國立陽明交通大學半導體工程學系跨域學程實施要點

NYCU Cross-disciplinary Program Implementation Guidelines for Department of Microelectronics

113 年 4 月 8 日半導體工程學系籌備處第一次系務籌備會議通過
113 年 4 月 11 日電機學院課程委員會議通過
113 年 5 月 20 日校課程委員會議通過

一、依據國立陽明交通大學跨域學程實施辦法，國立陽明交通大學半導體工程學系(簡稱本系)課程規劃以跨領域學習為主軸，為鼓勵學生再建立及增加跨域學習深度，提供學生可以在畢業學分不增加(或僅少量增加)情況下，修畢跨域學程，特訂定本實施要點。

Article One The guidelines are set up for Department of Microelectronics (hereinafter referred to as Our Department) of National Yang Ming Chiao Tung University in accordance with NYCU Cross-disciplinary Program Implementation Regulations. These guidelines provide the opportunity for students to proceed cross-disciplinary learning without increasing graduate credits (or only a few extra credits) as well as encourage students to conduct cross-disciplinary studies, build the depth of cross-disciplinary studies, and assist students expanding second specialties.

二、 依據國立陽明交通大學跨域學程實施辦法，跨域學程係指由陽明交通大學的學系、研究所、或學院提出模組課程，模組課程應包含該領域基礎核心知識，且總學分數以30學分為原則(最低可為28學分，最高不可超過32學分)，學生修習跨域學程，其課程將包含所屬學系的跨域學程模組課程以及第二專長系所或學院的跨域學程模組課程，並可於畢業證書上加註第二專長模組課程為跨域專長。

Article Two The cross-disciplinary program here means the cross-disciplinary module curriculum proposed by departments, institutes, or colleges of NYCU. In general, module curriculum should include the core knowledge curriculum of the field and the total credits will be based on 30 credits (28 credits the minimum and no more than 32 credits). The cross-disciplinary program that students take will include the cross-disciplinary program module curriculum of the department students are from (hereinafter refer to the original department) as well as the cross-disciplinary program module curriculum from the second specialty department or college. The name of module curriculum of the second specialty could be remarked as “cross-disciplinary specialty” on the diploma.

三、 本要點修業規定

Article Three Policies of these Guidelines

1. 本系學生欲修習跨域學程者：

1.For students of our department who would like to take cross-disciplinary program

(1) 得於每學年度公告申請期限內向本系提出申請，申請時註明欲申請的第二專長系所或學院，申請期限將由本系課程委員會提前一個月進行公告，公告中說明需準備的審查資料以及當年度本系開放給本系學生修讀跨域學程的名額，申請案經本系課程委員會審查通過後，需送到第二專長系所或學院審查，通過雙邊審查後，方可進入跨域學程。

(1). The application can be submitted to our department by the deadline announced by faculty

every year. The department or college of the second specialty that the student would like to apply for must be remarked on the application form, and the application deadline would be announced one month in advance by the Curricular Committee at our department. The documents needed to be prepared as well as the quota available for the students of our department in the given year will be released on the announcement. The application should be sent to the department or college of the second specialty for evaluation after it is approved by the Curricular Committee at our department. Students could take the cross-disciplinary program after evaluation by both sides.

(2) 本系學生修習跨域學程的課程，列示於「半導體工程學系跨域學程本系學生必修科目表(A)」，其課程包含：校必修(含共同必修)、本系基礎必修課程、本系跨域模組課程、以及第二專長系所或學院的跨域模組課程(以下簡稱他系跨域模組課程)，畢業學分以 130 學分為原則。他系跨域模組課程認定為跨域專長，於畢業證書本系名稱後加註此跨域專長。

(2). The courses of cross-disciplinary program taken by students in our department should be listed on "The Required Course List for the students at our department study cross-disciplinary program in Department of Microelectronics." The courses include required courses of the university (including general education subjects), core curriculum at our department, cross-disciplinary module curriculum at our department, and the cross-disciplinary module curriculum of the second specialty department or college (hereinafter referred to as cross-disciplinary module curriculum at other department) with at least 130 graduate credits. The cross-disciplinary module curriculum at other department would be recognized as cross-disciplinary specialty, and the name of the cross-disciplinary program will be remarked after the title of our department on the diploma.

