

長庚大學生物醫學研究所博士班必選修科目表（一一一學年度入學學生適用）2022.10

一、本所博士班畢業學分數至少需達 18 學分(不含論文 6 學分)

組別	生化細胞分生組	微生物學組	生理暨藥理學組	生物技術組	天然藥物組
必修	20	18	18	13	12
選修	0	0	0	5	6

書報討論課程於修滿四學分且提前通過學位考試者可免修，但仍需補足畢業學分。列於本所必選修科目表之課程皆可納入畢業學分核算。經指導老師同意，亦可選修本校其他博士班課程以達畢業總學分數要求，唯非本所課程之總學分數不可超過畢業學分數中選修總學分數之百分之五十。直攻博士班之學生，畢業時需達 30 學分(不含論文 6 學分)。

二、博士“論文”學分(6) 於通過學位考試並繳交通過審核論文後給予。

三、生物技術組課程均以英文授課，認可選修本校其他博士班英文授課之課程，但不可超過選修總學分數之百分之五十。

選讀博士班之生物技術組學生，認可生醫所及生技系碩士班之碩博課程 12 學分(含必修高等生物技術學 2 學分)。

四、本所外籍博士生畢業要求為 18 學分(不含論文 6 學分)，必修科目為書報討論課程 8 學分（一～四年上下學期，1 學分/學期），其餘可在指導教授協助規劃下選擇本表單上的相關科目。

五、畢業要求資訊請見當年度學生手冊

領域／組別 Divisions	必/選修 Required (R) or Elective (E)	科目名稱 Course Title	學分 Credit	開課 年級 Year	上學 期 Fall	下學 期 Spring	備註 Note
共同必修科目 General Required Courses	R	書報討論 Seminar (*)	8	1~4	8		一～四年級必修，共八學分。如提前完成學位考試及畢業手續，該學期及之後學分得免修。一～四年級間，若至其他研究機構或業界研習，學生須提出申請，經生醫所核定，該學期可免修。
	R	醫學新知導論 Current topics in biomedical sciences	2	1	2		左列科目為博士班核心課程，為必修三選一。99 學年度起適用。Core courses for the Ph.D. program. Completion of at least one course is required (starting in 2010).
	R	科學研究方法 Scientific methods	2	1		2	
	R	科學倫理與論文寫作 (*) Scientific integrity and scientific writing (*)	2	2		2	
生化暨細胞分生學組 Division of Biochemistry and Cellular Molecular Biology	R	高等生化學 Advanced biochemistry	3	1	3		左列必修科目，於碩士班期間曾經修習並通過，可於錄取後至開學前一週申請免修，但需附成績單及經指導教授、授課教師及所長同意。且需補足畢業學分數。 Required courses for PhD program. Students may be exempted from required course if the student has acquired these credits from previous program. The deadline for exemption applications is a week before the start of the semester. Application will have to be approved by the advisor, lecturer, and chairman, provided with the transcript. Besides, student still needs to fulfill the graduation credits.
	R	細胞生物學 Cell biology	3	1	3		
	R	分子生物學 Molecular biology	4	1		4	
微生物學組 Division of Microbiology	R	微生物學-細菌學 Microbiology-bacteriology	2	1	2		
	R	微生物學-寄生蟲學 Microbiology-parasitology	2	1	2		Offered jointly with the School of Medicine and School of Traditional Chinese Medicine 若五年內曾通過同課程、同學分數者，經指導教授、授課教師及所長同意後，得申請免修，仍需補足畢業學分數。 Course may be exempted for a student that has successfully completed an identical or equivalent course(es) within 5 years. Application will have to be approved by the advisor, lecturer, and chairman. Besides, student still needs to fulfill the graduation credits.
	R	微生物學-病毒學 Microbiology-virology	2	1		2	
	R	免疫學 Immunology	2	1		2	
生理暨藥理學組 Division of Physiology and Pharmacology	R	生理學 Physiology	4	1		4	Offered for international students in the Ph.D.
	R	藥理學 Pharmacology	4	1	4		
	R	人體生理學(*) Human physiology	4	1	4		
	R	醫學藥理學(*) Medicinal pharmacology	4	1		4	

