

**Planned Course Curriculum:**

1. **Total Time:** 60 Hours (30 Hours are distance learning and 30 Hours are in Taiwan)

2. **Course Outline:**

Distance Learning (30 Hours):

**A. Introduction to Telecom Communication Network (4G/5G),** (Total 12 Hours - 6 Hours are distance learning, 6 Hours are in Taiwan)

- a. Introduction of 4G/5G Mobile Phone (6 Hours)
  - i. 5G technology and development
  - ii. 5G architecture, protocol stack, and design objective
  - iii. 5GPP & NGMN
  - iv. ITU-R IMT-2020 vision
  - v. Mobile Edge computing & Fog computing

**B. Design of Antenna & Mobile Phone Communication System,** (Total 24 Hours - 12 Hours are distance learning, 12 Hours are in Taiwan)

- a. Antenna Principles (3 Hours)
  - i. Requirements of wireless communication links
  - ii. Functions of antenna in wireless communication system
  - iii. The generation of electromagnetic waves
  - iv. Important antenna parameters
- b. Antenna Designs for Mobile Terminals (3 Hours)
  - i. Antenna needs of mobile wireless communication
  - ii. Principle antenna types for mobile terminals
  - iii. Antenna miniaturization techniques
  - iv. Advanced antenna technologies
- c. Introduction of Communication Systems and Analog Modulations (3 hours)
  - i. Overview of a communication system:
    - Transmitter
    - Receiver
    - Channel
    - Noise
    - Interferences
  - ii. Introduction to analog modulations
    - Amplitude modulation
    - Angle modulations

- d. Digital Communications (3 Hours)
  - i. Discrete data detection
  - ii. Wireless channel models
  - iii. Modulation techniques and demodulation
  - iv. Equalization techniques
  - v. Channel coding

**C. The IC Design of Mobile Phone and Communication Equipments, (Total 24 Hours - 12 Hours are distance learning, 12 Hours are in Taiwan)**

- a. Introduction to VLSI (3 Hours)
  - i. Brief History of VLSI
  - ii. Basic Semiconductor Physics
  - iii. Basic Component in VLSI Circuits
  - iv. CMOS Fabrication Process
  - v. Basic Logic Gates and Circuits
  
- b. Introduction to digital circuits and cell-based design flow (3 Hours)
  - i. Digital Circuit Design Methodologies
  - ii. Combinatorial Circuit Families
  - iii. Sequential Circuits
  - iv. Delay and Power Estimation
  - v. Hardware Description Language
  - vi. Packaging and Testing
  
- c. Introduction to analog circuits and full-custom design flow (3 Hours)
  - i. MOS Transistor 1-V Characteristics
  - ii. Single-stage Amplifiers
  - iii. Frequency Response
  - iv. Circuit Simulation Software
  - v. Full-Custom Design Flow
  
- d. Introduction to integrated analog amplifier design (3 Hours)
  - i. Basic Amplifier Circuits
  - ii. Feedback and Stability
  - iii. Circuit Noise and Linearity
  - iv. Two-Stage Operational Amplifier Design Example

In Taiwan (30 Hours exclude Company Visits)\*:

**A. Introduction to Telecom Communication Network (4G/5G)** (Total 12 Hours - 6 Hours are distance learning, 6 Hours are in Taiwan)

- a. Android and iOS Software Development (6 Hours)
  - i. Android and iOS development
  - ii. Java programming
  - iii. APIs, web services and database
  - iv. Create Android and iOS application

**B. Design of Antenna & Mobile Phone Communication System** (Total 24 Hours - 12 Hours are distance learning, 12 Hours are in Taiwan)

- a. Communication System Laboratory Using Software Defined Radio Platform (12 Hours)
  - i. Introduction to USRP Software Defined Radio (SDR) Platform
  - ii. Introduction to SDR software - NI Labview
  - iii. Laboratory of SDR programming
  - iv. Laboratory of digital transmitter
  - v. Laboratory of digital receiver
  - vi. Laboratory of a digital communication system

**C. The IC Design of Mobile Phone and Communication Equipments,** (Total 24 Hours - 12 Hours are distance learning, 12 Hours are in Taiwan)

- i. The design and implementation of fundamental logic cells (3 Hours)
- ii. The laboratory of digital circuits and cell-based design flow (3 Hours)
- iii. The laboratory of basic analog circuits and full-custom design flow (3 Hours)
- iv. The laboratory of integrated amplifier design (3 Hours)

**D. Company visits: To MediaTek and/or Nanya**

*\*Visit to Taiwan is subjected to COVID-19 situation at that time.*