Course Outline

1. Document Information

Degree Program	Computer Science
Course Number	MATH/CS 449
Course Title	Introduction to Combinatorics
Semester Hours	3
Course Coordinator	Math Department
Revision Term	
Latest Revision	

2. 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.

3. Textbooks

- *A First Course in Discrete Mathematics*, Anderson, Ian. Springer Verlag, 2000. ISBN: 9781852332365.

4. References

5. Course Learning Outcomes

- To learn the basic concepts and techniques of combinatorics, including counting functions, pigeonhole principle, inclusion-exclusion, partitions, generating functions, and combinatorial designs.

6. Assessment of the Contribution to Student Outcomes

Outcome	1	2	3	4	5	6	7	8	9	10
Assessed	X									X

7. Prerequisites by Topic

Mathematics 349 with C or better.

8. 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}