Course Code	MTH311
Course Name	Combinatorics and its Applications
Credits	4
Course Offered to	UG/PG
Course Description	The aim of this course is to familiarize students with fundamental concepts in combinatorics, especially those used in enumeration. Topics covered include permutation groups, linear codes, Stirling and Bell numbers. Generating functions are introduced and their applications are discussed. Applications of group theory to enumeration: Burnside's Lemma and Polya's theory of counting are covered. Students are introduced to error correcting codes and linear codes over finite fields.

Pre-requisites

Pre-requisite (Mandatory)	Pre-requisite (Desirable)	Pre-requisite(other)
Math 1	Algebra	None

*Please insert more rows if required

Post Conditions*(For suggestions on verbs please refer the second sheet)

CO1	CO2	CO3	CO4
Students develop familiarity with fundamental combinatorial objects that appear in other fields of mathematics and computer science.	Students learn how to use combinatorial structures to represent mathematical problems and solve them.	Given a hypothetical combinatorial object, students learn how to compute the number of such objects.	Students learn to apply algebraic methods to solve combinatorial problems.

Weekly Lecture Plan

Week Number	Lecture Topic	COs Met	Assignment/Labs/Tutorial
1-2	Introductory Ideas: Solving Linear Recurrences, generating functions, Fibonacci numbers, Stirling numbers of the second kind.	CO1,CO2,CO3	Tutorial Sheets
3-4	Formal Power Series, Bell Numbers, Catalan Numbers, Stirling numbers of the first kind.	CO1,CO2,CO3	Tutorial Sheets
5-6	Applications of generating functions to unlabeled counting: Integer Partitions, Money changing problem etc.	CO1,CO2,CO3	Tutorial Sheets
7-8	Permutation groups, symmetry groups, Burnside's lemma with applications to enumeration.	CO1,CO2,CO3,CO4	Tutorial Sheets
9-10	The cycle index and Polya's theory of counting.	CO1,CO2,CO3,CO4	Tutorial Sheets
11-12	Error correcting codes, Linear Codes.	CO1,CO2,CO3,CO4	Tutorial Sheets
13	Graph enumeration/Systems of distinct Representatives/de Bruijn sequences (optional)	CO2,CO3	Tutorial Sheets

*Please insert more rows if required

Weekly Lab Plan - Not Applicable

Week Number	Laboratory Exercise	COs Met	Platform (Hardware/Software)

*Please insert more rows if required

Assessment Plan

Type of Evaluation	% Contribution in Grade
Quizzes	0.2
Minor Test	0.3
Major Test	0.5

*Please insert more row for other type of Evaluation

Resource Material

Type	Title
Reference Book	H. Wilf: Generatingfunctionology
Reference Book	R.P. Stanley: Enumerative Combinatorics Vol. 1
Reference Book	J.H. van Lint and R.M. Wilson: A Course in Combinatorics.
Reference Book	Alan Tucker: Applied Combinatorics