動物疫苗科技研究所

Graduate Institute of Animal Vaccine Technology

一、必修科目Required Courses

30039 專題討論 ４必 輪授

本課程擬指導學生由最新動物疫苗相關期刊中，挑選最新而重要的論文提出報告，並由全體教師、學生共同研討，讓學生學習到如何尋找資料、論文寫作、實驗設計與結果討論等實驗研究工作相關的技術。

30039 Seminar ４ R All Teachers

This curriculum is designed to advise students to collect update papers from Animal vaccine related journals, to make a presentation in class, and to discuss with teachers and classmates. This class let students to learn how to collect research papers, and to design, and perform their experiment.

30037 動物疫苗研究法 ２必 輪授

本課程旨教導學生進行動物疫苗研發之基本技巧。課程內容包括文獻攝取、試驗設計、統計分析及論文寫作。同時教導學生如何應用最新的技術研發較安全且有效的疫苗或研發簡單快速且有效的診斷試劑。

30037 Methods for Animal Vaccine Research ２Ｒ All Teachers

The aim of this course is to teach student the basic techniques for the development of veterinary vaccines. The contents of this course include literature searching, experimental designing and conducting, data analysis and thesis writing. In addition, new methodologies currently being used to develop safer and more effective vaccines and for the development of rapid, effective and simple diagnostics will be discussed in this course.

20493 疫苗學 ２必 朱純燕、莊國賓

本課程主要教導學生有關疫苗的相關免疫學理基礎及動物疫苗之應用。其課程內容包括疫苗之生物研究過程及近代免疫學理論對疫苗研究與發展之新領域等，並介紹不同動物之疫苗研發與應用。

20493 Vaccinology ２Ｒ C.Y. Chu，K.P. Chuang

The purpose of this course is to teach students the theory of vaccination and the applications of various veterinary vaccines. The contents include the past research on vaccination and the impact of update knowledge about cellular and molecular immunity on developing new generations of vaccines and also introduce the current research of veterinary vaccines and their applications.

20318 佐劑學 ２必 朱純燕、楊忠達

本課程內容介紹疫苗佐劑之用途、佐劑之生物與物化特性及其作用機轉、佐劑與生物體各種免疫細胞之交互作用、如何選擇適當之佐劑、不同佐劑之設計與製備，以及佐劑有效性之評估。

20318 Adjuvants ２Ｒ C.Y. Chu，C.D. Yang

This objective of this course is to introduce the purpose of an adjuvant, the acting mechanisms and related characteristics and chemical features of an adjuvant, the interactions of adjuvants with immune cells, the choice of the appropriate adjuvant and how to manufacture different types of adjuvants and evaluate their efficacy.

20492 疫苗工程學 ２必 朱純燕、莊國賓

課程包括：疫苗概論、抗原之結構與抗原性、免疫概論、疫苗工程之相關技術、培養系統總論、佐劑、劑型與配方、疫苗種類-依宿主區分、疫苗種類-依抗原區分、標準操作方式與品管、疫苗登記註冊與市場分析、生化技術產品之特別安全需求、影響疫苗之因子、未來之發展趨勢。

20492 Vaccine Engineering ２Ｒ C.Y. Chu，K.P. Chuang

The purpose of this course is to teach students the production techniques of various veterinary vaccines and diagnostics. The contents include general description of vaccines, structure of antigens and immuogenicity, the immunological basis of immunization, In vitro methods in vaccinology, Convergence of culture systems, adjuvants, vehicles and formulation, vaccines according to their target species, vaccines according to their antigenic target, good manufacturing practices and controls, registration and marketing specific safety requirements for products derived from biotechnology, factor influencing the outcome of vaccination, and future possibilities.

30057 碩士論文 ６必 各教師

每位碩士班研究生選定論文題目，再指導教授指導下進行實驗、研究、依據實驗研究結果完成論文。

30057 Master Thesis Research ６Ｒ All Teachers

Graduate students propose their research project, complete experiments and write a thesis under advisor supervision.

