Department	General Studies			**Major**							
Course Name	Discrete Math			**Course Code**	MATH 303						
Prerequisites	Math 301			**Credit Hours CRH**	4			CTH		6	
					L	3	P	2	T	1	

Course Description :

The course of discrete mathematics teach students how to think logically and mathematically, this course cover five important themes; Mathematical reasoning and mathematical logic, combinatorial analysis, discrete structure, algorithmic thinking , application and modeling

General Objective:

The course of discrete mathematics exposes students to aspects of mathematics which have found important applications in computer science and related areas. Logic is the basis of most computer programming, functions are paradigm for program modules, and relations provide the basis for the theory of data structures. This course is designed to student of science computer. The course give all of the mathematical foundations they need of their future studies.

Detailed Objectives:

Trainee will be able to:

1-	**Construct mathematical argument and solve counting problems and analyze algorithms.**
2-	**Work with discrete structures that include sets, permutations, relations, graphs, trees and finite state machines.**
3-	**Solve certain problems by the specification of an algorithm and then a computer program can be constructed and verified in the mathematical portions that it work properly.**
4-	**Analyze the computer memory and time required to perform a given computer program**
5-	**Model with discrete mathematics that is an extremely important problem-solving skill, and develop by constructing their own models.**

Detailed of Theoretical Contents				
Hours	**Contents**			**Assessment Tools**
6	**The Foundations: Logic and Proofs:** ● Propositional Logic ● Applications of Propositional Logic ● Predicates and Quantifiers ● Rules of Inference ● Introduction to proofs ● Proof Methods and Strategy			Quiz1 Exam1 Final Exam
	Textbook	1	M. Huth and M. Ryan, Logic in Computer Science, 2nd ed, Cambridge university Press, Cambridge, England, 2004	
4	**Basic Structures: Sets, Functions, Sequences, Sums, and Matrices** ● Sets ● Set Operations ● Functions ● Sequences and Summations ● Cardinality of Sets			Homework1 Exam1 Final Exam

Detailed of Theoretical Contents			
Hours	**Contents**		**Assessment Tools**
	● Matrices		
	Textbook	1	R. A. Brualdi, Introductory Combinatorics, 5th ed., Prentice-Hall, Englewood Cliffs, NJ,2009
6	**Algorithms:** ● Algorithms ● The Growth of Functions ● Complexity of Algorithms		Quiz2 Exam1 Final Exam
	Textbook	1	S. Baase and A. Van Gelder, Computer Algorithms: Introduction to Design and Analysis, 3rd ed., Adisson-Wesley, Reading, MA, 1999
4	**Number Theory and Cryptography:** ● Divisibility and Modular Arithmetic ● Integer Representations and Algorithms ● Primes and Greatest Common Divisors ● Solving Congruencies and Applications ● Cryptography		Homework2 Exam1 Final Exam
	Textbook	1	Richard Crandall and Carl Pomerance, 2nd ed., Prime Numbers: A Computational Perspective, Springer-Verlag, New York, 2010
		2	S. Baase and A. Van Gelder, Computer Algorithms: Introduction to Design and Analysis, 3rd ed., Adisson-Wesley, Reading, MA, 1999
4	**Induction and Recursion:** ● Mathematical Induction ● Strong Induction and Well-Ordering ● Recursive Definitions and Structural Induction ● Recursive Algorithms		Exam1 Final Exam
	Textbook	1	D. A. Gunderson, Handbook of Mathematical Induction, Chapman and Hall/CRC, Boca Raton, Florida, 2010
		2	Kenneth H. Rosen, 7th ed., Discrete Mathematics and its Applications, MC Graw Hill, 2012
4	**Counting:** ● The basic of Counting ● The Pigeonhole Principle ● Permutations and Combinations ● Binomial Coefficients and Identities ● Generalized Permutation and Combinations		Quiz3 Exam2 Final Exam
	Textbook	1	R.B.J.T Allenby and A. Slomson, How to Count: An Introduction to Combinatorics, 2nd ed., Chapman and Hall/CRC, Florida, 2010
		2	Kenneth H. Rosen, 7th ed., Discrete Mathematics and its Applications, MC Graw Hill, 2012

