The Academy of Innovative Semiconductor and Sustainable Manufacturing was the first to launch at a university in Taiwan to address the nation's high-tech talent constraints and the imperative for advancing semiconductor technology during the AI era. With support from NCKU's well-established research foundation in science and engineering, the Academy also strives to align the university-based R&D work closer to industry needs by allowing greater flexibility in academic infrastructure in faculty hiring of industry experts, budgeting, research, and training formats. The five degree programs are on Integrated Circuit Design, Semiconductor Process Technology, Semiconductor Packaging and Testing, Key Materials, and Smart and Sustainable Manufacturing, covering the whole spectrum of the semiconductor industry. The programs aim at educating future talents with a core value on "data-driven & energy-sensitive" competency to help students strive in the highly competitive semiconductor industry.

2022 Innovative Semiconductor Summer School has a total of 55 students participating, including 33 foreign students, from five countries, and all levels. With highly positive feedback, the Academy aims to provide this course annually for students who are interested in knowing this fundamentally important semiconductor industry. The mission is to enhance technology literacy and blend in the society in an era of chips and automation.



THE ESSENTIALS OF SEMICONDUCTOR TECHNOLOGY AND SUPPLY CHAINS

Core Course - 2 credits

The most comprehensive selection of topics offered by the Academy of Innovative Semiconductor and Sustainable Manufacturing of NCKU. With a theme on the essentials of semiconductor technology and supply chains, a series of lectures will be delivered by both the Academy's faculty and industry experts from top-notch research centers and businesses in Taiwan for an inclusive presentation of this subject. The topics will include IC design, techniques of nanomaterials and nanocomposites, fundamentals of device physics and fabrication, advanced packaging technology with AI, IoT, and 5G application, digital twin and IC packaging, VLSI process integration, and device measurement.

Organizer: Prof. Meng-Hsueh Chiang

PhD, Electrical and Computer Engineering,

University of Florida

Dept. Electrical Engineering & Program on Semiconductor Manufacturing Technology, NCKU

Area: Semiconductor Process Technology/Electrical Engineering

Features

TSMC-Newcomer Training Center(NTC) 1 Day Program

The program arranges a 1 Day Program hosted by Taiwan Semiconductor Manufacturing Center (TSMC) at its Newcomer Training Center in Taichung. It's an intensive course delivered by the research experts of TSMC.

TSMC, the first pure integrated circuit (IC) foundry in the world, provides manufacturing services for advanced ICs for the world market. Its NTC located in Taichung provides an integrated environment for practical operation and enhances the cultivation of quality talents to a large extent. Overall, this onsite visit is to provide comprehensive learning with the guidance of Taiwan's top industry experts for international and Taiwanese students of the program.

Features

TSRI-Lab Tour

The Taiwan Semiconductor Research Institute (TSRI) under the National Applied Research Laboratories (NARLabs) is a consolidation of the National Chip Implementation Center (CIC) and National Nano Device Laboratories (NDL). An integrated research environment for related fields of study in Taiwan is urgently required to enhance the overall cultivation of quality talents in response to the introduction of the 3-nm node; rapid development of new applications. In so doing, it aims to provide a comprehensive range of verification services for semiconductor devices, circuits, and system integration and create an open information and service platform for semiconductor industry.

Timetable

Time Interval (GMT+8)	Fri. Aug.18	Sat. Aug.19	Sun. Aug.20	Mon. Aug.21	Tue. Aug.22	Wed. Aug.23	Thu. Aug.24	Fri. Aug.25
9:10-10:00	Opening	Tainan Cultural Tour	Free	Advanced Semiconductor Technology	TSRI-Advanced Packaging Technology/Clean Room-Module Tour	Process and Materials Innovations to Enable 3nm node and Beyond	TSMC Newcomer Training Center 1 Day Program in Taichung	Circular Economy of Electronics Industry
10:10-11:00	IC Design Overview							
11:10-12:00								
12:10-13:00	Lunch			Lunch				Lunch
13:10-14:00	IC Design Overview			Techniques of Nanomaterials and Nanocomposites	Techniques of Nanomaterials and Nanocomposites	Process and Materials Innovations to Enable 3nm node and Beyond		Circulation of Silicon Resource in the Semiconductor Industry
14:10-15:00								
15:10-16:00	IC Design Overview TSRI Lab tour							
16:10-17:00								Presentations &Farewell
17:10-18:00								

Noted: The above courses/schedule are subject to change.