二、選修科目Elective Courses

40895 傳染病之致病機制 ３選 莊國賓

傳染病可由病毒，細菌，黴菌及寄生蟲等引起。本課程之目的在解釋傳染性致病原與宿主間之交互作用及其致病機制。課程內容包括病原之致病因子、宿主對病原之先天性及適應性免疫、病原對宿主防禦機制之反應以及個別疾病之致病機序。

40895 Pathogenesis of Infectious Diseases ３E K.P. Chuang

Infectious diseases can be caused by viruses, bacteria, fungus and parasites. The aim of this course is to explain the interaction between pathogenic microbes and the hosts, and to explain the mechanisms of pathogenesis of infectious diseases. The content of this course covers virulence factors of pathogens, host response against infection including innate and adaptive immunity, pathogen’s responses to host defense systems and pathogenic mechanisms of individual infectious disease.

40740 細胞分子免疫學 ２選 莊國賓

動物體對外來抗原或自體抗原引起之免疫反應之機制及其所涉及之細胞及其細胞素之間之相互作用及調控，另者,抗原及T細胞接受器之特性，T細胞及B細胞之活化，過敏反應，補體活化系統之調控等及自體免疫疾病等將一併討論。

40740 Cellular and Molecular Immunology ２E K.P. Chuang

The mechanisms of the host immune responses against the foreign and tautologies antigens were discussed. The objects included the function of the sensitized cells regulated by cytokines. The characteristics of antigens and T cell antigen receptors, activation of T-cell and B-cell, regulations of complement system based on molecular levels and autoimmune diseases will be discussed as well.

40022 分子診斷技術學 ２選 莊國賓

本課程將介紹分子生物技術檢測微生物、動植物之基因及其表面抗原。

40022 Molecular-based Diagnostic Techniques ２E K.P. Chuang

The curriculum will introduce the application of molecular-based techniques to detect the genes and surface antigens of microbial, animals and plants.

20065 分子生物學 ３選 鄭力廷

本課程目的在使研究生對分子生物學包括細胞生長分化的控制、基因的調控機制、突變與基因修補、基因疫苗以及基因療法有更深入的了解。

20065 Molecular Biology ３E L.T. Cheng

The purpose of this course is to introduce specific topics in molecular biology, such as the growth and differentiation of cells, gene regulations, gene mutation and gene repair, DNA vaccine and gene therapy.

55119 酵素與蛋白質工程學 ２選 楊忠達

本課程將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。

55119 Enzyme and Protein Engineering ２E C.D. Yang

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

20190 生物資訊學 ２選 楊忠達

本課程討論以電腦及網路資源來分析生物巨分子，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。

20190 Bioinformatics ２E C.D. Yang

The course discusses application of computer and internet resource 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.

20184 生物技術與生技產業 ３選 朱純燕

本課程旨在加強學生對生物技術，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。

20184 Biotechnology and Bioindustry ３E C.Y. Chu

The curriculum will emphasize three major areas, including genetic engineering, hybridoma techniques and protein engineering. This class is going to train students to understand the concept of biotechnology and their applications.

40707 基礎免疫學 ３選 莊國賓

瞭解免疫學的精義、免疫系統的要素及激發免疫反應的重要條件等基本知識。由基礎講起，介紹：1.先天及後天免疫要素，2.抗原、抗體之結構、功能與交互作用，3. 補體，4. B淋巴球及T淋巴球之生物學基礎，5.抗體的遺傳學基礎，6.主要組織相容抗原複合物之角色，7. 細胞激素。

40707 Essential Immunology ３E K.P. Chuang

Introduce the elements of Immunology from the basic concept, including: 1. Innate and Acquired Immunity. 2. Antigen, Antibody structure and function. 3. Complement. 4. Biology of B and T lymphocyte. 5. The genetic basis of Antibody structure. 6 The role of the major histocompatibility complex in the immune response. 7. Cytokines。

40906 微生物學特論 ３選 莊國賓

了解微生物在疫苗的製作上是非常重要的，所以本堂課除了從細菌基本構造講起外，也談到細菌和疾病之間的關係，並且講述微生物的致病機轉，唯有了解微生物的致病機轉才能找到製作疫苗最好的方法及目標，最後談到目前利用微生物在製作疫苗上最新的方法及策略。

40906 The Special Topic of Microbiology ３E K.P. Chuang

To understand the microorganisms is very important for vaccines development. In this class, we will introduce the structure of microorganisms and the relationship between microorganism and diseases. Base on this knowledge, the students can realize the pathogenesis of microorganisms and find out the best targets and new strategies for vaccines development.

