

生物科技系 四年制 中英文摘要
Department of Biological Science and Technology

一、必

修科目 Required Courses

05049 生物學(1) 3 必 許岩得、周映孜、胡紹揚上

生物學為生命科學重要之基礎科目，屬於總論性質的課程。本課程內容包含生命的化學組成，細胞結構、遺傳組成與變異、生物演化機制等，修完本課程學生將能對生物體的生命現象有基知識。

05049 Biology(1) 3R Y. D. Hsuw & Y.T. Jou & S. Y. Hu, F

Biology lecture is a foundational course of life science. The content of this course comprise the chemistry of life, cell structure, genetics, mechanisms of evolution, and ecology. After complete this course, students can understand the basic knowledge of life phenomenon.

21814 生物學實驗(1) 1 必 徐志宏&蔡添順、上

本實驗課程在使學生能以實驗印證理論，增進學生對理論之瞭解。實驗內容包括顯微鏡操作、生物含細菌、真菌、原生動物、植物與動物細胞的觀察、擴散作用、滲透作用之測定等。

21814 Biology Lab.(1) 1R D. J. H. Shyu & T. S. Tsai, F

The laboratory work is to acquaint students with both practical operation and theoretical aspects of the lecture subjects. The contents include the operate microscope, look and describe the organism including bacteria, fungi, protozoa, plant and animal cell, measurement of diffusion, osmosis.

20070 分析化學 2 必 徐睿良、下

分析化學主要含概定性與定量的分析方法以及離析的分析方法，本課程的主要目的為使學生瞭解組成樣品物質中各成份相對含量的離析、驗證與確認等工作。所探討的主題包括（1）分析化學的化學原理（2）實驗數據準確度與精密度的評定（3）介紹當前分析化學得各種技術。

20070 Analytical Chemistry 2R J. L. Hsu, S

The course in analytical chemistry deals principally with qualitative and quantitative methods of analysis and methods of analytical separation. The major objective of this course is to familiarize the students with separating, identifying, and determining the relative amounts of the components making up a sample of matter. The discussion topics will include the following; (1) the chemical principles of analytical chemistry, (2) judging the accuracy and precision of experimental data, (3) introduction of a wide range of techniques in modern analytical chemistry.

20071 分析化學實驗 1 必 徐睿良、下

本課程為搭配分析化學而開設，使同學熟練一般分析化學概念、流程及

實驗技術操作，進而對教材理論更深入了解並具備實務操作能力。內容包括緩衝液配置、酸鹼滴定、金屬離子濃度測定及有機物測定等定性及定量分析。每一實驗均包含樣品配置、濃度運算、分析原理、準確與精確、定性及定量等分析實務。

20071Analytical Chemistry Lab. 1R J. L. Hsu, S

The course is complementary to the principle of Analytical Chemistry and aimed to provide practical training in operation techniques involved in regular analytical flowcharts for students. The content includes buffer preparation, acid-base titration, quantification of metal ion concentration and measurement of organic compounds, and so on. Each experiment contains practices of sample preparation, concentration calculation, principles, accuracy and precision as well as qualification and quantitation.

20293 有機化學 3 必 張誌益、上

本課程乃著重於重要之碳化合（包括烷、烯、炔、醇、醚，有機鹵化物，芳香族化合物，醛，酮，酯與胺）之官能基反應，各類有機物之合成方法，相互間之關係以及其實際之應用。

20293Organic Chemistry 3R C. I. Chang, F

A systematic study of the important classes of carbon compounds (alkane, alcohol, ether, organic halides, aromatic compounds, aldehyde, ketone, carboxylic acid, ester and amine) reactions of their functional groups, methods of synthesis, relations and uses. Proteins are presented.

40252 有機化學實驗 1 必 張誌益、上

本課程為配合非主修有機化學的教材而開設，期使學生熟練一般實驗技術及操作，進而對教材理論的了解及應證。除物理常數之測定外，其他依官能基的種類逐一實驗；烷、烯、炔、苯、鹵烷、醇、酚、胺、醚、醛、酮、羧酸、羧酸衍生物、脂類、醣類、核酸與蛋白質。每一實驗的重點是由官能基所產生的化學、物理性質。部分實驗亦包括簡易少量的合成。

40252Organic Chemistry Lab. 1RC. I. Chang, F

This course is devised in conjunction with the lecture material nonmajors in organic chemistry. It provides students a profound understanding of subject-matter from laboratory work and familiarity with basic techniques. In addition to measurements of physical constants, the course is carried out in a functional approach: alkanes, alkenes alkyens, benzenes, organic halides, alcohols, ethers, aldehydes, ketones, carboxylic acids, and the deritatives of carboxylic acid, amines. Each experiment emphasizes the common chemical properties ascribed to functional groups.

20734 細胞生物學 3 必 顏嘉宏、上

本課程主要提供學生學習細胞生物學相關之基礎理論，將介紹生物界之細胞型態與特徵、細胞之胞器與作用、胞膜及胞器膜的功能、細胞基因之構造、原核與真核細胞之細胞差異、細胞增殖作用、細胞周期與凋亡作

用及其調節機制。

20734 Cell Biology

3R

C.H. Yen, F

General concepts on Cell Biology will be introduced in this course, which include an overview of cells, cell types and their features, cell structure and functions, cell membranes and plasma membranes, the organization of cellular genomes, differences between prokaryotes and eukaryotes, the proliferation of cells, cell cycle and apoptosis.

40113 生物化學(1)

3 必 鄭雪玲、張格東、胡紹揚、上

本課程包括基礎生化，探討有關醣類，核酸，脂肪及蛋白質的結構，功能，和代謝機制。

40113Biochemistry (1)

3R S. L. Cheng &S. L. Cheng& F.

Y. Hu, S

The course features the fundamental biochemistry including the structure, the function, and the metabolism of carbohydrates, nucleic acids, fatty acid and proteins.

40117 生物化學實驗

1 必 鄭雪玲、張格東、胡紹揚、上

本實習之目的在訓練並建立學生在生物化學領域之基本基礎與技術，課程內容包括儀器操作，pH 值之測定，醣類之定量，蛋白質之定量和活性分析，SDS-PAGE 之準備和電泳，核酸之定量和分子操作，限制酶消化之作用。

**40117Biochemistry Experiments
&S. L. Cheng& S. Y. Hu,F**

1R

S. L. Cheng

The purposes of this course are critically selected and tested to instruct students effectively in the basic principles and techniques within biochemistry areas. Course contents include the operation of machines, measurement of pH value, quantification of carbohydrate and protein, quantification of nucleic acid, SDS-PAGE, molecular cloning, and restriction enzyme digestions.

20899 微生物學

3 必 陳又嘉、張格東、胡紹揚、下

本課程之目的，在使學生瞭解醫用微生物的基本知識，範圍涵蓋臨床上常見的病原菌，及其生化實驗室菌種鑑別的方法。

20899 Microbiology

3R Y. C. Chen& K.T. Chang& S. Y.

Hu, S

An up-to-date study of essential microbiology in the concepts of basic and clinic application. it features mainly on the pathogenic bacterias that cause the diseases of the human being.

55043 微生物學實驗

1 必 陳又嘉、張格東、胡紹揚、下

本實習之目的在訓練並建立學生在醫用微生物學領域之基礎技術，課程內容包括顯微鏡的運用，正常菌叢在皮膚，上呼吸道，腸胃道，及泌尿

道的採集與鑑別，訓練學生完成菌種鑑別報告。

55043 Microbiology Lab. 1R Y. C. Chen& K.T. Chang& S. Y. Hu, S

An interactive study of microbiology in laboratory. It features mainly on knowing of differential diagnosis of pathogenic bacterias on skin, upper respiratory tract, gastrointestinal tract and urinary tract of the human body.

40115 生物化學(2)

3 必 鄭雪玲、張格東、胡紹揚、下

本課程主要著眼於病理生化學。藉由生化機制的觀點來探討暗藏於疾病下可能的問題癥節。

40115 Biochemistry (2)

3R S. L. Cheng &S. L. Cheng& S.

Y. Hu, S

An up-to-date study of pathobiochemistry. It features mainly on the discussion of abnormal biochemical status that is beneath in human diseases.

65005 生物技術

2 必

陳又嘉、鄭雪玲、下

本課程旨在加強學生對生物技術之了解、其範圍涵蓋遺傳工程技術、細胞融合技術和蛋白質工程技術等三大領域的理論和臨床上應用等方面的學習，培養生物技術相關人才為目的。

65005 Biotechnology

2R

YC Chen & H. L. Cheng

S

The curriculum will emphasize three major areas, including genetic engineering, hydridoma techniques and protein engineering .The purpose is to train students understanding the concept of biotechnology and their applications.

21794 分子生物學

2 必

胡紹揚、上

課程包括有關核酸蛋白質的分子結構說明，核酸及蛋白質的合成及代謝。其中特別強調原核生物之基因調控和分子轉錄特性的說明。真核生物之基因調控與結構和分子轉錄特性的比較。

21794 Molecular Biology

2R

S. Y. Hu, F

The course introduces following topics: 1. The basic structure of nucleic acids and proteins at the molecular level. 2. The biosynthesis and metabolism of nucleic acids and proteins at the molecular level. 3. The genetic regulation and molecular transcriptions of prokaryotes. 4. The genetic regulation and molecular transcriptions of eukaryotes.

