

program-and-course 國立陽明交通大學物理研究所跨域學程實施要點
Guidelines of the Cross-Disciplinary Program
Institute of Physics, National Yang Ming Chiao Tung University

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第一條 依據國立陽明交通大學跨域學程實施辦法，國立陽明交通大學物理研究所(以下簡稱本所)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。

Article One These Guidelines are prescribed by National Yang Ming Chiao Tung University Institute of Physics (hereinafter referred to as Our Institute) based on NYCU Cross-Disciplinary Program Implementation Regulations to provide the opportunity for students to access cross-disciplinary learning without increasing graduate credits (or only a few extra credits) in order to encourage students to conduct cross-disciplinary study, establish the depth of cross-disciplinary study, and assist students owning other specialties.

第二條 依據國立陽明交通大學跨域學程實施辦法，跨域學程係指由本所提出模組課程，模組課程包含物理領域基礎核心知識，且總學分數以30學分為原則，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本所第二專長跨域學程模組課程，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 designed by Our Institute. Module curriculum should include the core knowledge curriculum of Physics and the total credits will be 30 credits. The cross-disciplinary program will include the cross-disciplinary program module curriculum of the department they belong to as well as the cross-disciplinary program module curriculum from Our Institute for the second specialty. The module curriculum of the second specialty could be remarked as “cross-disciplinary specialty” on the diploma.

第三條 本辦法實施對象

1. 凡本校學士班學生均適用本辦法。
2. 外系學生欲修習跨域學程且選擇本所做為其跨域專長者
 - (1) 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）提出申請，通過原系以及本所的雙邊審查後，方可進入跨域學程。
 - (2) 外系學生修讀跨域學程且選擇本所做為其跨域專長者，其課程包含：校必修，原系基礎必修課程，原系跨域模組課程，以及列示於『物理研究所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物理為其跨域專長。
 - (3) 跨域模組課程與學生本系應修課程及學分重複者，由本所指定之相關選修課程補足。
 - (4) 修讀跨域學程學生在申請通過前已修習及格之科目學分，若合於跨域模組課程應修課程學分，得經本所審查同意後，予以追加採認。

Article Three Subjects of these Guidelines:

1. These Rules are available for all bachelor program students admitted by NYCU.
2. For students from other departments who would like to take the cross-disciplinary program and choose Our Institute as their cross-disciplinary specialty.
 - (1) Students could submit the application to the department that they belong to within the period announced annually by university; students could only take the cross-disciplinary program after approved by both their original department and our institute.
 - (2) The courses for students from other departments who would like to take the cross-disciplinary program and choose Our Institute as their cross-disciplinary specialty include compulsory courses of the university, core curriculum at their original department, cross-disciplinary modules at their original department, and the modules listed on “The compulsory course list for the students study cross-disciplinary program module curriculum in Institute of Physics” with at least 128 graduate credits. “Physics” will be remarked as their cross-disciplinary specialty after the title of their original department on the diploma.
 - (3) If the credits of the cross-disciplinary program module curriculum are the same with those of the required courses at the Major department, the duplication credits must be replaced with the elective courses related to the specialty appointed by our Institute.
 - (4) The credits of cross-disciplinary program module curriculums obtained before the student is admitted to take the cross-disciplinary program can only be counted under the recognition by our Institute.

第四條 本所由單位主管或其指定之專任教師擔任學程召集人，統籌執行學程各項事宜。學程召集人需指定至少一名專任教師擔任跨域學程導師，專責輔導跨域學程學生。

Article Four The Unit Chief that established the course or a full-time teacher designated by the Unit Chief shall act as the convener of the cross-disciplinary program to coordinate the implementation of various matters of the program. The convener of the program must appoint at least one full-time teacher to serve as a cross-disciplinary program tutor, who is responsible for tutoring cross-disciplinary program students.

第五條 為鼓勵不同系所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，得依本校教師授課時數核計原則規定辦理。

Article Five In order to encourage different departments or colleges to work 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.

