UVM MS+PHD Exam topics
SYLLABUS FOR COMBINATORICS

Basic enumeration: binomial coefficients, double-counting, inclusion-exclusion, derangements, Möbius function, Möbius inversion, Burnside's lemma, Stirling numbers, Bell numbers, generating functions, Fibonacci and Catalan numbers;

Posets: posets, (anti)chains, hypercubes, Erdős-Szekeres lemma
PhD only: Dilworth's theorem, Sperner's theorem, symmetric chains, Erdős-Ko-Rado theorem, the incidence algebra of a poset;

Partitions: *PhD only:* the function $p_k(n)$, Ferrers diagram, asymptotics, Euler's identity, asymptotics;

Graph theory: (spanning) trees, paths, cycles, Hall's theorem, Caley's theorem, connectivity, vertex/edge covering, Menger's theorem, Tutte's theorem, bipartite graphs, Kőnig's theorem, Erdős-Posa theorem, Hamiltonicity, coloring, Tutte polynomial, Turan and Ramsey numbers, flows, Ford-Fulkerson algorithm, Birkhoff's theorem, circulations, planarity, Kuratowski's theorem, the Matrix-tree theorem.
PhD only: Hadwiger conjecture, minors, well-quasi-ordering, Robertson-Seymour, tree-width, probabilistic method

Generating functions: Weighted sums of objects, Ordindary GFs, exponential GFs, Dirichlet series, exponential formula, 'Snake Oil', WZ Method.

Symmetric functions and tableaux: Standard and semistandard tableaux, tableaux insertion, hook