

STIPT 2025

National Taiwan University of Science and Technology

Program	Process & Modules	Equipment Engineering
Fall/2025	Semiconductor Fabrication*	Semiconductor Fabrication*
	Semiconductor Physics and Devices*	Vacuum and Plasma Techniques*
	Material Microstructure Analysis*	Wafer Fabrication Technology and Equipment
	Diffusion and Phase Transformation*	

Note.

1. Those with * are courses listed in TSMC Semiconductor Curriculum. Course descriptions are attached below.

Name in TSMC Curriculum	Name in NTUST Curriculum	Course Objectives
Semiconductor Fabrication	Fabrication Technology of Semiconductor Device	This course focused on the concepts of semiconductor processing and manufacturing. The class style is including lectures, invited talks, team project and homework.
Physics of Semiconductor Devices	Semiconductor Physics and Devices	This course helps to build up the basic knowledge in semiconductor physics and devices. Fundamentals of intrinsic semiconductors, diodes, field effect transistors, carrier transport phenomena, heterostructures, and various devices such as light emitting diodes, photodetectors, and photovoltaics will be covered in this course. Mathematical calculations will be important in understanding the underlying concept in the above-mentioned topics.
Material Microstructure Analysis	Materials Characterization	Introduction to the analysis principles and methods, including scanning electron microscopy, transmission electron microscopy, scanning transmission electron microscopy, Auger electron spectrometry, X-ray photoelectron spectrometry, secondary ion mass spectrometer, focus ion beam, and electron backscatter diffraction, for material microstructure, physical properties and chemical properties is the main purpose of this lecture. In addition, the students will be arranged to visit the corresponding instruments of materials characterization, which will effectively deepen students' impression of these instruments.
Diffusion and Phase Transformation	Kinetics and Phase Transformation of Materials	This course will explain the physical metallurgical behavior in metallic materials from three perspectives: processing, structures, and properties. It will introduce the fundamental principles of dislocations, grain boundaries, annealing phenomena, solid solutions, phase diagrams and phase transformation, and diffusion using the classic textbook "Reed Hill's Physical Metallurgy Principles." Students who take this course will learn more about material structures, how structures dictate properties, and how processing can change structures.
Vacuum and Plasma Techniques	Thin Films and Vacuum Technology	The thin film is one of the most important fields in the scientific and engineering domains. From corrosion prevention to the most advanced semiconductor devices, thin films are required. Therefore, this course aims to introduce the basic principles, material, processes, and applications of thin films, enabling students to gain a considerable understanding of the field.
	Wafer Fabrication Technology and Equipment	This course introduces the engineering techniques and process equipment used in the most critical aspect of the integrated circuit manufacturing industry—wafer fabrication. It emphasizes the process technology and characteristics of the equipment used in semiconductor plants. Various wafer fabrication steps are gradually introduced, starting with crystal growth, cutting, grinding, and polishing planarization. Additionally, it covers standard equipment in wafer production, such as robotic arms for wafer handling, pneumatic and vacuum systems for process gas supply, etc. Industry professionals are also invited to share their experiences. Towards the end, the course will delve deeply into one of the remarkable processes in semiconductor plants—lithography, diffusion, thin film deposition, etching, or chemical mechanical polishing (CMP). At the end of the course, students will be required to complete a project and participate in a competition to validate their learning outcomes.