40285 免疫原結構基因學與表達技術 ２選 輪授

病原的結構基因經常可轉錄轉譯出重要的抗原決定位來引起強烈的免疫反應，因此本課程將針對這些病原的重要結構基因之功能及調控機制加以探討，同時也幫助學生學習利用不同的表現系統針對結構基因加以表現成蛋白質，並獲得大量的重組蛋白以提高抗原的製備技術。

40285 Immunogenic Structural Genes and Expression Techniques 2E

Structural genes of infectious pathogens often transcribe and translate into important antigenic epitopes to induce strong immune responses. This curriculum will therefore explore the functions and regulation mechanisms of these pathogenic structural genes. Moreover, it will help students to use different expression systems to express these structural genes and to obtain the large-scale recombinant proteins for improving antigen preparation.

41030 應用基因體學 ２選 楊忠達

本課程將提供近年來在基因體學領域的詳細介紹及應用。本課程特別探討微生物之基因功能生物學及研究如何利用微生物基因體學結合微生物蛋白質體學來協助疫苗的研發。

41030 Applied Genomics ２E C.D. Yang

This curriculum provides an exhaustive introductions and applications of current research in the genomic field. In particular, it explores the gene functional biology of whole microorganisms and shows how microbial genomics can combine with microbial proteomics to apply to vaccine development.

30172 疫苗佐劑學 ２選 朱純燕、鍾曜吉等合授

本課程主要教導學生有關疫苗、佐劑的相關免疫學理基礎及動物疫苗之應用。其課程內容第一部分包括疫苗之生物研究過程及近代免疫學理論對疫苗研究與發展之新領域等，並介紹不同動物之疫苗研發與應用。第二部分介紹疫苗佐劑之用途、佐劑之生物與物化特性及其作用機轉、佐劑與生物體各種免疫細胞之交互作用、如何選擇適當之佐劑、不同佐劑之設計與製備，以及佐劑有效性之評估。

30172 Vaccine Adjunvats ２E C.Y. Chu，Y.C.Chung

The purpose of this course is to teach students the theory of vaccination, adjuvant and the applications of various veterinary vaccines. The first part of this course include the past research on vaccination and the impact of update knowledge about cellular and molecular immunity on developing new generations of vaccines and also introduce the current research of veterinary vaccines and their applications. This second objective of this course is to introduce the purpose of an adjuvant, the acting mechanisms and related characteristics and chemical features of an adjuvant, the interactions of adjuvants with immune cells, the choice of the appropriate adjuvant and how to manufacture different types of adjuvants and evaluate their efficacy.

30173 進階免疫學 ２選 莊國賓

瞭解進階免疫學的精義、免疫系統的要素及激發免疫反應的重要條件等基本知識。由基礎講起，並加入進階及最新之知識：1.先天及後天免疫要素，2.抗原、抗體之結構、功能與交互作用，3. 補體，4. B淋巴球及T淋巴球之生物學基礎，5.抗體的遺傳學基礎，6.主要組織相容抗原複合物之角色，7. 細胞激素。

30173 Advance Immunology ２E K.P. Chuang

Introduce the elements of Immunology from the basic, advance concepts and journal including: 1. Innate and Acquired Immunity. 2. Antigen, Antibody structure and function. 3. Complement. 4. Biology of B and T lymphocyte. 5. The genetic basis of Antibody structure. 6 The role of the major histocompatibility complex in the immune response. 7. Cytokines.