05010 生態學

2 必

蔡添順、下

生態學是探討生物之間以及其與環境間的交互關係，本課程的主要內容包含生態科學與原則、生物多樣性、環境問題、生態永續發展等項目。藉由課程講授與學生報告的方式，本課程將使學生對自身所處的環境與生態有著更深的認識，進而重視、關心與主動保護生態。

05010 Ecology**2R****T. S. Tsai, S**

Ecology is the scientific study of the relationships between organisms and their environment. This course features the ecological principles, biodiversity, environmental problems, and sustaining environment and ecology. With lectures as well as student reports, the course will urge students to have a deeper understanding of their own environment and ecology, to care current ecological events, and then to protect ecology actively.

20189 生技產業**2 必(四上)****合授 上**

本課程將提供學生生物技術的新近發展，課程中將介紹與討論包括能源、生物醫學、活性天然物、蛋白質工程、蛋白質體學、代謝體學等研究成果。並加入有關生物科技的產業現況與未來趨勢，涵蓋生物科技在各式產業的應用實務，並從市場、法規、行銷、生產、品管及專案管理等層面進行分析，藉此拓展同學職涯規劃的視野。

20189 Bioindustry 2R (grade 4)**W. L. Shih, J. L. Hsu, F**

The course offers students current developments in biotechnology. The researches of biofuel, protein engineering, proteomic, biomedicine, molecular diagnosis, bioactive compounds and metabolomic will be introduced and discussed in this course. Additionally, this course introduce the application scopes of biotechnology and to analyze the current status and future trends in biotech industries. Biotech industry analysis about the technologies in practice, industry overview and trends, regulation, marketing, manufacture, quality assurance and control, and project management will be also provided.

30039 專題討論**1 必****各教師、上**

本課程擬經由報告之收集、研讀與彙整，除令學生從而習得相關之專業知識外，亦期能由之獲得資料之分析、歸納與邏輯思考之能力，並藉由書面報告、口頭發表及討論之歷練，以培養學生之論文撰寫能力及口頭表達能力。

30039Seminar**1R****All Teachers, F**

The purpose of this course is to give students training on searching information, reviewing references, designing experiment, collecting and analyzing data. The subjects cover modern aspects of animal science and farm operation. Students must give oral presentation and dissertation.

202018 校外實習**9 必****合授、下**

本課程的目的為使學校課程內容與企業需求間更加緊密結合，透過校外實習之過程，讓學生熟悉研發、生產、品管及行銷等企業運作流程並瞭解企業制度與產業趨勢。進一步地，協助學生從實習經驗中充實專業技能、培養獨立思考、協調溝通的能力及敬業態度。

**202018 Bioindustrial Internship (off-campus)
teachers S****9R****All**

This course aims to establish close correlation between course contents in this department and industrial needs. Through the industry internship, students will be more familiar with business trends and key industrial components such as research and development, manufacturing, quality assurance, marketing, and so on. In addition, this course also aims to help students not only enrich job skills, but develop independent thinking, coordinating and communication ability, and professional attitude.

生技實務

9 必

合授、下

本課程的目的為使學校課程內容進行實務應用，透過全學期在校內各實習單位進行主題式產學相關實務專題演練之過程，讓學生熟悉研發、生產或品管等生技產業所需之實務技能與操作技術。進一步地，協助學生從實習經驗中充實專業技能、培養獨立思考、協調溝通的能力及敬業態度。

202018 Bioindustrial Industrial Practice (on-campus) 9R
All teachers S

This course aims to apply the background knowledge offered in this department for industrial needs. Through the project-based laboratory internship, students will be more familiar with the key practice and techniques as research and development, manufacturing or quality assurance in industries. In addition, this course also aims to help students not only enrich job skills, but develop independent thinking, coordinating and communication ability, and professional attitude.

備註

「校外實習」與「生技實務」為二選一之必修。大四學生需全數修「校外實習」到校外實習，除以下特殊情況者，另經系務會議通過同意可留至校內實習，改選「生技實務」，但須遵守相關校外實習規範。

特殊情況包括：預備研究生、身心障礙生、外籍生及特殊狀況者。

二、選修科目 Elective Courses

20791 智慧財產權

2 選

徐志宏、上

本課程主要介紹智慧財產權的基本常識、重要性、規定、申請及使用等相關技巧，始能在參與產業發展的過程中尊重及善用智慧財產權。課程內容包括智慧財產權之基本知識及法規、創新與保護的重要性、專利價值與策略、專利查詢、技術調查與管理、專利組織、專利申請、專利審查機制及實施與案例討論等。

20791 Intellectual Property

2 E

D. J. H. Shyu , F

This course is designed to introduce the basic knowledge and importance of intellectual property. The techniques of using patents and apply for a patent are also intended to be trained in this course to respect and take advantage of

intellectual property. The content includes the basis and laws of intellectual property, the importance of innovation and protection, patent value and strategy, patent search, technology investigation and management, patent office and organization, patent application, patent pending and case discussion.

20201 生物繪圖技術

2 選

周映孜&蔡添順、上

本課程旨在介紹並學習生物繪圖的技術，包括生物外形、特徵或分佈圖或模式圖等的繪圖原理、要點與技法等。學生將可資應用於作業或報告撰寫，甚至未來專長建立或其研究工作。期末並配合學生之成果展，進一步觀摩學習，並比較與欣賞。授課內容分為若干單元，各單元將有實作練習，包括生物繪畫歷史、鉛筆素描、針筆應用、分布圖、模式圖等。

20201 Techniques of Biological Illustration

2 E

Y.T. Jou

& T. S. Tsai, F

The main purpose is to introduce biological illustration and give guides how to apply techniques to show biological illustration. It includes the illustrations for external morphology, character, distribution map and model diagram. Students with this skill can apply to write homework and report, even establish an expertise or research works in the future. Via final exhibition of students' works, students can compare and admire biological illustrations. This course divided several units with practical excises, including history of biological illustration, skills for pencil illustration, skills for technical pen, distribution map and model diagram.

20306自由基生物學

2選

顏嘉宏、上

自由基指的帶有未配對電子的原子、離子或分子，而在使用氧作為代謝的生物體中，都會有自由基的產生。自由基在生物體內的角色很多元化。在植物方面，植物與病原菌的交互作用中，不管是造成植物罹病或引起植物的防禦反應，都有自由基有關。此外植物在逆境中成長或植物的衰老也與植物體內的自由基有關，而且在植物體內有一套抗氧化的系統，可以抵抗自由基所帶來的傷害。在動物方面，巨噬細胞內產生的自由基有助於加強動物體的防禦能力。然而在血管細胞產生的自由基則可以當做血管收縮或血管舒張的訊號傳遞物質。此外，動物體內產生過多的自由基與疾病及老化有很大關聯性，而且動物體內有抗氧化系統可以減弱自由基所帶來的傷害。由於自由基的研究已持續多年，理論基礎已趨穩定，而且已深入一般日常生活中，因此，我們擬開設此課程介紹學生基礎的自由基生物學概念及其應用。

20306Free Radical Biology

2S

C. H. Yen , F

A free radical is defined as any atom, ion or molecule with unpaired electron, and it is unavoidably produced in an organism that has the ability to utilize oxygen as an energy source. Free radicals play important multiple roles in an organism. In plants, free radicals are involved in growth, disease, immunity,

apoptosis or environmental stress. In vertebrates, free radicals act as second messengers mediated inflammation, cardiovascular function, immune responsiveness, aging and so on. However, there is an antioxidant system in an organism to regulate the free radicals-induced effects. Since the study of free radical biology have been explored for a long time and the fundamental knowledge or theory is well established, we will introduce the concepts and application of free radicals in plants and vertebrates to undergraduates (fourth-degree) in Department of Life Sciences.

21839 生物學(2)

3 必 許岩得、周映孜、胡紹揚上

本課程介紹生物學中近代發展之情形，著重於現代遺傳學，分子生物學之介紹。

21839 Biology(2)

3R Y. D. Hsuw &Y.T. Jou &S. Y.

Hu, S

The objective of this course is to introduce the recent development of biology, focusing on the introduction of modern genetics and molecular biology.

21815 生物學實驗(2)

1 選

徐志宏&蔡添順、下

本課程包括：1.顯微鏡之操作 2.顯微鏡之觀察 3.基本動物及植物之觀察 4.基礎之動物、植物生理實驗 5.基礎之生化實驗 6.基礎之遺傳實驗。

21815Biology Lab. (2)

1E

D. J. H. Shyu & T. S. Tsai , S

This course offers : 1. Operation of microscope 2. The observation of materials by microscope including animal materials and plant materials. 3. Fundamental experiments of animal physiology and plant physiology. 4. Fundamental Biochemistry lab. 5. Fundamental genetics lab.

