

前瞻半導體研究所
碩士班甲組：奈米元件與製程（簡稱：元件組）
 113 學年度

修業年限	1 年至 4 年為限。
應修學分數	24 學分(含主修組別核心課程至少 6 學分，及專業選修課程至少 12 學分) <small>*核心課程應先滿足 6 學分規定，超過之核心課程學分可列計專業選修學分。</small>
應 修(應選)課程 及符合畢業資格 之修課相關規定	<p>一、論文研討(書報討論)或企業研發實習(限參與本學院的相關企業)課程應加總通過 2 學期，但論文研討(書報討論)、企業研發實習不計入應修學分數 24 學分。</p> <p>二、學術研究倫理教育課程為必修教育課程，採網路教學方式，課程總測驗成績應達及格標準，但不計入應修學分數 24 學分。</p> <p>三、專業核心課程</p> <p style="color: red;">以下專業核心課程，若為「本所開設課程」或「本所專任老師開設課程」，應優先修習方可認列為核心課程學分。若為第二次重修則不在此限。</p> <ol style="list-style-type: none"> 1. 固態物理 2. 量子力學* 3. 半導體物理及元件** 4. 積體電路技術(一) 5. 固態熱力學 6. 複合物半導體元件與製程 7. 電子材料 <p><small>*量子力學(一)等同該科目</small> <small>**半導體元件物理與奈米電晶體等同該科目</small></p> <p>四、專業選修課程</p> <p style="color: red;">由本所或本所專任老師開設的相關領域具代表性的推薦科目列示如下</p> <ol style="list-style-type: none"> 1. 先進奈米電子和自旋電子元件簡介 2. 先進元件製造技術導論(一) 3. 先進元件製造技術導論(二) 4. 積體電路技術(二) 5. 半導體感測器 6. 先進堆疊式奈米結構製作 <p style="color: red;">相關領域具代表性的推薦科目列示如下，具體開課狀況請查詢當學期課表</p> <ol style="list-style-type: none"> 1. 量子物理與元件 2. 矽奈米元件及物理 3. 半導體物理及元件(二) 4. More Than Moore 元件 5. 功率半導體：元件設計、物理特性及可靠度 6. 先進化合物半導體及其應用 7. 半導體材料與元件特性分析 8. 半導體元件可靠度及其失效物理 9. 奈米線與無接面電晶體 10. 功能性材料與元件 11. 三維積體電路 12. 碳化矽製程技術 13. 記憶體元件與製程

14. 二維半導體概論
15. 2D 奈米電子學：材料，物理及其應用
16. 氧化物電子
17. 光電半導體物理及元件
18. 自旋電子元件及磁性記憶體
19. 元件設計與模擬實驗
20. 元件電路計測實驗
21. 半導體實驗
22. 光電子學
23. 基礎量子計算
24. 自旋電子學
25. 類比積體電路
26. 記憶體電路及系統設計
27. 功率積體電路
28. 積體電路與微電子系統之靜電放電防護設計特論
29. 材料分析
30. 薄膜電子材料
31. X 光繞射學
32. 相變化
33. 擴散學
34. 表面分析技術
35. 晶體學
36. 晶體缺陷
37. 材料機械性質
38. 高分子化學
39. 高分子物理
40. 計算材料科學導論
41. 材料物理性質
42. 薄膜工程
43. 材料科學導論
44. 應用電化學
45. 材料工程實驗(p-n junction)
46. 材料測試分析技術原理與應用
47. 電子構裝
48. 電漿物理與製程
49. 電子顯微鏡學
50. 奈影精要(一)
51. 精密儀器概論
52. 本校產學創新研究學院、電機學院、資訊學院、國際半導體學院、工學院和理學院專業研究所課程，且需指導教授同意，方可認列專業選修學分

五、未盡事宜以本所通過之修業規章為準。

Institute of Pioneer Semiconductor Innovation (MS Program)
Area A-Nanodevice and Process Group
(Abbreviated as: Device Group)