40896 傳染病免疫機轉 ３選 莊國賓

本課程旨在講述宿主對不同病原的免疫防禦機轉以及病原如何對抗宿主的防禦機制。內容包括宿主對病原體所引起之免疫反應、病原體如何逃避宿主免疫系統之辨認及攻擊以及應用病原體之免疫學特性作為進行傳染病之防治。

40896 The Mechanisms of Host Immunity to Infectious Diseases ３E K.P. Chuang

The aim of this course is to illustrate the main features of immunity to different types of pathogenic microorganisms and how microbes try to resist the mechanisms of host defense. The contents cover the immune responses of host against infectious pathogens, the evasion and subversion of the host immune defense by pathogens, and the application of the immunology knowledge to the prevention and control of infectious diseases.

40705 基因調控 ２選 鄭力廷

本課程內容介紹原核與真核細胞基因表現系統及生體內與生體外之基因調控機轉與順式及反式調控因子，並介紹細胞基因表達之相關訊息傳遞路徑。

40705 Gene Regulation ２E C.D. Yang

This objective of this course is to introduce the concepts on the gene expression systems and gene regulation mechanisms in prokaryotes and eukaryotes. Important topics also include the related signal transductions, and cis-/trans-transcription elements on regulating the gene expressions in three different systems including in vivo, ex vivo and in vitro systems.

40137 生物統計學特論 ２選 楊忠達

本課程旨在使學生能了解並利用適當之統計方法來分析資料及陳述，表示資料，以獲得正確的結論與資訊。所介紹之統計方法包括敘述性統計，Z-test，t-test，x2-test, ANOVA,及其他相關性統計方法。

40137 Special Topics on Biometry ２E L.T. Cheng

This course teaches students the understanding and usage of proper methods in analyzing data to obtain correct conclusion and information. The statistical methods taught in this course include descriptive statistics, Z-test, T-test F- test, x2-test, ANOVA, and other related fields.

40686 動物試驗技術 ２選 朱純燕

本課程旨教導學生各種動物研究模式、動物實驗之設計、動物實驗標準作業程序、動物實驗之禽畜舍管理技術包括飼育動物的軟、硬體條件，應具備之公害防範設備與措施。同時課程內容尤其注重於教導學生動物試驗之相關倫理及動物福利相關法規。

40686 Techniques in Lab Animal ２E C.Y. Chu

The aim of this course is to teach student the basic animal trial techniques regarding the varieties of different lab animals, how to develop an animal model, experimental designs for animal studies, standard operation procedure for animal care, management of animal and poultry care facility. The contents of this course also emphasize the animal welfare and related regulations.

41052 臨床免疫學 ２選 朱純燕

由免疫反應的調節及其運作情形、疫苗與免疫，進而探討免疫反應造成的傷害，免疫缺乏與免疫系統異常，過敏反應的臨床症狀與治療.。討論內容包括：1. T細胞與B細胞的活化，2. 免疫反應的調節，3. 傳染病的防禦與免疫法，4. 過敏反應，5. 免疫缺乏與免疫系統異常，6.移植免疫學，7. 腫瘤免疫學，8.免疫分析法及實驗系統。

41052 Clinical Immunology ２E C.Y. Chu

Discuss the control mechanisms in the immune response, including: 1. Activation and function of T and B cells. 2. Regulation of immune response. 3. Resistance and immunization to infectious disease. 4. Hypersensitivity reactions. 5. Immunodeficiency and disorders of the immune system. 6. Transplantation Immunology. 7. Tumor Immunology. 8. Immune assays and experimental systems.

40486 疫苗製程特論 ２選 朱純燕

課程內容包括：抗原製作、佐劑調配、劑型與配方、活毒疫苗製程、不活化疫

苗製程、基因工程疫苗製程等，符合優良藥品標準操作規範。全部課程於動物疫苗及佐劑先導工廠實地講解，訓練修課學生疫苗製造之實用能力，可直接與產業界人才需求接軌之課程。

40486 Advance Vaccine Manufacture Operation ２E C.Y. Chu

The purpose of this course is to teach students the production techniques of various veterinary vaccines. The contents include the manufacture operation training of antigen, adjuvant, formulation, live vaccines, inactivated vaccines and genetic vaccines. All practice will direct operate at vaccine pilot in person. These courses provide the industry demand training.

