

### S0288 普通化學 (General Chemistry) (3/3)

原子結構和週期表、原子與分子、化學鍵結、分子結構和軌域、化學能、氣體、液體和固體、化學動力學、酸和鹼、電化學

Atomic Structure and Periodicity, Atoms to Molecules, Chemical Bonding, Molecular Structure and Orbitals, Chemical Energy, Gases, Liquids and Solids, Chemical Kinetics, Acids and Bases, Electrochemistry

### S0289 普通化學實驗 (General Chemistry Laboratory) (1/1)

The following experiments have been designed to train students in related experimental techniques: preparation of soaps, synthesis of aspirin, ion analysis, the study of chemical equilibrium, DNA agarose gel electrophoresis, preparation of high-Tc superconductors, electrogravimetric analysis, chemical cells, preparation of buffer solutions, ion exchange chromatography, COD, DO, Karl Fischer analysis, volumetric titrations including acid-base titration, precipitation titration, complex formation titration, and oxidation/reduction titration.

### S0290 普通物理 (General Physics) (3/3)

Introduction to force and motion, work and energy, conservation laws, rotation, waves, thermodynamics, kinetic theory, electricity, magnetism, Maxwell's Equations, modern physics.

### S0291 普通物理實驗 (General Physics Laboratory) (1/1)

Basic measure, force, simple pendulum, simple harmonic motion, laws of collision, coefficient of linear expansion, mechanical equivalent, thermal-electron electromotive force, consonance, electric line of force, resistance law, oscilloscope, reflection.

### S0325 微積分 (Calculus) (3/3)

上學期(1<sup>st</sup> semester)

極限，連續性，單變數函數的微分，均值定理，微分的應用，單變數函數的積分，微積分根本定理，積分的應用，無窮級數

Limits, Continuity, Differentiation of functions of one variable, Mean Value Theorem, Applications of Differentiation, Integration of functions of one variable, Fundamental Theorem of Calculus, Applications of Integration, Infinite series

下學期(2<sup>nd</sup> semester)

多變數函數，多變數函數的極限與連續，偏微分，極大極小值的應用，多重積分，Fubini 定理  
Functions of several variables, Limits and Continuity, Partial Derivatives, Applications of maximum and minimum, Multiple Integrals, Fubini's Theorem

### **S0398 應用電磁學 (Applied Electromagnetism) (3,0)**

向量分析、靜電學、電位能、物質(導體與介電質)內之靜電場、電容、靜磁學

Vector Analysis, Electrostatics, Energy and Potential, Electrostatic fields in Matter (Conductor and Dielectrics), Capacitance, Magnetostatics

### **S0551 近代物理導論 (Introduction to Modern Physics) (0,3)**

Some failures of classical physics, development and concept of quantum mechanics, wave-particle dual property, special relativity, quantum statistics, crystal structure, electron in metals, band theory of solids, semiconductor devices, magnetic materials.

### **S0704 電子學實驗 (Electronics Lab.) (1/1)**

Diode characteristics, rectifier circuits, Zener regulator circuits, transistor biasing and transistor characteristics, operating point by-pass capacitor and incremental resistance, CE amplifier circuits, emitter follower circuit MOSFET characteristics, MOSFET amplifier circuits, differential amplifiers, and operational amplifiers.

### **S0931 材料科學導論 (Introduction of Materials Science) (2,0)**

原子鍵結、固態結構、機械性質、電性質、磁性質、光性質、材料應用

Atomic Bonding, Solid State Structures, Mechanical properties, Electrical Properties, Magnetic Properties, Optical properties, Applications of Materials

### **S0932 基礎生物 (Fundamental Biology) (0,3)**

生物中的分子, 細胞與胞器, 細胞膜的功能, 細胞與能量, 基因與遺傳, 生物技術簡介

Molecules of life, Cell and cellular organelle, Cell and energy, Gene and inheritance, Introduction to biotechnology

### **S0937 材料的合成與設計 (Synthesis and Design of Materials) (3/3)**

上學期(1<sup>st</sup> semester)

教導學生有關有機發光二極體、有機光伏打電池、染料敏化太陽能電池等有機光電元件的運作機制。並探討包含應用於有機發光二極體、有機光伏打電池、染料敏化太陽能電池之有機分子的設計原理和合成策略。

In the first semester, students will be introduced to the working principles for organic optoelectronic devices, which includes OLED, OPV and DSSC. The design principles and synthetic strategy for organic materials used in OLED, OPV and DSSC.

