研究生课程教学大纲（Syllabus）

<table>
<tr><td>课程代码
Course Code</td><td>PHY6008</td><td>*学时
Teaching Hours</td><td>64</td><td>*学分
Credits</td><td>4</td></tr>
<tr><td rowspan="2">*课程名称
Course Name</td><td colspan="5">物理学中的群论</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>*授课语言
Instruction Language</td><td colspan="5">English</td></tr>
<tr><td>*开课院系
School</td><td colspan="5">Physics and Astronomy</td></tr>
<tr><td>先修课程
Prerequisite</td><td colspan="5"></td></tr>
<tr><td rowspan="4">授课教师
Instructors</td><td>姓名 Name</td><td>职称 Title</td><td colspan="2">单位 Department</td><td>联系方式 E-mail</td></tr>
<tr><td>Yuichiro Nakai</td><td>副教授</td><td colspan="2">李政道研究所</td><td>ynakai@sjtu.edu.cn</td></tr>
<tr><td></td><td></td><td colspan="2"></td><td></td></tr>
<tr><td></td><td></td><td colspan="2"></td><td></td></tr>
<tr><td>*课程简介（中文）Course Description</td><td colspan="5"></td></tr>
<tr><td>*课程简介（English）Course Description</td><td colspan="5">I begin with the introduction to explain why group theory is important. The first half of the lecture course is on finite groups and the latter half is on continuous groups. I explain the basics of group theory and the symmetric group. Then, for preparation, I review vector space. The highlight of the first half of the course is the idea of group representations. Using this idea, I show several applications of finite groups to physical systems, including quantum mechanics. For the latter half of the course, I begin with the relation between Lie groups and Lie algebras. Then, I explain the example of rotations in 3D Space. Next, I present a general discussion on simple Lie algebras and their representations. The SU(3) group is a good example of this general discussion. Finally, I conclude with classification of simple Lie algebras.</td></tr>
</table>

	周次 Week	教学内容 Content	授课学时 Hours	教学方式 Format	授课教师 Instructor
*教学安排 Schedules	1	Introduction	3	Blackboard	Yuichiro Nakai
	2	Basics of Group Theory	3	Blackboard	Yuichiro Nakai
	3	Symmetric Group	3	Blackboard	Yuichiro Nakai
	4	Vector Space	3	Blackboard	Yuichiro Nakai
	5	Group Representations	3	Blackboard	Yuichiro Nakai
	6	Group Representations	3	Blackboard	Yuichiro Nakai
	7	Applications of Finite Groups	3	Blackboard	Yuichiro Nakai
	8	Quantum Mechanics and Group Theory	3	Blackboard	Yuichiro Nakai
	9	Continuous Groups and Lie Algebras	3	Blackboard	Yuichiro Nakai
	10	Continuous Groups and Lie Algebras	3	Blackboard	Yuichiro Nakai
	11	Rotations in 3D Space	3	Blackboard	Yuichiro Nakai
	12	Simple Lie Algebras and Their Representations	3	Blackboard	Yuichiro Nakai
	13	Simple Lie Algebras and Their Representations	3	Blackboard	Yuichiro Nakai
	14	The Group SU(3)	3	Blackboard	Yuichiro Nakai
	15	Classification of Simple Lie Algebras	3	Blackboard	Yuichiro Nakai
*考核方式 Grading Policy	Exercises: 70%, Final exam: 30%				
*教材或参考资料 Textbooks & References	Wu-Ki Tung, “Group Theory in Physics” Howard Georgi, “Lie Algebras in Particle Physics”				
备注 Notes					

备注说明：

1．带*内容为必填项；

2．课程简介字数为 300-500 字；教学内容、进度安排等以表述清楚教学安排为宜，字数不限。