(3) 本系學生修習跨域學程，若無法修畢跨域學程課程，得選擇放棄跨域學程，改修習原半導體工程學系組別之學士學位課程。

(3). For students at our department who study for cross-disciplinary program but are not able to complete the program, they shall give up the cross-disciplinary program and take credits of bachelor degree program at their original department, Department of Microelectronics category.

2. 外系學生欲修習跨域學程且選擇本系做為其跨域專長者

2. For students from other departments who would like to study for cross-disciplinary program and choose our department as their cross-disciplinary specialty

(1) 僅開放申請本系「奈米科學組」跨域學程。

(1). The interdisciplinary program is only open to applicants from our department's " Program of Nano-Sciences ".

(2) 得於每學年度公告申請期限內向其所屬學系（以下簡稱原系），通過原系以及本系的雙邊審查後，方可進入跨域學程。。

(2). They could submit the application to the department that they belong to by the deadline announced by faculty every year, and they could take the cross-disciplinary program after approved by both their original department and our department.

(3) 外系學生修讀跨域學程且選擇本系做為其跨域專長者，其課程包含：原系要求之校必修(含共同必修)、原系基礎必修課程及跨域模組課程，以及列示於「半導體工程學系

奈米科學組跨域模組課程必修科目表（B）」的模組課程，畢業學分達到原系要求，並於畢業證書原系名稱後加註**奈米科技**為其跨域專長。

(3). The courses for the students from other departments who would like to take cross-disciplinary program and choose our department as their cross-disciplinary specialty include original department required courses of the university (including general education subjects), core curriculum at their original department, cross-disciplinary module curriculum at their original department, and the module curriculum listed on "The Required Course List (B). The graduate credits for the students study cross-disciplinary module curriculum in Department of Microelectronics Program of Nano-Sciences" should meet the graduate credits of original department requirements. The name "Nano Technology" will be remarked as their cross-disciplinary specialty after the title of their original department on the diploma.

四、 本系指定至少一名專任教師擔任跨域學程導師，與外系所或學院的跨域學程導師組成導師群，專責輔導跨域學程的學生。

Article Four　Our department assigned one full-time teacher to be the mentor of the cross-disciplinary program and formed mentor group with teachers of cross-disciplinary program from other department or college to give guidance to cross-disciplinary program students.

五、為鼓勵不同系所或學院合作提出跨域共授課程，由兩位以上教師開授跨領域之創新整合式課程，得依本校教師授課時數核計原則規定辦理。

Article Five　In order to encourage different departments or colleges to working together to design cross-disciplinary curriculum, teaching hours for the innovative cross-disciplinary curriculum offered by more than two teachers could be calculated according to National Yang Ming Chiao Tung University Principles for Verifying and Calculating Teachers' Teaching Hours.

六、本要點如有未盡事宜，悉依本校學則及其他相關規定辦理。

Article Six　If there is any unaccomplished matter of these guidelines, it shall be handled in accordance with the school constitution of our university as well as other relevant regulations.

七、本要點經校級課程委員會通過後實施，修訂時亦同。

Article Seven　These guidelines were approved by Curricular Committee at the university level before putting them it into practice; the same shall be done upon any amendment thereto.

