课程大纲
COURSE SYLLABUS

1.	**课程代码/名称 Course Code/Title**	MAT8022 组合数学 Combinatorics
2.	**课程性质 Compulsory/Elective**	核心课程 Core Course
3.	**课程学分/学时 Course Credit/Hours**	3/48
4.	**授课语言 Teaching Language**	中英文（Chinese and English），英文教材
5.	**授课教师 Instructor(s)**	向青教授, 李才恒教授 Qing Xiang, Professor; Caiheng Li, Professor
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 chances 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	组合计数将包括重要而基本的组合方法，比如用两种方法计数，递归关系，生成函数，容斥原理，及在分类和分化中的应用。 Combinatorial Counting and Enumeration will cover fundamental methods, such as, counting in two ways, recurrence relations, and generating functions, the principle of inclusion and exclusion, and applications to typical objects like distributions and partitions.
Section 2	图论将覆盖多个重要课题，像 Hamiltonian 圈，图核，图的染色，图的因子分解，极值图论。 Graph Theory will cover most fundamental topics such as Hamiltonian cycles, graph minors, graph colouring, graph factorizations, and extremal graph theory.
Section 3	有限几何部分将覆盖重要的几何对象和设计，包括线性空间，射影空间，放射空间，对距空间，对称设计， t-设计。 Finite Geometry will cover important objects, such as Linear Spaces, Projective Spaces,

		Affine Spaces, Polar Spaces, symmetric designs, and t-designs。
	Section 4	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 5	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 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)	