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| **113(2)/2025 Spring Semester TIGP-ESS課程資料表****113(2)/2025 Spring Semester TIGP-ESS course information form** |
| 科目名稱(中文) | 氣膠與空氣污染 |
| Course Title (English) | Aerosols and Air Pollution |
| 授課時間Time | Tuesday14:00-17:00 |
| 授課地點Location | RCEC 4032 |
| 學分數Course Credits | 3 |
| 主要授課老師Main Instructors | Dr. Charles C.-K. Chou周崇光、Dr. Hing-Cho Cheung張慶祖、Dr. Chuan-Yao Lin林傳堯 |
| 聯絡郵件E-mail | ckchou@gate.sinica.edu.twjoaoc@gate.sinica.edu.twyao435@gate.sinica.edu.tw |
| 辦公時間Office Hours | by appointment |
| 課程目標Course Objectives | The objective of this course is to provide a comprehensive overview of atmospheric chemistry, including the formation, growth, dynamics, and properties of aerosols; the meteorology of air pollution; and the transport, diffusion, and removal of species in the atmosphere. |
| 授課內容Course Description | Properties of atmospheric aerosol, Ozone chemistry, air pollution meteorology and air pollution modeling |
| 教科書/參考書Textbooks/References | Atmospheric Chemistry and Physics |
| 自編教材比例Self-compiled Textbook/References Proportion(if any) |  50% |
| 授課方式Course Requirements | ▓講授(Lecture)；□研討(Seminar)；□實習/實驗(Internship/Experiment)；□個別指導(Individual Discussion)；□其他(Other) |
| 評量配分比重Course Grade |  |
| 對應之永續發展目標(SDGs)(請選擇至多3項與教學內容相關的項目) Corresponding Sustainable Development Goals (SDGs) (Please choose up to 3 items related to the teaching content) | □SDG1消除貧窮No Poverty□SDG2消除飢餓Zero Hunger□SDG3健康與福祉Good Health and Well-being□SDG4優質教育Quality Education□SDG5性別平等Gender Equality□SDG6潔淨飲水與衛生Clean Water and Sanitation□SDG7永續能源Affordable and Clean Energy□SDG8就業與經濟成長Decent Work and Economic Growth□ SDG9產業永續創新Industry, Innovation, and Infrastructure□SDG10減少不平等Reduced Inequality▓ SDG11永續城市與社區Sustainable Cities and Communities□SDG12永續消費及生產Responsible Consumption and Production▓SDG13氣候行動Climate Action□SDG14水生生態Life Below Water□SDG15陸地生態Life on Land□SDG16和平與正義制度Peace, Justice, and Strong Institutions□SDG17全球夥伴Partnerships for the Goals |
| 課程類別Course Category | □ STEAM□人文關懷Humanities and Social Sciences□跨域課程Interdisciplinary Courses▓問題導向Problem-Based Learning□總整課程Integrated Curriculum□媒體識讀Media Literacy□創新課程Innovative Curriculum□自主學習課程Self-Directed Learning□無None |
| 課程領域Areas | □基礎學科(共同)(Basic subjects (common)) □固態地球科學(Solid earth sciences) □水圈科學(Aquatic sciences) □應用語言(Applied Languages) ▓大氣科學(Atmospheric sciences) |
| 產業領域Areas | □地探科技(Geological monitoring technology) ▓氣象科技(meteorological science and technology) □太空科技(Space Technology) ▓環保科技(environmental protection science and technology) □資訊科技(Informational Technology) □教學研究(Teaching & research) □地質科技(Geosciences and technology) |

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| 課程進度與內容Lecture outline and content |
| 週次week | 日期Date | 主題Topic | 授課教師/指定閱讀或作業Instructor/Readings or assignments |
| **1** | 2/18 | Introduction | 張慶祖 |
| **2** | 2/25 | Generality of air pollution | 張慶祖 |
| **3** | 3/4 | Fundamentals of atmospheric aerosols (1) | 張慶祖 |
| **4** | 3/11 | Fundamentals of atmospheric aerosols (2) | 張慶祖 |
| **5** | 3/18 | Instrument of aerosol sampling and measurement | 張慶祖 |
| **6** | 3/25 | Characteristics of primary air pollutants | 張慶祖 |
| **7** | 4/1 | Fundamentals of photochemistry | 周崇光 |
| **8** | 4/8 | VOCs-NOx-O3 chemistry | 周崇光 |
| **9** | 4/15 | Instrument of VOCs sampling and measurement | 周崇光 |
| **10** | 4/22 | Midterm Exam. | 林傳堯 |
| **11** | 4/29 | Meteorology and air pollution | 林傳堯 |
| **12** | 5/6 | Atmospheric circulation and transport of air pollutants | 林傳堯 |
| **13** | 5/13 | Simulation of air quality | 林傳堯 |
| **14** | 5/20 | Lab experiment | 張慶祖 |
| **15** | 5/27 | Field experiment | 張慶祖 |
| **16** | 6/3 | Final Exam. | 張慶祖 |
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| 課程所屬學制(Educational System): 博士班(Doctoral Program) |