20499 科學方法

3 選

徐志宏、下

科學方法是科學家從蒐集整資料並盡力去建構一個能精確(指的是可信的、前後一致的，且非任意的)表述之結果的整個流程。個人認知與文化信仰都會影響每個人對於自然現象的洞察力與解釋方式。在發展理論或作出結論的時候，如能透過標準的程序與準則，盡量減少這些影響，將會使理論或結論更為精確。科學方法大至有 4 個步驟：1) 現象的觀察； 2) 構想假設來解釋現象； 3) 用假設來預測其他存在的現象，或預估數量； 4) 執行實驗利用結果來驗證假設

20499 Scientific Method

3 E

D. J. H. Shyu, S

The scientific method is the process by which scientists, collectively and over time, endeavor to construct an accurate (that is, reliable, consistent and non-arbitrary) representation of the world. Recognizing that personal and cultural beliefs influence both our perceptions and our interpretations of natural phenomena, we aim through the use of standard procedures and criteria to minimize those influences when developing a theory. The scientific method has four steps: 1) Observation and description of a phenomenon or group of

phenomena; 2) Formulation of an hypothesis to explain the phenomena; 3) Use of the hypothesis to predict the existence of other phenomena, or to predict quantitatively the results of new observations; 4) Performance of experimental tests of the predictions by several independent experimenters and properly performed experiments.

202023 生物資訊學導論

2 選

陳又嘉、上

生物資訊學課程將介紹生物資料庫及網站之建立、生物資訊的搜尋與生物資訊的分析。課程內容主要包括生物巨分子，例如蛋白質及核酸。重要議題包括文獻資料庫、序列資料庫、序列分析工具、實驗方法資源、基因拼圖資料庫、資料庫搜尋、核酸比對、微陣列晶片及蛋白質體學之分析等。

202023 Introduction of Bioinformatics 2 E

Y.C.Chen , F

This course will introduce databases, searching and analysis of bioinformation. It focuses and discusses application of computer and internet resources to analyze biological macromolecules, such as protein and DNA. Important topics include literature database, sequence database, sequence analysis tools, protocol resource, genome mapping database, database search, nucleotide alignments, microarray chips, and proteomics.

202025 精油產品操作實務 2 選

施玟玲、上

精油產品在市場上迅速成長，甚至標榜神奇效用，有鑑於此，規劃此課程以循序漸進方式介紹精油化學、萃取與、品管分析、生物活性研究、精油的芳療應用及精油產品製作，藉此增加同學對精油的深入了解與實務操作。

202025 Essential oil products 2 E

W. L. Shih , F

Essential oil products industry has mushroomed over the past several years, even claim the magic effects. Therefore, the course organization includes essential oil chemistry, extraction and reprocessed, quality control, biological activities research, aromatherapy and product manipulation.

化妝品原料學

大二上

選修 2 學分

施玟玲,上

認識化妝品原料是調製基礎，原料的特性影響產品品質。本課程目的在介紹目前化妝品使用之各類原料特性及功效，由化學命名開始，再分成基質原料、輔助性原料、賦形劑原料及活性機能原料，使同學能對原料充分了解，進而研製優質產品。

Cosmetics Ingredient

2E

W. L. Shih , F

Knowing of the cosmetics ingredient is the basis of cosmetics manufacture. The natural characteristics of raw materials affects the quality of product. The aim of this course is to introduce the nomenclature of various ingredients, then divide into the matrix materials, auxiliary materials, excipient materials and functional active materials. This course helps students

understanding the cosmetics raw materials well, and further can develop high quality commercial products.

22138 保健食品概論

2 選

施玫玲，下

講授保健食品相關知識，說明其定義、發展歷史及國際現況，比較各國保健食品相關申請認證文件內容及規定，介紹保健食品範圍，專有名詞法規，健康食品申請流程與內容，說明功能性原料之化學組成及生理功能，介紹食品安全性評估技術及其應用，內容包括食品毒理學，並由食品營養學觀點，說明保健食品之理論基礎與其在加工上之應用。

22138 Introduction to functional food

2 E

W. L. Shih, F

Definition and range of functional food will be discussed. The initiation, development and future trend of functional food industry will be introduced. The terms, systems of health food certification and related regulation of health food of various countries will be included and compared. The principle or active components and their functionalities on human body will be interpreted. Toxicology concerns about major compounds in functional products will be included. Nutritional point of views will be applied to explain the role and bioactivities of functional foods.

21430 動物解剖學

2 選

許岩得、上

課程概述：本課程為基本動物解剖學，著重於動物體內各系統的解剖與結構的認識。包括心臟循環系統、呼吸系統、內分泌系統、神經肌肉系統、消化系統、泌尿生殖系統，期使學生能夠將解剖學與生理學知識相結合並運用於生命科學、動物科學及實驗動物科學相關領域，往後修習生物醫學相關課程的基礎。

21430 Animal Anatomy

2 E

Y. D. Hsuuw, F

Lecture provides the anatomy concepts and understandings that focus on the animal anatomy and the observation of systemic structures. Courses contain the heart and circulation, respiration, endocrine system, nerve-muscular system, digestion, the urinary and reproductive system. Following the lectures, student might apply the knowledge on the life science, animal science or laboratory animal, or as a fundamental for the biomedical course and research.

21431 動物解剖學實驗

1 選

許岩得、上

本課程以哺乳動物實際解剖練習為主，著重於動物體內各系統的解剖與結構的觀察。包括心臟循環系統、呼吸系統、內分泌系統、神經肌肉系統、消化系統、泌尿生殖系統，期使學生能夠將解剖學與生理學知識相結合並運用於生命科學、動物科學及實驗動物科學相關領域，做為往後修習生物醫學相關課程的基礎。

21431 Animal Anatomy Lab.

1 E

Y. D. Hsuuw, F

Lecture provides the anatomy practice on mammalian animals that focus on the animal dissection and the observation of systemic structures. Courses contain the Skull, axial and appendicular skeletons, the cardiovascular,

respiratory, endocrine systems, the digestive, urinary and reproductive systems. Following the lectures, student might apply the knowledge on the life science, animal science or laboratory animal, or as a fundamental for the biomedical courses and studies.

20809 植物分類學 **2 選** **周映孜、上**
研究植物分類發展史、命名、重要種子植物分類群特徵數辨識、樹種的重要分布。

20809 Plant Taxonomy **2 E** **Y.T. Jou, F**
This course covers: 1. the aim of taxonomy 2. history summary 3. nomenclature 4. concepts of taxa 5. the construction and use 6. phytophagy and the terminology of plant description 7. angiosperms.

21467 植物分類學實驗 **1 選** **周映孜、上**
本實習目標為學生具備樹種鑑定之能力，於實習課程內以實務配合幻燈片，加上野外採集鑑定，訓練學生學以致用而有實際經驗。

21467 Plant Taxonomy Lab. **1 E** **Y.T. Jou, F**
The objective of this practice course is to provide the students with the ability to identify the various plants in the field. The contents include as follows: collecting plants in the field, identification and examination of herbarium specimens and slides, using the herbarium and introducing its importance in the study of taxonomy, and surveying the composition of plants in small areas

21851 生物技術與污染防治 **2 選** **徐睿良、上**
本課程主要介紹生物技術在環境污染防治之應用。內容包括微生物簡介、環境監控、污水處理、乾淨科技之應用、生物復育、替代能源及農業生物科技等。

21851 Environmental biotechnology **2 E** **J. L. Hsu, F**
The objective of this course is to introduce the applications of biotechnology in environmental protection and remediation. The course includes the basics of microbiology, environmental monitoring, sewage treatment, clean technology, bioremediation, energy and biofuel and agrobiotechnology.

22236、22237、22238 暑期實習(1)(2)(3) **2 選** **徐睿良等合授上**

本課程的目的為使學校課程內容與企業需求間更加緊密結合，透過暑期實習之過程，讓學生熟悉研發、生產、品管及行銷等企業運作流程並瞭解企業制度與產業趨勢。進一步地，協助學生從實習經驗中充實專業技能、培養獨立思考、協調溝通的能力及敬業態度。

22236、22237、22238 Summer Vacation Practice(1)(2)(3) **2S** **JL Hsu,**

etc. F

This course aims to establish close correlation between course contents in this department and industrial needs. Through the industry internship, students will be more familiar with business trends and key industrial components such as research and development, manufacturing, quality assurance, marketing, and so on. In addition, this course also aims to help students not only enrich job skills, but develop independent thinking, coordinating and communication ability, and professional attitude.

20832 植物解剖學

2 選

徐志宏、下

本課程主要講授植物體內部之解剖構造與功能。內容包括細胞之詳細介紹、薄壁組織、厚角組織、厚壁組織、維管組織、分泌組織與分生組織之特性、構造及功能，進而探討根、莖、葉、花、果實、種子等器官之解剖特性。

20832 Plant Anatomy

2 E

D. J. H. Shyu, S

The purpose of this course is to acquaint students with the anatomical structure and function of plants. The main topics included in this course are structure and function of plant cells, parenchyma, collenchyma, sclerenchyma, vascular bundle, secretory parenchyma and meristem. The anatomical characteristics of root, stem, leaf, flower, fruit and seed of higher plants are also discussed.

20834 植物解剖學實驗

1 選

徐志宏、下

本課程主要為配合植物解剖學的實驗課程中實際操作常用之技術，並且觀察及了解植物體內部之解剖構造與功能。內容包括細胞之詳細介紹、薄壁組織、厚角組織、厚壁組織、維管組織、分泌組織與分生組織之特性、構造及功能，進而探討根、莖、葉、花、果實、種子等器官之解剖特性。

20834 Plant Anatomy Lab.

1 E

D. J. H. Shyu, S

This experiment course is designed to practice commonly used techniques of plant anatomy to acquaint students with the plant anatomical structure and function. The main topics included in this course are structure and function of plant cells, parenchyma, collenchyma, sclerenchyma, vascular bundle, secretory parenchyma and meristem. The anatomical characteristics of root, stem, leaf, flower, fruit and seed of higher plants are also discussed.

