國立陽明交通大學資訊工程學系「生物資訊工程跨域學程」實施要點

National Yang Ming Chiao Tung University
Department of Computer Science
Implementation Guidelines for Cross-Disciplinary Program in Bioinformatics Engineering

資訊工程學系 110 學年度第 4 次課程委員會訂定(110 年 10 月 25 日)
資訊學院 110 學年度第 3 次課程委員會修訂(110 年 11 月 1 日)
110 學年度第 3 次校課程委員會通過(110 年 12 月 2 日)
110 學年度第 2 次教務會議核備通過(110 年 12 月 16 日)
資訊工程學系 111 學年度第 4 次課程委員會修訂(111 年 12 月 22 日)
資訊學院 111 學年度第 3 次課程委員會修訂(111 年 12 月 28 日)
資訊工程學系 111 學年度第 6 次課程委員會修訂(112 年 4 月 14 日)
資訊學院 111 學年度第 4 次課程委員會修訂(112 年 4 月 18 日)
111 學年度第 3 次校課程委員會通過(112 年 5 月 16 日)
111 學年度第 4 次教務會議核備通過(112 年 5 月 30 日)

一、依據國立陽明交通大學跨域學程實施辦法，國立陽明交通大學資訊工程學系(以下簡稱本系)為鼓勵大學部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，特訂定本實施要點。

These Implementation Guidelines are prescribed by National Yang Ming Chiao Tung University Department of Computer Science (hereinafter referred to as Our Department) based on NYCU 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 in expanding second specialty.

二、依據國立陽明交通大學跨域學程實施辦法，本系學生修習「生物資訊工程跨域學程」(以下簡稱本學程)，於修畢後可於畢業證書上加註「生物資訊工程」為跨域專長。

According to NYCU Implementation Guidelines for Cross-Disciplinary Program, students in our department could be remarked as “Cross-Disciplinary Specialty” on the diploma once they complete this program.

三、本要點實施細節

1.適用對象：本校資訊工程學系申請生物資訊工程跨域學程的學生適用本要點。

2.申請程序：

(1)本系學生欲修習本學程者得於**每學年**下學期向本系提出申請，經本系及生物科技學系課程委員會審查通過後，方可修習本學程。

(2)本學程的課程列示於「資訊工程學系『生物資訊工程跨域學程』必修科目表」，其課程包含：校定必修、基礎學科14學分、必修31學分、學程選修12學分、本系必修及主題學程課程(參閱本系必修科目表)、本系專業選修課程(至少9學分)(需修本系所開授的各專業科目，含大學部、研究所選修課程)、以及生物資訊工程跨域模組(28學分)，畢業學分至少128學分。本系甲組選擇跨域學程為畢業條件者，依本系必修科目表規定。

(3)修習本學程之學生，若無法完成(2)中所規定之課程，可回復修習原資訊工程學系的學士學位課程。

(4)除必修科目表備註可以抵免之科目外，其餘抵免皆需遞送免修申請表。

(5)跨域模組課程與學生本系應修課程及學分重複者，由生物科技學系指定之相關選修課程補足。

Guidelines in detail

1)People applicable to this program: undergraduate students who major in Department of Computer Science apply for Cross-Disciplinary Program of Bioinformatics Engineering.

2)Procedure to apply for this program:

(I)Students may submit applications to our department during the second semester every year. The application will be evaluated by the Curricular Committees at our department and the department of Biological Science &Technology respectively. Students are enrolled in the cross-disciplinary program only after their applications have been approved by both sides.

(II)Courses included in this program are listed on “The Required Course List for the students at our department study cross-disciplinary program of Bioinformatics Engineering”. Courses are classified as:

Required courses of the university

Core curriculum at our department: 66 credits

Cross-disciplinary program module courses of Bioinformatics Engineering: 28 credits

At least 128 credits are required for graduation

(III)If 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 of Computer Science.

(IV)Besides compulsory courses that have been marked as waivable, students may submit applications for waiving other courses.

(V)If any course in the cross-disciplinary program module has the same name or curriculum as one of the compulsory courses of our department, the passed credits of the course may not count in the program. The duplicated credits must be made up with a related elective course appointed by the department of the Biological Science &Technology.

四、本系之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。

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，得依本校教師授課時數核計原則，教師的授課時數可按到場時數計，但以開課前該門課程之實際簽呈為依據。

In order to encourage different departments or colleges working together for designing cross-disciplinary curriculum, teaching hours for the innovative cross-disciplinary curriculum offered by

more than two teachers could be calculated based on the actual teaching hours. However, the calculation will only be eligible with the official approval obtained before the curriculum starts.

