

# 國立交通大學材料科學與工程學系跨域學程實施要點

National Chiao Tung University

Cross-disciplinary Program Implementation Guidelines for

Department of Materials Science and Engineering

22.03.2016系課程委員會訂定

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- 一、依據國立交通大學跨域學程實施辦法，國立交通大學材料科學與工程學系(以下簡稱本系)為鼓勵學生進行跨領域學習，建立跨域學習深度，協助學生拓展第二專長，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，特訂定本要點。

The guidelines are set up for Department of Materials Science and Engineering (hereinafter refer to as Our Department) of National Chiao Tung University in accordance with NCTU Cross-disciplinary Program Implementation Regulations to provide the opportunity for students to proceed cross-disciplinary learning without increasing graduate credits (or only a few extra credits) in order to encourage students to conduct cross-disciplinary studies, build the depth of cross-disciplinary studies, and assist students to expand second specialties.

- 二、跨域學程係指由交通大學的學系、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學系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。

The cross-disciplinary program here means the cross-disciplinary module curriculum proposed by departments, institutes or colleges of NCTU. Module curriculum should include the core knowledge curriculum of the field and the total credits will be based on 30 credits (the minimum 28 credits and no more than 32 credits). The cross-disciplinary program that students take will include the cross-disciplinary program module curriculum of the department they 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 module curriculum of the second specialty could be remarked as “cross-disciplinary specialty” on the diploma.

- 三、本系設置「材料科學與工程」跨域學程，同時，本系與電子物理學系以及光電工程學系共同設置「三一學程」跨域學程，此兩個跨域學程的修業規定分別規範於第四點。

Our Department launches two cross-disciplinary programs. One is 「**Materials Science and Engineering**」 cross-disciplinary program, the other is 「Three-in-one」 cross-disciplinary program formed by Our Department , Department of Electrophysics, and Department of

photonics. The guidelines of the two cross-disciplinary programs are given in Article Four.

#### 四、本要點修業規定

Policies of these Guidelines

##### (一) 本系學生欲修習跨域學程者

Students of our department who would like to study for cross-disciplinary program

1. 得於大一下學期或大二下學期向本系提出申請，申請時註明欲申請的第二專長學系或學院，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，需送到第二專長學系或學院審查，通過雙邊審查後，方可進入跨域學程。

Students can submit their applications with the department or college of the second specialty they wish to apply in the 2<sup>nd</sup> semester of freshman or sophomore year.

Application deadline shall be announced along with materials required for verification and available numbers for students from our department of that year one month earlier by curriculum committee of our department. The application shall be submitted to the department or college of the second specialty for review after being verified by curriculum committee of our department; students can only enroll in the cross-disciplinary program once they pass both reviews.

2. 本系學生修習跨域學程的課程，列示於『材料科學與工程學系跨域學程本系學生必修科目表』，其課程包含：校必修(含共同必修28學分)，本系基礎必修課程，本系跨域模組課程，以及第二專長學系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129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。

Curriculum of cross-disciplinary program for students from our department is listed in “Compulsory courses list of cross-disciplinary program for students from Department of Materials Science and Engineering”. The curriculum must include compulsory courses at the university (including 28 credits of common compulsory), core curriculum of our department, cross-disciplinary program module curriculum of our department, and the cross-disciplinary program module curriculum of the second specialty department or college (hereinafter refer to as cross-disciplinary program module curriculum of other departments). The graduate credit needed for this cross-disciplinary program is at the basis of 129 credits. The module curriculum of the cross-disciplinary program of other departments will be recognized as cross-disciplinary specialty and be remarked on the diploma after the original department.

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，改修習原學系的學士學位課程。

If the student from our department is not able to finish his/her cross-disciplinary program, he/she could give up this program and take the undergraduate honors program of the original department instead.

(二) 外系學生欲選擇「材料科學與工程」跨域學程做為其跨域專長者

For students of other departments who would like to take 「**Materials Science and Engineering**」 cross-disciplinary program as their cross-disciplinary specialty.

- (1) 得於大一下學期或大二下學期向其所屬學系（以下簡稱原系）提出申請，通過原系以及本系的雙邊審查後，方可進入跨域學程。

Students can submit application to the department they are from (hereinafter refer to the original department) in the 2<sup>nd</sup> semester of freshman or sophomore year; students can only enroll in the cross-disciplinary program after they pass both reviews of the original department and our department.

