國立交通大學電機工程學系「跨域學程」實施要點

National Chiao Tung University
Department of Electrical and Computer Engineering
Implementation Guidelines for Cross-Disciplinary Program

106年3月15日電機系課程委員會通過
106年3月22日電機系務會議通過
106年10月23日電機系課程委員會通過
106年11月14日電機系務會議通過
107年1月3日電機系課程委員會通過
107年1月9日電機系務會議通過

一、依據國立交通大學跨域學程實施辦法，國立交通大學電機工程學系(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。

Article One These Implementation Guidelines are prescribed by National Chiao Tung University Department of Electrical and Computer Engineering(hereinafter referred to as Our Department) based on 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 study, build the depth of cross-disciplinary study, and assist students to expand second specialty.

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 the departments, institutes or colleges in National Chiao Tung University. 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 belong to 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 the student of our department who would like to take cross-disciplinary program

⑴ 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 within the dates of annual announcements by faculty. 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 information of evaluation documents needed to be prepared as well as the quota opened to the students of our department to study for this program 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 only 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『電機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 128 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 studied 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 Electrical and Computer.” The courses include required courses of the university (including 28 credits of 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 128 graduate credits. The cross-disciplinary module curriculum at other department would be recognized as cross-disciplinary specialty, and it 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，改修習原電機工程學系的學士學位課程。

(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 transfer to study for the bachelor degree program at the original Department of Electrical and Computer.

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 of other departments who would like to study for cross-disciplinary program and choose our department as their cross-disciplinary specialty

(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），通過原系以及本系的雙邊審查後，方可進入跨域學程。

(1) They could submit the application to the department that they belong to within the dates of annual announcements by faculty, they could only take the cross-disciplinary program after

approved by both their 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『電機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電機工程為其跨域專長。

(2) The courses for the students of other departments who would like to study for cross-disciplinary program and choose our department 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 Department of Electrical and Computer" with at least 128 graduate credits. The Department of Electrical and Computer will be remarked as their cross-disciplinary specialty after the title of their original department on the diploma.

四、本系指定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 at 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，得依本校教師授課鐘點核計原則第九條第六款規定，教師的授課鐘點數可按到場時數計，但以開課前該門課程之實際簽呈為依據。

Article Five 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.

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並提教務會議核備後實施，修訂時亦同。

Article Seven These guidelines were approved by Curricular Committee at university level and then submitted to the Council of Academic Affairs for approval-for-reference before putting it into practice; the same shall be done upon any amendment thereto.

電機工程學系「跨域學程」本系學生必修科目表(A)

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

類別 Category	選別 Classification	科目名稱 Courses	學分 Credits		開課系所 Dept.	備註 Remarks
			上學期 Fall Semester	下學期 Spring Semester		
本系基礎必修（53 學分） Core curriculum at our department (53 credits)	基礎必修課程（53 學分） Fundamental Compulsory Courses (53credits)	微積分(一) (二) Calculus (I) (II)	4	4	電機系 ECE	
		物理(一) (二) General Physics (I) s(II)	4	4	電機系 ECE	
		線性代數 Linear Algebra	3		電機系 ECE	
		微分方程 Differential Equation	3		電機系 ECE	
		生涯規劃與導師時間 Career Planning and Mentor's Hours	0	0	電機系 ECE	得以生涯規劃免修 Can be waived by "Career Planning"
		服務學習(一) (二) Student Service Education (I) (II)	0	0	電機系 ECE	
		電路學 Circuit Theory	3		電機系 ECE	
		電磁學(一) (二) Electromagnetics(I) (II)	3	3	電機系 ECE	
		電子學(一) (二) Electronics (I) (II)	3	3	電機系 ECE	
		電子實驗(一) (二) Electronics Labs (I) (II)	2	2	電機系 ECE	
		訊號與系統 Signals and Systems	3		電機系 ECE	
		計算機概論與程式設計 Intro. to Computers and Programming	3		電機系 ECE	
		邏輯設計與實驗 Logic Design and Lab	3		電機系 ECE	
		微算機原理與實驗 Principle of Microcomputer	3		電機系 ECE	
專業選修領域 Elective Courses in Professional Programs		應從 10 個領域(詳見附表)自行選擇一個主修領域及該領域至少 1 門必選修、3 門選修及 1 門實驗課，修滿至少 15 學分。 You are required to choose 1 programs from 10 different programs, and take at least 1 Required elective courses, 3 elective courses, and 1 Lab from that program. At least 15 credits.				