Academic Year 2024

Duration of Study	One to Four years
Minimum Credits Required	24 Credits (including at least 6 credits of core courses and 12 credits of required elective courses)
Curriculum and Regulations	<p>I. Students must pass “Seminar” or “R&D Internship” for a total of 2 semesters. Only those R&D Internship programs offered through corporations approved by the Institute will be accredited. Note that these are not counted for the required minimum 24 credits for graduation.</p> <p>II. Students are required to take and pass the online course of Academic and Research Ethics by the end of the first semester of their enrollment. This will not be counted for the required credits for graduation.</p> <p>III. Core Courses (Select a minimum of 2 courses from the list below.) The following core courses, if offered by the institute or taught by full-time faculty members of the institute, must be taken as a priority in order to be counted as core course credits. This requirement does not apply to second retakes.</p> <ol style="list-style-type: none"> 1. Solid State Physics 2. Quantum Mechanics* 3. Semiconductor Physics and Devices** 4. Integrated Circuit Technology 5. Thermodynamics of Solid 6. Intro. to Compound Semiconductor Device & Process 7. Electronic Materials <p>*Quantum Mechanics (I) is equivalent to this subject ** Semiconductor Device Physics and Nanoscale Transistors is equivalent to this subject</p> <p>IV. Required Elective Course (Select a minimum of 4 courses from the list below.) Representative recommended subjects in relevant fields offered by the institute or taught by full-time faculty members of the institute are listed as follows:</p> <ol style="list-style-type: none"> 1. Introduction to Emerging Devices from Nanoelectronics and Spintronics 2. Introduction to advanced device fabrication technology (I) 3. Introduction to advanced device fabrication technology (II) 4. Integrated Circuit Technology (II) 5. Semiconductor Sensors 6. Fabrication of advanced stacked nanostructure <p>Representative recommended subjects in the relevant fields are listed as follows. Please refer to the current semester's course schedule for specific course offerings.</p> <ol style="list-style-type: none"> 1. Quantum Physics and Devices 2. Silicon Nanometer Devices and Physics 3. Semiconductor Physics and Devices (II) 4. More Than Moore Devices 5. Power semiconductor devices: Device design, Characteristics, and Reliability 6. Advanced Compound Semiconductors and Their Applications 7. Semiconductor Material and Device Characterization 8. Reliability and Failure Physics of Semiconductor Devices 9. Nanowire and junction less transistors 10. Functional Materials and Devices

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| | <ol style="list-style-type: none"> 11. 3D Integrated Circuits 12. SiC Process Technology 13. Semiconductor Memories and Their Fabrication Technologies 14. Introduction to 2D Semiconductors 15. 2D Nanoelectronics: Materials, Physics, and Applications 16. Oxide Electronics 17. Optoelectronic Semiconductor Physics and Devices 18. Spintronics Devices and Magnetic Memory 19. Device Design and Simulation Lab 20. Device and Circuit Characterization Laboratory 21. Semiconductor Laboratory 22. Optical Electronics 23. Quantum Computing 24. Spintronics 25. Analog Integrated Circuits 26. Memory Circuits and System 27. Power Integrated Circuits 28. Special Topics on ESD Protection Design in Integrated Circuits and Microelectronic Systems 29. Material Analysis 30. Thin Film Electronic Materials 31. X-ray Diffraction 32. Phase Transformations 33. Diffusion 34. Surface Analysis Techniques 35. Crystallography 36. Defects in Crystals 37. Mechanical Behaviors of Materials 38. Polymer Chemistry 39. Polymer Physics 40. Introduction to Computational Materials Science 41. Physical Properties of Materials 42. Thin Film Technology 43. Introduction to Materials Science 44. Applied Electrochemistry 45. Advanced Materials Labs (p-n junction) 46. Principles and Applications of Materials Characterization Techniques 47. Electronic Packaging 48. Plasma Physics and Process 49. Transmission Electron Microscopy 50. Essence of Nanotechnology (I) 51. Introduction to Advanced Instruments 52. Professional courses offered by the Industry Academia Innovation School, College of Electrical and Computer Engineering, College of Computer Science, the International College of Semiconductor Technology, the College of Engineering, and the College of Science institutes require the approval of the supervising professor for recognition of professional elective credits. <p>V. For additional details, refer to the “Master’s Program Academic Regulations” of the Institute of Pioneer Semiconductor Innovation</p> |
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前瞻半導體研究所