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| 核心能力I: 請點選本課程培養學生具備核心能力之強度指數，並填寫對應之評量方式Please select core abilities and its corresponding assessments of this course |
| 請勾選學程所訂之核心能力(可複選)V獨立思考與研究能力Independent thinking and research capacityV進階數理及專業知識能力Advanced mathematical and professional knowledge and abilityV觀測模擬及分析推理能力Observation simulation and analysis of reasoning ability□電腦及程式語言運用能力Computer and programming language proficiency□國際視野與語文溝通能力International perspective and language communication skills□專業倫理及服務學習能力Professional ethics and service-learning ability |
| 核心能力II: 請點選本課程培養學生具備核心能力之強度指數，並填寫對應之評量方式Please select the core abilities and its corresponding assessments of this course |
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| 強度指數Overall ratingof Core Abilities | 1非常低Very Low | 2低Low | 3普通Medium | 4高High | 5非常高Very High | 評量方式Corresponding Assessments |
| 獨立思考與研究能力Independent thinking and research capacity | □ | □ | □ | ▓ | □ | □紙筆測驗/會考(Test/Exam) □作業練習(Assignments) ▓口頭報告/口試(Presentation/Oral Exam) ▓專題研究報告(書面)(Research Report(printed on paper)) □實作/實驗(Practices/Experiments) ▓出席/課堂表現(Attendance/Performance) □學習檔案評量(Portfolios Assessment) □自我評量/同儕互評(Self-Assessment/ Peer Assessment) □作品/創作展演(Products/Creative Performance) □其他(Others)  |
| 進階數理及專業知識能力Advanced mathematical and professional knowledge and ability | □ | □ | □ | ▓ | □ | □紙筆測驗/會考(Test/Exam) □作業練習(Assignments) ▓口頭報告/口試(Presentation/Oral Exam) □專題研究報告(書面)(Research Report(printed on paper)) □實作/實驗(Practices/Experiments) □出席/課堂表現(Attendance/Performance) □學習檔案評量(Portfolios Assessment) □自我評量/同儕互評(Self-Assessment/ Peer Assessment) □作品/創作展演(Products/Creative Performance) □其他(Others)  |
| 觀測模擬及分析推理能力Observation simulation and analysis of reasoning ability | □ | □ | □ | ▓ | □ | □紙筆測驗/會考(Test/Exam) □作業練習(Assignments) ▓口頭報告/口試(Presentation/Oral Exam) □專題研究報告(書面)(Research Report(printed on paper)) ▓實作/實驗(Practices/Experiments) □出席/課堂表現(Attendance/Performance) □學習檔案評量(Portfolios Assessment) □自我評量/同儕互評(Self-Assessment/ Peer Assessment) □作品/創作展演(Products/Creative Performance) □其他(Others)  |
| 電腦及程式語言運用能力Computer and programming language proficiency | □ | □ | □ | □ | □ | □紙筆測驗/會考(Test/Exam) □作業練習(Assignments) □口頭報告/口試(Presentation/Oral Exam) □專題研究報告(書面)(Research Report(printed on paper)) □實作/實驗(Practices/Experiments) □出席/課堂表現(Attendance/Performance) □學習檔案評量(Portfolios Assessment) □自我評量/同儕互評(Self-Assessment/ Peer Assessment) □作品/創作展演(Products/Creative Performance) □其他(Others)  |
| 國際視野與語文溝通能力International perspective and language communication skills | □ | □ | □ | ▓ | □ | □紙筆測驗/會考(Test/Exam) □作業練習(Assignments) ▓口頭報告/口試(Presentation/Oral Exam) □專題研究報告(書面)(Research Report(printed on paper)) □實作/實驗(Practices/Experiments) □出席/課堂表現(Attendance/Performance) □學習檔案評量(Portfolios Assessment) □自我評量/同儕互評(Self-Assessment/ Peer Assessment) □作品/創作展演(Products/Creative Performance) □其他(Others)  |
| 專業倫理及服務學習之能力Professional ethics and service-learning ability | □ | □ | □ | □ | □ | □紙筆測驗/會考(Test/Exam) □作業練習(Assignments) □口頭報告/口試(Presentation/Oral Exam) □專題研究報告(書面)(Research Report(printed on paper)) □實作/實驗(Practices/Experiments) □出席/課堂表現(Attendance/Performance) □學習檔案評量(Portfolios Assessment) □自我評量/同儕互評(Self-Assessment/ Peer Assessment) □作品/創作展演(Products/Creative Performance) □其他(Others)  |

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