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 The cross-disciplinary modules offer by departments or colleges at our university; choose one to complete.	28	
共同必修 Common Required Courses		30	通識課程至少 22 學分，外語至少 8 學分，共同課程至多採計 40 學分 [註 1] General Courses at least 22 credits, Language at least 8 credits, Common courses 28credits(include Language 8 credit), count 40 credits at most.
最低畢業學分 Minimum Credits Required for Graduation		128	

註：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。

電機工程學系「跨域模組課程」必修科目表(B)

The Required Courses List for the students study Cross-disciplinary module curriculum in ECE Department

類別 **Category**	選別 **Classification**	科目名稱 **Courses**	學分 **Credits**	開課系所 **Dept.**	備註 **Remarks**
本系跨域模組（32 學分） Cross-disciplinary courses at our department (32 credits)	必修(17 學分) Compulsory Courses (17 credits)	邏輯設計與實驗 Logic Design and Lab	3	電機系 ECE	
		跨領域專題(一) Projects of Cross-disciplinary(I)	0	電機系 ECE	
		跨領域專題(二) Projects of Cross-disciplinary(II)	0	電機系 ECE	必選修 Required elective courses
		電子學(一) Electronics (I)	3	電機系 ECE	
		電子實驗(一) Electronics Lab (I)	2	電機系 ECE	
		訊號與系統 Signals and Systems	3	電機系 ECE	
		微分方程 Differential Equation	3	電機系 ECE	
		微算機原理與實驗 Principle of Microcomputer	3	電機系 ECE	
專業選修領域 Elective Courses in Professional Programs	應從 10 個領域(詳見附表)自行選擇一個主修領域及該領域至少 1 門必選修、3 門選修及 1 門實驗課，修滿至少 15 學分。 You are required to choose 1 programs from 10 different programs, and take at least 1 Required elective courses, 3 elective courses, and 1 Lab from that program. At least 15 credits.				
總學分 Total Credits			32		

電機系專業選修十大領域

10 Programs

領域名稱 Program	大學部課程 Undergraduate Curriculum					研究所課程 Graduate Curriculum
	代表性相關必修課程 Representative required courses	**大二選修 Grade 2 Elective course**		**大三、大四專業領域選修 Grade 3 and Grade 4 Elective course**	**實驗課 Labs**	
系統控制 System Control	線性代數 Linear Algebra 微算機原理與實驗 Principle of Microcomputer 訊號與系統 Signals and Systems	必選修 compulsory elective courses	複變函數 Complex Variables 或 or 機率 Probability	自動控制系統 Automatic Control Systems	控制實驗 Control Lab	
		其他選修 other elective courses	微算機系統與實驗 Microcomputer Systems and Lab	•控制系統設計 Design and Simulation of Control Systems 數位訊號處理導論 Introduction to Digital Signal Processing 動態系統模擬與實現 Analysis and Simulation of Dynamic Systems		智慧型控制 Intelligent Control 線性系統理論 Linear System Theory 隨機過程 Stochastic Processes 數位訊號處理 Digital Signal Processing 電腦控制系統 Computer Control System 嵌入式作業系統 Embedded Operating Systems
多媒體訊號處理 Multimedia Signal Processing and Communications	線性代數 Linear Algebra 訊號與系統 Signals and Systems	必選修 compulsory elective courses	機率 Probability	數位訊號處理導論 Introduction to Digital Signal Processing	數位訊號處理晶片實驗 Digital Signal Processing Chips Labs	
		其他選修 other elective courses		語音處理導論 Introduction to Speech Processing 互動式音訊處理導論 Introduction to Interactive		語音處理 Digital Speech Processing 聽語資訊處理 Auditory and Acoustic Information Process 適應性訊號處理

				Audio Processing		Adaptive Signal Processing 資料壓縮 Data Compression 數位訊號處理 Digital Signal Processing 機器學習 Machine Learning 雲端運算與巨量資料分析 Cloud Computing and Big Date Analytics
晶片設計 System-on-chip	電子學(一) 電子學(二) Electronics(I) (II)	必選修 compulsory elective courses	程式化邏輯系統設計 Programmable Logic System Design	#1 超大型積體電路導論 Introduction to VLSI Circuits 類比積體電路導論 Introduction to Analog Integrated Circuits	#2 VLSI 實驗 VLSI lab	類比積體電路設計 Integrated Circuit Design 超大型積體電路系統設計 VLSI System Design and Application
		其他選修 other elective courses		數位訊號處理導論 Introduction to Digital Signal Processing 微機電系統技術導論 Introduction to Micro Electro Mechanical Systems		數位訊號處理 Digital Signal Processing
通訊科學與系統 Communication Sciences and Systems	線性代數 Linear Algebra 訊號與系統 Signals and Systems	必選修 compulsory elective courses	機率 Probability	通訊系統導論 Introduction to Communication Systems 數位通訊導論 Introduction to Digital Communications	通訊系統實驗 Communication System Lab 數位訊號處理晶片實驗 Digital Signal Processing Chips Lab	
		其他選修 other elective		通訊系統電腦模擬 Computer Simulation of		隨機過程 Random Process 數位通訊 Digital

		courses		Communication Systems 數據通訊 Data Communication		Communication 檢測與估計 Detection and Estimation 展頻通訊 Spread Spectrum Communications 無線通訊 Wireless Communication 消息理埨 Information Theory 編碼理論 Coding Theory
機器人仿生科技 Robots and Bioelectronics	線性代數 Linear Algebra 訊號與系統 Signals and Systems	必選修 compulsory elective courses	機率 Probability	機器人科技與應用 Robotics Technology and Application 類神經網路導論 Artificial Neural Networks 嵌入式作業系統 Embedded Operating Systems 自走式機器人 Mobile Robots 進階物件導向程式設計 Advanced Object-Oriented Programming (五選二) (at least two)	智慧機器人實驗 Intelligent Robotics Laboratory 數位訊號處理晶片實驗 Digital Signal Processing Chips Labs	數位訊號處理 Digital Signal Processing 模糊系統 Fuzzy Systems
		其他選修 other elective courses	JAVA 程式設計 JAVA Programming 資料結構 Data Structure 自動控制系統			線性系統理論 Linear System Theory 智慧型資料分析 Intelligent Data Analysis 機器人學 Robotics

			Automatic Control Systems			
電力電子 Power Electronics	電子學 Electronics 電子實驗 Electronics Labs 電路學 Circuit Theory 微算機原理與實驗 Principle of Microcomputer.	必選修 compulsory elective courses	無	電力電子導論 Introduction to Power Electronics 電力工程導論 Introduction to Electrical Power Engineering (每學年至少開一門課)	電力電子實驗 Power Electronics Labs	電力電子 Power Electronics 電動機控制 Motor Control 數位電源控制 Digital Power Control 功率積體電路設計 Power Integrated Circuit Design 類比積體電路設計 Design and Applications of Analog Integrated Circuits 交換式電源供應器設計 Switching Power Supply Design
		其他選修 other elective courses		自動控制系統 Automatic Control Systems 類比積體電路導論 Introduction to Analog Integrated Circuits		
無線科技 Wireless and Microwave Techniques	電磁學(一) 電磁學(二) Electromagnetics (I) (II)	必選修 compulsory elective courses		微波工程導論 Foundations for Microwave Engineering 天線導論 Introduction to Antennas	射頻電路原理與實驗 Principle and Lab of RF Circuit	微波工程(一) Microwave Engineering(1) 天線理論 Antenna Theory 類比積體電路設計 Integrated Circuit Design 物理數學 Mathematical Methods of Physics 高等電磁學 Advanced Electromagnetics
		其他選修 other elective courses		數值分析 Numerical Analysis 光電工程導論 Introduction to Opto-electronic Engineering 無線通訊之電波傳播與天線 Radio Propagation and		微波工程(二) Microwave Engineering(2) 微波量測原理 Theory of Microwave Measurement 微波電路設計與製造 Microwave Circuit Design Laboratory 電磁共容