生物技術組 Division of Biotechnology	R	系統生物學之先進技術 (*) Advanced technologies in systems biology (*)	3	1	3		
	R	科學倫理與論文寫作 (*) Scientific integrity and scientific writing (*)	2	1		2	
天然藥物組 Division of Natural Product	R	高等天然藥物學特論 Special topics in natural products	2	1	2		
	E	專題討論-生化暨細胞分生 (一) (*) Special topics in biochemistry, cell & molecular biology (1) (*)	2	1	2		
	E	生醫英語期刊專業語法(*) Biological and biomedical English paper writing style(*)	2	1	2		
	E	體學時代的生物技術與生物標誌 Biotechnology and biomarkers in the 'Omic Era'	1	1	1		暑期開課,上限 60 人 summer course, class limit: up to 60 students
	E	質譜定量蛋白質體學 (實作) Mass spectrometry-based quantitative proteomics (Hands-on)	1	1	1		暑期開課,上限 30 人 summer course, class limit: up to 30 students
	E	轉錄體學與數據分析 Transcriptomics (Hands-on)	1	1	1		暑期開課,上限 20 人 summer course, class limit: up to 20 students
	E	蛋白質體學與質譜分析 (實作) Proteomics and mass spectrometry (Hands-on)	1	1	1		暑期開課,上限 30 人 summer course, class limit: up to 30 students per class
	E	生技產業校外實習 Practical training in biotechnology industry	1	1	1		實習課程, 暑期開課 practice course (summer only)
	E	抗體備製與純化 (實作) Antibodies: production and purification (Hands-on)	1	1		1	
	E	膜轉運與胞吐特論(*) Special topics in membrane trafficking and exocytosis(*)	2	1		2	
	E	專題討論-生化暨細胞分生 (二) (*) Special topics in biochemistry, cell & molecular biology (2) (*)	2	1		2	
	E	論文與計畫寫作 Writing theses and research proposals	2	1	2		提供中文課程一班; 英文課程一班
	E	生物資訊分析課程 Bioinformatics	2	1	2		
	E	高等免疫學(*) Advanced immunology (*)	3	1	3		具有免疫基礎之研究生 for students with background knowledge in Immunology.
	E	熱帶醫學 Tropical medicine	2	1	2		自 109 學年度起,隔年開設 offered bi-annually, starting in 2020
	E	微生物與人類歷史 Microbes and human history	2	1	2		自 105 學年度開始, 隔年開設。 offered bi-annually, starting in 2016 上限 30 人 class limit: up to 30 students
	E	病毒--寄主互動特論 Special topics in virus-host interactions	2	1	2		自 111 學年度起隔年開設, 需修過微生物學。 Starting in 2022, offered bi-annually. Prerequisite: Microbiology
	E	細菌致病分子學 Bacterial pathogenesis	2	1		2	自 91 年始,隔年開設 offered bi-annually, starting in 2002 提供中文課程一班; 英文課程一班
	E	高通量定序分析 High-throughput sequencing analysis	2	1		2	
	E	訊號傳遞 Signal transduction	2	1	2		
	E	循環系統特論 Special topics in circulation	3	1	3		

