

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。

**20071 Analytical 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、下**

本課程乃著重於重要之碳化合物（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。

**20293 Organic Chemistry 3R C. I. Chang, S**

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、下**

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、糖類、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。

**40252 Organic Chemistry Lab. 1R C. I. Chang, S**

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 derivatives of carboxylic acid, amines. Each experiment emphasizes the common chemical properties ascribed to functional groups.

**21839 生物學(2) 3 必 許岩得、周映孜、胡紹揚、下**

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. Hsuuw & 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.

**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，將介紹生物各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。

**40113 Biochemistry (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。

**40117 Biochemistry Experiments** **1R** **S. L. Cheng & S. L. Cheng & S. Y. Hu, F**

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.

**23538 生物技術(1)** **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。

**23538 Biotechnology(1)** **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** **施玟玲、徐睿良、黃卓治、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** **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。

**30039 Seminar** **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.

**23539 生物技術(2)** **2 必** **陳又嘉、鄭雪玲、下**

本課程旨在加強學生對生物技術應用之了解、其範圍涵蓋生物技術於農業、醫學、工業、環境等領域的應用，新近研究案例也將被介紹，訓練同學可將所學融入未來工作。

The curriculum will introduce the applications of biotechnologies in agriculture, medicine, industry and environment. The updated cases will also be involved in this course. The purpose is to train students to understand the concept of biotechnologies and their applications.

## 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 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、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、分佈圖、模式圖等。

### 20201 Techniques of Biological Illustration 2 E Y.T. Jou, 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、下

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。

### **20306 Free Radical Biology**

**2E**

**C. H. Yen ,S**

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.

### **235534 精油研究與產品開發 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。

### **235534 Essential oil products 2E**

**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.

### **M0036 主題演講**

**1選**

**邀請數位講員、下**

本主題演講擬邀請在新穎生技食品及生技美妝品領域之學研專家，分享創新研發靈感以及如何將研發數據轉譯為商品化之歷程，藉此能讓同學全面了解新穎生技產品如何從無到有，終能進入市場。

**M0036 Keynote Speech 1E Speaker, S**

The special topic will invite science and technology advisors, share their experiences on innovative research and development inspiration and how translate the RD data to commercial products. In this way, students can fully understand how new biotechnology products can come from scratch and eventually enter the market.

**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。

**21815 Biology 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來驗證假設

**20499 Scientific Method 3E 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.

**22138 保健食品概論 2 選 施玟玲、上**

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 3 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 3 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. phytophraphy 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

**23537 生物技術與污染物 2 選 徐睿良、下**

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。

**23537 Environmental biotechnology 2 E J. L. Hsu , S**

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 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) 2E 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 2E 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. 1E 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&陳添喜、下**

本課程在介紹同學認識動物分類學基本原理與方法，了解分類工作之方法、內容及其流程。主要涵蓋的課題包括分類學的起源、分類學的潮流、物種的觀念、分類學的步驟、分類學歷史、學名發音、動物命名學、以及文獻研讀與口頭報告。

**20655 Animal Systematics** **2 E** **T. S. Tsai & T. S. Chen, S**

This course features the basic theory, methodology, and practices of animal systematics. It includes mainly the rise of systematics, newer trends in systematics, concepts of species, history and procedures of taxonomy, pronunciation of scientific names, nomenclature, as well as literature reading and oral presentation.

**20627 脊椎動物學** **2 選** **蔡添順、下**

課程提供脊椎動物學的訓練，包括脊椎動物的形態、解剖與功能的比較。課程內容包括脊椎動物多樣性、生命週期、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、內分泌系統、神經系統及感覺器官。脊椎動物學的知識將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 Biology** **2 E** **T. S. Tsai, S**

Lecture provides the discipline of vertebrate biology, including the vertebrate morphology, comparative anatomy and function. Courses contain the diversity of vertebrates, life history, integument, skeletal system, respiratory system, circulatory system, digestive system, urogenital system, endocrine system, nervous system, and sensory organs. The knowledge of this course is essential in biodiversity monitoring or experimental animal science.

