课程教学大钢

<table>
<tr><td colspan="6">课程基本信息（Course Information）</td></tr>
<tr><td>课程代码
（Course Code）</td><td>PH339 (教学班)</td><td>学时
（Credit Hours）</td><td>3</td><td>学分
（Credits）</td><td>48</td></tr>
<tr><td rowspan="2">课程名称
（Course Name）</td><td colspan="5">（中文）等离子体物理</td></tr>
<tr><td colspan="5">（英文）Plasma Physics</td></tr>
<tr><td>课程属性
(Course Type)</td><td colspan="5"></td></tr>
<tr><td>开课院系
（School）</td><td colspan="2">（英文）Physics</td><td>开课学期
（Term）</td><td colspan="2">Spring semester（英文）</td></tr>
<tr><td>先修课程
（Prerequisite course）</td><td colspan="5">（英文）Fluid Mechanics, Statistical mechanics, Classical electrodynamics</td></tr>
<tr><td>授课教师
（Instructors）</td><td colspan="5">Nasr A. M. Hafz （英文）</td></tr>
<tr><td>课程简介（Description）
300-500 字</td><td colspan="5">The course is introductory-level plasma physics where I teach students the fundamental concepts, theories and some potential applications for plasma physics. Fundamental theories include single-particle approach as a first step which gives a reasonable background on different particle drift motions in various E- and B-field configurations some are relevant to E-B fields of magnetic-confinement machines like EAST Tokamak in CHINA. The fluid-theory of plasma physics is given and directly applied to various (tens) kinds of plasma waves (EM and ES) and their propagation characteristics in plasma. A modified approach of the fluid theory, called “MHD” is applied to get the electrical properties and the stability properties of the plasma in various confinement configurations, including the most famous 2D equilibrium configuration called “Grad-Shafranov”. Finally I teach the basics of the microscopic theory of plasma physics which is the kinetic approach. Based on this theory I derive the exact dispersion relationship of plasma waves and the so called “Landau damping”. Throughout the course, we teach how the plasma physics is applied, for example to create a nuclear fusion reactor for future energy needs etc.</td></tr>
<tr><td colspan="6">课程教学大纲（course syllabus）</td></tr>
<tr><td>*学习目标(Learning Outcomes)</td><td colspan="5">After completing the course, students should know:
1． Plasma in nature and how to create it on earth and laboratory
2． Single-particle motions and drifts in variety of E- and B- field configurations
3． Macroscopic “Fluid” theory of plasma physics and the plasma approximation
4. Plasma waves and their propagation (Plasma Optics)
5. The Plasma Diffusion problem and Resistivity
6. Magnetohydrodynamics and the Equilibrium configurations of plasmas
7. Microscopic theory of plasma physics (Kinetic approach) and Landau damping
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*教学内容、进度安排及要求

(Class Schedule & Requirements)

教学内容 topics	学时 Credit hours	教学方式 Teaching methodology	作业及要求 tasks	基本要求 Intended learning outcomes	考查方式 Assessment methods
Introduction and basic parameters of plasma media	4				
Single particle motion in various E-B fields	6				
Fluid formulation of plasma physics	6				
Plasma Waves	8				
Advanced Plasma Waves	4				
Plasma Diffusion	4				
Electrical properties of Plasma	4				
MHD and Equilibrium	6				
Kinetic Theory of plasmas& and Landau damping	4				
Final Exams	2				
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	（英文）
考核方式 (Assessment methods and Grading)	（英文）I assess students based on the following 1. Activity in class 2. Assignments and homework 3. Attendance 4. Midterm-exam results 5. Final exam results
教材或参考资料 (Textbooks & Other Reading Materials)	F.F. Chen ”Introduction to Plasma Physics and Controlled Fusion” Vol.1 R. O. Dendy: Plasma Physics: An Introductory Course
备注 （Notes）	（英文）