碩士班乙組：晶片設計與自動化（簡稱：晶片組）

113 學年度

修業年限	1 年至 4 年為限。
應修學分數	24 學分(含主修組別核心課程至少 6 學分，及專業選修課程至少 12 學分) *核心課程應先滿足 6 學分規定，超過之核心課程學分可列計專業選修學分。
應修(應選)課程及符合畢業資格之修課相關規定	<ol style="list-style-type: none"> 論文研討(書報討論)或企業研發實習(限參與本學院的相關企業)課程應加總通過 2 學期，但論文研討(書報討論)、企業研發實習不計入應修學分數 24 學分。 學術研究倫理教育課程為必修教育課程，採網路教學方式，課程總測驗成績應達及格標準，但不計入應修學分數 24 學分。 專業核心課程 以下專業核心課程，若為「本所開設課程」或「本所專任老師開設課程」，應優先修習方可認列為核心課程學分。若為第二次重修則不在此限 <ol style="list-style-type: none"> 數位積體電路 計算機結構 記憶體電路及系統設計 類比積體電路 功率積體電路 射頻積體電路 演算法 計算機輔助設計特論 實體設計自動化 專業選修課程 由本所或本所專任老師開設的相關領域具代表性的推薦科目列示如下 <ol style="list-style-type: none"> 進階電子設計自動化 射頻微電子工程 射頻通訊系統放大器設計概論 相關領域具代表性的推薦科目列示如下，具體開課狀況請查詢當學期課表 <ol style="list-style-type: none"> 數位通訊積體電路 數位信號處理超大型積體電路 數位訊號處理 積體電路設計實驗 數位訊號處理 微波電路 高頻電路與設計實驗 自動駕駛系統之深度學習技術 智慧霧運算系統和設計 醫療電子臨床導入 電腦視覺應用 積體電路與微電子系統之靜電放電防護設計特論 資料轉換積體電路 高等數位訊號處理 侵入與非侵入式生醫工程

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| | <ol style="list-style-type: none">16. 生醫影像處理系統17. 太赫茲無線通訊系統18. 生醫電子與系統19. 感測與致動積體電路20. 量子運算21. 波導與元件設計概論22. 人工智慧23. 機器學習24. 深度學習25. 強化學習原理26. 最佳化理論與應用27. VLSI 測試與可測試性設計28. 本校產學創新研究學院、電機學院、資訊學院、國際半導體學院、工學院和理學院專業研究所課程，且需指導教授同意，方可認列專業選修學分。 |
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五.未盡事宜以本所通過之修業規章為準。

Institute of Pioneer Semiconductor Innovation(MS Program)
Area B-Chip Design and Automation Group
(Abbreviated as: Chip Group)

Academic Year 2024

Duration of Study	One to Four years
Minimum Credits Required	24 Credits (including at least 6 credits of core courses and 12 credits of required elective courses)
Curriculum and Regulations	<p>I. Students must pass “Seminar” or “R&D Internship” for a total of 2 semesters. Only those R&D Internship programs offered through corporations approved by the Institute will be accredited. Note that these are not counted for the required minimum 24 credits for graduation.</p> <p>II. Students are required to take and pass the online course of Academic and Research Ethics by the end of the first semester of their enrollment. This will not be counted for the required credits for graduation.</p> <p>III. Core Courses (Select a minimum of 2 courses from the list below.) The following core courses, if offered by the institute or taught by full-time faculty members of the institute, must be taken as a priority in order to be counted as core course credits. This requirement does not apply to second retakes.</p> <ol style="list-style-type: none"> 1. Digital Integrated Circuits 2. Computer Architecture 3. Memory Circuits and System 4. Analog Integrated Circuits (Design) 5. Power Integrated Circuits (Design) 6. Radio-Frequency Integrated Circuits (Design) 7. Algorithms 8. Special Topics in Computer Aided Design 9. Physical Design Automation <p>IV. Required Elective Course (Select a minimum of 4 courses from the list below.) Representative recommended subjects in relevant fields offered by the institute or taught by full-time faculty members of the institute are listed as follows:</p> <ol style="list-style-type: none"> 1. Advanced EDA Topics 2. Radio-Frequency Microelectronics Engineering 3. Introduction to Amplifier Design for Radio-Frequency Communication Applications <p>Representative recommended subjects in the relevant fields are listed as follows. Please refer to the current semester's course schedule for specific course offerings.</p> <ol style="list-style-type: none"> 1. Digital Communication Integrated Circuits 2. VLSI Digital Signal Processing 3. Digital Signal Processing 4. Integrated Circuit Design Laboratory 5. Digital Signal Processing 6. Microwave Circuits 7. High-Frequency Circuit Design and Laboratory 8. Deep Learning Technology for Autonomous Driving Systems 9. Intelligent Fog Computing Systems and Designs 10. Clinical Application of Medical Electronic Devices 11. Computer Vision 12. Special Topic on ESD Protection Design in Integrated Circuits and Microelectronics Systems Data Conversion Integrated Circuits 13. Data Conversion Integrated Circuits

