

前膽半導體研究所碩士班(甲組：半導體材料與構裝)

111 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	<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> <ol style="list-style-type: none"> 1. 固態熱力學 2. 電子構裝 3. 三維積體電路 4. 電漿物理與製程 5. 材料微觀結構分析 6. 半導體物理及元件(一) 7. 複合物半導體元件與製程 8. 半導體製程或微電子積體電路製程 9. 電子顯微鏡學 10. 電子材料 <p>四. 專業選修課程</p> <ol style="list-style-type: none"> 1. More Than Moore 元件 2. X 光繞射學 3. 相變化 4. 擴散學 5. 表面分析技術 6. 材料分析 7. 晶體學 8. 晶體缺陷 9. 材料機械性質 10. 高分子化學 11. 高分子物理 12. 計算材料科學導論 13. 材料物理性質 14. 薄膜工程 15. 材料科學導論 16. 應用電化學 17. 功能性材料與元件 18. 薄膜電子材料 19. 材料工程實驗(p-n junction) 20. 固態物理 21. 固態物理學導論 22. 積體電路技術(一) 23. 半導體實驗 24. 先進化合物半導體及其應用 25. 半導體材料與元件特性分析 26. 半導體元件可靠度及其失效物理

27. 量子力學
 28. 材料測試分析技術原理與應用。
 29. 本組專任、業師、兼任或合聘教師所開設與本組相關之專業研究所課程
- 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 – Semiconductor Material and Packaging
 Academic Year 2022

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.)</p> <ol style="list-style-type: none"> i. Thermodynamics of Solid ii. electronic Packaging iii. 3D Integrated Circuits iv. Plasma Physics & Process v. Microstructural Characterization of Materials vi. Semiconductor Physics and Devices (I) vii. Intro. to Compound Semiconductor Device & Process viii. Semiconductor Processings or VLSI Manufacture Technology ix. Transmission Electron Microscopy x. Electronic Materials <p>IV. Required Elective Course (Select a minimum of 4 courses from the list below.)</p> <ol style="list-style-type: none"> i. More Than Moore Devices ii. X-ray Diffraction iii. Phase Transformations iv. Diffusion v. Surface Analysis Techniques vi. Material Analysis vii. Crystallography viii. Defects in Crystals ix. Mechanical Behaviours of Materials x. Polymer Chemistry xi. Polymer Physics xii. Introduction Computational Materials Science xiii. Physical Properties of Materials xiv. Thin Film Technology xv. Introduction to Materials Science xvi. Applied Electrochemistry xvii. Functional Material and Devices xviii. Thin Film Electronics Materials xix. Advanced Materials Labs. (p-n junction)

- xx. Solid State Physics
- xxi. Introduction to solid state physics
- xxii. Integrated Circuit Technology (I)
- xxiii. Semiconductor Laboratory
- xxiv. Advanced Compound Semiconductors and Their Applications
- xxv. Semiconductor Material and Device Characterization
- xxvi. Reliability and Failure Physics of Semiconductor Devices
- xxvii. Quantum Mechanics
- xxviii. Principles and Applications of Materials Characterization Techniques
- xxix. For other courses that are not listed above, consult with the administrative staff of the institute for approval.

V. For additional details, refer to the “Master’s Program Academic Regulations” of the Institute of Pioneer Semiconductor Innovation

前膽半導體研究所碩士班(乙組：半導體元件與製程)

