课程大纲
COURSE SYLLABUS

1.	课程代码/名称 **Course Code/Title**	MAT7058 组合数学 II, Combinatorics II
2.	课程性质 **Compulsory/Elective**	选修课程 Elective Course
3.	课程学分/学时 **Course Credit/Hours**	3/48
4.	授课语言 **Teaching Language**	英文 English
5.	授课教师 Instructor(s)	向青，李才恒，向子卿，Ferdinand Ihringer
6.	是否面向本科生开放 **Open to undergraduates or not**	是 Yes
7.	先修要求 **Pre-requisites**	MA103b 线性代数 I & II，MA214 抽象代数 MA103b Linear Algebra, MA214 Abstract Algebra

8. 教学目标 Course Objectives

组合数学是一门由众多分支组成的学科，包括组合计数和组合机构，比如图论，有限几何，编码和密码学，组合设计。本课程是组合数学的第二学期的课程，将根据学生和教师的兴趣选择侧重点。其目标是让学生了解和掌握组合数学的基础理论，基本方法，重要例子以及主要结果培养学生在组合数学领域初步的科研能力。 Combinatorics consists of various branches, including combinatorial enumerations and structures, graph theory, finite geometry, block designs, codes and cryptography. This course will choose some of these topics according to the research interests of students and the lecturer in each semester. The aim is to provide students opportunities to understand fundamental theory, important examples and main results, and can use combinatorial methods in the future study and research.

9. 教学方法 Teaching Methods

讲授 Lecture；讨论，discussion

10. 教学内容 Course Contents

Section 1	编码理论将覆盖：编码和译码的基础理论，线性码，Hamming 码，循环码，和 BCH 码等。 Coding Theory will cover basic theory for encoding and decoding, linear codes, Hamming codes, cyclic linear codes, and BCH codes.	
Section 2	强正则图将覆盖强正则图的基本理论，像强正则图的定义，图谱刻画，基本例子，唯一性，与几何的关系。 In the chapter on strongly regular graphs, we will cover basic definitions, spectral characterization, basic examples, uniqueness, etc.	
Section 3	代数图论将覆盖 Cayley 图，高度对称图，强正则图, 图谱和 Ramsey 理论。 Algebraic graph theory will cover Cayley graphs, symmetrical graphs, strongly regular graphs, spectral graph theory, and Ramsey theory.	
Section 4	高斯系数，组合几何，有限域上的射影几何，极空间，ovoids and spreads Gaussian coefficients, combinatorial geometry, projective geometry over finite fields,	

		polar spaces, ovoids and spreads.
	Section 5	结合方案， 包括汉明方案，Johnson 方案， Delsarte 理论 In association schemes, we will cover Hamming schemes, Johnson schemes, linear programming bounds
	Section 6	广义多边形（是一类特殊的 Tits 几何），和群在几何上的作用。 Generalized polygons, and group actions on geometries.
11.	课程考核 Course Assessment	
	Assessments, 作业(30%); 考试 examination (70%)	
12.	教材及其它参考资料 Textbook and Supplementary Readings	
	1、A Course in Combinatorics, J. Van Lint and R. M. Wilson 2、Combinatorics: topics, techniques, algorithms, by Peter Cameron 3、Enumerative Combinatorics, by Richard Stanley 4、Graph Theory, by Richard Diestel 5、Lecture Notes (由授课教师编写)	