E	神經科學 Neuroscience	2	1	2		
E	高級生物統計學 Advanced biostatistics	2	1	2		
E	內分泌學 Endocrinology	2	1		2	
E	老化特論 Special topics in aging	2	1		2	
E	藥理學特論 Special topics in pharmacology	2	1		2	自 101 學年度始，隔年開設 offered bi-annually, starting in 2012
E	星型膠細胞生理病理學 Astrocytes in the pathophysiology of the nervous system	2	1		2	
E	神經生物學 Neurobiology	2	1		2	(與醫學系同修) offered jointly with School of Medicine
E	分子影像 (*) Molecular imaging (*)	3	1	3		兩年開一次：96 學年度起開課 offered bi-annually, starting in 2007
E	疫苗研發 (*) Vaccine development (*)	3	1	3		兩年開一次：98 學年度起開課 offered bi-annually, starting in 2009
E	新興病毒特論 (*) Special topics in emerging viruses (*)	2	1	2		
E	RNA 病毒特論 (*) Special topics in RNA viruses (*)	2	1	2		
E	自由基生物醫學(*) Free radical biology and medicine	2	1	2		
E	轉譯癌症醫學 (*) Translational cancer medicine (*)	2	1	2		碩博合開，且須修過「細胞生物學」或「分子生物學」 Offered jointly with the MS program Prerequisite: Cell Biology or Molecular Biology
E	高等細菌學(*) Advanced bacteriology (*)	2	1		2	
E	高等劑型設計特論 Special topics in dosage form design	2	1	2		
E	天然物與血栓平衡 Natural products and the balance of thrombosis	2	1	2		
E	發炎藥理學特論 Special topics in inflammopharmacology	2	1	2		
E	藥廠與專利申請實務特論 Special topics in the pharmaceutical factory and patent application	2	2	2		碩博合開 Offered jointly with the MS program
E	中藥資訊研究 Information studies of traditional Chinese medicine	2	2	2		碩博合開 Offered jointly with the MS program
E	高等藥物化學特論 Special topics in advanced medicinal chemistry	2	2	2		
E	高等基因藥理學特論 Special topics in pharmacogenomics	2	2		2	自 110 學年度起隔年開設。Starting in 2021, offered bi-annually.
E	藥效學特論 Special topics in pharmacodynamics	2	1		2	碩博合開 Offered jointly with the MS program
E	製藥生技學特論 Special topics in industrial pharmaceutical biotechnology	2	1		2	碩博合開 Offered jointly with the MS program
E	表觀遺傳學特論 Special topics in epigenetics	2	2		2	自 111 學年度起隔年開設。Starting in 2022, offered bi-annually.
E	中草藥產業技術開發 Industrial development of Chinese medicine and herbal drugs	2	2		2	碩博合開
E	生化暨分子生物學(*) Biochemistry and molecular biology (*)	2	1	2		與新興病毒分子醫學國際碩士學位合開 In conjunction with the International Master Degree Program for Molecular Medicine in Emerging Viral Infections.
E	生物資訊與生物統計學(*) Bioinformatics & biostatistics (*)	2	1	2		

E	細胞生理與訊號傳遞(*) Cellular physiology & signal transduction (*)	2	1	2	
E	應用於新興感染症之動物模式(*) Animal model for studying emerging infectious diseases(*)	2	1	2	
E	基因組數據科學(*) Genomic data science(*)	2	1	2	
E	深度學習與 Python 語言(*) Deep learning with Python(*)	2	1	2	
E	細胞分子生物學(*) Molecular & cellular biology (*)	2	1	2	
E	細胞生物學特論(*) Advanced cell biology (*)	2	1		2
E	高等微生物學(*) Advances in microbiology (*)	2	1		2
E	高等免疫學新知(*) Advances in immunology(*)	2	1		2
E	細胞生長與細胞凋亡(*) Cell growth and apoptosis (*)	2	1		2
E	新興病毒新知技術特論(*) Technologies and Advances in Emerging Viral Infections(*)	2	1		2
E	分子病毒方法學概論(*) Methodology of molecular virology(*)	2	1		2
E	抗病毒藥物之研發(*) Anti-virus drug development(*)	2	1		2
E	高等臨床病毒學(*) Advanced clinical virology(*)	2	1		2
E	檢驗試劑之研發(*) Test reagent kit development(*)	2	1		2

註： 1、打(*)者為英文授課。

2、學生所選欲修習之科目，需經過指導老師之同意及簽名。

所長：_____

課程委員會：_____

Graduate Institute of Biomedical Sciences, Chang Gung University

Graduate Program Ph.D Curriculum (2022~2023)

- Students pursuing a PhD degree must fulfill a minimum 18 course credits and 6 credits for PhD dissertation. Students may choose any courses listed below. With the approval of the advisor, students may also take courses offered by other doctoral programs in CGU to meet the credit requirement for graduation; only the total credits earned from other PhD programs cannot exceed 50% of the total elective credits for graduation. For students without a MS degree, 30 credits are required for graduation (plus 6 credits for PhD dissertation).
- The 6 credits for PhD Dissertation are given after passing the final defense and submitting the approved dissertation.
- See PhD student manual for graduation requirements.

