

# 课程大纲

## COURSE SYLLABUS

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| 1.  | <b>课程代码/名称</b><br>Course Code/Title               | 大气环境数值模拟<br>Numerical Modeling of Atmospheric Environment   |
| 2.  | <b>课程性质</b><br>Compulsory/Elective                | 选修<br>Elective  |
| 3.  | <b>开课单位</b><br>Offering Dept.                     | 环境科学与工程学院<br>School of Environmental Science and Engineering  |
| 4.  | <b>课程学分/学时</b><br>Course Credit/Hours             | 3/48  |
| 5.  | <b>授课语言</b><br>Teaching Language                  | 中英双语<br>Chinese and English   |
| 6.  | <b>授课教师</b><br>Instructor(s)                      | 沈惠中<br>Huizhong Shen  |
| 7.  | <b>开课学期</b><br>Semester                           | 2023 年秋季<br>Fall 2023   |
| 8.  | <b>是否面向本科生开放</b><br>Open to undergraduates or not | 否<br>No   |
| 9.  | <b>先修要求</b><br>Pre-requisites                     | 无<br>None   |
| 10. | <b>教学目标</b><br>Course Objectives                  | <p>(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>通过本课程的学习, 研究生将掌握大气环境数值模拟的基本理论和方法, 提升研究生在环境问题分析和解决方案制定等方面的能力, 了解大气模式反向模拟等大气数值模式的最前沿研究。通过本课程大量的上机操作, 提升研究生的计算机编程能力和数据处理技能。本课程注重培养研究生的团队协作精神和独立思考能力, 为其今后从事环境科研和工作打下基础。</p> <p>Through this course, graduate students will acquire a solid understanding of the basic theories and methods of atmospheric environment numerical simulation, enhance their ability in environmental problem analysis and solution formulation, and be exposed to cutting-edge research in atmospheric numerical models such as inverse modeling. Through extensive computer-based exercises in this course, graduate students will also improve their computer programming skills and data processing capabilities. This course emphasizes the cultivation of graduate students' team collaboration spirit and independent thinking ability, laying a foundation for their future engagement in environmental research and work.</p>                              |
| 11. | <b>教学方法</b><br>Teaching Methods                   | <p>(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>本课程采用多种教学手段, 包括讲授、上机实习、案例分析、讨论等, 激发学生的学习兴趣和提高学习效果。本课程的教学内容包括大气环境数值模拟基础、数值模式建立与参数化、大气物理及化学过程模拟、模式验证及应用等, 涵盖了大气环境数值模拟的主要内容。为了保证教学质量, 本课程要求研究生在课程学习过程中进行课堂作业、课程论文和小组汇报等多项评估。</p> <p>This course adopts multiple teaching methods, including lectures, computer-based exercises, case analyses, and discussions, to stimulate students' learning interest and improve their learning outcomes. The teaching content of this course covers the fundamentals of atmospheric environment numerical simulation, numerical model establishment and parameterization, atmospheric physical and chemical process simulation, model validation, and application, covering the major aspects of atmospheric environment numerical modeling. To ensure teaching quality, this course requires graduate students to complete multiple assessments during the course learning process, including classroom assignments, course papers, and group reports.</p> |
| 12. | <b>教学内容</b><br>Course Contents                    | <p>(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>  |
|     | <b>Section 1</b>                                  | 绪论<br>Introduction to numerical modeling of atmospheric environment   |

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| <b>Section 2</b>   | 数值模型建模基础<br>Numerical model development   |
| <b>Section 3</b>   | 排放清单<br>Emission inventory  |
| <b>Section 4</b>   | 控制方程及数值方法<br>Model equations and numerical approaches   |
| <b>Section 5</b>   | 大气物理过程<br>Numerical methods for physical processes  |
| <b>Section 6</b>   | 大气化学过程<br>Numerical methods for chemical processes  |
| <b>Section 7</b>   | 模型验证<br>Model evaluation  |
| <b>Section 8</b>   | 分析方法简介<br>Analysis approaches   |
| <b>Section 9</b>   | 反向模拟<br>Inverse modeling for atmospheric chemistry  |
| <b>13. 课程考核</b><br><b>Course Assessment</b>                        |   |
|  | <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>学生分数将由考勤 (20%)、上机表现 (20%)、平时作业 (40%)、期末汇报决定 (20%)<br/>Students will be evaluated based on their class participation (20%), computer-based exercise performance (20%), homework (40%), and oral presentation (20%).</p> |
| <b>14. 教材及其它参考资料</b><br><b>Textbook and Supplementary Readings</b> |   |
|  | 无<br>None   |