**20628 脊椎動物學實驗** **1 選** **蔡添順、下**

課程提供學生包括魚類、兩生類、爬行動物、鳥類或哺乳類等脊椎動物的形態、解剖與功能的多樣性比較與實習。此外還有包括動物採集與標本製作實習。

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

Lecture provides practices of vertebrate diversity and dissection, including the comparative morphology, anatomy and function on fish, amphibians, reptiles, birds or mammals. In addition, the course also provides practices of animal collection and specimen preparation.

**23053 進階分析化學實作** **2 選** **張誌益、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。

**23053 Industrial analytical chemistry practice 2E C. I. Chang, 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 2E 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 施玟玲、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 W. L. Shih, 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 3E 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.

**21166 應用微生物**

**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。

**21166 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、下**

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 , S**

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**

所有動物中至少有 96% 的種類是屬於無脊椎動物。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。

**208471 Invertebrate Biology**                      **2 E**                      **T. S. Tsai, F**

About 96% of all animal species lack backbones, which are belong to invertebrates. 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.

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.

**23540 兩生爬行動物學**                      **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。

**23540 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.

**23056 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。

**23056 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.

**23057 化妝品概論與應用** 2 選 施玟玲、下

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、化妝品品管檢驗、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。

**23057 Concept and Application of Functional Cosmetic** 2E W. L. Shih,S

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。

**40249 Organic 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** **3 E** **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.

**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 2E 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**                      **2E**                      **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、下**

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** **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。

**20662 Animal Histology** **3 E** **K.T. Chang, F**

An interactive study of Human Histology. It features microscopic

anatomy and physiology of the cells in human tissues.

### **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**

The practice program provides the fundamental techniques of embryo manipulation in the biomedical or developmental researches. Practices including the animal care and feeding, sexual differentiation, mating management, hormone-induced superovulation, pregnancy examination, embryo collection, embryo culture, embryonic cell differentiation staining and embryo transfer.

### **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**

**2 選**

**施玟玲、上**

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 W. L. Shih, F**

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.

**22781 生物學跨領域之創意與創新 2選 顏嘉宏(+業師)、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 E 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 2E 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 2E 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).

**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** **胡紹揚、下**

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** **S. Y. Hu, S**

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 smoatic stem cell biology, mainly focusing on the physiology and biochemistry of hematopoietc stem cells, mesenchymal stem cells, neuron stem cells and hepatic oval cells etc, for clinical and phamaceutical application.

**20664 動物幹細胞建立與應用** **2選** **許岩得下**

「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 2E Y. D. Hsuuw , S**

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、下**

「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 1E Y. D. Hsuuw , S**

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 施玫玲、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 3E 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 施玫玲、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 2E 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** **鄭雪玲、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** **H. L. Cheng, 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 Tumor 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.

**M0002 微生物發酵技術** **1 選** **胡紹揚、上**

微生物發酵技術為生技產業的重要平台，本課程將針對微生物發酵技術之類別、特徵與應用領域進行系統性介紹，使學生明瞭應用於農業之微生物菌種及其發酵工程之特點，另外，本課程也將介紹發酵工程中常使用之設備和液態與固態之發酵系統，最後課程將介紹發酵工程之後處理及產物提取之技術。本課程將使學生獲得微生物發酵技術之概念，有助於將來微生物製劑之開發以及其應用於植物病蟲害之防治。

**M0002 Microbial fermentation technology** **1S** **S. Y. Hu, F**

Microbial fermentation technology is an important platform for the biotechnology industry. This course will introduce the categories, characteristics and application of technologies used in the process of fermentation. Students will know how to use and apply particular agricultural microorganisms in specific processes. This course will also introduce equipment that is commonly use in the fermentation industry, emphasizing in the liquid and solid state of fermentation systems. Lastly, final product extraction and post-fermentation treatment will be introduced. With the concepts learned in this course, students are expected to develop biological control for pest control.

**202058 訊息傳遞** **3 選** **施玟玲、下**

本課程將介紹細胞外之分子與細胞膜上之接受體之交互作用，使細胞膜之接受體活化，將胞外之訊號擴大後傳遞到胞內，以及細胞如何整合外來訊息導致最後的生物反應。

**202058 Signal Transduction** **3S** **W. L. Shih , S**

This course will introduce the interaction of an extracellular ligand with a transmembrane receptor and then activation of receptor. Subsequently, a signal being amplified and transduced across the membrane. And, how cell integrate the extracellular signals result in the final cellular response.

