课程大纲 COURSE SYLLABUS		
1.	**课程代码/名称** **Course Code/Title**	ESS5029 统计地震学 （Statistical Seismology）
2.	**课程性质** **Compulsory/Elective**	专业选修课 （specialized elective course）
3.	**课程学分/学时** **Course Credit/Hours**	2/32
4.	**授课语言** **Teaching Language**	中英 Bilingual
5.	**授课教师** **Instructor(s)**	韩鹏 (Han, Peng)
6.	**先修要求** **Pre-requisites**	本课程需要有积分变换、概率论与数理统计基础并具备基本的编程能力（主要基于 matlab）。 Prerequisites: Integral Transform, Probability Theory & Mathematical Statistics, and basic programming skills. MATLAB will be used extensively throughout the course.
7.	**教学目标** **Course Objectives**	
	本课程为地球物理学相关专业研究生的选修课。本课程主要教授统计地震学的基本理论、方法以及在实际地震资料处理及地震危险性评估中的应用。修完本课程后，应具有以下能力： （1） 掌握地震活动的统计规律及其内在独立性、随机性 （2） 掌握长期地震预测的统计方法 （3） 掌握地震预测预报方法的统计检验 （4） 认识已有地震预测预报方法的能力和限度 （5） 了解地震活动的物理模型 This is a specialized course for students in Geophysics or other related areas. Upon completing the course, students should be able to: (1) Understand the statistical characteristics of seismicity, and its inherent independence and randomness. (2) Know basic statistical methods and models for long-term earthquake forecast. (3) Perform statistical test of earthquake forecast/predication (4) Understand the ability and limits of existing earthquake prediction methods. (5) Know physical model of seismicity.	
8.	**教学方法** **Teaching Methods**	
	本课程前半部分主要侧重于数理统计的理论知识讲解及统计地震学模型、方法介绍，后半部分则侧重于实际运用。通过理论讲解结合编程处理实际观测数据来加深学生对理论知识的理解,并在此基础上培养学生解决地震危险性评估中存在的实际问题的能力。修完本课程后学生将对统计地震学理论有深入了解并能够基于地震目录解决地震活动性分析中的一些实际问题，尤其是掌握如何运用统计地震学模型对地震的危险性	

	进行评估。 The first-half of this course will focus on the fundamental theory/models of statistical seismology, and the last-half will mainly discuss how to apply them to practical problems. By combining direct instruction and programming exercises for practical catalog data, this course will enhance students' understanding of speculative knowledge and develop their problem-solving skills. On completion of this course, students are expected to gain insights into the theory of statistical seismology, and abilities to apply them to specific problems in Geophysical areas, particularly know how to apply statistical models in earthquake risk assessment.
9.	**教学内容** **Course Contents**

	Section 1	地震的量度 (Earthquake magnitude) week: 1-2 内容：体波震级、面波震级、矩震级及其换算，震级完备性评估 Contents: Body wave magnitude, surface wave magnitude, moment magnitude and magnitude conversion， magnitude of completeness (Mc)
	Section 2	地震活动的统计规律及其内在独立性、随机性（Statistical characteristics of seismicity, and its inherent independence and randomness）week：3-5 内容：古登堡-理查特定律，宇津-大森定律，传染型余震序列模型 Contents: Gutenberg-Richard's Law, Utsu-Omori's Law, EATS model
	Section 3	长期地震预测的统计方法 (Statistical methods and models for long-term earthquake forecast) week：6-10 内容：地震空区，地震平静，加卸载响应比， 泊松模型，复发模型，应力释放模型，复合模型 Contents: Seismic gap; Seismic quiescence; Load-unload rate; Stationary Poisson models; Renewal/recurrence models; Stress release models; hybrid model
	Section 4	地震预测/预报的统计检验 (Statistical test of earthquake forecast/predication) week: 11-13 内容：R 值评分，ROC，Molchan 误差曲线 Contents: R score, ROC, Molchan error diagram
	Section 5	地震活动的物理模型 (Physical model of seismicity) week: 14-16 内容：地震自相似性，速度-状态摩擦准则，地震触发 Contents: Self-similarity of earthquakes, Rate and State Friction Law, earthquake static and dynamic triggering

10.	**课程考核** **Course Assessment**

	课程最终成绩根据五次作业和期末报告综合评定（课程作业 50%+期末报告 50%）。作业内容为运用课程中所学习到的统计地震分析方法，编写程序处理实际地震目录（主要基于 Matlab）。 Assessment will be based on five assignments (50%) and final report (50%). The assignments are compiling programs (mostly based on Matlab) to analyse practical earthquake catalogues.
11.	**教材及其它参考资料** **Textbook and Supplementary Readings**
	1) Aki & Richards, Quantitative Seismology 2) W. H. K. Lee, H. Kanamori, P.C.Jennings, and C. Kisslinger (Academic Press, San Diego) International Handbook of Earthquake & Engineering Seismology, Part A 3) 宇津徳治「地震学」（共立出版） 4) 松浦&大中「地震発生の物理学」（东京大学出版社 日语）