Divisions		Course Title	Credit	Year	Semester		Note
					Fall	Spring	
General Required Courses		Seminar (*)	8	1	1	1	Students must take all 8 semesters.
				2	1	1	
				3	1	1	
				4	1	1	
		Scientific Integrity and Scientific Writing (*)	2	2		2	
Suggested Courses	Biochemistry and Cellular Molecular Biology	Advanced Biochemistry	3	1	3		
		Cell Biology	3	1	3		
		Molecular Biology	4	1		4	
	Microbiology and Immunology	Microbiology-Bacteriology (*)	2	1	2		
		Microbiology-Parasitology	2	1	2		
		Microbiology-Virology	2	1		2	
		Immunology	2	1		2	
	Physiology and Pharmacology	Human Physiology (*)	4	1	4		
		Medicinal Pharmacology (*)	4	1		4	
	Biotechnology	Advanced Technologies in Systems Biology (*)	3	1	3		
	Natural Products	Special Topics in Natural Products	2	1	2		
Elective Courses	Biochemistry and Cellular Molecular Biology	Special Topics in Biochemistry, Cell & Molecular biology (1) (*)	2	1	2		
		Biological and Biomedical English Paper Writing Style (*)	2	1	2		
		Biochemistry and Molecular Biology(*)	2	1	2		
		Special Topics in Membrane Trafficking and Exocytosis(*)	2	1		2	
		Advanced Cell Biology (*)	2	1		2	
		Cell Growth and Apoptosis (*)	2	1		2	
		Special Topics in Biochemistry, Cell & Molecular biology (2) (*)	2	1		2	
	Microbiology and Immunology	Advances in Microbiology (*)	2	1		2	
		Advances in Immunology (*)	2	1		2	
		Advanced Immunology (*)	3	1	3		For students with basic knowledge in Immunology.
		Writing theses and research proposals(*)	2	1	2		
		Bacterial pathogenesis (*)	2	1		2	
		Bioinformatics & Biostatistics (*)	2	1	2		
	Physiology and Pharmacology	Cellular Physiology & Signal Transduction (*)	2	1	2		
	Biotechnology	Molecular Imaging (*)	3	1	3		Offered bi-annually, starting in 2007
		Vaccine Development (*)	3	1	3		Offered bi-annually, starting in 2009
		Special Topics in Emerging Viruses (*)	2	1	2		
		Special Topics in RNA Viruses (*)	2	1	2		
		Free Radical Biology and Medicine (*)	2	1	2		

		Translational Cancer Medicine (*)	2	1	2		Prerequisite: Cell Biology or Molecular Biology
		Advanced Bacteriology (*)	2	1		2	
	Others	Animal Model for Studying Emerging Infectious Diseases(*)	2	1	2		Offered by the International Master Program for Molecular Medicine in Emerging Viral Infections (MMEVI)
		Genomic Data Science (*)	2	1	2		
		Deep Learning with Python (*)	2	1	2		
		Molecular & Cellular Biology (*)	2	1	2		
		Technologies and Advances in Emerging Viral Infections (*)	2	1		2	
		Methodology of Molecular Virology (*)	2	1		2	
		Anti-virus Drug Development (*)	2	1		2	
		Advanced Clinical Virology (*)	2	1		2	
		Test Reagent Kit Development (*)	2	1		2	

Note:

1. Subjects chosen by students must be approved and signed by the Dissertation supervisor.
2. An asterisk (*) indicates a course taught in English.

Director of GIBMS: _____

Head of the Course Committee: _____