**202041 真菌學** **2 選** **陳又嘉、下**

本課程乃以真菌類緣為主幹，分別描述下列真菌—(1) 黏菌綱 (2) 根瘤菌綱(3) 結合菌綱 (4) 卵菌綱 (5) 子囊菌綱 (6) 擔子菌綱 (7) 不完全菌綱的形態、生理、生殖、遺傳、分類、生態及其在農業、醫學及工業上的應用及影響。

**202041 Mycology** **2 E** **YC Chen, S**

The course is to introduce the morphology, physiology, propagation, genetics, ecology, classification and the importance of each group of the fungi, which include : (1) Myxomycetes (2) Plasmodiophoromycetes (3) Zygomycetes (4) Oomycetes (5) Ascomycetes (6) Basidiomycetes and (7) Duteromycetes.

**23535 生物科技與六級農業** **2 選** **周映孜、上**

生物科技應用範圍涵蓋農業，隨著六級農業的推廣兩者間相輔相成，不但可以協助一級農業的生產，提升二級農業的加工，更能透過三級農業的服務擴散效益，讓同學在往後的基礎課程中可以明白生物科技的重要與未來。課程中將增加學生操作與互動課程增加上課內容的活潑性。

**23535 The Sixth Industrialization for Biotechnology and Agricultural** **2E**  
**Ying Tzy, Jou, S**

The application of biotechnology covers agriculture, with the promotion of the sixth industrialization for complement each other, how to help the production of primary agriculture, improve the processing and distribution, and also provide benefits to the students through the diffusion of benefits from agriculture. After this course, students can understand the importance and future of biotechnology. Courses will increase student activity and interaction courses to increase the liveliness of the content.

**23533 生活化學** **2 選** **陳又嘉、下**

本課程從化學的基本原理以及自然界和生命中形成的不同化合物和其化學反應開始。我們將介紹食品、工業、醫藥、農業等影響人類的許多化學物質，並討論它們對生活和永續發展的影響。

**23533 Life chemistry** **2E** **YC Chen, S**

This course begins from the basic principles of chemistry and the variety of compounds found in nature and life and their chemical reactions. We will

introduce many chemical substances that affect human beings, such as food, industry, medicine, and agriculture and discuss their impact on life and sustainable development.

### **23541 蛇毒科技**

**2 選**

**蔡添順、下**

蛇毒成分複雜且多樣化，不同蛇毒的毒性、藥理及臨床症狀各有特點，可分成神經毒、血循毒、壞死毒、心臟毒、腎臟毒、肌肉毒及其他類型。蛇毒學研究包含毒理學、基因體學、轉錄體學、蛋白質體學及抗血清蛋白質體學、以及醣類體學等層面。依據藥理特性，分離純化特殊蛇毒蛋白，再結合分子生物學及結構化學的方法，可應用於製藥、檢驗和抗蛇毒血清的製造。蛇毒成份目前已被應用於治療糖尿病、高血壓、慢性疼痛及腦中風等病症，以及抗凝血與消炎作用。本課程主要介紹蛇毒多樣性以及蛇毒研究方法、成果、發展及蛇毒科技應用，修課學生也會進行文獻研讀與口頭報告。

### **23541 Snake Venom Technology**

**2 E**

**T. S. Tsai , S**

Snake venom is complex and diverse in composition and varied in the toxicity, pharmacology, and clinical symptoms, which can be divided into neurotoxin, hemostasis toxin, necrotoxin, cardiotoxin, nephrotoxin, myotoxin, and other types. Snake venom researches include toxicology, genomics, transcriptomics, proteomics, antiveomics, and glycomics. According to the pharmacological properties, the separation and purification of specific venom proteins, combined with the approaches of molecular biology and structural chemistry, can be used in the pharmaceutical, examination, and antivenom manufacture. Snake venom compositions have been used in treating diabetes, hypertension, chronic pain, and stroke, as well as displaying anticoagulant and anti-inflammatory effects. This course mainly aims to present the diversity of snake venoms as well as the method, achievement, development, and application of snake venom technology. Students in the course will also read literatures and make oral presentations.

### **202018 校外實習**

**9 選**

**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) 9E All teachers ,S**

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.

**23055 生技實務 9選 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。

**23055 Bioindustrial Industrial Practice (on-campus) 9E 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.