Topic: IC Design Overview

Lecture 1: Binary logic & Arithmetic Modules

Description

IC design overview is to introduce the fundamentals of IC design to those interested in this field. It starts from basic binary logic blocks followed by arithmetic modules. Modules are organized in a logical way to perform computation. Then how to transform and realize a design into an integrated circuit by hardware description language and state-of-the-art design tools. In the end, how one can validate and confirm the success of the design. A concise yet insightful view can help learners quickly grasp the essences of IC design. It would be highly useful to people who want to have a jump start and know how we train students in Taiwan.

Lecturer: Associate Prof. Chih-Hung Kuo

PhD, Electrical Engineering, University of Southern California

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

Area: IC Design/ Electrical Engineering

Length: 6 hours (of four 1-hr lectures and one 2-hr TSRI lab tour)

Topic: IC Design Overview

Lecture 2:

Essences of Computer Organization

Lecturer: Prof. Ing-Chao Lin

PhD, Computer Science and Engineering, Pennsylvania State University

Dept. Computer Science and Information Engineering & Program on Integrated Circuit Design, NCKU

Area: IC Design/ Computer Science & Information Engineering

Lecture 3:

Transform Design using HDL & EDA Tools

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

Lecture 4: :

IC Design Flow (followed by a lab tour at TSRI)

Lecturer: Dr. Hann-Huei Tsai

Vice Director, NARLabs TSRI, Tainan

Area: IC Design

Topic: Advanced Semiconductor Technology

Lecturer: Associate 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

Lecturer: Assistant 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

Description

Advanced semiconductor technology: from materials, devices to measurements

Length: 3 hours

Topic: TSRI–Advanced Packaging Technology/Clean Room–Module Tour

Description

This course will introduce advanced packaging technology. AI, IoT, and the application of 5G with high computing performance, high speed transmission, and low power consumption are becoming much more important. Using the advanced package technology, Moore's law can be prolonged, which is also a big challenge in the semiconductor industry. This course will introduce the evolution of packages from 2D to 3D, including wafer handling, wafer thinning, bonding, 2.5D/3D packing, fan-out technology…, etc.

This course will arrange a visit to Taiwan Semiconductor Research Institute. TSRI under the National Applied Research Laboratories is a consolidation of the National Chip Implementation Center (CIC) and National Nano Device Laboratories (NDL). TSRI provides the integrated research environment for related fields of study in Taiwan to enhance the overall cultivation of quality talents.

Lecturer: Dr. Pei Ling Li

NARLabs TSRI, Tainan

Length: 3 hours

Topic: TSRI–Advanced Packaging Technology/Clean Room–Module Tour

Lecturer: Tang Yuan Fu

Engineer, NARLabs TSRI, Tainan

Lecturer: Laifu Tsai

Engineer, , NARLabs TSRI, Tainan

Lecturer: Yuming Yeh

Engineer, NARLabs TSRI, Tainan

Lecturer: Shih Han Hsu

Engineer, NARLabs TSRI, Tainan

Topic: Techniques of Nanomaterials and Nanocomposites

Description

This course will introduce the basic principle of the fabrication of nanomaterials and nanocomposites. The unique properties of nanomaterials strongly depend on their morphology and composition, leading to specialized applications, such as sensing, optical and electronic devices. Therefore, the fabrication process of nanomaterials plays an important role in manipulating material properties. The properties of nanocomposites can be influenced by the intrinsic properties of individual materials and extrinsic properties of syngenetic effects between materials, which make it possible to engineer the desired properties of nanocomposites. This course also focuses on designing the special functions of nanomaterials and nanocomposites for desirable applications.

