2-Week International School of Semiconductor: Circuit Design, Manufacturing, Packaging, and Inspection

Overview

The 2-Week International School of Semiconductor offers an immersive experience for students and professionals to gain a comprehensive understanding of semiconductor technology. From circuit design to manufacturing, packaging, and inspection, participants will learn theoretical concepts and acquire hands-on skills through intensive lectures, laboratory sessions, and cultural exchange activities.

Program Highlights

- Duration: 2 weeks (Monday to Friday, 9:00 AM - 5:00 PM)
- Focus Areas:
    1. Circuit Design Fundamentals
    2. Semiconductor Manufacturing Processes
    3. Packaging and Testing Techniques
    4. Advanced Inspection Methods using cutting-edge tools (e.g., SEM, AFM)
    5. Future Technologies and Green Initiatives
- Audience: International students and professionals with an interest in semiconductor technology and applications.
- Location: iCAST Labs, National Chung Hsing University (NCHU), Taiwan

Program Schedule

Week 1: Foundations and Practical Skills

Week 1	Morning (9am-12pm) Lecture	Afternoon (2-5pm) Hand-on
Day 1	Opening Introduction to Semiconductors	Lab Tour in iCAST Circuits with Arduino(I) Dr. Utkarsh Kumar/Dr. Chandrasekar Room 226 (iCAST)
Day 2	Semiconductor Materials	Circuits with Arduino(II) Dr. Utkarsh Kumar/Dr. Chandrasekar Room 226 (iCAST)
Day 3	IC Design	Photomask Design & Pattering Sample Preparation Techniques (iCAST & Instrument Center)
Day 4	Thin Film Technology	Lithography, Etching & Deposition

		Processes (Instrument Center)
Day 5	Solar Cell Semiconductor Devices	Optical Microscope (OM) & Atomic Force Microscope (AFM) (iCAST)

Week 2: Advanced Processes and Applications

Week 2		
Day 6	Green Technology	Packaging and Testing
Day 7	Green Manufacturing	Scanning Electron Microscope (SEM) (iCAST)
Day 8	Semiconductor Manufacturing	Packaging & Testing application (ICPMS) (Instrument Center)
Day 9	Semiconductor Devices	Cultural Visit: National Museum of Natural Science (NMNS) –" TSMC Semiconductor World " Visit
Day 10	Future Semiconductor Technologies	Lab Report and Group Presentations Closing (iCAST)

Target Audience

- Undergraduate and graduate students interested in STEM.
- Professionals seeking an introduction to semiconductor technology.
- International participants aiming to expand their expertise and network.

Learning Outcomes for a 2-Week Semiconductor School

By the end of this 2-week program, participants will:

1. **Understand Fundamental Semiconductor Concepts**:
    - Gain a comprehensive understanding of semiconductor physics, materials, and key manufacturing processes, including photolithography, thin film deposition, and etching.
2. **Develop Practical Skills**:
    - Acquire hands-on experience in semiconductor sample preparation, photomask patterning, lithography, and device fabrication.
    - Learn how to use advanced tools such as Optical Microscopes (OM), Atomic Force Microscopes (AFM), and Scanning Electron Microscopes (SEM).
3. **Connect Theory to Real-World Applications**:

- Understand the role of packaging and testing in the functionality and reliability of semiconductor devices.
- Explore cutting-edge technologies like green semiconductor innovations and the future of semiconductor manufacturing.

4. **Cultural Exchange**:
   Visit the leading exhibition at the National Museum of Natural Science's TSMC Semiconductor World to bridge classroom learning with real-world industry advancements, while fostering cross-cultural understanding and appreciation of Taiwan's contributions to global semiconductor technology.
5. **Foster Innovation and Critical Thinking**:
   - Engage in discussions about green technology and sustainable semiconductor manufacturing to understand the industry's role in global environmental challenges.
6. **Lab Report and Presentation**:
   - Consolidate the knowledge and hands-on experiences gained throughout the program by preparing and presenting lab reports, fostering teamwork, and encouraging critical thinking.

This program provides a well-rounded introduction to the semiconductor industry, preparing participants for further exploration or potential engagement in this critical technology field.

Learning Outcomes

1. **Technical Mastery**: Gain in-depth knowledge of semiconductor physics, materials, manufacturing processes, and packaging techniques.
2. **Practical Experience**: Operate industry-standard equipment like SEM, AFM, and lithography tools to fabricate and inspect semiconductor devices.
3. **Global Perspective**: Explore the latest trends in green technology and future semiconductor innovations, fostering a sustainable outlook.
4. **Cultural Enrichment**: Participate in cultural exchange activities and visit Taiwan's leading semiconductor exhibition to connect classroom learning with real-world applications.

Day 5 Afternoon: Lab Report and Presentation

Objective: Consolidate the knowledge and hands-on experiences gained throughout the program by preparing and presenting lab reports, fostering teamwork, and encouraging critical thinking.

Activity Details

1. **Lab Report Preparation (2:00 PM - 3:30 PM)**
    - Each group will summarize their key findings from the week's experiments, including:
        - Sample preparation
        - Photomask patterning
        - Lithography and etching
        - SEM/AFM inspection results
        - Packaging and testing insights
    - Format: Brief written report with visuals (graphs, photos of lab setups, etc.).
2. **Group Presentations (3:30 PM - 5:00 PM)**
    - Each group will give a **5-10 minute presentation** covering:
        - Goals of the experiments
        - Methods and equipment used
        - Results and observations
        - Challenges faced and solutions implemented
        - Future implications or applications of the techniques learned.
    - Presentations will be followed by a brief **Q&A session** with peers and instructors.

Learning Outcome:
Participants will improve their scientific communication skills, learn to analyze and present experimental data effectively, and reflect on how their learning applies to real-world semiconductor research and applications.
This session encourages collaboration, fosters confidence in presenting technical work, and serves as a capstone activity for the program.