六、修讀跨域學程學生在獲核准前已修習及格之科目學分，若合於第二專長模組課程應修課程學分，得經第二專長的系所或學院審查同意後，予以追加採認。

The credits of cross-disciplinary program module curriculums having obtained before the student is admitted to take the cross-disciplinary program can only be counted if the credits are recognized by the department or college of the second specialty.

七、修讀跨域學程學生之選課手續應於加退選期限內完成，且每學期所修之第二專長模組課程科目、學分及成績均列記於其歷年成績表內。

Students taking a cross-disciplinary program shall enroll courses of the program by the deadlines of course registration. The courses, credits, and grades of the cross-disciplinary program module curriculums should be listed in the annual transcripts in each semester.

八、學生之第二專長模組課程學分及成績分別併入學期修讀學分總數及學期平均成績計算。

The courses, credits, and grades of cross-disciplinary program are incorporated into the student's semester credits and average grades.

九、修讀跨域學程學生，擬終止修讀跨域學程者，應至教務處申請撤銷其跨域學程資格，並回復至所屬學系修課規定。其已修習及格之第二專長模組課程學分，經所屬學系核定，報教務處備查後得抵免其所屬學系選修課程學分。

Students taking a cross-disciplinary program and intending to terminate the study in the cross-disciplinary program shall register with the Office of Academic Affairs for withdrawal from the program and follow the regulations and requirements of their major department. The passed courses of the cross-disciplinary program can be used as credit waiver against ones of the core courses in the major with the approval of the major department and submit to the Office of Academic Affairs for archiving purposes.

十、修讀跨域學程學生凡符合跨域學程規定畢業者，其畢業生名冊、歷年成績表及學位證書應加註跨域專長名稱。但畢業時如尚未修滿跨域學程規定之科目與學分，不得申請發給有關跨域學程之任何證明。

For students who earn sufficient credits and meet the requirements of the cross-disciplinary program, the name of the cross-disciplinary program will be noted in the graduates roster, transcripts, and diplomas, otherwise, no certificate of the cross-disciplinary program will be issued.

十一、本要點如遇修訂，須主動知會生物科技學系。

Our department should notify Biological Science &Technology department if the guidelines need to be revised.

十二、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 these guidelines, it shall be handled in accordance with the school constitution of our university as well as other relevant regulations.

十三、本要點經系、院及校級課程委員會審查通過後實施，修訂時亦同。

These guidelines were approved by Curricular Committee at department, college and university level before putting it into practice; the same shall be done upon any amendment thereto.

資訊工程學系「生物資訊工程跨域學程」必修科目表
The Required Course List for the students at our department study cross-disciplinary program of Bioinformatics Engineering

類別 **Category**	選別 **Classification**	科目名稱 **Courses**	學分 **Credits** 上學期 **Fall Semester**	學分 **Credits** 下學期 **Spring Semester**	開課系所 **Dept.**	備註 **Remarks**
本系學分（66 學分） Core curriculum at our department（66 credits）	基礎科學 14 學分，必修 31 學分，學程選修 12 學分，本系必修及主題學程課程(參閱本系必修科目表)，本系專業選修課程(至少 9 學分)(需修本系所開授的各專業科目，含大學部、研究所選修課程)。本系甲組選擇跨域學程為畢業條件者，依本系必修科目表規定。 備註：可以「生醫資訊跨領域專題(一)(二)」申請免修「資訊工程專題(一)(二)」。 Basic Science = 14 credits Compulsory courses = 31 credits Elective Program Courses = 12 credits Elective Professional Courses = 9 credits (All elective courses offered by the Dept. of CS (including elective courses in both undergraduate and graduate programs) Note : Biomedical Informatics Cross-Disciplinary Projects (I) (II) can be exempted from Computer Science and Engineering Projects(I)(II). Credits can be replaced by other courses offered in the Computer Science Department.					
生物資訊工程跨域模組（28 學分） 修畢於畢業證書加註「跨域專長：生物資訊工程」 Cross-disciplinary modules at other departments (28credits) Could be remarked as “Cross-Disciplinary Specialty” on the diploma	必修 13 學分 Compulsory Courses	生醫資訊跨領域專題(一)(二) Biomedical Informatics Cross-Disciplinary Projects (I) (II)	2	2	生科系/資工系 DBT/CS	1. 需資訊工程學系和生物科技系教授共同指導。 2. 可以「資訊工程專題(一)(二)」申請免修「生醫資訊跨領域專題(一)(二)」。 The student shall be jointly supervised by professors of DBT and CS
		普通生物學 (一)(二) General Biology (I)(II)	3	3	BST	必修 6 學分 註:若本系必修基礎科學選擇普通生物學(一)(二)為畢業學分，此處不足之必修 6 學分，請由生物資訊工程跨域模組之選修科目補足學分。