40484 疫苗免疫學 ２選 朱純燕

探討與疫苗相關之免疫反應與機制。討論內容包括：1.免疫反應的調節2.新生動物之免疫反應3.黏膜免疫4. 劑型、免疫途徑與劑量對免疫反應之影響5.新型疫苗之免疫優勢6.疫苗免疫副作用之探討7. 豬用疫苗免疫適期之探討8.反芻獸用疫苗免疫適期之探討。

40484 Immunology of vaccine ２E C.Y. Chu

The aim of this course is to discuss immune responses of vaccines, including: 1. Regulation of immune response. 2. Immunity in the Fetus and Newborn 3. Mucosal immunity. 4. Influence factors: route, type and dose. 5. Immune responses of new type vaccines. 6. Disorders of vaccination 7.Appropriate vaccination regimen of swine vaccines. 8. Appropriate vaccination regimen of ruminant vaccines.

40282免疫功能技術評估 ２選 合授

當抗原或疫苗進行動物免疫之後，需有特定免疫評估技術協助分析所引起的功能性免疫反應，本課程即幫助學生瞭解各種免疫評估技術之原理及應用，以加強學生在免疫反應分析及評估能力。

40282 Immunological Evaluation Techniques ２E All Teachers

Many special immunoevaluation techniques should be used to analyze the effective immune responses induced by the given antigens or vaccines. This curriculum will help students to realize theorems and applications of different immunoevaluation techniques and to reinforce their capacities for analyzing immune responses.

40283 免疫功能技術評估實習 1選 合授

本課程將教導學生操作各種免疫評估技術以分析功能性免疫反應。

40283 Practice of Immunological Evaluation Techniques 1E All Teachers

This curriculum will teach students to operate different immunoevaluation techniques for analyzing effective immune responses.

30133 英文學術演講 2選 鄭力廷

課程內容包括：基本學術演講結構，Powerpoint演講稿整理與呈現方式，問答時回復方式。訓練運用簡明英文，清楚表達實驗結果與論點。加強基本句型與改正常見錯誤發音。

30133 Academic Presentation in English 2E L.T.Cheng

This course provides training in the presentation of scientific research in English. Basic presentation structure, PowerPoint preparation, and response during Q&A segment will be covered. Emphasis will be on the use of concise English to clearly communicate theories and experimental results. Training includes composition of proper sentences and correction of common pronunciation mistakes.

40143 生物製劑檢驗技術 ２選 朱純燕

本課程旨教導學生生物製劑檢驗與研究，課程內容介紹生物製劑檢驗之重要性、檢驗目標、及檢驗技術，包括疫苗製劑之封緘檢驗與研究、血液製劑之檢驗、抗生素製劑之檢驗與研究、與檢驗基準之研訂，並加強應用生物技術於藥物之開發及藥品研發動物試驗優良實驗室操作規範。課程亦介紹相關之調查研究及衛生安全評估、檢驗方法之研訂、標準品之標定及供應、產品安全評估、產品比較性檢驗以及相關法規。

40143 Inspection Techniques on Biological Products ２E C.Y. Chu

The aim of this course is to teach student major objective of an inspection, important aspect of an inspection and the inspection techniques. The course also include the System of Inspection/Registration, the production and examination procedures on varieties of biological products including vaccines and veterinary vaccines, inspection tasks on other biological products including blood products and anti-biotics, Safety and Inspection Service, application of biological systems and organisms to inspection techniques and the related regulations.

40483 疫苗市場行銷學 ２選 柯冠銘

本課程主要目的在將市場行銷策略應用在動物疫苗公司的經營管理上。學生須學習如何提供消費者信賴公司產品為高價值與形象之特殊行銷技巧，課程中的案例將探討保障與維護公司投資者利益的方法、發展與媒體的關係、辦產品發表會以及做好公共關係等的技巧。

40483 Vaccine Marketing ２E G.M. Ke

The subject of course in Marketing is the application of marketing strategies to animal vaccine businesses and managements. Students should learn the special techniques necessary to promote and price vaccine to consumers, i.e. veterinarians and farmers. Extensive use of case studies includes methods of securing and maintaining corporate sponsorship, developing media relations, press conferences and the use of public relations techniques.