111 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	<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> <ol style="list-style-type: none"> 1. 半導體製程或積體電路技術 (一) 2. 半導體物理及元件(一) 3. 固態物理或固態物理學導論 4. 量子力學 <p>四. 專業選修課程</p> <ol style="list-style-type: none"> 1. 半導體實驗 2. 半導體物理及元件(二) 3. 複合物半導體元件與製程 4. 先進化合物半導體及其應用 5. 半導體材料與元件特性分析 6. 半導體元件可靠度及其失效物理 7. 積體電路技術 (二) 8. 元件電路計測實驗 9. 固態理論 10. 矽奈米元件及物理 11. 記憶體元件與製程 12. 功率半導體：元件設計、物理特性及可靠度 13. 碳化矽製程技術 14. More Than Moore 元件 15. 元件設計與模擬實驗 16. 二維半導體概論 17. 2D 奈米電子學：材料，物理及其應用 18. 氧化物電子 19. 基礎量子計算 20. 自旋電子學 21. 功能性材料與元件 22. 類比積體電路 23. 記憶體電路及系統設計 24. 功率積體電路 25. 奈影精要 (一) 26. 薄膜電子材料 27. 精密儀器概論 28. 光電子學 29. 量子物理與元件 30. 三維積體電路 31. 積體電路與微電子系統之靜電放電防護設計特論 32. 光電半導體物理及元件

	<p>33. 材料分析</p> <p>34. 自旋電子元件及磁性記憶體</p> <p>35. 奈米線與無界面電晶體</p> <p>36. 本組專任、業師、兼任或合聘教師所開設與本組相關之專業研究所課程</p> <p>五. 本組碩士新生，若大學未修過「近代物理」、「量子力學」、「量子化學」、「量子物理」、「固態物理」其中之一者，均需補修大學部的「近代物理」、「量子力學」、「固態物理」其中一門課程，並提出申請。</p> <p>六. 未盡事宜以本所通過之修業規章為準</p>
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Institute of Pioneer Semiconductor Innovation
MS Program
Area B – Semiconductor Device and Processing
 Academic Year 2022

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.)</p> <ol style="list-style-type: none"> 5. Semiconductor Processings or Integrated Circuit Technology (I) 6. Semiconductor Physics and Devices (I) 7. Solid State Physics or Introduction to solid state physics 8. Quantum Mechanics <p>IV. Required Elective Course(Select a minimum of 4 courses from the list below.)</p> <ol style="list-style-type: none"> i. Semiconductor Laboratory ii. Semiconductor Physics and Devices (II) iii. Intro. to Compound Semiconductor Device & Process iv. Advanced Compound Semiconductors and Their Applications v. Semiconductor Material and Device Characterization vi. Reliability and Failure Physics of Semiconductor Devices vii. Integrated Circuit Technology (II) viii. Device and Circuit Characterization Laboratory ix. Solid State Theory x. Silicon Nanometer Devices and Physics xi. Semiconductor Memories and Their Fabrication Technologies xii. Power semiconductor devices: Device design, Characteristics, and Reliability xiii. SiC Process Technology xiv. More Than Moore Devices xv. Device Design and Simulation Lab. xvi. Introduction to 2D Semiconductors xvii. 2D nanoelectronics: Materials, Physics, and Applications xviii. Oxide Electronics

- xix. Quantum Computing
- xx. Spintronics
- xxi. Functional Materials and Devices
- xxii. Analog Integrated Circuits
- xxiii. Memory Circuits and System
- xxiv. Power Integrated Circuits
- xxv. Essence of Nanolithography (I)
- xxvi. Electronic Materials
- xxvii. Introduction to Advanced Instruments(I)
- xxviii. Optical Electronics
- xxix. Quantum Physics and Devices
- xxx. 3D Integrated Circuits
- xxxi. Special Topic on ESD Protection Design in Integrated Circuits and Microelectronics Systems
- xxxii. Semiconductor Optoelectronic Devices and Physics
- xxxiii. Materials Analysis
- xxxiv. Spintronics Devices and Magnetic Memory
- xxxv. Nanowire and junctionless transistors
- xxxvi. For other courses that are not listed above, consult with the administrative staff of the institute for approval.

