

## 課程大綱 syllabus

課程 (course) : General Chemistry II

教師 (teacher) : Keng Pei Yuin

項目	此科目對應之系所課程規畫所欲培養之核心能力 Core capability to be cultivated by this course	權重 (百分比) Percentage
1	運用數學、科學及材料科學與工程知識的能力 The ability to employ the knowledge of mathematics, science, and materials science & engineering.	40
2	設計及執行實驗，以及分析解釋數據的能力 The ability to design and execute experiments, analyze and interpret data.	n/a
3	執行實驗所需技術、技巧及使用實驗工具解決問題之能力 The ability to employ the techniques and tools that are needed in executing experiments and in solving problems.	10
4	設計工程系統或製程之能力 The ability to design engineering systems or processes.	n/a
5	有效溝通及團隊合作的能力 The ability to communicate and cooperate in team works.	10
6	發掘、分析及處理問題的能力 The ability to discover, analyze, and solve problems.	15
7	認識當代材料問題，瞭解材料對於環境、社會及全球的影響，並培養持續學習的習慣與能力 The ability to know contemporary materials issues, to realize the influences of materials on the environment, the society, and the globe, and to keep the habit of learning continuously.	15
8	瞭解專業倫理及社會責任 The ability to realize professional ethics and social responsibility.	10

### 課程簡述(必填) Brief Course Description (required) :

(50-200 words if possible, up to 1000 letters / 最多500個中文字) ,

The General Chemistry II is a continuation from General Chemistry I, in which the course will start with discussing properties of Solutions, chemical equilibria, acid-base, organic chemistry and biochemistry. This course is designed for first year undergraduate students expand their fundamental knowledge in atomic structure to chemical bonding to intermolecular forces and apply these fundamental concepts to understanding chemistry of surrounding our daily lives such as rust, acid rain, heartburn, hemoglobin, and medical diagnostic to name a few.

### 關鍵字(必填) course keywords(required) :

課程內容「中文暨英文關鍵字」至少5個，每個關鍵字至多20個中文，以半形逗點分隔

**(必填)** Please fill in at least 5 course keywords (up to 40 letters for each keyword) and use commas to separate them. (required)

Chemical equilibrium, acid-base, solutions, electrochemistry, kinetics, organic chemistry, biochemistry

### General Chemistry II (普通化學, 下學期)

1. Solutions (2 weeks)
  - 2-1. Solution and solubility & energetics of solution formation
  - 2-2. Solution equilibrium and concentration
  - 2-3. Colligative properties of Colloids
2. Chemical kinetics (2 weeks)
  - 3-1. The rate of chemical reaction and effect of temperature on reaction rate
  - 3-2. Reaction mechanism & Catalysis
  - 3-3. Chemical equilibrium & Equilibrium constant
  - 3-4. Le Châtelier's principle
3. Acids and bases (2 weeks)
  - 4-1. Acid strength & Acid ionization constant
  - 4-2. pH, acid and base solutions
  - 4-3. Polyprotic acids Lewis acids/bases
4. Free energy and thermodynamics (2 weeks)
  - 5-1. Spontaneous and nonspontaneous processes
  - 5-2. Entropy & state change
  - 5-3. Entropy change in chemical reactions
  - 5-4. Heat transfer
5. Electrochemistry (2 weeks)
  - 6-1. Oxidation-reduction
  - 6-2 Cell potential, free energy, equilibrium constant
  - 6-2. Voltaic cells & electricity generation
6. Radioactivity and Nuclear Chemistry
  - 7-1. Types and stability of radioactivity
  - 7-2 Radioactivity & Fission
  - 7-3. Nuclear transmutation and transuranium
7. Organic Chemistry (3 weeks)
  - 8-1. Hydrocarbons & Alkanes & Alkenes & Alkynes
  - 8-2. Aromatic hydrocarbons & functional groups
  - 8-3. Diabetes & Lipids & Carbohydrates & Proteins
  - 8-4. DNA
8. Nonmetals & metals & Metallurgy (Self- study)

- 9-1. Insulated materials
- 9-2. metal structures and alloys
- 9-3. metallurgical process & transition metals
- 9-4. Coordination compounds & isomerization

References.

1. Chemistry: A molecular approach, Fourth Edition, Nivaldo J. Tro

Assessments: Three exams and mock quizzes. Each exam is 25% each. Mock quizzes consist of 15% of the total score.

Generation Artificial Intelligence (A.I.) Ethics Statement. The use of AI is conditionally open in this course. Based on the principles of transparency and responsibility, this course encourages students to use AI to collaborate or learn from each other to improve the quality of the course output. According to the "Guidelines for AI Collaboration, Co-learning and Quality Cultivation in University Educational Fields" announced by our University, this course is conditionally open. The following explains how to use generative AI in course output.

1. Students must briefly explain how to use generative AI for topic ideation, sentence modification, or structural reference in the "title page footnote" or "after citing literature" in class assignments or reports. If it is checked and used but not marked in the homework or report, the teacher, school or related units have the right to re-grade the homework or report or not to score.
2. If there are references to self-generated AI in the teaching materials or learning materials of this course, the teacher will also mark them on the slides or orally.
3. Students who take this course are deemed to have agreed to the above ethics statement when choosing courses.