55088 實驗動物學特論 ２選 莊國賓

本課程適合需要用到動物試驗的學生修習，課程內容可分為：1.基因品質管制－學習監控實驗動物基因特性的技術，以維護實驗的正確性；2.健康與病理學監控－學習診斷、預防及治療實驗動物疾病的方法；3.動物行為及動物福利－選擇有關之文獻作回顧報告；4.麻醉與外科手術－在合格獸醫師指導下進行練習；5.倫理與法規－認識有關處理實驗動物該考慮和遵守之國內外法規與倫理，例如安樂死的操作技術與程序。

55088 Advanced Laboratory Animal Science ２E K.P. Chuang

This course is fitted to veterinary graduate students who wish to work in the projects regarding animal experiments. The program covers all aspects needed for qualification to use laboratory animals and consists of the follows: Genetic quality control: techniques for monitoring the genetic quality of strains. Health monitoring and pathology: practical methods of diagnosis, pathogenic control and treatment of laboratory animals. Behavior and welfare: written report based on a review of selected literature. Anesthesia and surgical procedures: practical training under supervision of experienced technicians and investigators. Ethics and legislation: ethical considerations on the use of animals for research; national and international regulations; euthanasia of animal.

40677 動物用藥品管理法規 ２選 柯冠銘

本課程主要講授動物用藥管理法及其他有關畜牧獸醫之法規及條例，以供日後從事獸醫工作之遵循依據，並說明各項獸醫法規制定之緣由。

40677 Animal Pharmaceutical Products Jurisprudence ２E G.M. Ke

The Management Law of the Animal Pharmaceutical Products and some other animal husbandry & veterinary medical laws and rules, as the reference for their doing the veterinary works in the future. Meanwhile some explanation concerning the reason of the regulation made were also given for the student.

40287 免疫評估技術 ２選 柯冠銘

當疫苗或抗原進行動物免疫之後，需有特定免疫評估技術協助分析所引起的免疫反應，本課程即幫助學生瞭解各種免疫評估技術之原理及應用，以加強學生在免疫反應分析及評估能力。

40287 Immunoevaluation Techniques ２E G.M. Ke

Many special immunoevaluation techniques should be used to analyze the immune responses induced by the given antigens or vaccines. This curriculum will help students to realize theorems and applications of different immunoevaluation techniques and to reinforce their capacities for analyzing immune responses.

41031 應用蛋白質體學 ２選 楊忠達

本課程將提供近年來在蛋白質體學領域的詳細介紹及應用。本課程特別探討微生物之蛋白質功能生物學及研究如何利用微生物蛋白質體學分析法協助疫苗的研發。

41031 Applied Proteomics ２E C.D. Yang

This curriculum provides an exhaustive introductions and applications of current research in the proteomic field. In particular, it explores the protein functional biology of whole microorganisms and demonstrates how microbial proteomic analyses can aid in vaccine development.

40286 免疫基因與生物資訊概論 ２選 合授

病原的結構基因經常可轉錄轉譯出重要的抗原決定位來引起強烈的免疫反應，因此本課程將針對這些病原的重要結構基因之功能及調控機制加以探討，同時也幫助學生學習利用不同的表現系統針對結構基因加以表現成蛋白質，並獲得大量的重組蛋白以提高抗原的製備技術，同時本課程也協助學生瞭解並應用基因資料庫、使用RNA序列的預測法、序列多型性、蛋白質結構預測、分子之間的作用及蛋白質鑑定。

40286 Introduction to Immunogenic Genes and Bioinformatics ２E All Teachers

Structural genes of infectious pathogens often transcribe and translate into important antigenic epitopes to induce strong immune responses. This curriculum will therefore explore the functions and regulation mechanisms of these pathogenic structural genes. Moreover, it will help students to use different expression systems to express these structural genes and to obtain the large-scale recombinant proteins for improving antigen preparation. Moreover, this curriculum will also help students realize and apply genomic databases, predictive methods using RNA sequences, sequence polymorphisms, protein structure prediction, intermolecular interactions, and proteomic approaches for protein identification.