- (2) 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：校必修(含共同必修28學分)，原系基礎必修課程，原系跨域模組課程，以及列示於『材料科學與工程學系跨域模組課程必修科目表』的模組課程，畢業學分以128學分為原則，並於畢業證書原系名稱後加註材料科學與工程為其跨域專長。

For students from other departments who would like to study for cross-disciplinary program and choose our department as his/her cross-disciplinary specialty, the curriculum must include compulsory courses at the university (including 28 credits of common compulsory), core curriculum of the original department, cross-disciplinary module curriculum of the original department, and module curriculum listed in “Compulsory courses list of cross-disciplinary module curriculum for Department of Materials Science and Engineering”. The graduate credit needed for this cross-disciplinary program is at the basis of 128 credits and Materials Science and Engineering could be remarked as “cross-disciplinary specialty” on the diploma after the original department.

(三) 本系或外系學生欲選擇三一學程做為其跨域專長者

For student who would like to take 「Three-in-one」 cross-disciplinary program as their cross-disciplinary specialty.

- (1) 得於大一下學期或大二下學期向其所屬學系（以下簡稱原系）提出申請，通過原系以及三一學程系群的雙邊審查後，方可進入跨域學程。

They could submit the application to the department that they belong to during the second semester of the first year or the second semester of the second year, they could only take the cross-disciplinary program after approved by both their

original department and the committee of 「Three-in-one」 program.

- (2) 學生修讀跨域學程且選擇本學程做為其跨域專長者，其課程包含：校必修(含共同必修28學分)，原系基礎必修課程，原系跨域模組課程，以及列示於『三一學程(電子物理系，光電工程學系，材料工程學系) 跨域模組課程 必修科目表』的模組課程，畢業學分以128學分為原則，並於畢業證書原系名稱後加註『三一學程(電子物理/光電/材料)』為其跨域專長。

The courses for the students who would like to study for cross-disciplinary program and choose 「Three-in-one」 program as their cross-disciplinary specialty include required courses of the university (including 28 credits of 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 for the students study cross-disciplinary module curriculum in 「Three-in-one」 program” with at least 128 graduate credits. The 「Three-in-one (Electrophysics/Photonics/Material)」 will be remarked as their cross-disciplinary specialty after the title of their original department on the diploma.

- 五、本系指定一名專任教師擔任跨域學程導師，與外學系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。

Our department assigns a full-time faculty member as the mentor of cross-disciplinary program and form mentor groups with mentors from cross-disciplinary program of original departments or colleges to give guidance to the students in this program.

- 六、為鼓勵不同學系或學院合作提出跨域共授課程，兩位以上教師開授跨領域之創新整合式課程，得依本校教師授課鐘點核計原則第9條第6款規定，教師的授課鐘點數可按到場時數計，但以開課前該門課程實際簽呈為依據。

In order to encourage different departments or colleges working together for the proposal of cross-disciplinary curriculum, the number of teaching hours for the innovating integrated curriculum offered by more than two teachers could be calculated by the actual time of teaching according to Subparagraph 6, Article 9 of National Chiao Tung University Teaching Hours Accounting Principle; however, it will be in accordance with the official approval of the curriculum before the course starts.

- 七、本要點如有未盡事宜，悉依本校學則及其他相關規定辦理。

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

- 八、本要點經校級課程委員會通過並提教務會議核備後實施，修訂時亦同。

The guideline is approved by school-level curriculum committee and submitted to Academic Affairs Meeting for approval reference before putting it into practice, and shall do the same upon any amendment thereto.

料科學與工程學系跨域學程 本系學生 必修科目表 (A)

Cross-disciplinary Program for Students from Department of Materials Science and Engineering

Compulsory Courses List (A)

