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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) | 海洋生物地球化學實驗 |
| Course Title (English) | Marine Biogeochemistry Laboratory |
| 授課時間  Time | Thu. 9:00-12:00 |
| 授課地點  Location | RCEC 6040 |
| 學分數  Course Credits | 3 |
| 主要授課老師 Main Instructors | Dr. Tung-Yuan Ho何東垣、Dr. Cheng-Shiuan Lee 李承軒 |
| 聯絡郵件  E-mail | tyho@gate.sinica.edu.tw |
| 辦公時間 Office Hours | by appointment |
| 課程目標 Course Objectives | To learn the analytical and sampling skills in field work for the collection of hydrographic data and seawater samples and the basic analytical chemistry of seawater. |
| 授課內容 Course Description | To teach the essential analytical techniques in the determination of fundamental hydrographic properties of seawater. |
| 教科書/參考書 Textbooks/References | A Manual of Chemical and Biological Methods for Seawater Analysis, Parsons |
| 自編教材比例  Self-compiled Textbook/References Proportion(if any) |  |
| 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 | Lab reports 100% |
| 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** | 2/20 | Introduction | 何東垣 |
| **2** | 2/27 | Determination of salinity in seawate | 何東垣 |
| **3** | 3/6 | Determination of dissolved oxygen in seawater | 何東垣 |
| **4** | 3/13 | Determination of nitrite | 何東垣 |
| **5** | 3/20 | Determination of soluble reactive phosphate | 何東垣 |
| **6** | 3/27 | Determination of nitrate | 何東垣 |
| **7** | 4/3 | Determination of silicate(兒童及清明) | 何東垣 |
| **8** | 4/10 | Determination of pigment | 李承軒 |
| **9** | 4/17 | Determination of Fe (II) | 何東垣 |
| **10** | 4/24 | Determination of POC/PON 2-1 | 李承軒 |
| **11** | 5/1 | Determination of POC 2-2 | 李承軒 |
| **12** | 5/8 | Determination of DOC 2-1 | 李承軒 |
| **13** | 5/15 | Determination of DOC 2-2 | 李承軒 |
| **14** | 5/22 | Determination of pH/DIC/Alkalinity 2-1 | 何東垣 |
| **15** | 5/29 | Determination of pH/DIC/Alkalinity 2-2 | 何東垣 |
| **16** | 6/5 | Determination of Trace metals | 何東垣 |
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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)  □獨立思考與研究能力Independent thinking and research capacity  □進階數理及專業知識能力Advanced mathematical and professional knowledge and ability  □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 |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | 強度指數 Overall rating of 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) | |