V. Students admitted into this area must have passed one of the following courses including: "Modern Physics", "Quantum Mechanics", "Quantum Chemistry", "Quantum Physics", and "Solid State Physics" during their undergraduate study. If not, they must pass one of the following courses in undergraduate level:

- i. Modern Physics
- ii. Quantum Mechanics
- iii. Solid State Physics

VI. For additional details, refer to the "Master's Program Academic Regulations" of the Institute of Pioneer Semiconductor Innovation.

前膽半導體研究所碩士班(丙組：積體電路設計)

111 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	<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(Digital IC/EDA 領域)</p> <ol style="list-style-type: none"> 1. 數位積體電路 2. 數位通訊積體電路 3. 計算機結構 4. 數位信號處理超大型積體電路 5. 實體設計自動化 6. 計算機輔助設計特論 7. 數位訊號處理 8. 積體電路設計實驗 <p>四. 專業核心課程(Analog/RF IC 領域)</p> <ol style="list-style-type: none"> 1. 類比積體電路 2. 數位訊號處理 3. 射頻積體電路 4. 功率積體電路 5. 記憶體電路及系統設計 6. 微波電路 7. 高頻電路與設計實驗 <p>五. 專業選修課程</p> <ol style="list-style-type: none"> 1. 自動駕駛系統之深度學習技術 2. 智慧霧運算系統和設計 3. 醫療電子臨床導入 4. 電腦視覺應用 5. 積體電路與微電子系統之靜電放電防護設計特論 6. 資料轉換積體電路 7. 高等數位訊號處理 8. 侵入與非侵入式生醫工程 9. 生醫影像處理系統 10. 太赫茲無線通訊系統 11. 生醫電子與系統 12. 感測與致動積體電路 13. 量子運算 14. 波導與元件設計概論 15. 射頻通訊系統放大器設計概論 16. 本組專任、業師、兼任或合聘教師所開設與本組相關之專業研究所課程 <p>六. 未盡事宜以本所通過之修業規章為準</p>

Institute of Pioneer Semiconductor Innovation
MS Program
Area C – Integrated Circuit Design
Academic Year 2022

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 for Digital/EDA Major (Select a minimum of 2 courses from the list below.)</p> <ol style="list-style-type: none"> i. Digital Integrated Circuits ii. Digital Communication Integrated Circuits iii. Computer Architecture iv. VLSI Digital Signal Processing v. Physical Design Automation vi. Special Topics in Computer Aided Design vii. Digital Signal Processing viii. Integrated Circuit Design Laboratory <p>IV. Core Courses for Analog/RF IC Major (Select a minimum of 2 courses from the list below.)</p> <ol style="list-style-type: none"> i. Analog Integrated Circuits ii. Digital Signal Processing iii. Radio-Frequency Integrated Circuits iv. Power Integrated Circuits v. Memory Circuits and System vi. Microwave Circuits vii. High-Frequency Circuit Design and Laboratory <p>V. Required Elective Course(Select a minimum of 4 courses from the list below.)</p> <ol style="list-style-type: none"> i. Deep learning technology for autonomous driving systems ii. Intelligent Fog Computing Systems and Designs iii. Clinical Application of Medical Electronic Devices iv. Computer Vision v. Special Topic on ESD Protection Design in Integrated Circuits and Microelectronics Systems vi. Data Conversion Integrated Circuits vii. Advanced Digital Signal Processing viii. Invasive and Non-Invasive Biomedical Engineering ix. Biomedical Image Processing Systems x. THz Wireless Communication System xi. Bio-Medical Circuits and Systems xii. Sensing and Actuating Integrated Circuits xiii. Quantum Computing xiv. Introduction to Waveguides and Component Design xv. Introduction to Amplifier Design for Radio-Frequency Communication

Applications

xvi. For other courses that are not listed above, consult with the administrative staff of the institute for approval.

VI. For additional details, refer to the “Master’s Program Academic Regulations” of the Institute of Pioneer Semiconductor Innovation.

前膽半導體研究所博士班

111 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 2022

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>