

美國加州大學聖地牙哥分校電機與電腦工程學系先修課程表

美國加州大學聖地牙哥分校電機與電腦工程學系 (Electrical and Computer Engineering, ECE) 分為以下六個專業領域：電腦工程 (CE)、通訊理論與系統 (CTS)、電子電路與系統 (ECS)、智慧系統、機器人與控制 (ISRC)、機器學習與資料科學 (MLDS)，以及光電工程 (PHO)。選擇一個專業領域，於就讀國立中興大學三年期間，修畢該領域先修課程要求的科目。各專業領域所採認的先修課程代碼如下：

1. **Computer Engineering 電腦工程 (CE)**
Pre-requisite courses include ECE: 5, 15, 16, 17, 25, 30, 35, 45, 65, 100, 101, 109
2. **ICommunication Theory and Systems 通訊理論與系統 (CTS)**
Pre-requisite courses include ECE: 5, 15, 17, 25, 30, 35, 45, 65, 100, 101, 102, 107, 109
3. **Electronic Circuits and Systems 電子電路與系統 (ECS)**
Pre-requisite courses include ECE: 5, 15, 25, 30, 35, 45, 65, 100, 101, 102, 103, 107, 109
4. **Intelligent System, Robotic and Control 智慧系統、機器人與控制 (ISRC)**
Pre-requisite courses include ECE: 5, 15, 16, 17, 25, 30, 35, 45, 65, 100, 101, 107, 109
5. **Machine Learning and Data Science 機器學習與資料科學 (MLDS)**
Pre-requisite courses include ECE: 5, 15, 16, 17, 25, 30, 35, 45, 65, 100, 101, 107, 109
6. **Photonics 光電工程 (PHO)**
Pre-requisite courses include ECE: 5, 15, 25, 30, 35, 45, 65, 100, 101, 103, 107, 109

先修課程代碼對照表

UC San Diego Course	NCHU Course
ECE 5: Experience ECE: Making, Breaking, Hacking Stuff	Engineering Ethics 工程倫理
ECE 15: Engineering Computation	Computer Programming 計算機程式設計
ECE 16: Rapid Hardware and Software Design	Microprocessors, 微處理機 Fast Prototypes of Digital Systems 數位系統之快速雛型製作
ECE 17: Object-Oriented Programming: Design and Development with C++	Object Oriented Programming 物件導向程式設計
ECE 25: Introduction to Digital Design	Switching Circuits & Logic Design 交換電路與邏輯設計
ECE 30: Introduction to Computer Engineering	Computer Organization 計算機組織
ECE 35: Introduction to Analog Design	Electrical Circuits (I) 電路學(一)
ECE 45: Circuits & Systems	Electrical Circuits (II) 電路學(二)
ECE 65: Components & Circuits Laboratory	Lab in Electrical Engineering (I), 電工實驗(一) Lab in Electrical Engineering (II), 電工實驗(二) Lab in Electrical Engineering (III) 電工實驗(三)
ECE 100: Linear Electronic Systems	Signals and Systems 信號與系統
ECE 101: Linear Systems Fundamentals	Engineering Mathematics (II) 工程數學(二)
ECE 102: Introduction to Active Circuit Design	Electronics (I), 電子學(一) Electronics (II) 電子學(二)
ECE 103: Fundamentals of Devices & Materials	Semiconductor Devices 半導體元件
ECE 107: Electromagnetism	Electromagnetics (I), 電磁學(一) Electromagnetics (II) 電磁學(二)
ECE 109: Engineering Probability & Statistics	Engineering Mathematics (III) 工程數學(三)

備註：若該項目有多門對應課程，至少選修一門即可。

各專業領域課程規劃說明

I. Computer Engineering Specialization

Pre-requisite courses include ECE: 5, 15, 16, 17, 25, 30, 35, 45, 65, 100, 101, 109

Table 1.1 outlines a recommended course schedule for students to follow during their first year in the Program for the Computer Engineering Specialization. All courses are 4 credits unless otherwise noted.

Table 1.1: Sample Course Schedule for Students in the First Year of the Program

Fall Quarter	Winter Quarter	Spring Quarter
ECE 111 - Advanced Digital Design Project	ECE 143 - Programing for Data Analysis	Technical Electives (M.S.)
ECE 158A - Data Networks I	ECE 140A - The Art of Product Engineering I	ECE 108 - Digital Circuits
Technical Electives	ECE 141A - Software Systems I	ECE 141B - Software Systems II
Technical Electives (M.S.)	ECE 191 - Engineering Group Design Project	Technical Electives (M.S.)

