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| **112(1)/2023 Fall Semester TIGP-ESS課程資訊表**  **112(1)/2023 Fall Semester TIGP-ESS course information form** | | | |
| 科目名稱(中文) | | 科學計算 | |
| Course Title (English) | | Scientific Programming | |
| 授課時間  Time | | Mon. 2 – 5 PM | |
| 授課地點  Location | | IES 311 | |
| 學分數  Course Credits | | 3 | |
| 主要授課老師 Main Instructors | | Eh Tan | |
| 聯絡郵件  E-mail | | [tan2@earth.sinica.edu.tw](mailto:tan2@earth.sinica.edu.tw) | |
| 辦公時間 Office Hours | | Fri. 11 AM at IES Room 503 | |
| 課程目標 Course Objectives | | Introduction to scientific programming with Python. | |
| 授課內容 Course Description | | This course is designed for absolute beginners. No past programming experience is required. The course will be offered in a “flip-classroom” fashion. The students will have to watch online video or read online course material before the class and bring their own laptop computer to the class for in-class exercises. | |
| 教科書/參考書 Textbooks/References | | Introduction to Scientific Programming with Python, by Joakim Sundnes, Springer, 2020 (https://doi.org/10.1007/978-3-030-50356-7)  Scipy Lecture Note (https://scipy-lectures.org/) | |
| 自編教材比例  Self-compiled Textbook/References Proportion(if any) | | 100 | |
| 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 | | 60% Homework, 20% Midterm, 20% Final | |
| 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) | |
| 課程進度與內容  Lecture outline and content | | | |
| 週次  week | 主題  Topic | | 授課教師/指定閱讀或作業  Instructor/Readings or assignments |
| **1** | Python programming environment | |  |
| **2** | Basic types and containers | |  |
| **3** | Control flow | |  |
| **4** | Numpy | |  |
| **5** | Matplotlib | |  |
| **6** | String and text IO | |  |
| **7** | Binary IO | |  |
| **8** | Functions | |  |
| **9** | Midterm | |  |
| **10** | Interpolation | |  |
| **11** | Machine Learning | |  |
| **12** | Integration | |  |
| **13** | Finite difference | |  |
| **14** | Symbolic math | |  |
| **15** | Debugging and profiling | |  |
| **16** | Final | |  |
| **17** | Advanced Material I | |  |
| **18** | Advanced Material II | |  |
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| 課程所屬學制(Educational System): 博士班(Doctoral Program) | | | |
| 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) | | | | |