		生理學(一) Physiology (I)	3	生科系 DBT	必修 3 學分
	選修 15 學分 Elective Courses	化學 Chemistry	3	生科系 DBT	左列課程至少選 9 學分 At least 9 credits selected
		微生物學 Microbiology	3		
		遺傳學 Genetics	3		
		演化生物學 Evolutionary Biology	3		
		生物化學 (一) Biochemistry (I)	3		
		生物化學 (二) Biochemistry (II)	3		
		分子生物學 (一) Molecular Biology (I)	3		
		分子生物學 (二) Molecular Biology (II)	3		
		細胞生物學 (一) Cell Biology (I)	2		
		細胞生物學 (二) Cell Biology (II)	2		
		組織學 Histology	3		
		生理學(二) Physiology (II)	3		
		免疫學 Immunology	3		
		神經生物學 (一) Neurobiology (I)	2		
		神經生物學 (二) Neurobiology (II)	2		
		結構生物學 Structural Biology	3		
		腫瘤生物學 Oncology	3		
		細菌基因體特論 Special Topics in Bacterial Genomics	2		
		普通生物學實驗 General Biology Lab.	1		
		生物化學實驗 Biochemistry Lab.	1		
		微生物學實驗 Microbiology Lab.	1		
		分子生物學實驗 Molecular Biology Lab.	1		

		生物科技概論（一）或（二） Introduction to Biotechnology I or II	1		
		計算生物概論 Introduction to Computational Biology	2		
		細胞生物學實驗 Cell Biology Lab.	1		
		計算生物實驗 Computational Biology Lab.	1		
		結構生物學 Structural Biology	3		
		分子模擬 Molecular Simulation	3	生資所	
		生物序列分析與高通量技術 Sequencing Technology and High-throughput Data Analysis	3		
		結構生物資訊 Structural Bioinformatics	3		
		統計熱力學 Statistical Thermodynamics	3		
		網路生物學實作及應用 Implementation and Application of Network Biology	3		
		資料庫系統概論 Intro. to Database Systems	3	資工系 CS	左列課程至少選 6 學分 At least 6 credits selected
		人工智慧概論 Intro. to Artificial Intelligence	3		
		機器學習概論 Intro. to Machine Learning	3		
		人工智慧總整與實作 Artificial Intelligence Capstone	3		
		數值方法 Numerical Methods	3		
		計算機圖學概論 Intro. to Computer Graphics	3		
		影像處理概論	3		

		Intro. to Image Processing			
		多媒體與人機互動總整與實作 Multimedia and Human Computer Interaction Capstone	3		
		編譯器設計概論 Intro. to Compiler Design	3		
		計算機系統管理 Computer System Administration	3		
		高等 UNIX 程式設計 Advanced Programming in the UNIX Environment	3		
		作業系統總整與實作 Operating Systems Capstone	3		
		數位電路實驗 Digital Circuit Lab.	3		
		微處理機系統原理與實作 Microprocessor Systems: Principles and Implementation	3		
		嵌入式系統總整與實作 Embedded Systems Capstone	3		
		計算機網路概論 Intro. to Computer Networks	3		
		密碼學概論 Intro. to Cryptography	3		
		網路程式設計概論 Intro. to Network Programming	3		
		電腦安全總整與實作 Computer Security Capstone	3		
		通訊原理與無線網路 Principles of Communications and Wireless Networks	3		
		網路系統總整與實作 Network Systems Capstone	3		
		正規語言概論 Intro. to Formal Languages	3		

		競技程式設計(一) Competitive Programming (I)	3		
		圖形理論 Graph Theory	3		
		難解計算問題專論 Selected Topics in Intractable Problems	3		
		隨機演算法 Randomized Algorithms	3		
		資訊理論與壓縮編碼的應用 Information Theory and Data Compression Practices	3		
		機器學習演算法理論基礎 Algorithmic Foundation of Machine Learning	3		
校必修 General Courses			學分數 依入學年度規定 Credits criterion based on the year of register	校定必修：依入學年度規定 General course based on the year of register	
最低畢業學分 Minimum Credits Required for Graduation			128		

※重要課程擋修制度請參閱本系學士班修業辦法。
For the prerequisite of some important courses, please check the CS regulations
※人工智慧總整與實作為生物資訊工程跨域模組課程之第二專長總整課程。
Artificial Intelligence Capstone is the second specialty course of Cross-disciplinary program module courses of Bioinformatics Engineering