20655 動物分類學

2 選

蔡添順、下

本課程主要涵蓋的課題包括分類學的起源，分類學的潮流，分類定義，物種的觀念，分類學的步驟“採集—鑑定—描述—發表”，參考書目的製作與應用，和動物命名學。

20655 Animal Taxonomy

2 E

T. S. Tsai, S

An up-to-date study of animal taxonomy. It features mainly on “Rise of Taxonomy”, “Newer Trends in Taxonomy”, “Zoological Classification”,

“Concepts of Species”, “Taxonomic Collection-Identification-Description and Publication”, “Reference Works in Taxonomy” and “Zoological Nomenclature”.

20627 脊椎動物學 **2 選** **蔡添順、下**

課程提供一個脊椎動物學的訓練，包括脊椎動物的形態、解剖與功能的比較。課程內容包括生命的週期、表皮系統、骨骼系統、呼吸系統、循環系統、消化系統、泌尿生殖系統及內分泌系統，提供脊椎動物學的知識做為學生日後學習生物多樣性或實驗動物科學的基礎。

20627 Vertebrate Zoology **2 E** **T. S. Tsai , S**

Lecture provides the discipline of vertebrate biology, including the vertebrate morphology, comparative anatomy and function. Courses contain the life history, integument, skeletal system, respiratory system, circulatory system, digestive system, urogenital system and endocrine system

20628 脊椎動物學實驗 **1 選** **蔡添順、下**

課程提供學生具有脊椎動物解剖實習，包括魚類、兩棲、爬蟲、鳥類及哺乳類等脊椎動物的形態、解剖與功能的比較。內容包括各種脊椎動物表皮、骨骼、呼吸、循環、消化、泌尿生殖及內分泌系統之觀察與解剖。

20628 Vertebrate Zoology Lab. **1 E** **T. S. Tsai , S**

Lecture provides the practice of vertebrate dissection, including the comparative morphology, anatomy and function on fish, amphibian, reptile, bird and mammal. Courses contain the integument, skeletal system, respiratory system, circulatory system, digestive system, urogenital system and endocrine system.

化妝品調製實驗 **大二下** **選修 1 學分** **施玟玲**

基於配方設計理論及原料特性基礎，本實作課程內容涵蓋各類化妝保養品配方調製流程，藉由實作過程熟悉如何製造生產化妝品，學習儀器操作，再經實際試用，收集回饋問卷，可作為配方調整或設計不同產品訴求的參考資料。

Cosmetic Manufacture **1E** **W. L. Shih , S**

Base on the formula design rationales and raw materials characteristics, this practice course content covers various kind of cosmetics formula and manufacture process. Students learn how produce products, how operate instruments by practice. Further actual service test and collect feedback questionnaire, the data could serve as our reference for formula modification and different demands new product design.

21850 動物老化生物學 **2 選** **鄭雪玲、下**

本課程旨在介紹並討論動物老化的定義、特徵、研究方法與分子機制，以及延緩老化或健康老化的可能方法與機制。由個體，器官與組織，到細

胞的老化皆涵蓋在本課程中。

21850 The Biology of Animal Aging 2 E

H. L. Cheng, S

The content of this class is to introduce and discuss the definition, characteristics, research methods and molecular mechanisms of animal aging, as well as the potential methods and mechanisms of anti-aging or healthy aging. It covers the investigation of senescence at the levels of organisms, tissues/organs, and the cell.

進階分析化學實作 2 學分 4 小時 選 徐睿良(合授)、下

本課程將針對產業所需之分析化學技術進行介紹與實務演練。課程內容包括：各式分析方法之介紹、數據處理、分析器材與儀器之基本操作、主題式術科演練。藉此，使同學熟悉分析化學技術在產業之應用。

Industrial analytical chemistry practice 2 /4 E

J. L. Hsu, S

This course aims to provide industrial analytical chemistry practices, which includes introduction of analytical methods, data processing, operation of equipment and instruments, and experimental practices. Through this training, students will be more familiar with the analytical chemistry practices and their industrial applications.

21039 實驗動物操作技術

2 選

顏嘉宏、下

課程主要是介紹飼養管理實驗動物，以小白鼠、大白鼠及兔子為主，包括動物配種、懷孕檢查、繁殖、採血、灌食、注射及基礎實驗動物外科技術操作等相關知識。

21039 Manipulation of Laboratory Animals 2 E

C. H. Yen, S

Lecture provides student to learn the feeding and management on laboratory animal, such as mouse, rat and rabbit. Courses containing the mating of laboratory animal, examination of pregnancy, breeding, blood sampling, injection, and the fundamental operation of animal surgeries.

21040 實驗動物操作技術實習

1 選

顏嘉宏、下

課程主要是讓學生實際操作實驗動物(以小鼠及大鼠為主)的飼養管理及動物配種、懷孕檢查、繁殖、採血、灌食、注射及基礎實驗動物外科技術操作等。此外也會以衛生署公告的健康食品功能性評估辦法為例，教導學生如何誘導小鼠(或大鼠)成為特定的疾病模式以輔助進行相關健康食品的功能性評估。

21040 Practice of Manipulation of Laboratory Animals 1S C. H. Yen, S

The course will train the students to be an technician doing the laboratory animals (rat and mice) housing & management, breeding, tissue collection, gavage, injection, and general surgical technics. Additionally, the students will create specific disease animal model to evaluate the beneficial effects of interested substance on physiological functions in this course.

55038 植物生理學**3 選****徐志宏、上**

本課程在使學生獲得有關植物生理學之基本知識，課程內容包括植物生理之概念、植物之吸水及蒸散作用、礦物營養及養分之輸送、光合作用、呼吸作用、氮素代謝作用，脂質及其他二次代謝物之代謝，以及植物生長與分化。

55038 Plant Physiology**3 E****D. J. H. Shyu, F**

The purpose of this course is to acquaint students with knowledge of basic principles and the application of plant physiology in the agricultural system. The contents include: Introduction of concepts of plant physiology, the process of absorption and transpiration in plants photosynthesis and respiration, nitrogen intermediary metabolism, mineral nutrition and its translocation, growth regulators and their applications, and physiology of seed germination.

55039 植物生理學實驗**1 選****徐志宏、上**

本實驗課程在使學生能以實驗印證理論，增進學生對理論之瞭解。實驗內容包括擴散作用、滲透作用、原生質分離之觀察、水勢、滲透勢、蒸散作用及根壓之測定，礦物營養診斷、輸導作用、呼吸作用、呼吸酵素之一般檢驗，植物蛋白質之抽取及分析、光補償點之測定及利用薄層色層分析法分離光合色素、葉綠素吸收光譜與定量之測定、植物生長調節劑生理功能之觀察等。

55039 Plant Physiology Lab.**1 E****D. J. H. Shyu, F**

The laboratory work is to acquaint students with both practical operation and theoretical aspects of the lecture subjects. The contents include the observation of diffusion, osmosis and plasmolysis, measurement of water potential and transpiration, plant nutrition and symptoms of mineral deficiency, measurement of root pressure, translocation of organic solutes in phloem, quantity of respiratory enzymes, extraction and quantitative determination of plant protein, separation of photosynthetic pigments by TLC, chlorophyll absorption spectrum and quantitative determination, and physiological functions of growth regulators.

20691 基因體學**2 選****徐志宏、上**

本課程主要為分子生物學之進階課程，目的在利用分子生物學之技術以達到探究生物體基因體序列及其功能的目的，亦為基因體科學研究之基礎課程。課程內容包括分子生物技術、圖譜分析、定序策略及方法、基因表現分析、序列分析方法、高通量遺傳學、蛋白質體學、結構基因體學、基因體結構、微生物基因體學、比較基因體學、人類基因體、訊息傳遞、醫藥應用、藥物基因體學、疾病診斷、農業應用及道德與規範等。

20691 Genomics**2 E****D. J. H. Shyu, F**

This course is the advanced course of molecular biology. It is designed to introduce the genome sequences and their functions of certain organisms, so it is also the basic course of genomic science research. The content includes techniques of molecular biology, mapping techniques, sequencing strategy and

methods, gene expression analysis, sequence analysis methods, high-throughput genetics, proteomics, structural genomics, genome structure, microbial genomics, comparative genomics, human genome, signal transduction, pharmaceutical applications, pharmacogenomics, disease diagnosis, agriculture applications, and ethical issues and regulations.

41033 應用微生物學

3 選

陳又嘉、上

本課程主要介紹食用真菌與其他可應用於農工業的微生物。授課內容主要包括靈芝、巴西蘑菇、香菇、雲芝、蟬花、蟲草、茯苓等菌類，其形態分類、有效成分分析，並介紹其調節身體機能的可能機制；此外，酒類釀造、乳製品發酵、有機酸與甜味劑之生產，其相關微生物與生理特性，及工業中微生物可開發生產的酵素及其作用機制，也將在課程中介紹。

41033 Applied Microbiology

3 E

Y. C. Chen , F

The course discusses edible fungi and the application of those useful microorganisms in agriculture and industry. The morphology and identification of mushrooms interested are introduced. The possible mechanisms of human physiology regulated by bioactive compounds of fungi are also discussed. Besides, the microorganisms related to organic acids, sweeteners, and enzyme production, brew and milk fermentation are also discussed in this course.