第六條 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 are other matters not described in these guidelines; it shall be handled in accordance with the school constitution of our university as well as other relevant regulations.

第七條 本要點經本所務會議通過，所屬學院課程委員會及校級課程委員會通過後實施，修訂時亦同。

Article Seven These guidelines were approved by the Institute affairs meeting, reviewed by the curriculum committee at both college and university levels; the same shall be done upon any amendment thereto.

物理研究所跨域模組課程必修科目表 (B)
The Compulsory Course List for Cross-Disciplinary Program in Institute of Physics (B)

一、來自百川學士學位學程學生。From Arete Honors Program.

類別 Category	科目名稱 Name of course	學分 Credits	開課系所 Offered	備註 Remark
第一階段(共 12 學分) Stage 1(Total 12 credits)				
必修 Required courses	經典物理(一) Classical Physics (I)	3	物理所 IOP	1.內容為力學、電磁學、熱力學、特殊相對論等。Contents: Mechanics, Electromagnetics, Thermodynamics, Special Relativity. 2.經典物理(一)：修過電物系理論力學(一)或物理所古典力學得申請抵免。Classical Physics (I): A credit waiver may be granted for students who have taken Theoretical Mechanics (I) in the Department of Electrophysics or Classical Mechanics in the Institute of Physics. 3.經典物理(二)：修過電物系電磁學(一)得申請抵免。Classical Physics (II): A credit waiver may be granted for students who have taken Electromagnetics (I) in the Department of Electrophysics.
	經典物理(二) Classical Physics (II)	3		
必選修 Required elective courses	應用數學(二) Applied Mathematics (II)	3	電物系 DEP	1.左列二擇一。Choose one out of the two courses from the left. 2.數學相關課程：百川學士學位學程物理專業核心補充課程之外的 2 學期數學相關課程。Engineering mathematic courses: Two engineering mathematic courses rather than Enrichment courses for Programs of Physics Emphasis in the Arete Honors Program.
	應用數學(三) Applied Mathematics (III)	3	應數系 DAM	
	2 學期數學相關課程 Two engineering mathematic courses	3 3	工學院 COE 電機學院 ECE	
第二階段(共 12 學分) Stage 2(Total 12 credits)				
必修 Required courses	量子力學(一) Quantum Mechanics (I)	3	物理所 IOP	修過電物所量子力學(一)(二)得申請抵免。A credit waiver may be granted for students who have taken Quantum Mechanics (I) and (II) in the Institute of Electro-Physics.
	量子力學(二) Quantum Mechanics (II)	3		
必選修 Required elective courses	進階實驗(一) Advanced Lab (I)	3	物理所 IOP	1.左列二擇一。Choose one out of the two courses from the left. 2.進階實驗(一)或(二)：修過電子學(一)得二擇一申請抵免。Advanced Lab (I) or Advanced Lab (II): A credit waiver from either Advanced Lab (I) or Advanced Lab (II) may be granted for students who have taken Electronics (I).
	*核心課程 *Core curriculum	3		
	進階實驗(一) Advanced Lab (I)	3	物理所 IOP	
進階實驗(二) Advanced Lab (II)	3			
第三階段(共 6 學分) Stage 3(Total 6 credits)				
必選修 Required elective courses	專題課程 Topic courses	3	物理所 IOP	左列四擇二。Choose two out of the four courses from the left.
	專題課程 Topic courses	3		
	*核心課程 *Core curriculum	3		
	*核心課程 *Core curriculum	3		

二、來自工數、應數非必修的科系。From a department where Engineering Mathematics and Applied Mathematics are not compulsory courses.