類別 Category	科目名稱 Course Title	學分 Credit	開課學系 Department	備註 Remarks
本系基礎必修 (38 學分) Fundamental Compulsory Course of Our Department (38 credits)	化學(一)(二) General Chemistry (I) (II)	6	應化系 Department of Applied Chemistry	
	化學實驗(一)(二) General Chemistry Labs (I) (II)	2	應化系 Department of Applied Chemistry	
	物理(一)(二) General Physics (I) (II)	8	物理小組 Physics group	
	物理實驗(一)(二) General Physics Labs (I) (II)	2	物理小組 Physics group	
	微積分(一)(二) Calculus (I) (II)	8	微積分小組 Calculus group	
	工程數學(一)(二) Engineering Mathematics (I) (II)	6	材料系 Department of Materials Science and Engineering	
	材料基礎實驗(一) Elementary Materials Labs (I)	2	材料系 Department of Materials Science and Engineering	
	材料工程實驗(一)(二) Advanced Materials Labs (I) (II)	4	材料系 Department of Materials Science and Engineering	
	服務學習(一)(二) Campus Service (I) (II)	0	材料系 Department of Materials Science and Engineering	
	導師時間 Mentor Program	0	材料系 Department of Materials Science and Engineering	共 4 學期 4 semesters in total
本系跨域模組 (29-30 學分) (28-32 學分) [註 1] Cross-disciplinary Module of Our Department (29-30 credits) (28-32 credits) * 1	材料科學與工程導論(一)(二) Introduction of Materials Science and Engineering (I) (II)	6	材料系 Department of Materials Science and Engineering	
	材料熱力學(一)(二) Thermodynamics of Materials(I) (II)	6	材料系 Department of Materials Science and Engineering	
	晶體結構與繞射導論 Introduction of Crystallography and Diffraction	3	材料系 Department of Materials Science and Engineering	
	專業選修 Elective Professional Courses	物理冶金(一) Physical Metallurgy(I)	3	材料系 Department of Materials Science and Engineering
	物理冶金(二) Physical Metallurgy(II)	3	材料系 Department of Materials Science and Engineering	
	材料基礎實驗(二) Elementary Materials Labs.(II)	2	材料系 Department of Materials Science and Engineering	

		材料機械性質 Mechanical Behaviors of Materials	3	材料系 Department of Materials Science and Engineering	materials courses respectively)
		材料動力學概論 Rate Processes in Materials	3	材料系 Department of Materials Science and Engineering	
		材料微觀結構分析 Microstructural Characterization of Materials	3	材料系 Department of Materials Science and Engineering	
		材料力學 Mechanics of Materials	3	材料系 Department of Materials Science and Engineering	
	材料選修 Elective Materials Courses	金屬材料 Metal Materials	3	材料系 Department of Materials Science and Engineering	
		陶瓷材料 Ceramics Materials	3	材料系 Department of Materials Science and Engineering	
		電子材料 Electronics Materials	3	材料系 Department of Materials Science and Engineering	
		高分子材料科學 Polymer Materials Science	3	材料系 Department of Materials Science and Engineering	
他系跨域模組 (28 學分) (28-32 學分) Cross-disciplinary Module of Other Departments (28 credits) (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 Select one cross-disciplinary module program provided by any department or college of NCTU.		28		
	合計 Total		129	校必修(含共同必修 28 學分(含外語課程 必修 8 學分)，至多採計 40 學分)[註 2] Compulsory courses at the university (including 28 credits of common compulsory (including 8 credits of compulsory program of foreign language) and the approvable number of credit shall not exceed 40) * 2	
	最低畢業學分 Minimum Credits for Graduation		129		

註 1：(A) 表中之本系跨域模組 = (B) 表

Remark1: The cross-disciplinary module of our department in list (A) is equivalent to list (B).

註 2：本校共同必修科目表規定，外語課程必修至少 6 學分。如大學部學生修習共同必修學分數超過 28 學分以上，本校至多可採至 40 學分於最低畢業學分內，但各學系另有規定者，從其規定。

Remark2: According to NCTU General Education Subject Regulations, students are required to take at

least 6 credits of foreign language program. If the common compulsory courses of an undergraduate exceed 28 credits, NCTU will only approve 40 credits (max.) to be counted as credits for graduation. However, the approval should follow any other applicable related regulations of each department.

材料科學與工程學系學系 跨域模組課程 必修科目表 (B)

Cross-disciplinary Module Curriculum for Department of Materials Science and Engineering

Compulsory Courses List (B)

