

# 课程大纲

## COURSE SYLLABUS

1.	<b>课程代码/名称</b> Course Code/Title	空间等离子体物理学 Space Plasma Physics																		
2.	<b>课程性质</b> Compulsory/Elective	专业必修课 Compulsory																		
3.	<b>课程学分/学时</b> Course Credit/Hours	3/48																		
4.	<b>授课语言</b> Teaching Language	中英 Chinese & English																		
5.	<b>授课教师</b> Instructor(s)	叶生毅 YE, Shengyi																		
6.	<b>先修要求</b> Pre-requisites	无 None																		
7.	<b>教学目标</b> Course Objectives	<p>本课程介绍空间等离子体物理学的基本知识，为后续空间物理专业课程的学习或未来从事空间物理相关研究工作奠定基础。</p> <p>This course introduces the fundamentals of space plasma physics, preparing the students for future studies and related research works in the field of space physics.</p>																		
8.	<b>教学方法</b> Teaching Methods	授课 Lectures																		
9.	<b>教学内容</b> Course Contents	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"><b>Section 1</b></td> <td>介绍 This section introduces the definition and basic characteristics of plasma.</td> </tr> <tr> <td><b>Section 2</b></td> <td>单粒子轨道理论 This section discusses the motion of a single charged particle in background magnetic and electric fields.</td> </tr> <tr> <td><b>Section 3</b></td> <td>磁流体力学 This section introduces the basic magnetohydrodynamic (MHD) equations which describe plasma as an ionized fluid.</td> </tr> <tr> <td><b>Section 4</b></td> <td>等离子体波 This section covers plasma waves: their dispersion relations and different properties.</td> </tr> <tr> <td><b>Section 5</b></td> <td>等离子体扩散和电阻 This section addresses the diffusion in plasmas and plasma resistivity due to particle collision</td> </tr> <tr> <td><b>Section 6</b></td> <td>等离子体不稳定性 This section discusses the concept of plasma equilibrium and instability. It will also introduce several typical instabilities in plasmas.</td> </tr> <tr> <td><b>Section 7</b></td> <td>动力学理论 This section introduces the kinetic plasma description, including Boltzmann equation, Vlasov equation, and their connection with MHD.</td> </tr> <tr> <td><b>Section 8</b></td> <td>非连续性和激波 This section introduces discontinuities in space and shock waves</td> </tr> <tr> <td><b>Section 9</b></td> <td>非线性过程 This section briefly introduces some nonlinear effects in plasma</td> </tr> </table>	<b>Section 1</b>	介绍 This section introduces the definition and basic characteristics of plasma.	<b>Section 2</b>	单粒子轨道理论 This section discusses the motion of a single charged particle in background magnetic and electric fields.	<b>Section 3</b>	磁流体力学 This section introduces the basic magnetohydrodynamic (MHD) equations which describe plasma as an ionized fluid.	<b>Section 4</b>	等离子体波 This section covers plasma waves: their dispersion relations and different properties.	<b>Section 5</b>	等离子体扩散和电阻 This section addresses the diffusion in plasmas and plasma resistivity due to particle collision	<b>Section 6</b>	等离子体不稳定性 This section discusses the concept of plasma equilibrium and instability. It will also introduce several typical instabilities in plasmas.	<b>Section 7</b>	动力学理论 This section introduces the kinetic plasma description, including Boltzmann equation, Vlasov equation, and their connection with MHD.	<b>Section 8</b>	非连续性和激波 This section introduces discontinuities in space and shock waves	<b>Section 9</b>	非线性过程 This section briefly introduces some nonlinear effects in plasma
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<b>Section 10</b>	碰撞过程 This section introduces some of the collisional processes in plasma.
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<b>10. 课程考核</b> <b>Course Assessment</b>	
	<p>请再此注明：①考查/考试；②分数构成。</p> <p>考试：作业 30%，期中考试 30%，期末考试 40%</p> <p>homework 30%. mid-term exam 30%, final exam 40%</p>
<b>11. 教材及其它参考资料</b> <b>Textbook and Supplementary Readings</b>	
	<p>Introduction to plasma physics with space and laboratory applications, Gurnett and Bhattacharjee</p> <p>Introduction to plasma physics and controlled fusion, Francis F. Chen</p>