

研究生课程教学大纲 (Syllabus)

课程代码 Course Code	ASTR8106	*学时 Teaching Hours	48	*学分 Credits	3
*课程名称 Course Name	天体物理流体力学 Astrophysical hydrodynamics				
*授课语言 Instruction Language	English				
*开课院系 School	Department of Astronomy				
先修课程 Prerequisite	No				
授课教师 Instructors	姓名 Name	职称 Title	单位 Department	联系方式 E-mail	
	Yosuke Mizuno	副教授	TDLI	mizuno@sjtu.edu.cn	
*课程简介 (中文) Course Description					
*课程简介 (English) Course Description	<p>Hydrodynamics is a successful framework to describe the dynamics of matter in the universe on all scales. This course will provide an introduction to the mathematical and physical properties of hydrodynamics and its extension to magnetised fluids, i.e. magnetohydrodynamics in astrophysics. Starting from overview of fluids and plasmas in astrophysics, the equations of hydrodynamics will be derived and their most important properties will be discussed. The course will also discuss the nonlinear nature of the hydrodynamics equations and the occurrence of nonlinear waves such as shocks. Then we will deal with neutrally charged and magnetised plasmas and discuss the basic features of ideal magnetohydrodynamics and the associated nonlinear waves. The final part of lecture will provide the astrophysical applications.</p>				

	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	Basic Concept of fluid	3	Lecture	Y.Mizuno
	2	Formulations of the hydrodynamic equations	3	Lecture	Y.Mizuno
	3	Kinetic theory	3	Lecture	Y.Mizuno
	4	Gravity & hydrostatic equilibrium	3	Lecture	Y.Mizuno
	5	Waves	3	Lecture	Y.Mizuno
	6	Shock and discontinuities	3	Lecture	Y.Mizuno
	7	Bernoulli's equation & transonic flow	3	Lecture	Y.Mizuno
	8	Fluid instabilities	3	Lecture	Y.Mizuno
	9	Viscous flows	3	Lecture	Y.Mizuno
	10	Basic concept of plasmas	3	Lecture	Y.Mizuno
	11	Single particle motion	3	Lecture	Y.Mizuno
	12	Magnetohydrodynamic equations	3	Lecture	Y.Mizuno
	13	MHD waves	3	Lecture	Y.Mizuno
	14	MHD shock and discontinuities	3	Lecture	Y.Mizuno
	15	MHD instabilities	3	Lecture	Y.Mizuno
*考核方式 Grading Policy	Attendance (20%) Homework (40%) Final report or presentation (40%)				
*教材或参考资料 Textbooks & References	<ol style="list-style-type: none"> 1. C.J. Clarke & R.F. Carswell, 2007 "Principles of Astrophysical Fluid Dynamics" (Cambridge University Press, Cambridge, UK) 2. L. Rezzolla & O. Zanotti, 2013 "Relativistic Hydrodynamics" (Oxford University Press, Oxford UK) 3. J. Goedbloed & S. Poedts, 2004 "Principles of Magnetohydrodynamics: With Applications to Laboratory and Astrophysical Plasmas" (Cambridge University Press, Cambridge, UK) 4. E.R. Priest, 1982, "Solar Magnetohydrodynamics" (Springer, Netherlands) 				
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。