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Cameron’s book provides a wider range of topics and background than Stanley’s. Stanley’s book is more sophisticated than Cameron’s; it also has a narrower focus and greater depth. I strongly recommend consulting both books during the course.

Prerequisites: The only background we will assume is basic knowledge of linear algebra. Familiarity with groups and finite fields from algebra may be helpful. We will discuss these notions during the course as necessary.

Course outline: The course is divide into three parts. The first part will include a number of topics and techniques about enumeration: counting subsets of a set, multinomial coefficients, counting permutations, Cayley’s theorem on labelled trees, ordinary and exponential generating functions, recurrence relations, compositions of integers, integer partitions and its generating functions, Young diagrams, standard Young tableau, set partitions, Stirling numbers, Bell numbers, and the twelve fold way.

The second part will be a brief interlude on the principle of inclusion-exclusion and various applications to enumeration and number theory.

The third part will be on ordered sets. The topics will include basic notions about posets (e.g., rank Hasse diagrams, chains, ideals), lattices, distributive lattices, modular and semimodular lattices, geometric lattices, the incidence algebra, the Möbius inversion, and characteristic polynomial. Most topics will be illustrated with several important examples: the boolean algebra $\mathbb{B}_n$, the divisor lattice $D_n$, the set partition lattice $\Pi_n$, and Young’s lattice.  
(Note: The third part may be replaced by algebraic graph theory.)

Student work: There will be five or six problem sets during the course. You may discuss problems with one another. However I request that you write up your own solutions to the problems. Grades will be based on these problem sets.

Other books you should be aware of:  
N. Biggs, *Algebraic Graph Theory*, 1994  
M. Bona, *A Walk through Combinatorics*, 2006  
*The Handbook of Combinatorics*, MIT press and North Holland, 1996  
D. Stanton and D. White, *Constructive Combinatorics*, Springer, 1986  