Technical elective (M.S.) courses will count towards the student's UC San Diego M.S. degree requirements, and these credits will not be transferred to NCHU. Courses counted towards the student's NCHU B.S. degree requirements cannot be applied towards UC San Diego M.S. degree requirements.

Table 1.2: Sample Course Schedule for Students in the Second Year of the Program (Comprehensive Exam)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 260A - VLSI Digital System Algorithms and Architecture	ECE 260B - VLSI Integrated Circuits and Systems Design	ECE 260C - VLSI Advanced Topics
ECE 253 - Digital Image Processing	ECE 226 - Optimization and Acceleration of Deep Learning on Various Hardware Platforms	ECE 284 - Computer Architecture
Technical Electives (M.S.)	Technical Electives (M.S.)	ECE 268 - Security of Hardware Embedded System

Tables 1.2 and 1.3 outline the recommended course schedule for students to follow during their second year in the Program for the Computer Engineering Specialization, with Comprehensive exam and Thesis option.

Table 1.3: Sample Course Schedule for Students in the Second Year of the Program (Thesis)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 260A - VLSI Digital System Algorithms and Architecture	ECE 260B - VLSI Integrated Circuits and Systems Design	ECE 260C - VLSI Advanced Topics
ECE 253 - Digital Image Processing	ECE 226 - Optimization and Acceleration of Deep Learning on Various Hardware Platforms	ECE 284 - Computer Architecture
ECE 299 - Research	ECE 299 - Research	ECE 268 - Security of Hardware Embedded System

II. Communication Theory and Systems Specialization

Pre-requisite courses include ECE: 5, 15, 17, 25, 30, 35, 45, 65, 100, 101, 102, 107, 109

Table 2.1 outlines a recommended course schedule for students to follow during their first year in the Program for the Communication Theory and Systems Specialization. All courses are 4 credits unless otherwise noted.

Table 2.1: Sample Course Schedule for Students in the First Year of the Program

Fall Quarter	Winter Quarter	Spring Quarter
ECE 155- Digital Communications Theory	ECE 159* - Introduction to Data Processing and Information Theory	ECE 153 - Probability and Random Processes for Engineers
ECE 158A - Data Networks I	ECE 158A - Data Networks II	ECE 157A - Communications Systems Laboratory I
Technical Electives	Technical Electives (M.S.)	Technical Electives (M.S.)
Technical Electives	ECE 191 - Engineering Group Design Project	Technical Electives (M.S.)

Technical elective (M.S.) courses will count towards the student's UC San Diego M.S. degree requirements, and these credits will not be transferred to NCHU. Courses counted towards the student's NCHU B.S. degree requirements cannot be applied towards UC San Diego M.S. degree requirements. ECE 159 might not be offered every year.

Table 2.2: Sample Course Schedule for Students in the Second Year of the Program (Comprehensive Exam)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 250 - Random Processes	ECE 269 - Linear Algebra	ECE 258B - Digital Communication
ECE 257A - Multiuser Communication Systems	ECE 258A - Digital Communication	ECE 273 - Convex Optimization and Applications
Technical Electives (M.S.)	ECE 257B - Principles of Wireless Networks	Technical Elective (M.S.)

Tables 2.2 and 2.3 outline the recommended course schedule for students to follow during their second year in the Program for the Communication Theory & Systems Specialization, with Comprehensive exam and Thesis option.

Table 2.3: Sample Course Schedule for Students in the Second Year of the Program (Thesis)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 250 - Random Processes	ECE 269 - Linear Algebra	ECE 258B - Digital Communication
ECE 257A - Multiuser Communication Systems	ECE 258A - Digital Communication	ECE 273 - Convex Optimization and Applications
ECE 299 - Research	ECE 257B - Principles of Wireless Networks	ECE 299 - Research

III. Electronic Circuits and Systems Specialization

Pre-requisite courses include ECE: 5, 15, 25, 30, 35, 45, 65, 100, 101, 102, 103, 107, 109

Table 3.1 outlines a recommended course schedule for students to follow during their first year in the Program for the Electronic Circuits and Systems Specialization. All courses are 4 credits unless otherwise noted.

Table 3.1: Sample Course Schedule for Students in the First Year of the Program

Fall Quarter	Winter Quarter	Spring Quarter
ECE 164 - Analog Integrated Circuit Design	ECE 111 - Advanced Digital Design Project	ECE 165 - Digital Integrated Circuit Design
ECE 166 - Microwave Systems and Circuits	Technical Electives	ECE 163 - Electronic Circuits and Systems
ECE 260A (M.S.) - VLSI Digital System Algorithms and Architecture	ECE 260B (M.S.) - VLSI Integrated Circuits and Systems	Technical Electives (M.S.)
Technical Electives	Technical Electives	Technical Electives (M.S.)