Detailed of Theoretical Contents			
Hours	**Contents**		**Assessment Tools**
4	**Discrete Probability:** ● An Introduction to Discrete Probability ● Probability Theory ● Bayes' Theorem ● Expected Value and Variances		Exam2 Final Exam
	Textbook	1	Sheldon M. Ross, A First Course in Probability Theory, 7th ed., Prentice-Hall, Englewood Cliffs, NJ, 2009
		2	Kenneth H. Rosen, 7th ed., Discrete Mathematics and its Applications, MC Graw Hill, 2012
2	**Relations:** ● Relations and Their Properties. The Pigeonhole Principle ● n-ray Relations and Their Applications ● Representing Relations ● Closures of Relations ● Equivalence Relations ● Partial Orderings		Homework3 Exam2 Final Exam
	Textbook	1	R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5th ed., Addison-Wesley, Reading, MA, 2003
6	**Graphs and Trees:** ● Graphs and Graph Models ● Graph Terminology and Special Types of Graphs ● Representing Graphs, Isomorphism and Connectivity ● Euler and Hamilton Paths ● Shortest-Path Problems ● Planar Graph and Graph Coloring ● Tree and Applications ● Tree Traversal ● Spanning Tree and Minimum		Exam2 Final Exam
	Textbook	1	G. Agnarsson and R Greenlaw, Graph Theory: Modeling, Applications, and Algorithms, Prentice Hall, Englewood Cliffs, NJ, 2006
4	**Boolean Algebra:** ● Boolean Functions ● Representing Boolean Functions ● Logic Gates ● Minimization of circuits		Homework4 Final Exam
	Textbook	1	M. Huth and M. Ryan, Logic in Computer Science, 2nd ed, Cambridge university Press, Cambridge, England, 2004
2	**Modeling Computation:** ● Finite-State Machines ● Language Recognition ● Turing Machine		Quiz4 Final Exam
	Textbook	1	J. G. Brookshear, Theory of Computation, Benjamin Cummings, Redwood city, CA, 1989

Detailed of Practical Contents			
Hours	**Contents**		**Assessment Tools**
2	**The Foundations: Logic and Proofs:** ● Propositional logic ● Predicates and quantifiers ● Rules of inference and introduction to proofs		
	Textbook	1	M. Huth and M. Ryan, Logic in Computer Science, 2nd ed, Cambridge university Press, Cambridge, England, 2004
4	**Basic Structures: Sets, Functions, Sequences, Sums, and Matrices** ● Sets, set operations and cardinality of sets ● Functions, sequences and summations ● Matrices		
	Textbook	1	R. A. Brualdi, Introductory Combinatorics, 5th ed., Prentice-Hall, Englewood Cliffs, NJ,2009
2	**Algorithms:** ● Algorithms and complexity of algorithms ● The Growth of Functions		
	Textbook	1	S. Baase and A. Van Gelder, Computer Algorithms: Introduction to Design and Analysis, 3rd ed., Adisson-Wesley, Reading, MA, 1999
4	**Number Theory and Cryptography:** ● Divisibility, modular arithmetic, integer representations ● Primes and Greatest Common Divisors ● Solving Congruencies and Applications ● Cryptography		
	Textbook	1	Richard Crandall and Carl Pomerance, 2nd ed., Prime Numbers: A Computational Perspective, Springer-Verlag, New York, 2010
2	**Induction and Recursion:** ● Mathematical Induction, strong Induction and Well-Ordering ● Recursive Definitions, structural Induction and recursive Algorithms		
	Textbook	1	Kenneth H. Rosen, 7th ed., Discrete Mathematics and its Applications, MC Graw Hill, 2012
2	**Counting:** ● The basic of Counting ● The Pigeonhole Principle ● Permutations, Combinations, Binomial Coefficients and Identities		
	Textbook	1	Kenneth H. Rosen, 7th ed., Discrete Mathematics and its Applications, MC Graw Hill, 2012
		2	R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5th ed., Addison-Wesley, Reading, MA, 2003

Detailed of Practical Contents			
Hours	**Contents**		**Assessment Tools**
2	**Discrete Probability:** ● Discrete Probability and Probability Theory ● Bayes' Theorem ● Expected Value and Variances		
	Textbook	1	Kenneth H. Rosen, 7th ed., Discrete Mathematics and its Applications, MC Graw Hill, 2012
4	**Relations:** ● Relations and Their Properties. The Pigeonhole Principle ● n-ray Relations, Representing Relations, Closures of Relations and Equivalence Relations ● Partial Orderings		
	Textbook	1	R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5th ed., Addison-Wesley, Reading, MA, 2003
		2	Kenneth H. Rosen, 7th ed., Discrete Mathematics and its Applications, MC Graw Hill, 2012
4	**Graphs and Trees:** ● Graphs, Graph Models, Graph Terminology, Representing Graphs, Isomorphism and Connectivity ● Euler and Hamilton Paths and Shortest-Path Problems ● Planar Graph and Graph Coloring ● Tree, Tree Traversal, Spanning Tree and Minimum		
	Textbook	1	G. Agnarsson and R Greenlaw, Graph Theory: Modeling, Applications, and Algorithms, Prentice Hall, Englewood Cliffs, NJ, 2006
		2	Kenneth H. Rosen, 7th ed., Discrete Mathematics and its Applications, MC Graw Hill, 2012
4	**Boolean Algebra:** ● Boolean Functions and it's Representation ● Logic Gates ● Minimization of circuits		
	Textbook	1	M. Huth and M. Ryan, Logic in Computer Science, 2nd ed, Cambridge university Press, Cambridge, England, 2004
2	**Modeling Computation:** ● Finite-State Machines ● Language Recognition ● Turing Machine		
	Textbook	1	J. G. