

课程大纲

COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	大气化学 Atmospheric Chemistry
2.	课程性质 Compulsory/Elective	专业选修
3.	开课单位 Offering Dept.	环境科学与工程学院 School of Environmental Science and Engineering
4.	课程学分/学时 Course Credit/Hours	3/48
5.	授课语言 Teaching Language	中文/英文 Chinese/English
6.	授课教师 Instructor(s)	杨新 Xin Yang
7.	开课学期 Semester	秋季 Fall
8.	是否面向本科生开放 Open to undergraduates or not	是
9.	先修要求 Pre-requisites	CH105 大学化学 或者 CH103 化学原理 两门课中任意一门
10.	教学目标 Course Objectives	<p>This course is an elective for both undergraduate and postgraduate students in the Environmental Science major. The fundamental aspects of atmospheric chemistry, including stratospheric chemistry, tropospheric chemistry, and aerosol physics and chemistry, will be presented during the lectures. The goal of this course is to help students develop a comprehensive and quantitative understanding of atmospheric chemistry, and build accuracy and fluency in scientific English. The course also prepares students for other advanced atmospheric environmental courses at the postgraduate level.</p>
11.	教学方法 Teaching Methods	讲授 lecture
12.	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.)	<p>Section 1 介绍 Introduction (2hr)</p> <p>介绍大气圈层的基本情况, 大气化学的研究内容。我国大气污染以及大气治理的基本现状。介绍本课程的授课内容及考核要求和南方科技大学正在进行的大气化学研究。</p> <p>This section introduces the basic situation of the atmosphere and the research content of atmospheric chemistry. The basic status quo of air pollution and air pollution control in China. Introduce the teaching content and assessment requirements of this course. In addition, introduce ongoing atmospheric chemistry research at SUSTech.</p> <p>Section 2 大气化学基础</p> <p>介绍大气化学的基本内容, 主要包括气体的混合比, 数浓度, 分压和大</p>

<p>Fundamentals of Atmospheric Chemistry (4hr)</p>	<p>气圈层压力和温度的垂直剖面，气压定律和海洋对大气圈层的影响。 This section introduces the fundamentals of atmospheric chemistry, including gas mixing ratio, number density, partial pressure, the vertical profile of atmospheric pressure and temperature, the Barometric Law, and the impact of the ocean on the atmosphere.</p>
<p>Section 3 大气模型和传输 Models and Atmospheric Transport (4hr)</p>	<p>介绍大气模型和传输的基本内容，主要包括一盒模型，多盒模型和膨胀模型，地转流，大气环流和垂直传输。 This section introduces the models and atmospheric transport, including the one-box model, the multibox models, the puff models, the Geostrophic Flow, the General Circulation, and the vertical transport.</p>
<p>Section 4 地球化学循环 Geochemical Cycles (4hr)</p>	<p>介绍地球化学循环的基本内容，主要包括地球主要元素循环，氮循环，氧循环和碳循环。 This section introduces the geochemical cycles, including the geochemical cycling of elements, the nitrogen cycle, the oxygen cycle, and the carbon cycle.</p>
<p>Section 5 温室效应 Greenhouse Effect (2hr)</p>	<p>介绍温室效应的基本内容，主要包括辐射，地球有效温度，大气吸收辐射，辐射强迫。 This section introduces the greenhouse effect, including radiation, the effective temperature of the earth, absorption of radiation by the atmosphere, and radioactive forcing.</p>
<p>Section 6 化学动力学 Chemical Kinetics (2hr)</p>	<p>介绍大气化学动力学的基本内容，主要包括气相反应，可逆反应，光解反应，自由基反应。 This section introduces the atmospheric chemical kinetics, including gas-phase reactions, reverse reactions, photolysis, and radical-assisted reaction chains.</p>
<p>Section 7 平流层化学 Stratospheric Chemistry (4hr)</p>	<p>介绍平流层化学的基本内容，主要包括查普曼机制，催化损失循环，极地臭氧损失，气溶胶效应。 This section introduces the stratospheric chemistry, including the Chapman Mechanisms, the catalytic loss cycles, polar ozone loss, and the aerosol effect.</p>
<p>Section 8 对流层化学 Tropospheric Chemistry (6hr)</p>	<p>介绍对流层化学的基本内容，主要包括羟基自由基，全球一氧化碳和甲烷的估算，HOx 的循环，臭氧的产生，全球氮氧化物估算，全球对流层臭氧估算，人为行为对臭氧和羟基自由基的影响。 This section introduces tropospheric chemistry, including the hydroxyl radical, global budgets of CO and methane, the cycling of HOx, production of ozone, the global budget of nitrogen oxides, the global budget of tropospheric ozone, and anthropogenic influence on ozone and hydroxyl radical.</p>
<p>Section 9 气溶胶 Aerosol Physics & Chemistry (6hr)</p>	<p>介绍气溶胶的基本内容，主要包括来源，大小分布，损失过程，直接和间接影响，大气成核，二次有机气溶胶，非均相反应。 This section introduces tropospheric chemistry, including sources, size distributions, loss processes, direct and indirect effects, atmospheric nucleation, secondary organic aerosols, and heterogeneous reactions.</p>
<p>Section 10 空气污染 Air Pollution (2hr)</p>	<p>介绍空气污染的基本内容，主要包括空气污染和臭氧，臭氧形成和控制策略，臭氧产生效率。 This section introduces air pollution, including air pollution and ozone, ozone formation and control strategies, and ozone production efficiency.</p>
<p>Section 11 酸雨 Acid Rain (2hr)</p>	<p>介绍空气污染的基本内容，主要包括酸的来源和酸雨的影响。 This section introduces air pollution, including sources of acids and the effects</p>

of acid rain.

13. 课程考核
Course Assessment

① 考核形式

考试

② 分数构成

Attendance: 10%, Homework: 40%, Final exam&Project: 50%

14. 教材及其它参考资料
Textbook and Supplementary Readings

Textbook:

Introduction to Atmospheric Chemistry by Daniel J. Jacob, Princeton University Press, 1999.

Supplementary Material:

Chemistry of the Upper and Lower Atmosphere: Theory, Experiments, and Applications by Barbara J. Finlayson-Pitts & James N. Pitts, Jr., Academic Press, 2000

Atmospheric Chemistry and Physics: From Air Pollution to Climate Change by John H. Seinfeld & Spyros N. Pandis, John Wiley & Sons, Inc., 2006