Length: 6 hours

Lecturer: Assistant Prof. Su-Wen Hsu

PhD, Materials Science and Engineering, University of California, San Diego

Dept. Chemical Engineering& Program on Key Materials, NCKU

Area: Key Materials/Chemical Engineering

Topic: Process and Materials Innovations to Enable 3nm node and Beyond

Lecturer: Dr. Samuel Chiu

Senior Technical Director, Applied Materials Taiwan

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

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.

Description

Scaling, PPAC and Patterning Complexity
-PPAC (Performance. Power. Area and Cost)
-Patterning Complexity

Inflection, Challenges and Roadmap

Generic FinFET Logic Process Flow Introduction

Length: 6 hours

Topic:
-Circular Economy of Electronics Industry
-Circulation of Silicon Resource in the Semiconductor Industry

Description

The concept of circular economy has gained significant attention in recent years, with various industries adopting different systems to tackle issues. In Taiwan, the electronics industry is a key contributor to the economy, but it also generates a significant amount of waste, pollution, and some problems. Therefore, there is a pressing need to improve the sustainability of this sector. This class aims to introduce some systems and recycling technologies (silicon resources) which can help Taiwan achieve the goals of the circular economy and address these challenges.

Lecturer:

Lecture: Circular Economy of Electronics Industry

Lecturer: Associate Prof. Wei-Sheng Chen

PhD, Resource Engineering, NCKU

Dept. Resource Engineering, NCKU

Area: Waste Disposal/Resource Technology/ Mineral/Waste Classification/Refined Metallurgy

Lecture: Circulation of Silicon Resource in the Semiconductor Industry

Lecturer: Shao-Hua Hu

Chief Technology Officer, Transcene Corp.

Length: Each for 3 hours

NCKU

THE TOP UNIVERSITY IN TAIWAN

National Cheng Kung University (NCKU), established as “Tainan Technical College” in 1931, has transformed into one of the most established, comprehensive universities in Taiwan. With about 21,000 students and 2,000 faculty members in total, NCKU has continued as a leader in the fields of engineering, science, management, and medicine. NCKU has always been dedicated to promoting student mobility and welcomes international exchange students from partner universities worldwide every year.

RANKING & PERFORMANCE

THE WORLD UNIVERSITY RANKINGS

2022 Impact Rankings in Taiwan

Top One

QS WORLD UNIVERSITY RANKINGS®

2023 QS World Ranking

224

BEST GLOBAL UNIVERSITIES U.S.News & WORLD REPORT

GLOBAL SCORE

47.2

台南
Tainan

TAINAN, THE OLDEST CAPITAL CITY

Tainan is the ancient capital of Taiwan. This city continues to host a variety of cultural festivities and religious ceremonies all year round. Traditions have been well sustained in this modernized city. The city's gourmet food culture guarantees one can find delicious food of every kind.

Life in Tainan has a charming balance between the new and the old, and the fast and the slow.

2023
NCKU AISSM Summer School

Date: Aug. 18th – Aug. 25th, 2023

Application Deadline: June 14th, 2023

Language: All in English

Eligibility: senior undergraduate or new graduate students, currently enrolled in college with an engineering or science background

Number of Participants: 30 students, domestic and overseas

Format: In-person

Completion: NCKU transcript

Core Course – 2 credits

Learn about semiconductor supply chains and the core technologies involved in semiconductor manufacturing.

TSMC-Newcomer Training Center 1 Day Program

A one-day intensive course at the world-leading company to learn theory with practice of cutting-edge technology.

Fees

2023 NCKU AISSM Summer School

Application Fee	Program fee		
USD 50		Early Bird Rate By May 31, 2023	Regular
	Non-NCKU Partner Schools	USD 1,520	USD 1,900
	NCKU Partner School	USD 800	USD 1,000

- Save on the program fee with a 20% discount by applying for the program before May 31st.
- The application fee is not refundable. Refund policy please refer to the information on website.
- The Program Fee covers lunches of days with classes. Accommodation cost and other meals are to be not included.
- For European Students! APPLY FOR "Taiwan-Europe Connectivity Scholarship"

Welcome, for students from all over the world to join us!

Apply through NCKU Incoming Short Term Activities System

Contact Information

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