	<ol style="list-style-type: none"> 14. Advanced Digital Signal Processing 15. Invasive and Non-Invasive Biomedical Engineering 16. Biomedical Image Processing Systems 17. THz Wireless Communication System 18. Bio-Medical Circuits and Systems 19. Sensing and Actuating Integrated Circuits 20. Quantum Computing 21. Introduction to Waveguides and Component Design 22. Artificial Intelligence 23. Machine Learning 24. Deep Learning 25. Reinforcement Learning 26. Optimization Theory and Applications 27. VLSI Testing and Design for Testability 28. Professional courses offered by the Industry Academia Innovation School, College of Electrical and Computer Engineering, College of Computer Science, the International College of Semiconductor Technology, the College of Engineering, and the College of Science institutes require the approval of the supervising professor for recognition of professional elective credits. <p>V. For additional details, refer to the “Master’s Program Academic Regulations” of the Institute of Pioneer Semiconductor Innovation.</p>
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前膽半導體研究所(博士班)

113 學年度

修業年限	2 年至 7 年為限。
應修學分數	18 學分(含本所核心課程至少 6 學分，及本所專業選修課程至少 6 學分) *核心課程應先滿足 6 學分規定，超過之核心課程學分可列計專業選修學分。
逕博應修學分數	逕行修讀博士班學位研究生(簡稱逕博生)至少 24 學分。(不包含論文研討、企業研發實習課程、及學位論文研究)
應修(應選)課程及符合畢業資格之修課相關規定	<p>一. 論文研討(書報討論)或企業研發實習(限參與本學院的相關企業)課程應加總通過 2 學期，但論文研討(書報討論)、企業研發實習不計入 18 學分中。</p> <p>二. 應修習並通過本校語言/寫作中心開設之研究生英文課程兩門或(本校)博士班英語能力考核。英文修習可使用第三方公正機構之英文檢定成績來抵免，抵免標準由本所另訂定之。</p> <p>三. 學術研究倫理教育課程為必修教育課程，採網路教學方式，課程總測驗成績應達及格標準，但不計入應修學分數。</p> <p>四. 未盡事宜以本所通過之修業規章為準。</p>

Institute of Pioneer Semiconductor Innovation(Ph.D. Program)

Academic Year 2024

Duration of Study	Two to Seven years
Minimum Credits Required	18 Credits (including at least 6 credits of core courses and least 6 credits of required elective courses)
Minimum Credits Required for Direct Admission without MS Degree	24 Credits (including at least 6 credits of core courses and 12 credits of required elective courses, "Seminar" and "R&D Internship" excluded)
Curriculum and Regulations	<p>I. Students must pass "Seminar" or "R&D Internship" for a total of 2 semesters. Only those R&D Internship programs offered through corporations approved by the Institute will be accredited. Note that these are not counted for the required minimum 18 credits for graduation.</p> <p>II. Students must pass two English courses offered by the Language Teaching and Research Center of the University or the English Proficiency Test. Application for the waiver of English courses may be applied by the students who meet the requirements regulated by the institute for the English Proficiency Test.</p> <p>III. Students are required to take and pass the online course of Academic and Research Ethics by the end of the first semester of their enrollment. This will not be counted for the required credits for graduation.</p> <p>IV. For additional details, refer to the "PhD Program Academic Regulations" of the Institute of Pioneer Semiconductor Innovation.</p>