半導體工程學系「跨域學程」本系學生必修科目表(A)

The Required Courses List for the students at our department who study Cross-disciplinary Program in Department of Microelectronics

【固態電子組】Solid-State Electronics

類別 Category	科目名稱 Course Title	學分 Credit	備註 Remarks
本系基礎必修 （50 學分） Fundamental Required Course (50 credits)	物理(一)(二) Physics	8	
	物理實驗(一) (二) Physics Labs.	2	
	化學(一)(二) Chemistry	6	
	微積分(一)(二) Calculus	8	
	生涯規劃與導師時間 Career Planning and Mentor’s Hours	0	
	線性代數 Linear Algebra	3	
	計算機概論與程式設計 Introduction to Computers and Programming	3	
	半導體科技-基礎服務學習 Semiconductor Technology -Foundational Service Learning	0	需修畢通過二門「基礎服務學習課程」或一門「專業服務學習課程」 either 2 Basic Service-learnings or 1 Professional Service-learning should be passed
	半導體科技-專業服務學習 Semiconductor Technology -Professional Service Learning	0	
	電路學 Circuit Theory	3	
	電子學(一) (二) Electronics Ⅱ	6	
	電磁學(一) Electromagnetics Ⅰ	3	
	近代物理 Modern Physics	3	
	電子實驗(一) (二) Electronics Labs	4	
	學士專題研究(一) Special Project (b.s.) Ⅰ	1	
本系跨域模組 （28 學分） Cross-disciplinary Module (28 credits)	微分方程 Differential Equations	3	
	電磁學 (二) Electromagnetics Ⅱ	3	
	機率與統計 Probability and Statistics	3	
	半導體元件物理 Semiconductor Device Physics	3	
	量子力學導論 Introduction to Quantum Mechanics	3	
	半導體實驗	2	

	Semiconductor Laboratory		
	固態物理(一) Solid State Physics(I)	3	
	學士專題研究(二) Special Project (b.s.) Ⅱ	1	
	專業選修：至少 7 學分。 7 credits at least from the courses in Appendix 1	7	詳見附表一固態電子組專業選修表列課程 Please refer to Appendix 1 for the list of professional elective courses for the Program of Solid-State Electronics.
他系跨域模組 (依他系學分數規定) Cross-disciplinary modules at other department (28-32 credits)	本校各系所或學院所提供之跨域模組學程，擇一修畢 Complete one cross-disciplinary modules offered by departments or colleges at our university	28	
校共同必修 Common Required Courses			校訂共同科目依照本校相關規定。 Common required courses should follow the university regulations.
最低畢業學分(合計) Minimum Credits for Graduation		130	

【奈米科學組】Nano Technology

類別 Category	科目名稱 Course Title	學分 Credit	備註 Remarks
本系基礎必修 （51 學分） Fundamental Required Course (51 credits)	物理(一)(二) Physics	8	
	物理實驗(一) (二) Physics Labs.	2	
	化學(一)(二) Chemistry	6	
	化學實驗 Chemistry Labs.	1	
	微積分(一)(二) Calculus	8	
	生涯規劃與導師時間 Career Planning and Mentor’s Hours	0	
	線性代數 Linear Algebra	3	
	普通生物學實驗 General Biology Lab.	1	
	半導體科技-基礎服務學習 Semiconductor Technology -Foundational Service Learning	0	需修畢通過二門「基礎服務學習課程」或一門「專業服務學習課程」 either 2 Basic Service-learning or 1 Professional Service-learning should be passed
	半導體科技-專業服務學習 Semiconductor Technology -Professional Service Learning	0	
	有機化學 Organic Chemistry	3	

