

课程大纲

COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	ESE5023 Computing and Programming for Environmental Research
2.	课程性质 Compulsory/Elective	Elective
3.	课程学分/学时 Course Credit/Hours	3/48
4.	授课语言 Teaching Language	English
5.	授课教师 Instructor(s)	Lei ZHU
6.	是否面向本科生开放 Open to undergraduates or not	No
7.	先修要求 Pre-requisites	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.) C or C++; Applied Mathematics; Or permission of the instructors
8.	教学目标 Course Objectives	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.) This course will introduce students to modern computing software, programming tools, and practices that are broadly applicable in their later research. This course will include introduction to Unix, version control and data backup, programming in three commonly used languages (FORTRAN, R, and Python), tools for data analysis and visualization, and high performance computing exercises on cluster computers. This course will boost students' programming and computing skills, which are in high demand in the era of Big Data.
9.	教学方法 Teaching Methods	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.) This course is a project-oriented, hands-on course, facilitating student learning through a combination of lectures, in-class exercises, homework, final project, and one-on-one interaction during the office hours. All topics will be taught through example data sets, demos, and research problems from Environmental Science.
10.	教学内容 Course Contents	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)
	Section 1	Unix operating system and Shell languages (I)
	Section 2	Unix operating system and Shell languages (II)
	Section 3	Version control and data backup with Git
	Section 4	FORTRAN tutorial
	Section 5	Intermediate FORTRAN: functions, modules, and debugging
	Section 6	R tutorial
	Section 7	Data analysis with R (I): common data formats; file I/O; data cleaning
	Section 8	Data analysis with R (II): simple statistical analysis

	Section 9	Data analysis with R (III): time series analysis
	Section 10	Data analysis with R (IV): spatial data analysis
	Section 11	Data visualization with R (I): basics of scientific plotting
	Section 12	Data visualization with R (II): ggplot and map making
	Section 13	Making websites with R Markdown
	Section 14	Final presentation
11.	课程考核 Course Assessment	
	<p>(① 考核形式 Form of examination; ②. 分数构成 grading policy; ③ 如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)</p> <p>Students will be evaluated at the end of the semester based on their homework (bi-weekly, 30%), oral presentation (30%), term paper (30%), and class participation (10%).</p>	
12.	教材及其它参考资料 Textbook and Supplementary Readings	
	There is no required textbook. Readings will be freely available from online resources made available through the course website.	