40284 免疫科技與產業應用 ３選 合授

課程以介紹疫苗產業相關應用技術為主。將討論產業裡研發，生產，品管過程會運用上之相關技術。也以經濟角度來探討疫苗產業之價值鏈。

40284 Immunological Technologies and Industrial Applications 3E All Teachers

This class will introduce various technologies that are currently being used in the animal vaccine industry. Technologies pertaining to the R&D, production, and quality control processes will be discussed. The state of the animal vaccine industry will also be examined from the economic perspective.

41036 營養免疫學 ２選 合授

本課程主要提供學生全面性關於營養學及其相關健康科學知識，使修習此課程之學生了具有了解食物之功能和營養對免疫學之關係。學生可明白現今營養理論及營養科學基礎如何影響和避免急性及慢性疾病，了解營養對免疫反應的影響。

41036 Nutritional Immunology ２E All Teachers

This course aims to provide students with a comprehensive knowledge on nutrition and related health science:

To understand nutritional immunology knowledgement in the sources and functions of food and the relationship of nutrition on immunology.

To understand current theories and scientific basis for nutrition in prevention of acute or chronic human diseases.

To understand the effects of nutrition in immune response.

22160 疫苗製程特論實習 1選 朱純燕

帶領學生實際操作活毒與次單位疫苗製程。同時介紹動物疫苗及佐劑先導工廠與講解優良藥品標準操作規範。

22160 Practical in Vaccine Production 1E C.Y. Chu

Students will participate in the production of attenuated and subunit vaccine. The operation of the Vaccine Pilot Plant will be introduced and the regulations of standard vaccine production will be explained.

22159免疫基因與生物資訊實習 1選 楊忠達

本課程協助學生瞭解一般的生物資訊學概念，學生將學會使用並應用資料庫搜尋與免疫反應調節相關的基因，並進行核酸序列分析、序列多型性分析、蛋白質結構預測、分子間作用的模擬及蛋白質體學之蛋白質鑑定。

22159 Pratical in Bioinformatics 1E C.D Yang

The curriculum will help students realize the general concepts of bioinformatics. Students will learn to use and apply data banks to search genes, which involve immune response regulations, and perform nucleotide sequence analysis, sequence polymorphism analysis, protein structure prediction, simulation of intermolecular interactions, and proteomic approaches for protein identification.

產業實務 2選 合授

本課程內容主要是讓學生有機會至動物疫苗相關公私立單位進行實務操作，以提升學生之實務經驗及技能，達到學理及實務並重之目的，並可使學生提早暸解產業脈動，做為就業前之準備。

Industry Internship 2E All Teachers

This aims of the course are to provide the practice opportunities for students at other animal vaccine related organizations and private companies. The output goal is to enable improved students’ real experiences and skills which will help to fulfilling interaction between theory and practice, understating the industry dynamic and preparation for employment.

30143 傳染病分子醫學與疫苗研發海外實習 2選 鄭力廷

此課程由學生前往海外頂尖實驗室參與傳染病分子醫學與疫苗研發，以英文溝通，討論實驗，報告成果。因國際學術交流大多以英文進行，此課程有助學生溝通能力並增長國際視野。

30143 Vaccine and Drug Research for Infectious Diseases ２E L.T. Cheng

Students will participate in research in a productive laboratory in a foreign setting. English will be used for communication and oral presentations. Since English is the primary language for biomedical research, this overseas study will improve students’ communication skills in English and expand their international experience.

專題研究(1) 1選 輪授

本課程擬指導學生由最新動物疫苗相關期刊中，挑選最新而重要的論文提出報告，並由全體教師、學生共同研討，讓學生學習到如何尋找資料、論文寫作、實驗設計與結果討論等實驗研究工作相關的技術。

Special Topics(1) 1E All Teachers

This curriculum is designed to advise students to collect update papers from Animal vaccine related journals, to make a presentation in class, and to discuss with teachers and classmates. This class let students to learn how to collect research papers, and to design, and perform their experiment.