Technical elective (M.S.) courses, as well as ECE 260A and ECE 260B will count towards the student's UC San Diego M.S. degree requirements, and these credits will not be transferred to NCHU. Courses counted towards the student's NCHU B.S. degree requirements cannot be applied towards UC San Diego M.S. degree requirements.

Table 3.2: Sample Course Schedule for Students in the Second Year of the Program (Comprehensive Exam)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 203 - Biomedical Integrated Circuits and Systems	ECE 264A - CMOS Analog Integrated Circuits and Systems I	ECE 264B - CMOS Analog Integrated Circuits and Systems II
ECE 263 - Power Management Integrated Circuit	ECE 265A - Communication Circuit Design I	ECE 265B - Communication Circuit Design II
Technical Electives (M.S.)	Technical Electives (M.S.)	ECE 251A - Digital Signal Processing I

Tables 3.2 and 3.3 outline the recommended course schedule for students to follow during their second year in the Program for the Electronic Circuits & Systems Specialization, with Comprehensive exam and Thesis option.

Table 3.3: Sample Course Schedule for Students in the Second Year of the Program (Thesis)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 203 - Biomedical Integrated Circuits and Systems	ECE 264A - CMOS Analog Integrated Circuits and Systems I	ECE 264B - CMOS Analog Integrated Circuits and Systems II
ECE 263 - Power Management Integrated Circuit	ECE 265A - Communication Circuit Design I	ECE 265B - Communication Circuit Design II
ECE 299 - Research	ECE 299 - Research	ECE 251A - Digital Signal Processing I

IV. Intelligent System, Robotic and Control Specialization

Pre-requisite courses include ECE: 5, 15, 16, 17, 25, 30, 35, 45, 65, 100, 101, 107, 109

Table 4.1 outlines a recommended course schedule for students to follow during their first year in the Program for the Intelligent System, Robotics and Control Specialization. All courses are 4 credits unless otherwise noted.

Table 4.1: Sample Course Schedule for Students in the First Year of the Program

Fall Quarter	Winter Quarter	Spring Quarter
ECE 171A - Linear Control System Theory	ECE 175A - Elements of Machine Intelligence: Pattern Recognition and Machine Learning	ECE 175B - Elements of Machine Intelligence: Probabilistic Reasoning and Graphical Models
ECE 174 - Introduction to Linear and Nonlinear Optimization with Applications	ECE 172A - Introduction to Intelligent Systems: Robotics and Machine Intelligence	Technical Electives (M.S.)
Technical Electives	ECE 191 - Engineering Group Design Project	Technical Electives (M.S.)
Technical Electives	Technical Electives	Technical Electives (M.S.)

Technical elective (M.S.) courses will count towards the student's UC San Diego M.S. degree requirements, and these credits will not be transferred to NCHU. Courses counted towards the student's NCHU B.S. degree requirements cannot be applied towards UC San Diego M.S. degree requirements.

Table 4.2: Sample Course Schedule for Students in the Second Year of the Program (Comprehensive

Exam)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 253 - Digital Image Processing	ECE 269 - Linear Algebra	ECE 272A - Dynamic Systems I: Linear Systems
ECE 271A - Statistical Learning I	ECE 276A - Sensing and Estimation in Robotics	ECE 276B - Planning and Learning in Robotics
Technical Electives (M.S.)	ECE 271B - Statistical Learning II	ECE 273 - Convex Optimization and Applications

Tables 4.2 and 4.3 outline the recommended course schedule for students to follow during their second year in the Program for the Intelligent System, Robotic and Control Specialization, with Comprehensive exam and Thesis option.

Table 4.3: Sample Course Schedule for Students in the Second Year of the Program (Thesis)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 253 - Digital Image Processing	ECE 269 - Linear Algebra	ECE 272A - Dynamic Systems I: Linear Systems
ECE 271A - Statistical Learning I	ECE 276A - Sensing and Estimation in Robotics	ECE 276B - Planning and Learning in Robotics
ECE 299 - Research	ECE 299 - Research	Technical Electives (M.S.)

V. Machine Learning and Data Science Specialization

Pre-requisite courses include ECE: 5, 15, 16, 17, 25, 30, 35, 45, 65, 100, 101, 107, 109

Table 5.1 outlines a recommended course schedule for students to follow during their first year in the Program for the Machine Learning and Data Science Specialization. All courses are 4 credits unless otherwise noted.