	計算機概論與程式設計 Introduction to Computers and Programming	3	
	電子學(一) (二) Electronics Ⅱ	6	
	電磁學(一) Electromagnetics Ⅰ	3	
	電子實驗(一) Electronics Lab. Ⅰ	2	
	近代物理 Modern Physics	3	
	生物化學(一) Biochemistry Ⅰ	2	
本系跨域模組 （29 學分） Cross-disciplinary Module (29 credits)	微分方程 Differential Equations	3	
	電磁學 (二) Electromagnetics Ⅱ	3	
	普通生物學 General Biology	3	
	材料科學與工程導論 Introduction to Materials Science and Engineering	3	
	奈米科技導論 Int. to Nano Science	3	
	奈米科學與工程實驗 Nano Science and Engineering Lab.	1	
	學士專題研究(一)(二) Special Project (b.s.)	2	
	生物化學(二) Biochemistry Ⅱ	2	
	專業選修：奈米電子領域、奈米光電領域、奈米材料領域及奈米生科領域擇一領域修讀，至少 7 學分。 7 credits at least from the courses in Appendix 2	7	詳見附表二奈米科學組專業選修領域表列課程 Appendix 2 for Professional Elective Field Course List for Program of Nano-Sciences
他系跨域模組 (依他系學分數規定) Cross-disciplinary modules at other department (28-32 credits)	本校各系所或學院所提供之跨域模組學程，擇一修畢 Complete the cross-disciplinary modules offered by departments or colleges at our university.	28	
校共同必修 Common Required Courses			校訂共同科目依照本校相關規定。 Common required courses should follow the university regulations.
最低畢業學分(合計) Minimum Credits for Graduation		130	

半導體工程學系奈米科學組「跨域學程」他系學生必修科目表(B)

The Required Courses List for the students at our department study Cross-disciplinary Program in Department of Microelectronics Program of Nano-Sciences

類別 Category	科目名稱 Course Title	學分 Credit	備註 Remarks
本系跨域模組 （30 學分） Cross-disciplinary courses at our department (30 credits)	微分方程 Differential Equations	3	
	普通生物學 General Biology	3	
	材料科學與工程導論 Introduction to Materials Science and Engineering	3	
	電子學(一) Electronics Ⅰ	3	
	電子實驗(一) Electronics Lab. Ⅰ	2	
	近代物理 Modern Physics	3	
	奈米科技導論 Int. to Nano Science	3	
	學士專題研究(一) (二) Special Project (b.s.)	2	
	生物化學(一)(二) Biochemistry	4	
	奈米科學與工程實驗 Nano science and engineering Lab.	1	
	專業領域列表課程，至少選修 3 學分 Courses from the list of professional field, at least 3 credits must be chosen	3	詳見附表二奈米科學組專業選修領域表列課程 Appendix 2 for Professional Elective Field Course List for Program of Nano-Sciences
總學分 Total Credits		30	

附表一 Appendix 1

固態電子組專業選修表列課程

Professional elective course list for the Program of Solid-State Electronics

	科目 Course Name	學分 Credit
1	邏輯設計 Logic Design	3
2	材料科學與工程導論 Introduction to Materials Science and Engineering	3
3	訊號與系統 Signals and Systems	3
4	複變函數 Complex Variables	3
5	數位電路與系統 Digital Circuits and Systems	3
6	半導體物理/半導體基礎理論 Semiconductor Physics /Fundamentals of Semiconductors	3
7	超大型積體電路設計導論 Introduction to VLSI Design	3
8	積體電路設計實驗 Integrated Circuit Design Laboratory	3
9	類比積體電路導論 Introduction to Analog Integrated Circuits	3
10	類比積體電路實驗 Analog Integrated Circuits LAB	3
11	半導體工程 Semiconductor Engineering	3
12	晶體結構與繞射導論 Introduction to Crystallography and Diffraction	3
13	化合物半導體元件與製程 Intro. to Compound Semiconductor Device & Process	3
14	專題研究(三) Independent Study (III)	1
15	固態物理(二) Solid State Physics (II)	3
16	電子材料 Electronic Materials 或 尖端半導體材料 Advanced Semiconductor Materials	3
17	積體電路技術(一) Integrated Circuit Technology (I)	3
18	元件電路計測實驗 Device and Circuit Characterization Laboratory	3
19	積體電路技術(二) Integrated Circuit Technology (II)	3
20	熱力學/熱物理/材料熱力學 Thermodynamics	3