專題研究(2) 1選 輪授

本課程延續前一學期授課內容進度。擬指導學生由最新動物疫苗相關期刊中，挑選最新而重要的論文提出報告，並由全體教師、學生共同研討，讓學生學習到如何尋找資料、論文寫作、實驗設計與結果討論等實驗研究工作相關的技術。

Special Topics(2) 1E All Teachers

This course is a continuation of the previous semester lectures progress .This curriculum is designed to advise students to collect update papers from Animal vaccine related journals, to make a presentation in class, and to discuss with teachers and classmates. This class let students to learn how to collect research papers, and to design, and perform their experiment.

專題研究(3) 1選 輪授

本課程延續前一學期授課內容進度。本課程擬指導學生由最新動物疫苗相關期刊中，挑選最新而重要的論文提出報告，並由全體教師、學生共同研討，讓學生學習到如何尋找資料、論文寫作、實驗設計與結果討論等實驗研究工作相關的技術。

Special Topics(3) 1E All Teachers

This course is a continuation of the previous semester lectures progress .This curriculum is designed to advise students to collect update papers from Animal vaccine related journals, to make a presentation in class, and to discuss with teachers and classmates. This class let students to learn how to collect research papers, and to design, and perform their experiment.

專題研究(4) 1選 輪授

本課程延續前一學期授課內容進度。本課程擬指導學生由最新動物疫苗相關期刊中，挑選最新而重要的論文提出報告，並由全體教師、學生共同研討，讓學生學習到如何尋找資料、論文寫作、實驗設計與結果討論等實驗研究工作相關的技術。

Special Topics(4) 1E All Teachers

This course is a continuation of the previous semester lectures progress .This curriculum is designed to advise students to collect update papers from Animal vaccine related journals, to make a presentation in class, and to discuss with teachers and classmates. This class let students to learn how to collect research papers, and to design, and perform their experiment.

【疫苗佐劑學】 Vaccine adjuvants -全英語授課 2 朱純燕、鍾曜吉等合授

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| 本課程主要教導學生有關疫苗、佐劑的相關免疫學理基礎及動物疫苗之應用。其課程內容第一部分包括疫苗之生物研究過程及近代免疫學理論對疫苗研究與發展之新領域等，並介紹不同動物之疫苗研發與應用。第二部分介紹疫苗佐劑之用途、佐劑之生物與物化特性及其作用機轉、佐劑與生物體各種免疫細胞之交互作用、如何選擇適當之佐劑、不同佐劑之設計與製備，以及佐劑有效性之評估。Vaccine adjuvants 2 EThe purpose of this course is to teach students the theory of vaccination, adjuvant and the applications of various veterinary vaccines. The first part of this course include the past research on vaccination and the impact of update knowledge about cellular and molecular immunity on developing new generations of vaccines and also introduce the current research of veterinary vaccines and their applications. This second objective of this course is to introduce the purpose of an adjuvant, the acting mechanisms and related characteristics and chemical features of an adjuvant, the interactions of adjuvants with immune cells, the choice of the appropriate adjuvant and how to manufacture different types of adjuvants and evaluate their efficacy. 1. **具備疫苗與佐劑及生技相關之專業能力**
2. 具備創新思考與協調合作能力
3. 具備國際觀
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【進階免疫學】 Advanced Immunology -全英語授課 ２ 莊國賓

瞭解進階免疫學的精義、免疫系統的要素及激發免疫反應的重要條件等基本知識。由基礎講起，並加入進階及最新之知識：1.先天及後天免疫要素，2.抗原、抗體之結構、功能與交互作用，3. 補體，4. B淋巴球及T淋巴球之生物學基礎，5.抗體的遺傳學基礎，6.主要組織相容抗原複合物之角色，7. 細胞激素。

Introduce the elements of Immunology from the basic, advanced concepts and journal including: 1. Innate and Acquired Immunity. 2. Antigen, Antibody structure and function. 3. Complement. 4. Biology of B and T lymphocyte. 5. The genetic basis of Antibody structure. 6 The role of the major histocompatibility complex in the immune response. 7. Cytokines。

1. 具備疫苗與佐劑及生技相關之專業能力
2. 具備國際觀