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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 |
| 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 |
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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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