下學期(2<sup>nd</sup> semester)

會延續材料合成的內容，更深入探討立體化學反應、化學反應活性以及反應機構。而與材料合成息息相關的烯類反應、炔類反應、以及自由基反應也會一併介紹。

The second semester of this course will be focusing on stereochemistry, chemical reactivity and reaction mechanisms. In addition, alkene related reactions, alkyne related reactions, and radical related reactions, will also be included.

### **S0938 生醫材料 (Biomedical Material) (2,0)**

生醫材料的種類, 天然生物高分子, 蛋白質的結構與功能, 糖蛋白的修飾, 蛋白質的誘導與純化, 材料的生物相容性, 材料的毒性測試, 生醫材料的應用

Types of biomedical materials, Natural biomacromolecules, Protein structure and function, Modification of glycoprotein, Induction and purification of protein, Biocompatibility of materials, Toxicity tests of materials, Application of biomedical materials

### **S0939 奈米科學 (Nanoscience) (0,2)**

簡介奈米科學與材料的發展、演進、應用與分析等，為何需要奈米科學或是奈米材料，科學家如何藉由觀察發現奈米結構，如何研究分析進而控制奈米材料的製作等。

This course will introduce how nanoscience developed, applied and analyzed. Why human being needs nanoscience or nanomaterials? How scientists fined nanostructures and how they investigated to control nanoscience?

### **S0940 材料的結構與檢測 (Structure and Measurement of Material) (2/2)**

上學期(1<sup>st</sup> semester)

光學顯微術(穿透、吸收、反射原理和應用), 拉曼光譜顯微術(拉曼散射原理和應用), 電子顯微術(電子與材料散射原理和應用), 同步輻射技術介紹, X光光譜顯微術(聚焦X光原理和應用), X光粉末繞射(布拉德繞射原理和應用), 原子力顯微術(凡得瓦吸引力原理和應用), 電子穿隧顯微術(量子穿隧效應和應用), 電化學影像術(氧化還原電流轉移原理和應用)

Optical microscopy (absorption, transmission, reflection, and application), Raman microscopy (Raman scattering and application), Electron microscopy (electron-matter interaction and application), Synchrotron-related technology, X-ray microscopy (X-ray focusing principle and application), X-ray powder diffraction (Bragg diffraction and application), Atomic force microscopy (van der Waal's force and application), Scanning transmission microscopy (quantum transportation and application), Electrochemical microscopy (redox current transport and application)

下學期(2<sup>nd</sup> semester)

分子光譜學(分子吸收光譜、分子放射光譜), 核磁共振光譜、分子質譜學、分離方法(氣相層析法、液相層析法)

Molecular Spectrometry (Molecular Absorption Spectrometry, Molecular Luminescence Spectrometry), Nuclear Magnetic Resonance Spectroscopy, Molecular Mass Spectrometry, Separation Methods (Gas Chromatography, Liquid Chromatography)

### **S0941 材料科學實驗(一) (Material Science Experiment (I)) (1/1)**

上學期(1<sup>st</sup> semester)

緩衝溶液製備，滲透與透析作用，蛋白質化學與電泳分析；聚合酶連鎖反應，蛋白質量的測定，酵素活性測定，質體 DNA 純化分離，免疫組織化學染色

Buffer preparation, Osmosis and dialysis, protein chemistry and gel electrophoresis, Polymerase Chain Reaction, Measurement of protein amount, Measurement of enzymatic activity, Isolation and purification of plasmid DNA, Immunohistochemistry

下學期(2<sup>nd</sup> semester)

緩衝溶液的製備，滲透作用與透析，蛋白質化學與電泳分析，蛋白質量的測定，酵素活性測定，質體 DNA 之分離，細胞膜化學

Preparation of buffer systems, Osmosis and dialysis, Protein chemistry and electrophoresis, Quantitative determination of protein, Determination of enzyme activity, Isolation of plasmid DNA, Chemistry of cell membrane

### **S0942 材料學研究方法 (Methods in Material Research) (2/2):**

This course considers topics are the experiments in studying material sciences, including nano, biomedical, macromolecular and optoelectronic materials. Students are allowed to enter the material-related laboratories to do some specific topics under the instruction by the principal investigator.

### **E0961 電子學 (Electronics) (3/3)**

DC, AC, passive components, digital, analog, semiconductors, diodes, power suppliers, junction transistors, small-signal amplifiers, field-effect transistors, operational amplifiers, feedback circuits, and frequency responses