

Dept Number	MATH/CS 449	Course Title	Introduction to Combinatorics							
Semester Hours	3	Course Coordinator	Math Department							
Catalog Description	This course will introduce the student to various basic topics in combinatorics that are widely used throughout applicable mathematics. Possible topics include: elementary counting techniques, pigeonhole principle, multinomial principle, inclusion and exclusion, recurrence relations, generating functions, partitions, designs, graphs, finite geometry, codes and cryptography.									
Textbooks										
<i>A First Course in Discrete Mathematics</i> , Anderson, Ian. Springer Verlag, 2000. ISBN: 9781852332365.										
References										
Course Learning Outcomes										
<ul style="list-style-type: none"> To learn the basic concepts and techniques of combinatorics, including counting functions, pigeonhole principle, inclusion-exclusion, partitions, generating functions, and combinatorial designs. 										
Assessment of the Contribution to Program Outcomes										
Outcome →	1	2	3	4	5	6	7	8	9	10
Assessed →	X									X
Prerequisites by Topic										
Mathematics 349 with C or better.										

Major Topics Covered in the Course

1. Basic tools of combinatorics: product and sum rule, selections and arrangements, basic ideas of graph theory { 6 classes }
2. Combinatorial techniques:
Inclusion and exclusion, binomial theorem, multinomial coefficients, Pigeonhole principle, permutations-transpositions, parity, unique cycle decomposition { 6 classes }
3. Generating functions and recurrences: power series, ordinary and exponential generating functions, probability generating functions { 6 classes }
4. Polya's theorem { 6 classes }
5. Coding theory: codes and linear codes, Shannon's theorem, error correction and detection, application of the pigeonhole principle { 10 classes }
6. Block designs: balanced incomplete block designs, Hadamard Matrices, Latin squares. { 6 classes }