				Antennas for Wireless Communications 通訊電子學 Communication Electronics 固態電子學		Electromagnetic Compatibility in Integrated Circuits 微波主動元件 Active Microwave Circuit 射頻積體電路設計 Radio Frequency Integrated Circuits Design 射頻積體電路實驗 Radio Frequency Integrated Circuits Lab 手機行動通訊系統 Mobile Phone Communication System
資訊通訊 Information and Communications	計算機概論與程式設計 Introduction to Computers and Programming	必選修 compulsory elective courses	物件導向程式設計 Object-Oriented Programming 機率 Probability	數據通訊 Data Communication	通訊網路實驗 Communication Networks Lab 軟體創意專題 Creative Software Project	排隊理論 Queuing Theory 計算機網路 Computer Networks
		其他選修 other elective courses	資料結構 Data Structure Java 程式設計 JAVA Programming	網路安全導論 Introduction to Network Security 嵌入式系統導論 Introduction to Embedded Systems 電腦網路導論 Introduction to Computer Networks 作業系統 Operating Systems 無線網路導論 Introduction to Wireless Networks		無線網路 Wireless Network 行動計算 Mobile Computing 無線感測網路 Wireless Sensor Networks and RFID Technologies 無線隨意網路 Wireless Ad Hoc Networks 網路隨機過程 Network Random Process 網路安全 Network Security 嵌入式系統設計 Embedded Systems Design 演算法 Algorithms

生醫工程 Biomedical Electronics and Information	電子學(一) Electronics(I) 電子學實驗 Electronics Labs 訊號與系統 Signals and Systems	必選修 compulsory elective courses		醫學工程 Biomedical Engineering Research 或 or 人體結構、功能、臨床及醫療器材 Human Function Anatomy and Medical Instrument Application	生醫工程實驗 Biomedical Engineering Laboratory	
		其他選修 other elective courses		醫用機器人設計(2 年開一次) Medical robotics design 數位訊號處理導論 Introduction to Digital Signal Processing		神經彌補裝置 Neural Prosthesis 數位訊號處理 Digital Signal Processing 影像處理 Digital Image Processing 生醫信號分析與模擬 Biomedical Signal Analysis and Modeling 超音波導論與應用 Introduction to Ultrasound and its Applications 近代生醫電學 Modern Bioelectricity 生醫統計學 Biomedical Statistics
計算機工程 Computer Engineering	計算機概論與程式設計 Introduction to Computers and Programming 邏輯設計與實驗 Logic Design and Lab	必選修 compulsory elective courses	資料結構 Data Structure	計算機組織 Computer Organization 作業系統 Operating Systems	人本計算實驗 Human-Centric Computing Laboratory	計算機結構 Computer Architecture 演算法 Algorithms 計算機網路 Computer Network
		其他選修 other elective courses	離散數學 Discrete Mathematics 物件導向程式設計 Object-Oriented Programming	嵌入式系統導論 Introduction to Embedded Systems 電腦網路導論 Introduction to Computer Networks		排隊理論 Queuing Theory 嵌入式系統設計 Embedded System Design 雲端運算與巨量資料分析 Cloud Computing and Big Date Analytics 平行程式

						Parallel Programming 智慧型手機應用程式設計 Smart Phone Programming 機器學習 Machine Learning 資料科學 Data Science

註:

A. 「#」代表須先修過#1 再修#2 或兩門同時修習。「#」 denotes that you should study #1 and then #2 or study both in the same time.

B. 「•」代表每學年至少開課一次。「•」 denotes that these courses would be opened at least one time in an academic year.