40560 消化道微生物

3 選

陳又嘉、上

本課程內容主要介紹動物消化道生理環境、消化道微生物與宿主和微生物間營養關係，其中，包含瘤胃微生物、腸道益生菌(例如乳酸菌)、白蟻腸道菌等都將在課程中介紹，而這些腸道微生物的應用潛力也將在課堂中進行討論。

40560 Gastrointestinal Microbiology

3 E

Y. C. Chen , F

The contents of this course focus on the description of digestive trace environment, gastrointestinal microorganisms and the interaction of microorganisms and hosts. In this course, rumen microorganisms, probiotics (eg. lactic acid bacteria) and termite gut microbes will be introduced. The applications of gastrointestinal microorganisms will also be discussed.

20847 無脊椎動物學

2 選

蔡添順、上

本課程旨在介紹無脊椎動物之生物多樣性和分類、形態、行為、生態與生理等基本生物學，並強調無脊椎動物與其它動植物之相互關係及其在生態系之角色與功能。

20847 Invertebrate Zoology

2 E

T. S. Tsai, F

The course includes the biodiversity and classification, morphology, behavior, ecology, and physiology of invertebrates. It emphasizes the relationships between invertebrates and other animals and plants, and their functions and roles in ecosystems.

20848 無脊椎動物學實驗 **1 選** **蔡添順、上**

所有動物中至少有 96% 的種類是屬於無脊椎動物。無脊椎動物學因此是一個高度多樣的領域，它提供了豐富多樣且值得研究的生物。本實驗讓學生透過在實驗室觀察活體與標本解剖，以探索無脊椎動物的形態、解剖與功能。本課程亦提供野外觀察採集或標本製作之實習。

20848 Invertebrate Zoology Lab. **1 E** **T. S. Tsai, F**

About 96% of all animal species lack backbones, which are belong to invertebrates. Invertebrate Zoology is therefore a highly diverse field, providing a rich array of astonishing organisms worthy of study. This lecture provides practices of invertebrate diversity and dissection, including the comparative morphology, anatomy and function of invertebrates. In addition, the course also provides practices of animal collection and specimen preparation.

20656 動物行為學 **2 選** **蔡添順、上**

動物行為學是一門探討動物行為的機制和表現的科學。此課程強調行為發生的遠因及近因、功能，以及動物如何利用行為以適應其生態及社會環境。課程主題包括覓食、捕食者－獵物交互作用、棲地選擇和空間使用、溝通、敵對、性擇、交配系統、親代育幼、以及社會行為等。此課程亦將會介紹觀察和量化行為的方法，以利學生獨自完成研究計畫。

20656 Animal Behavior **2 E** **T. S. Tsai , F**

Animal Behavior is the study of mechanism and performance of animal behavior. The course emphasizes the ultimate and proximate factors, and function of behaviors, and how it allows animals to adapt to the demands of their ecological and social environments. Topics will includes the role and mechanism of behaviors in foraging, predator-prey interactions, habitat selection and spacing, communication, aggregation, sexual selection, mating system, and parental care, and group living. The course also introduces methods for the observation and quantification of behavior in order to accomplish an independent study project.

21843 外溫四足動物學 **2 選** **蔡添順、上**

脊椎動物可分為具有外溫及內溫生理的二大類群，亦可分為主要適應水域生活的魚類與陸域生活的四足類。具有外溫生理的四足動物是地球上適應多樣性最高的動物類群之一。這些動物包含在一般所謂的兩生爬行動物類群中，但是不包含廣義爬行動物中的鳥類。本課程講授的內容將包括外溫四足動物的形態、生理、生殖、攝食、行為、生態、生物地理與系統分類及多樣性。課程最後將引導學生閱讀相關文獻以將所得知識融會貫通並予以應用。

21843 Herpetology **2 E** **T. S. Tsai , F**

Vertebrates can be classified as ectotherms and endotherms, as well as fish and tetrapods. Ectothermic tetrapods exhibit an amazing diversity of adaptations to varied habitats. The herpetology features morphology, physiology, reproduction, feeding, behavior, ecology, biogeography,

classification, and diversity of amphibians and reptiles (not including birds). Students will learn and experience the knowledge in the lecture by paper reading processes.

20659 動物基因轉殖

2 選

胡紹揚、上

水生動物為人類重要蛋白質來源之一，也是研究人類疾病的新興實驗動物之一。本課程內容以魚類為主體，介紹目前基因轉殖的技術與應用範疇，培養學生對水生動物應用發展的興趣。

20659 Animal Transgenics

2 E

S. Y. Hu , F

Marine animals are important protein sources for human, and also an emerging animal model for studying human diseases. The objective of this course is to make students understand applied aspect of transgenic biotechnology in marine animals and culture students to expand the development of marine biotechnology.

動物基因轉殖實習

1 選

胡紹揚、上

本課程內容以魚類為主體，介紹水生觀賞魚種之基因改造育種技術，透過讓學生實務操作顯微注射等轉殖技術，培育新品系之水生觀賞品種，使學生具備觀賞水族動物繁養與育種之技術。

Animal Transgenics Practice

1S

S. Y. Hu , F

The course use fish as subject to introduce genetically modified breeding technology. The objective of this course is to make students practically manipulate microinjection and culture a new breed, and make students with culture and breeding skill of ornamental marine animals.

化妝品概論與應用 大三上 選修 2 學分 施玟玲、陳秀足

使用化妝品目的在用以潤澤髮膚，刺激嗅覺，掩飾體臭或修飾容貌，產品琳琅滿目。本課程內容包含化妝品化學、化妝品品質檢驗、傳統及新穎化妝品類型及實例以及化妝品產業實務，能將學理與實務無縫接軌，培養獨立思考能力。

Concept and Application of Functional Cosmetic

2E

W. L. Shih F

The aim of cosmetics usage is to moisturize the skin and hair, stimulate smells, hide body odor and face modification, therefore, a comprehensive collection of products had been developed. The course content includes cosmetics chemistry, cosmetics quality control inspection, traditional and novel cosmetics, as well as cosmetics industry. This course helps students combining the rationals and practices, and also develop independent thinking ability.

40249 有機分析

3 選

徐睿良、上

本課程將介紹分析有機分子常用的分離方法、分析技術及分析儀器，包括：各式分離方法與分析技術的原理、分析儀器及圖譜解析。讓同學對

於分析有機分子，不管是原理還是實際操作上，有更進一步的瞭解，並使同學在這些分析方法的應用上更有效率。

40249Organic Analysis

3 E

J. L. Hsu , F

This course will be focused on the introduction of separation methods, analytical technologies and related instruments commonly used in organic molecule analysis. The contents include principles, instrumentations and data analysis of the separation methods and analytical technologies.

40761 蛋白質體學

2 選

徐睿良、上

本課程將對蛋白質體學進行通盤性的介紹，從蛋白質體學的入門介紹、蛋白質體學所需的方法與工具、到蛋白質體學的應用範疇，包括大規模的蛋白質身份鑑定、結構蛋白質體學、蛋白質轉譯後修飾鑑定、蛋白表現量分析及蛋白—蛋白作用網絡分析等。

40761 Proteomics

2 E

J. L. Hsu , F

In this course, principles of proteomics will be comprehensively introduced from the basic definition, tools for proteomics and their further applications. Subjects will be focused on protein mining, structural proteomics, post-translation modifications, protein expression profiling and protein-protein interaction mapping.

21854 蛋白質體學實習

1 選

陳又嘉&徐睿良、上

本課程將介紹蛋白質體學常用的一些實驗方法，從樣品的前處理、蛋白質的分離純化、酵素水解、質譜分析、資料庫輔助的蛋白質鑑定、大規模蛋白表現差異分析至蛋白質轉譯後修飾鑑定等。藉由連貫式實驗的設計，不只使同學熟悉這些基本實驗技術的操作，同時也使同學瞭解蛋白質體研究主要的分析流程及其在生物科技領域的應用。

21854 Proteomics experimental course

1 E

Y. C. Chen & J. L. Hsu , F

In this course, the main experimental methods involved in current proteomics including sample preparations, protein separations, enzymatic digestions, mass spectrometric analysis, database-assisted protein identifications, large-scale protein expression profiling and characterization of protein post-translational modifications will be widely introduced. Through the integrated experimental design, students will be not only familiar with experimental techniques but will be clear about the main analytical pipeline for proteome research and its applications in biotechnology.

20327 免疫學

3 選

張格東、上

本課程涵蓋人體免疫學中有關及時性與適應性免疫反應，補體系統，B與T淋巴球的發育與活化，以及免疫反應在人體的運作機制，包括自體免疫與過敏反應等。

20327 Immunology

3 E

K.T. Chang,

F

An up-to-date study of the human immune system. It features enhanced

coverage of aspects of innate and adaptive immunity, complement system, B- and T-cell development, and the nature of the immune response in the human body.

20620 病毒學

3 選

張格東、上

本課程將著重在醫用病毒學。課程內容將包括電子顯微鏡的原理及應用，病毒的分類，結構與複製機制，血清學鑑定方法，肝炎病毒，流感病毒 (H1N1)，腸病毒及 SARS 的認識與探討。

20620 Virology

3E

K.T. Chang, F

An up-to-date study of medical virology. It features on the taxonomy, the structure and the replication of virus in general; the principle and application of electron microscope and the serological techniques for differential diagnosis of viruses, by which mainly on the field of hepatitis viruses, influenza viruses (ex. H1N1) and the viruses that causes respiratory distress (ex. SARS).