類別 Category	科目名稱 Course Title	學分 Credit	開課學系 Department	備註 Remarks	
本系跨域模組 (29-30 學分) 修畢於畢業證書 加註『跨域專 長：材料科學與 工程』 Cross-disciplinary Module of Our Department (29-30 credits) “Cross-disciplinary specialty: <b>Materials Science and Engineering</b> ” could be remarked on the diploma after completing courses	材料科學與工程導論(一)(二) Introduction of Materials Science and Engineering (I) (II)	6	材料系 Department of Materials Science and Engineering		
	材料熱力學(一)(二) Thermodynamics of Materials(I) (II)	6	材料系 Department of Materials Science and Engineering		
	晶體結構與繞射導論 Introduction of Crystallography and Diffraction	3	材料系 Department of Materials Science and Engineering		
	專業 選修 Elective Professio nal Courses	物理冶金(一) Physical Metallurgy(I)	3	材料系 Department of Materials Science and Engineering	10 選 5 (專業選修及 材料選修至 少各 1 門) 5 courses out of 10 (select at least 1 course from elective and materials courses respectively)
		物理冶金(二) Physical Metallurgy(II)	3	材料系 Department of Materials Science and Engineering	
		材料基礎實驗(二) Elementary Materials Labs.(II)	2	材料系 Department of Materials Science and Engineering	
		材料機械性質 Mechanical Behaviors of Materials	3	材料系 Department of Materials Science and Engineering	
		材料動力學概論 Rate Processes in Materials	3	材料系 Department of Materials Science and Engineering	
		材料微觀結構分析 Microstructural Characterization of Materials	3	材料系 Department of Materials Science and Engineering	
		材料力學 Mechanics of Materials	3	材料系 Department of Materials Science and Engineering	
	材料 選修 Elective Materials Courses	金屬材料 Metal Materials	3	材料系 Department of Materials Science and Engineering	
		陶瓷材料 Ceramics Materials	3	材料系 Department of Materials Science and Engineering	
		電子材料 Electronics Materials	3	材料系 Department of Materials Science and Engineering	
高分子材料科學 Polymer Materials Science		3	材料系 Department of Materials Science and Engineering		
總學分 (28-32 學分) Total Credit (28-32 credits)		29-30			



三一學程（電子物理學系，光電工程學系，材料科學與工程學系）

跨域模組課程 必修科目表（C）

The Required Course List for students who study cross-disciplinary program and choose 「Three-in-one (Electrophysics/Photonics/Material)」 as their cross-disciplinary specialty

Compulsory Courses List (C)

類別 Category	科目名稱 Course Title	學分 Credit	開課學系 Department	備註 Remarks
三一學程 跨域模組 (28 學分) Cross-disciplinary modules in Three-in-one program (28 credits) 修畢於畢業證書加 註『跨域專長：三一 學程(電子物理/光 電/材料)』 It could be remarked as “Cross-Disciplinary Specialty : Three-in-one (Electrophysics/Photonic s/Material)” on the diploma after the module curriculum is completed. Introduction to Laser	模組一：理論與計算物理 Moldue 1:Theoretical and Computational Physics			[物理建模與計算實作] 於 107 學年度開課 [Physical Modelling and Computations labs.] will be opened in academic year 2018.
	近代物理(一) Modern Physics (I)	3	電物 Electrophysics	
	量子力學導論 Int. to Quantum Mechanics	3	電物 Electrophysics	
	計算物理 Computational Physics	3	電物 Electrophysics	
	物理建模與計算實作 Physical Modeling and Computons labs.	3	電物 Electrophysics	
	探索 X 實作 X-exploring Implementation	2	電物 Electrophysics	
	模組二：半導體及量子科技 Moldue 2:Semiconductor and Quantum technology			1 電物系[半導體物理及 元件]和光電系[半導體 元件及物理] 請擇一修習 To avoid duplication, please only choose one of the following two courses: [Semiconductor Physics and Devices](Electrophysics) and [Semiconductor Devices and Physics](Photonics)
	近代物理(一) Modern Physics (I)	3	電物 Electrophysics	
	半導體物理及元件 <sup>1</sup> Semiconductor Physics and Devices <sup>1</sup>	3	電物 Electrophysics	
	固態物理(一) Solid State Physics (I)	3	電物 Electrophysics	
	電子實驗 Electronics Labs.	2	電物 Electrophysics	
	探索 X 實作 X-exploring Implementation	2	電物 Electrophysics	
	模組三：雷射與光電科技 Moldue 3:Laser and Optoelectronics technology			
	電磁學(一) Electromagnetics (I)	3	電物 Electrophysics	
	光學概論(一) Introduction to Optics(I)	3	電物 Electrophysics	
	雷射導論 Introduction to Laser	3	電物 Electrophysics	
	實驗物理 Experimental Physics	2	電物 Electrophysics	