附表二 Appendix 2

奈米科學組專業選修表列課程

Professional Elective Field Course List for Program of Nano-Sciences

	科目 Course Name	學分 Credit	領域 Areas
1	量子力學導論 Introduction to Quantum Mechanics	3	【奈米電子領域】 Nanoelectronics
2	固態物理(一) Solid State Physics (I)	3	
3	固態物理(二) Solid State Physics (II)	3	
4	半導體元件物理 Semiconductor Device Physics	3	
5	半導體工程 Semiconductor Engineering	3	
6	矽奈米元件及物理 Silicon Nanometer Devices and Physics	3	
7	奈米製造與量測技術 Nanofabrication and Characterization	3	
8	奈影精要 Essence of Nanolithography	2	
9	機率或機率與統計 Probability or Probability and Statistics	3	
10	複變函數 Complex Variables	3	
11	數值分析 Numerical Analysis	3	
12	熱物理 Thermal Physics	3	
13	類比積體電路導論 Introduction to Analog Integrated Circuits	3	
14	半導體實驗 Semiconductor Laboratory	2	
1	固態物理(一)或固態物理導論 Solid State Physics (I) or Introduction to Solid State Physics	3	【奈米光電領域】 Nanophotonics
2	光學概論(一) Introduction to Optics(I)	3	
3	光學概論(二) Introduction to Optics(II)	3	
4	半導體元件物理 Semiconductor Device Physics	3	
5	奈米製造與量測技術 Nanofabrication and Characterization	3	
6	近代物理(二) Modern Physics (II)	3	
7	量子力學導論 Int. to Quantum Mechanics	3	
8	雷射導論 Int. to Laser	3	
9	熱物理 Thermal Physics	3	
10	光電子學或光電子學(一)或光電子學(二) Optical Electronics	3	
11	電動力學(一) Electrodynamics (Ⅰ)	3	
12	電動力學(二) Electrodynamics (II)	3	
13	量子光學 Quantum Optics	3	
14	富氏光學或材料光學 Fourier Optics or The Optical Properties of Materials	3	
15	光學實驗 Optics Lab	2	

	科目 Course Name	學分 Credit	領域 Areas
1	材料熱力學(一) Thermodynamics of Materials (I)	3	【奈米材料領域】 Nanomaterials
2	材料熱力學(二) Thermodynamics of Materials (II)	3	
3	物理化學 Physical Chemistry	3	
4	金屬材料 Metal Materials	3	
5	電子材料 Electronic Materials	3	
6	陶瓷材料 Ceramics Materials	3	
7	高分子材料科學 Polymer Materials Science	3	
8	表面分析技術 Surface Analysis Techniques	3	
9	材料微觀結構分析 Microstructural Characterization of Materials	3	
10	物理冶金(一) Physical Metallurgy (I)	3	
11	物理冶金(二) Physical Metallurgy (II)	3	
12	晶體結構與繞射導論 Introduction to Crystallography and Diffraction	3	
13	奈米材料與簡介 Int. to Nanostructured Materials	3	
1	微生物學 Microbiology	3	【奈米生科領域】 Nano-biological science and technology
2	分子生物學 Molecular Biology	3	
3	生物資訊應用 Bioinformatics	3	
4	細胞生物學(一) Cell Biology (I)	2	
5	細胞生物學(二) Cell Biology(II)	2	
6	遺傳學 Genetics	3	
7	免疫學 Immunology	3	
8	生物光譜學 Biospectroscopy	2	
9	蛋白質物理生化學 Physical Biochemistry of Protein	3	
10	生物機器學習 Machine Learning in Computational Biology	3	
11	組織光學 Tissue Optics	3	
12	有機化學(二) Organic Chemistry (II)	3	
13	生理學(一) Physiology (I)	2	
14	生理學(二) Physiology (II)	2	
15	神經生物學(一) Neurobiology (I)	2	
16	神經生物學(二) Neurobiology (II)	2	
17	計算生物概論 Introduction to Computational Biology	2	