類別 Category	科目名稱 Name of course	學分 Credits	開課系所 Offered	備註 Remark
第一階段(共 12 學分) Stage 1(Total 12 credits)				
必修 Required courses	經典物理(一) Classical Physics (I)	3	物理所 IOP	1.內容為力學、電磁學、熱力學、特殊相對論等。Contents: Mechanics, Electromagnetics, Thermodynamics, Special Relativity. 2.經典物理(一)：修過電物系理論力學(一)或物理所古典力學得申請抵免。Classical Physics (I): A credit waiver may be granted for students who have taken Theoretical Mechanics (I) in the Department of Electrophysics or Classical Mechanics in the Institute of Physics. 3.經典物理(二)：修過電物系電磁學(一)得申請抵免。Classical Physics (II): A credit waiver may be granted for students who have taken Electromagnetics (I) in the Department of Electrophysics.
	經典物理(二) Classical Physics (II)	3		
必選修 Required elective courses	物理數學(一) Mathematical Physics (I)	3	物理所 IOP	1.左列三擇一。Choose one out of the three courses from the left. 2.數學相關課程：微積分之外的 2 學期數學相關課程。Engineering mathematic courses: Two engineering mathematic courses rather than Calculus.
	物理數學(二) Mathematical Physics (II)	3		
	應用數學(一) Applied Mathematics (I)	3	電物系 DEP 工學院 COE 電機學院 ECE	
	應用數學(二) Applied Mathematics (II)	3		
2 學期數學相關課程 Two engineering mathematic courses other than Calculus.	3	3		
第二階段(共 12 學分) Stage 2(Total 12 credits)				
必修 Required courses	量子力學(一) Quantum Mechanics (I)	3	物理所 IOP	修過電物所量子力學(一)(二)得申請抵免。A credit waiver may be granted for students who have taken Quantum Mechanics (I) and (II) in the Institute of Electro-Physics.
	量子力學(二) Quantum Mechanics (II)	3		
必選修 Required elective courses	進階實驗(一) Advanced Lab (I)	3	物理所 IOP	左列二擇一。Choose one out of the two courses from the left.
	*核心課程 *Core curriculum	3		
	進階實驗(一) Advanced Lab (I)	3	物理所 IOP	
進階實驗(二) Advanced Lab (II)	3			
第三階段(共 6 學分) Stage 3(Total 6 credits)				
必修 Required courses	專題研究論文(一) Topic Research and Thesis (I)	3	物理所 IOP	總整課程 Capstone Course
	專題研究論文(二) Topic Research and Thesis (II)	3		

三、來自工數、應數為必修的科系與應數系學生。From a department where Engineering Mathematics or Applied Mathematics are compulsory courses. From Department of Applied Mathematics.

類別 Category	科目名稱 Name of course	學分 Credits	開課系所 Offered	備註 Remark
第一階段(共 12 學分) Stage 1(Total 12 credits)				
必修 Required courses	經典物理(一) Classical Physics (I)	3	物理所 IOP	1.內容為力學、電磁學、熱力學、特殊相對論等。Contents: Mechanics, Electromagnetics, Thermodynamics, Special Relativity. 2.經典物理(一)：修過電物系理論力學(一)或物理所古典力學得申請抵免。Classical Physics (I): A credit waiver may be granted for students who have taken Theoretical Mechanics (I) in the Department of Electrophysics or Classical Mechanics in the Institute of Physics. 3.經典物理(二)：修過電物系電磁學(一)得申請抵免。Classical Physics (II): A credit waiver may be granted for students who have taken Electromagnetics (I) in the Department of Electrophysics.
	經典物理(二) Classical Physics (II)	3		
必選修 Required elective courses	近代物理(一) Modern Physics (I)	3	物理所 IOP	1.左列四擇二。Choose two out of the four courses from the left. 2.修過電物系近代物理(一)(二)得申請抵免。A credit waiver may be granted for students who have taken Modern Physics (I) and (II) in the Department of Electrophysics.
	近代物理(二) Modern Physics (II)	3		
	*核心課程 *Core curriculum	3		
	*核心課程 *Core curriculum	3		
第二階段(共 12 學分) Stage 2(Total 12 credits)				
必修 Required courses	量子力學(一) Quantum Mechanics (I)	3	物理所 IOP	修過電物所量子力學(一)(二)得申請抵免。A credit waiver may be granted for students who have taken Quantum Mechanics (I) and (II) in the Institute of Electro-Physics.
	量子力學(二) Quantum Mechanics (II)	3		
必選修 Required elective courses	進階實驗(一) Advanced Lab (I)	3	物理所 IOP	左列二擇一。Choose one out of the two courses from the left.
	*核心課程 *Core curriculum	3		
	進階實驗(一) Advanced Lab (I)	3	物理所 IOP	
	進階實驗(二) Advanced Lab (II)	3		
第三階段(共 6 學分) Stage 3(Total 6 credits)				
必修 Required courses	專題研究論文(一) Topic Research and Thesis (I)	3	物理所 IOP	總整課程 Capstone Course
	專題研究論文(二) Topic Research and Thesis (II)	3		