Table 5.1: Sample Course Schedule for Students in the First Year of the Program

Fall Quarter	Winter Quarter	Spring Quarter
ECE 171A - Linear Control System Theory	ECE 175A - Elements of Machine Intelligence: Pattern Recognition and Machine Learning	ECE 175B - Elements of Machine Intelligence: Probabilistic Reasoning and Graphical Models
ECE 174 - Introduction to Linear and Nonlinear Optimization with Applications	ECE 172A - Introduction to Intelligent Systems: Robotics and Machine Intelligence	Technical Electives (M.S.)
Technical Electives	ECE 191 - Engineering Group Design Project	Technical Electives (M.S.)
Technical Electives	Technical Electives	Technical Electives (M.S.)

Technical elective (M.S.) courses will count towards the student's UC San Diego M.S. degree requirements, and these credits will not be transferred to NCHU. Courses counted towards the student's NCHU B.S. degree requirements cannot be applied towards UC San Diego M.S. degree requirements.

Table 5.2: Sample Course Schedule for Students in the Second Year of the Program (Comprehensive Exam)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 143 - Programing for Data Analysis	ECE 269 - Linear Algebra	ECE 228 - ML for Physical Applications
ECE 271A - Statistical Learning I	ECE 285 - Special Topics in Signal and Image Processing/Robotics and Control Systems	Technical Electives (M.S.)
ECE 225A - Probability and Statistics for Data Science	ECE 271B - Statistical Learning II	Technical Electives (M.S.)

Tables 5.2 and 5.3 outline the recommended course schedule for students to follow during their second year in the Program for the Machine Learning and Data Science Specialization, with Comprehensive exam and Thesis option.

Table 5.3: Sample Course Schedule for Students in the Second Year of the Program (Thesis)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 299 - Research	ECE 269 - Linear Algebra	ECE 228 - ML for Physical Applications
ECE 271A - Statistical Learning I	ECE 143 - Programing for Data Analysis	ECE 285 - Special Topics in Signal and Image Processing/Robotics and Control Systems
ECE 225A - Probability and Statistics for Data Science	ECE 299 - Research	ECE 273 - Convex Optimization and Applications

VI. Photonics Specialization

Pre-requisite courses include ECE: 5, 15, 25, 30, 35, 45, 65, 100, 101, 103, 107, 109

Table 6.1 outlines a recommended course schedule for students to follow during their first year in the Program for the Photonics Specialization. All courses are 4 credits unless otherwise noted.

Table 6.1: Sample Course Schedule for Students in the First Year of the Program

Fall Quarter	Winter Quarter	Spring Quarter
ECE 182 - Electromagnetic Optics, Guided-Wave, and Fiber Optics	ECE 181 - Physical Optics and Fourier Optics	ECE 183 - Optical Electronics
ECE 185 - Lasers and Modulators	ECE 184 - Optical Information Processing and Holography	Technical Electives (M.S.)
Technical Electives	ECE 191 - Engineering Group Design Project	Technical Electives (M.S.)
Technical Electives	Technical Electives	Technical Electives (M.S.)

Technical elective (M.S.) courses will count towards the student's UC San Diego M.S. degree requirements, and these credits will not be transferred to NCHU. Courses counted towards the student's NCHU B.S. degree requirements cannot be applied towards UC San Diego M.S. degree requirements.

Table 6.2: Sample Course Schedule for Students in the Second Year of the Program (Comprehensive Exam)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 240A - Lasers and Optics	ECE 240B - Optical Information Processing	ECE 240C - Optical Modulation and Detection
ECE 247A - Advanced BioPhotonics	Technical Electives (M.S.)	ECE 241A - Nonlinear Optics
Technical Electives (M.S.)	Technical Electives (M.S.)	ECE 244A - Statistical Optics

Tables 6.2 and 6.3 outline the recommended course schedule for students to follow during their second year in the Program for Photonics Specialization, with Comprehensive exam and Thesis option.

Table 6.3: Sample Course Schedule for Students in the Second Year of the Program (Thesis)

Fall Quarter	Winter Quarter	Spring Quarter
ECE 240A - Lasers and Optics	ECE 240B - Optical Information Processing	ECE 240C - Optical Modulation and Detection
ECE 247A - Advanced BioPhotonics	Technical Electives (M.S.)	ECE 241A - Nonlinear Optics
ECE 299 - Research	ECE 299 - Research	ECE 244A - Statistical Optics