Textbook: Peter J. Cameron's "Combinatorics: Topics, Techniques, Algorithms," Cambridge University Press, 1994.

Comments on textbook:

The text contains far more material than can be studied in a semester, especially at the pace which evolved.
The text is dense, written at a high level, and is seemingly too mathematical for the tastes of many of the students enrolled in the course. Much background on algebra and number theory is provided, and it proved helpful to cover that background rather thoroughly. I would happily use this outstanding text in a future course.

Syllabus

1. What is Combinatorics?
   Sample problems – How to use this book – What you need to know – Exercises

2. On number and counting
   Natural numbers and arithmetic – Induction – Some useful functions – Orders of magnitude – Different ways of counting – Double counting – Appendix on set notation – Exercises

3. Subsets, partitions, permutations
   Subsets – Subsets of fixed size _ The Binomial Theorem and Pascal's Triangle – Project: Congruences of binomial coefficients – Permutations – Estimates for factorials – Selections – Equivalence and order _ Project: Finite topologies – Project: Cayley's Theorem on trees – Bell numbers – Generating combinatorial objects – Exercises

4. Recurrence relations and generating functions
   Fibonacci numbers – Aside on formal power series – Linear recurrence relations with constant coefficients – Derangements and involutions – Catalan and Bell numbers – Computing solutions to recurrence relations – Project: Finite fields and QUICKSORT – Exercises

9. Finite geometry

    Linear algebra over finite fields – Gaussian coefficients

17. Error-correcting codes

    Finding out a liar – Definitions – Probabilistic considerations – Some bounds – Linear codes; Hamming codes – Perfect codes – Linear codes and projective spaces – Exercises