探索 X 實作 X-exploring Implementation	2	電物 Electrophysics	
<b>模組四：智慧光源 Module 4: Smart Light Source</b>			<sup>2</sup> 修電物系[近代物理(一)]等同於光電系[近代物理] <sup>2</sup> [Modern Physics](Photonics) is the same as [Modern Physics (I)] (Electrophysics) <sup>3</sup> [智慧光源科技與實作]於 107 學年度開課 <sup>3</sup> [Smart light source technology] will be opened in academic year 2018.
光子學(一) Elements of Photonics(I)	3	光電 Photonics	
近代物理 <sup>2</sup> Modern Physics <sup>2</sup>	3	光電 Photonics	
材料光學 Optical Properties of Materials	3	光電 Photonics	
智慧光源科技與實作 <sup>3</sup> Smart light source technology <sup>3</sup>	3	光電 Photonics	
<b>模組五：光設計與光調變 Module 5 : Light Design and Modulation</b>			
光子學(一) Elements of Photonics(I)	3	光電 Photonics	
光學設計、製作與量測 Design,fabrication,testing & measurement	3	光電 Photonics	
波動光學與數值模擬 Numerical simulation of wave optics	3	光電 Photonics	
矽基液晶光學系統設計與實作 Optical Laboratory Based on Liquid Crystal on Silicon	3	光電 Photonics	
<b>模組六：感測與顯示 Moldue 6: Sensing and Display</b>			<sup>1</sup> 電物系[半導體物理及元件]和光電系[半導體元件及物理]請擇一修習 <sup>1</sup> To avoid duplication, please only choose one of the following two courses: [Semiconductor Physics and Devices](Electrophysics) and [Semiconductor Devices and Physics](Photonics) <sup>4</sup> [生化感測元件]於 107 學年度開課，修課需具備[半導體元件物理]基礎 <sup>4</sup> [Bio-Chemical Sensors] will be opened in academic year 2018, the pre-requirement is [Semiconductor Devices and Physics]
半導體元件及物理 <sup>1</sup> Semiconductor Devices & Physics <sup>1</sup>	3	光電 Photonics	
感測器基礎實作與嵌入式系統應用 Solid-State Sensor and Embedded System	3	光電/電機合 Photonics/ Electrical Engineering	
顯示電子電路 Electronic Circuits for Display	3	光電 Photonics	
生化感測元件 <sup>4</sup> Bio-Chemical Sensors <sup>4</sup>	3	光電 Photonics	
<b>模組七：材料結構與鑑定 Moldue 7: Structure Characterization of Materials</b>			

材料科學與工程導論 (一) Introduction to Materials Science and Engineering (I)	3	材料 Material	
晶體結構與繞射導論 Introduction to Crystallography and Diffraction	3	材料 Material	
材料微觀結構分析 Microstructural Characterization of Materials	3	材料 Material	
<b>模組八：材料製造</b> <b>Module 8: Fabrication of Materials</b>			
材料工程實驗(一) Advanced Materials Labs.(I)	2	材料 Material	
材料基礎實驗(一) Elementary Materials Labs.(I)	2	材料 Material	
材料基礎實驗(二) Elementary Materials Labs.(II)	2	材料 Material	
半導體製程 Semiconductor Processing	3	材料 Material	
<b>模組九：材料特性</b> <b>Module 9: Properties of Materials</b>			
材料機械性質 Mechanical Behavior of Metal	3	材料 Material	
材料物理性質 Physical Properties of Materials	3	材料 Material	
電子材料 Electronic Materials	3	材料 Material	
<b>模組十：生醫工程</b> <b>Module 10: Biomedical Engineering</b>			
生醫物理導論暨實作 Introduction to Biomedical Physics and Implementation (I)	3	電物 Electrophysics	
生醫光子學導論 Introduction to Biophotonics	3	光電 Photonics	
奈米生醫材料簡介 Introduction to Nano-Biomaterials	3	材料 Material	
總學分 Total	28	修課條件： Requirements: 1.必選學分(16-18 學分)： 自選三個模組，此三個模組的每個模組需至少修畢兩門課程，共六門必選課程。 Required courses (16-18 credits): Choose 3 modules from the 10 to serve as the required modules. Take 2 courses in every required module. 2.其餘學分可從十個模組的課程中	

		<p>自由選擇。 Optional courses: for the remaining credits, freely choose among the 10 modules.</p> <p>3. 滿足上述條件並修滿 28 學分則完 成此跨域學程。</p> <p>The cross-disciplinary program is completed after obtaining total 28 credits and satisfying the above two conditions,</p>
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