55027 動物生理學

3 選

顏嘉宏、上

課程的設計主要是著重於動物各生理系統結構、特性及其在體內上所扮演的功能。包括化學訊息、賀爾蒙控制、心臟循環系統、呼吸系統、恆定機能、代謝作用系統、神經系統、消化系統、生殖系統、泌尿系統及免疫系統，以使學生能夠運用於生命科學與動物科學相關領域，作為往後修習生物醫學相關課程的基礎。

55027 Animal Physiology

3E

C. H. Yen , F

Design of lecture is focus on the systemic structures of animal physiology, speciality and their functions in body, which including the chemical signaling, regulation of hormones, heart and circulation, respiration, homeostasis, metabolism, nerve system, digestion, reproduction, urinary system and immunity. Following the lectures, student might apply the knowledge on the life science and animal science, or as a fundamental for the biomedical course and research.

55028 動物生理學實驗

1 選

顏嘉宏、上

本課程為基本生理學實驗，著重於動物體內各系統的生理結構的觀察、功能檢測及其在體內所扮演的角色。包括血液心臟循環系統、神經肌肉系統、消化系統、內分泌恆定機能、泌尿生殖系統，期使學生能夠將生理學實驗與生理學知識相結合並運用於生命科學與動物科學相關領域，作為往後修習生物醫學相關課程的基礎。

55028 Animal Physiology Lab. 1E

C. H. Yen , F

Basic laboratory of physiology is focus on the observation of systemic structures, examination of functions and their role in animal body. All experiments including blood, the heart and circulation, the nerve-muscular system, digestion, the endocrine and homeostasis, and the reproductive and urinary system. Following the laboratory, student might associate the experiments with the knowledge of physiology, and apply on the life science and animal science, or as a fundamental for the biomedical course and research.

40026 天然物化學**3 選****張誌益、上**

植物製造並蓄積不同的化學物質，譬如生物鹼、類胡蘿蔔與類黃酮，人們已長久使用這些化合物作為醫藥與營養素用途，本課程將經由生合成推導介紹這些植物的二次代謝產物，內容將由 shikimic acid pathway, polyketide pathway 及 mevalonic acid pathway 等生合成途徑觀察多樣性的天然物。

40026 Natural Product Chemistry**3 E****C. I. Chang, F**

Plants produce and accumulate a wide variety of chemicals, such as alkaloids, carotenoids, and flavonoids. Human beings have benefited from these compounds for many years in both medical and nutritional context. This course will introduce those secondary metabolism of plant through biosynthetic approach. The immense variety of natural products could be surveyed by biosynthetic schemes such as shikimic acid pathway, polyketide pathway and mevalonic acid pathway etc.

20818 植物生長與發育**2 選****徐志宏、下**

本課程主要延續植物生理學之課程，介紹與植物生長及發育相關的機制與原理，以奠立學習植物科學之分子發育基礎。課程內容包括生長與發育基本概念、植物激素如生長素、細胞分裂素、脫落酸、乙烯、油菜固醇對植物生長及發育的影響、環境反應如光型態發生、趨性、週期節律、溫度影響以及次級代謝產物與路徑等。

20818 Plant Growth and Development**2 E****D. J. H. Shyu, S**

This course is not only the advanced course but the molecular development basis of plant physiology. It is designed to introduce the mechanisms and principles of plant growth and development. The content includes the basic concepts of plant growth and development, the effects of plant hormone such as auxin, cytokinin, abscisic acid, brassinosteroids on plant growth and development, environmental responses such as photomorphogenesis, tropisms, circadian rhythms, temperature effects, and secondary metabolism and pathways.

40837 植物生物化學**2 選****徐志宏、下**

本課程的目的在使學生對植物特有的生化反應有基本的了解。個別的主題包括光合作用、呼吸作用、氮同化作用、脂質代謝、細胞壁形成、植物荷爾蒙和次及代謝物的生合成。

40837 Plant Biochemistry**2 E****D. J. H. Shyu, S**

The purpose of this course is to provide students with a fundamental understanding of biochemistry unique to plants. Individual topics include photosynthesis, respiration, nitrogen assimilation, lipid metabolism, cell wall formation, and biosynthesis of plant hormones and secondary metabolites.

30093 環境基因體學**2 選****徐志宏、下**

本課程主要探討生物體因應不同環境變化在基因表現層次上所造成的反應，利用基因體技術的分析了解特定環境或環境因子對基因表現程度的影響，進而瞭解在特定環境中基因體多樣性及多形性存在的意義，並對決定人類健康、環境與生態系統以及自然族群的影響因子及其永續發展建立系統性的觀念及輪廓。

30093 Environmental Genomics 2S D. J. H. Shyu, S

The course of environmental genomics aims to explore the responses of gene expression of organisms to the changes in various environments. The uses of genome technology will facilitate the understanding of effects of certain environment or environmental factors on gene expression as well as the meanings of presence of genome diversity and polymorphisms within a particular environment. The systematic conceptual framework and sustainable development of determining factors for the human health, environment and ecosystems, and natural populations will be discussed.

21849 動物適應與仿生科技 2 選 蔡添順、下

本課程是一門探討動物適應機制與應用的跨領域實驗科學。適應的部份將包括呼吸、循環、能量代謝、排泄、運動、感覺...等層面，及其與環境中物理、化學及生物因子之交互作用。藉由生理、生物化學、生物物理與分子生物的整合探討，以了解動物多樣化的適應機制、功能與演化。其中的知識是仿生學與科技設計的基礎。課堂中將以有趣問題來引起學生注意與動機（例如老鼠可在液體裏呼吸嗎？高海拔飛翔的鳥類如何克服缺氧及失溫？草履蟲為何沒有肌肉？響尾蛇飛彈設計的創意來源？）。

21849 Morphological and physiological adaptations of animals 2 E
T. S. Tsai, S

This course is a cross-disciplinary science that seeks to describe the mechanisms and applications of animal adaptations. It addresses ecological questions about the controls over the respiration, circulation, metabolism, excretion, movement, sensation, and others, as these processes are affected by interactions between animals with their physical, chemical, and biotic environment. At a level of integration (physiology, biochemistry, biophysics, molecular biology), the diversified adaptations can help us understand the functional significance of specific animal traits and their evolutionary heritage. Its knowledge is the basis of design and technology of bionics. Students will learn the basics and applications of animal adaptations, giving interesting questions for attention and motivation, such as “May mice breathe in the liquid?”, “How do birds soaring at high altitude overcome hypoxia or hypothermia?”, “Why does the paramecium have no muscles?”, or “What is the sidewinder’s design inspired from?”.

20690 基因重組及表現 2 選 鄭雪玲&陳又嘉、下

本課程將著重於 DNA 重組技術的介紹並介紹常用之原核基因及真核基因表達系統。

20690 Gene Recombination and Expression 2S H. L. Cheng & Y. C. Chen, S

This course emphasize the technologies of recombinant DNA, and introduce the prokaryotic and eukaryotic expression systems.

202065 分離科學及實習 3 選 徐睿良、下

分離科學在科學與技術領域、甚至化學及生技產業上扮演舉足輕重的角色。本課程的目的為介紹各式新舊分離技術之原理及其應用範圍，同時藉由實際操作，使同學學習如何將分離科學應用於生物科技領域。

202065 Separation science & laboratory practice 3 E J. L. Hsu, F

Separation is an old yet new technology, plays a key role in various fields of science and technology as well as in chemical- and bio-industries. The aim of this course is not only to provide an overview of separation science but also to offer laboratory practice for their practical application, especially, to biotechnology.

22629 品保與品管 2 選 陳又嘉、徐睿良

品保與品管可確保產品的品質在各種產業上扮演舉足輕重的角色。本課程的目的為使同學具備品保與品管之概念、瞭解其產業應用之各種實務，並學習如何將品保與品管落實於生物科技產業。課程內容涵蓋品質的概念、各種品質制度、品管與品保之關係、全面品質保證系統、各式品管方法及生技產業之各式優良實務。

22629 Quality assurance and quality control 2S J. L. Hsu, Y. C. Chen, S

Quality assurance (QA) and quality control (QC) have been used to guarantee the quality of products and play a key role in various industries. The aim of this course is to provide students an overview of QA & QC, as well as some good practices. Contents include concept of quality, various quality systems, relationships between QA and QC, total quality assurance management, QC methods and good practices in quality assurance.

21848 醫用胚胎學 2 選 張格東、下

本課程的設計主要是幫助學生了解生命的開始，包括一般胚胎學 -- 生殖細胞的形成、受精過程、胚胎著床、胚胎發育、胚幹細胞的分化；與系統胚胎學的器官形成、先天的遺傳缺陷、細胞治療與再生醫學的應用。

21848 Medical Embryology 2 E K. T. Chang, S

Lecture will help the students to understand the origin of life, including gametogenesis, fertilization, implantation, embryo development, and differentiation of embryonic stem cells in terms of general embryology; as well as systemic embryology on the topic of organogenesis and congenital birth

defects.

20662 動物組織學

3 選

許岩得&張格東、上

一個互動性的教學，重點著放於比較人體與小鼠組織在顯微解剖學和細胞生理學的認識與差異。其中包括皮膚，神經系統、肌肉與骨骼系統、呼吸系統、泌尿系統、消化系統、內分泌系統及免疫系統。

20662Animal Histology

3 E

Y.D. Hsuuw & K.T. Chang, F

An interactive study of Human Histology. It features microscopic anatomy and physiology of the cells in human tissues.