四、來自生科系與應化系學生。From Department of Biological Science and Technology and Department of Applied Chemistry.

類別 Category	科目名稱 Name of course	學分 Credits	開課系所 Offered	備註 Remark
第一階段(12 學分) Stage 1(Total 12 credits)				
必修 Required courses	經典物理(一) Classical Physics (I)	3	物理所 IOP	1.內容為力學、電磁學、熱力學、特殊相對論等。Contents: Mechanics, Electromagnetics, Thermodynamics, Special Relativity. 2.經典物理(一)：修過電物系理論力學(一)或物理所古典力學得申請抵免。Classical Physics (I): A credit waiver may be granted for students who have taken Theoretical Mechanics (I) in the Department of Electrophysics or Classical Mechanics in the Institute of Physics. 3.經典物理(二)：修過電物系電磁學(一)得申請抵免。Classical Physics (II): A credit waiver may be granted for students who have taken Electromagnetics (I) in the Department of Electrophysics.
	經典物理(二) Classical Physics (II)	3		
必選修 Required elective courses	近代物理(一) Modern Physics (I)	3	物理所 IOP	1.左列四擇二。Choose two out of the four courses from the left. 2.修過電物系近代物理(一)(二)、生科系物理化學(二)得申請抵免。A credit waiver may be granted for students who have taken Modern Physics (I) & (II) in the Department of Electrophysics and Physical Chemistry (II) in Department of Biological Science and Technology.
	近代物理(二) Modern Physics (II)	3		
	物理化學(二) Physical Chemistry (II)	3		
	*核心課程 *Core curriculum	3		
第二階段(12 學分) Stage 2(Total 12 credits)				
必修 Required courses	生物物理學 Biophysics	3	物理所 IOP	
	非平衡統計專題 Topics in Non-Equilibrium Statistics	3		
	原子與分子物理(一) Atomic Molecular Physics (I)	3		
	統計力學(一) Statistical Mechanics (I)	3		
第三階段(6 學分) Stage 3(Total 6 credits)				
必修 Required courses	專題研究論文(一) Topic Research and Thesis (I)	3	物理所 IOP	總整課程 Capstone Course
	專題研究論文(二) Topic Research and Thesis (II)	3		

註 1：總學分：30 學分。修畢於畢業證書加註「跨域專長：物理」。

Total credits: 30 credits. It could be remarked as “Cross-disciplinary Specialty: Physics” on the diploma after the module curriculum is completed.

註 2：*核心課程：統計力學(一)、固態物理(一)(二)、粒子物理(一)、電動力學(一)(二)、古典力學、量子場論(一)、原子與分子物理(一)、廣義相對論、宇宙學簡介、計算物理、數值分析。

*Core curriculum: Statistical Mechanics (I), Solid State Physics (I) and (II), Particle Physics (I),

Electrodynamics (I) and (II), Classical Mechanics, Quantum Field Theory (I), Molecular Physics (I), General Relativity, Introduction to Cosmology, Computational Physics and Numerical Methods for Physics.

註 3：擋修(先修)規定：所有課程必須先修過基礎(一)的課程，才能再選修進階(二)的課程。

Prerequisite requirement: For all the courses, the fundamental course which is marked as (I) shall be taken before the advanced course which is marked as (II).

註 4：只要跨域或百川學生需求，本所當學年一定提供相關跨域模組之課程。

The courses for the cross-disciplinary program of Institute of Physics are offered according to the need from students.