22115 中型實驗動物學

3 E

許岩得 下

本課程將幫助學生了解有關中型實驗動物(如犬、豬及非人類靈長類)的基本概念，包括動物倫理與福利、飼養與營養、食物與環境豐富化、健康與行為、正向增強訓練、解剖生理及在生物醫學上之應用(如退化性疾病、再生醫學及藥物開發)。

22115 Mid-size laboratory Animal

3 E

Yan-Der HSUW,S

The lectures will provide a general concept of the mid-size laboratory animal (such as dog, pig and nonhuman primate) for student to understand the animal ethics and welfare, feeding and nutrition, food and environmental enrichment, health and behavior, positive reinforcement training, physiology and anatomy and applications in biomedical researches(including, degenerative diseases, regeneration medicine and drug development).

胚胎操作實習

1 選

許岩得、下

課程主要提供學生具備基本的胚胎操作技術，做為日後生物醫學或相關研究應用，課程內容包括小鼠的照養、性別辨識、賀爾蒙誘導排軟、配種，懷孕鑑定，胚胎收集、胚胎操作、胚胎培養及區別染色技術等。

Practice of Embryo manipulation

1E

Y. D. Hsuuw , S

40019 分子病毒學

3 選

施玟玲、下

內容介紹重要觀念之介紹與掌握，非常適合初學者與已修過一般病毒學、但重要觀念掌握不清楚之學生。瞭解如何來研究病毒，包括主要之研究方法與技術，能夠使修課之學生，對於如何開始研究病毒有一完整之概念。使修課之學生能夠掌握病毒之一般共同特性與瞭解病毒基因表現之多樣性並強調重要病毒(如禽流感病毒)之如何致病與其為何難以預防之理由。

40019 Molecular Virology

3 E

W. L. Shih , S

The contents of this course including (1) The structure and classification of virus (2) The replication and gene expression of viral genetic materials (3)How interaction and disease progression in virus-infected cells (4) The traditional and new methods in preventing and treating virus infection (5) The analysis and research techniques of virology.

21840 進階生物技術**施政玲 三下****選修 2 學分**

生物科技快速興起，揭開的基因時代，為使本系學生具備完善生物科技知能，基於已具備生物技術概論的基本知識，本課程延伸介紹生物科技在保健食品、活性天然物、新藥研發及農業上之研發應用，讓學生獲得生物科技之產業應用研發知識技能。在授課教學內容上，利用講義及影片之數位教材，配合新興的生技研發現況，使學生學習溝通、表達、邏輯思考及解決問題之能力，充分擴展對生物科技之相關知能及視野。

21840 Advanced Biotechnology**Elective, 2 credit**

Biotechnology emerged rapidly as an important field, and opened a genetic era. In order to provide with complete knowledge of biotechnology, this course introduce biotechnology in more advanced. Courses focus on health food, bioactive compounds, new drug development and research and development in agriculture, students could gain knowledge and skills on industry application. Using digitized teaching materials, coordinating with new biotech situation, so that students gain abilities about communication, expression, logical thinking and solve the facing problems, and, fully expand the knowledge and perspective in biotechnology field.

健康食品功能性評估 大三下 選修 2 學分 施政玲下

課程除了介紹健康食品研發理念及配方設計之外，上市前之產品之安全性及功能性試驗為最重要關鍵性。市場上高度認可並信賴獲得相關國家認證的產品，市場佔有率持續提升。本課程將針對目前國內保健食品研發時所需之動物實驗基礎知識、實驗設計規劃及國內健康食品法規所規定之相關安全性及功效性認證實驗進行說明及解析。

Functional Evaluation of Health Food**2E W. L. Shih, S**

In addition to introduce the research development concept and formula design, the safety and functionality of product before commercialized is the most critically. People highly recognition and trust certified products in the market, and its market share increased continually. This course focused on the basic knowledge of animal test, experiments design and the regulations of health food.

美容保養實習 大三下 選修 1 學分 施政玲、陳秀足

此課程教導學生護膚學的專業知識與技能，課程內容包含皮膚的諮詢與分析，保養品之選購，敷面劑的使用，專業護膚儀器的操作與應用以及按摩手技，將讓學生結合化妝品專業知識，將理論及應用完全結合。

Beauty Care Practice 1E**W. L. Shih**

This course designed to assist students in understanding the knowledge and new skills about skincare, beauty therapy, client consultation, cosmetics purchasing principles, treatment of exfoliation, massage skills, face mask therapy and operation of beauty equipment. Students can integrate the cosmetics professional knowledge and the practice training.

22781 生物學跨領域之創意與創新 2 選 顏嘉宏(+業師)、(三年級)下

本課程由教師及業師講解生物學整合性、多面向的相關知識，例如動物、植物、生態、細胞、人體等，再導入五創的概念，即創意、創新、創造、創藝、創業，讓學生選

定其有興趣之題目，進行問題/產品導向的教學(PBL 教學法，Problem/Product based learning)，並協助學生將學習成果撰寫成報告及後續的商品化。

22781 Multidisciplinary Innovative and Creative Application of Biology 2 S
assigned, S

This course will provide the integrated biological knowledge, such as animal, plant, ecosystem, cell biology, and human physiology, and the concept of innovation by teachers from Dept. Biological Science and Technology, and from various industries. Students will do the Problem/Product based learning to complete his/her report and commercialize his/her product if possible.

30096 光合作用特論 2 選 周映孜、下

從生物物理學、生物化學、分子生物學、生態生理學等不同觀點討論光合作用。光合作用是植物學最廣泛被討論的題目，無論是作物生長、產量提升、環境適應、基因表現、蛋白結構等，關於光合作用的研究遍及植物生態生理到分子生化，原核到真核，本課程將透過光合作用色素系統說明植物如何去除光合作用中的過氧化自由基、光的捕獲將如何將光能轉變成化學能，利用生化代謝路徑說明二氧化碳轉變成糖類的步驟、光合作用酵素或相關蛋白的結構、植物如何改變型態結構生理特性以利光合作用進行適應環境。

30096 Special Topics in Photosynthesis 2 E Y.T. Jou, S

Living organisms interact with the others and environment, photosynthesis is about the biochemistry and metabolism. Sunlight provides the energy that operates the light and carbon reactions. Lots of photosynthesis studies were used molecular evidence and ecology physiology, such as pigment systems to understand the functions of superoxide, molecular and biochemistry studies the structure of the photosynthetic apparatus.

40851 植物逆境生理學 2 選 周映孜、下

植物逆境生理學在全球暖化與環境的過度開發議題中越顯重要，課程目的在讓學生明白環境因子對植物造成的傷害，與植物適應環境的原理，課程中將會利用教科書、期刊論文等資料說明，包含數種常見的環境逆境，如：(1)植物的耐高溫機制、細胞組織的熱休克；(2) 低溫寒害與凍害；(3) 鹽分逆境；(4)乾旱缺水逆境；(5)機械傷害逆境等。

40851 Physiological Plant Pathology 2 E Y. T. Jou, S

Plant stress physiology is a global issues related to the environment. To gain knowledge about environmental stresses on whole plant, several sections will be introduced: (1) heat shock/thermo-tolerance, (2) chilling injury and freezing, (3) salt stress, (4) drought stress, (5) wound stress. The research approaches being used to study environmental stresses by examining recent publications from scientific journals.

20827 植物細胞與組織培養 2 選 周映孜、下

本課程主要介紹植物細胞與組織培養的常用操作技術及其應用方向，建立無菌培養的觀念及技術，以培育產業發展應用的人才。課程內容包括細胞全能性與型態發生、微體繁殖原理、遺傳與變異、基本植物組織培養技術、常用植物組織及器官培養方法、細胞培養方法、原生質體培養方法、原生質體融合、雜種細胞篩選與鑑定、雜交技術之應用、人工種子原理、技術與應用、超低溫保存原理、方法與檢測以及植物基因轉殖技術與應用等。

20827 Plant Cell and Tissue Culture

2S

Y. T. Jou , S

This course is designed to introduce useful techniques and applications of plant cell and tissue culture. The sterile concepts and industrial application techniques are intended to be established in this course. The content includes totipotency and morphogenesis, the principles of micropropagation, genetics and variations, basic techniques of plant tissue culture, common techniques of plant tissue and organ culture, cell culture, protoplast culture and fusion, hybrid cell selection and identification, applications of hybrid cells, principles, techniques, and applications of artificial seeds, principles and techniques of cryopreservation, and techniques and applications of transgenic plants.

20828 植物細胞與組織培養實驗

1 選

周映孜、下

本課程主要為配合植物細胞與組織培養的實驗課程，實際操作常用之技術，同時建立無菌培養的觀念，以達到培育產業發展應用的人才的目的。課程內容包括無菌技術、培養基配製、癒合組織誘導、繼代培養、莖頂及根端培養、胚珠、胚芽、子房培養、花藥及花粉培養、細胞培養及原生質體培養、體細胞雜合及基因轉殖法等。

20828 Plant Cell and Tissue Culture Lab.

1S

Y. T. Jou , S

This experiment course is designed to practice commonly used techniques and to establish the sterile concepts of plant cell and tissue culture for incubation of talents in this field. The content includes aseptic techniques, medium preparation, callus induction, subculture, stem tip and root tip culture, ovule, embryo, and ovary culture, anther and pollen culture, cell culture, protoplast culture, somatic cell hybrid, and transgenic techniques.

40027 天然物化學實驗

2 選

張誌益、下

本課程之目的將訓練研究生熟悉天然物分離、純化與結構鑑定相關之實驗設計、操作方法與技術，內容將包含樣品之前處理、萃取、濃縮、分配萃取、管柱層析、再結晶、高效能液相層析、核磁共振光譜、質譜、紅外線光譜與紫外/可見光光譜等主題。

40027 Natural Products Chemistry Lab. 2 E

C. I Chang , S

The purpose of this course is designed to train graduate students to understand the experimental designs, general methodologies and techniques in related to the isolation, purification and structure elucidation of natural products. Subjects included preparation of materials, extraction, concentration, partition, column chromatography, recrystallization, high performance liquid

chromatography, nuclear magnetic resonance spectrometer (NMR), infrared spectrometer (IR), and ultraviolet/visible spectrophotometer (UV-vis).

22630 職能訓練

2 選

輪授,下

職能訓練課程主要介紹進入產業市場的相關知識，包括產業發展、趨勢、市場評估、公司規範、職場倫理、智慧財產權等。課程同時配合現場生產流程之實務操作，讓學生瞭解生產廠之作業流程與規範，訓練作業現場之操作技術，培養學生實務能力以提升就業之優勢。

22630 Functional training

2 S

S

The course is aimed to introduce basic knowledge for student entering industry which including the trend of industrial development, assessment of market, corporation instructions, employment ethics and intellectual property rights etc. The course also combines the practice training in the production process of factory to make student understand the specification of production process. The objective of the course is to make students have practical ability for improving the competitive advantages in their career.

20813植物功能性基因體學之應用 2選

徐志宏、上

植物功能基因體學的課程主要是應用植物分子生物學及植物生物技術的方法，系統性的探討參與植物生長、發育、適應環境與代謝過程中所有相關基因群的表現、調控及其功能，藉由包括 mRNA、蛋白質及代謝產物量的偵測、突變篩選及生物資訊資料庫的整合等策略，以了解整個植物轉錄體、蛋白質體及代謝體等隨著基因表現活性而產生的變化，並可對各種植物基因體的序列進行比較及分析，對作物在質及量上的品種改良、中草藥代謝產物、林木生理及環境保護的研究亦深具重要性。

20813 Plant Functional Genomics and Applications

2 E

D. J. H. Shyu , F

This course is an application of approaches of plant molecular biology and plant biotechnology to systematically investigate the expression, regulation, and function of related gene clusters involved in plant growth, development, environmental adaptation, and metabolism. Strategies used to examine the changes of transcriptome, proteome, and metabolome in response to gene expression patterns include the detection of mRNA, protein and metabolite production, mutant selection, and integration of bioinformatic databases. Analysis of plant comparative genomics also provides important information for researches in plant improvement and breeding, medicinal plant and secondary metabolites, woody plant physiology and environment protection.

20814植物功能性基因體學之應用實驗 1選

徐志宏、上

利用植物功能基因體學課程中所學習到的原理、技術與方法，實際應用於目標植物基因體的研究上；實驗課程內容包括基因庫的構築、功能基因的篩選、生物資訊探勘及基因表現分析等，用以探討參與植物特定生長

發育時期的過程中所有相關基因群的表現、調控及其功能。使用的實驗方法包括 RNA 的製備、cDNA 基因庫的構築、蛋白質水解酵素基因的篩選、基因表現差異的分析與基因鑑定等。

20814 Plant Functional Genomics and Applications Lab.

1

E D. J. H. Shyu , F

This course is designed to utilize the principles, techniques, and approaches learned from lecture for applying on plant genomics studies. The contents include the construction of gene library, the selection of functional genes, the mining of bioinformatics, and the analysis of gene expression. For the investigation of expression, regulation, and function of related gene clusters involved in certain growth and development stages, methods such as RNA preparation, cDNA library construction, proteolytic enzyme genes screening, differential gene expression and analysis, and gene identification will be applied.

20059 內分泌學

2 選

許岩得&胡紹揚、上

本課程主要講授內分泌腺（組織）所分泌的激素種類、調節作用機轉、下視丘和腦下腺間之相互調控，激素的生理機能以及內分泌相關疾病，本課程將有助於學生對激素整體了解，以培養更深入研究內分泌之能力。

20059 Endocrinology

2 E

Y. D. Hsuuw & S. Y. Hu , F

This course is designed for study the classes of hormones, the mechanisms of hormone action, the control of hypothalamic-hypophyseal hormone and the physiological roles of the endocrine glands (tissues) in domestic animal. After complete this course, students can understand the hormone functions and can learn advance topic easily.

40760 蛋白質工程學

3 選

鄭雪玲、上

本課程介紹常用於生物科技酵素之種類及功能，以及探討蛋白質之純化、結構、功能及其應用。

40760 Protein Engineering

3 E

H. L. Cheng, F

The course will introduce the classification and function of enzymes used in biotech, with special focus on the purification, structure, function and application of proteins.

22355 幹細胞生物學

3 選

張格東、上

本課程將介紹成體幹細胞如血液幹細胞、間葉幹細胞、神經幹細胞、肝臟幹細胞等之細胞生理學與生化特性，並針對臨床醫學與生物製藥的未來發展性進行探討。

22355 Stem Cell Biology

3 E

K.T. Chang, F

An up-to date discussion of somatic stem cell biology, mainly focusing on the physiology and biochemistry of hematopoietic stem cells, mesenchymal stem cells, neuron stem cells and hepatic oval cells etc, for clinical and pharmaceutical

application.

20664動物幹細胞建立與應用

2選

許岩得、上

「動物胚胎幹細胞建立與應用」課程中教授與胚胎幹細胞建立與應用之學理與目前在生物科技、藥物及再生醫學之應用，包括介紹胚胎學、胚胎幹細胞之建立與最新胚胎幹細胞相關科技應用等內容。

20664 Application and Establishment of Stem Cells

2 E

Y. D. Hsuuw , F

The course will present the establishment of embryonic stem cells from preimplantation embryos, and its new insights of applications in biotechnology, pharmaceuticals and regenerative medicine. Lectures include the embryology, embryo culture, establishment of embryonic stem cells, and the current cell biology and biotechnology in embryonic cell differentiations.

20665動物幹細胞建立與應用實習

1選

許岩得、上

「動物胚胎幹細胞建立與應用實習」課程中，以實際操作方式讓學生學習實驗動物飼養、超級排卵、麻醉藥之配製及注射、體外取胚技術、體外胚胎培養、胚胎內細胞發育能力檢測及胚胎幹細胞之分離與培養觀察等各項技術。

20665 Practice of Application and Establishment of Stem Cells

1

E

Y. D. Hsuuw , F

The practice course will present the fundamental of animal breeding, manipulation of superovulation, Recovery of preimplantation embryos from pregnancy, embryo culture in vitro, morphological observation on embryo development, isolation of the inner cell mass from blastocysts, establishment of embryonic stem cells, embryonic stem cell culture and stem cell differentiation.

40743 細胞凋亡

3 選

施玟玲、上

介紹細胞凋亡機制與生物體的關係並加強學生與最新發表論文的認識與剖析，講解疾病的發生與細胞凋亡訊息傳遞路徑的相關性，以及當今利用調控凋亡訊息傳遞路徑於疾病治療之策略。並講解各種細胞凋亡的分析方法與原理，包括流式細胞分析的原理及應用。利用對於細胞凋亡機制的探討，幫助學生融合現階段已知的分子生物學或細胞生物學技術及觀念，並培養其在生命科學基礎方面的思考能力。

40743Apoptosis

3 E

W. L. Shih , F

The course will introduce the molecular mechanisms of apoptosis, the apoptosis related disease and how to cure this disease base upon the control of apoptosis, the principle and rationale of apoptosis analysis techniques.

40684 動物細胞培養

2 選

施玟玲、上

本課程的目的是讓學生了解動物細胞培養的原理、操作和應用，內容包括初代細胞培養、繼代細胞培養、細胞株培養，各種細胞株之特性及細胞分析技術。

40684Animal Cell Culture **2 E** **W. L. Shih , F**

The objective of this course is to introduce the principles, manipulation and practical applications of animal cell culture. Course contents include primary cell culture, passage cell culture, cell line culture, the specific characteristics of cells and the techniques of cell analysis.

40022 分子診斷技術學 **2 選** **施玟玲、上**

本課程將介紹分子生物技術檢測及鑑別微生物、遺傳疾病及複雜疾病。

40022 Molecular-Based Diagnostic Technique **2 E** **W. L. Shih , F**

The course introduces the applications of molecular-based techniques to detect and differentiate microbial, as well as the diagnosis of genetic and complex disease.

20932 腫瘤生物學 **2 選** **顏嘉宏、上**

課程的設計主要是介紹腫瘤細胞發生的概論，包括基因跟腫瘤關係、腫瘤起源、基因表達與調控、致癌基因與腫瘤抑制基因的表現、訊息傳遞途徑、基因的突變等。

20932 Cancer Biology **2S** **C. H. Yen , F**

The course will introduce the general concepts of oncogenesis, such as the mutation, oncogenes and tumor suppressor genes, cell cycle regulation, apoptosis, and cancer therapy.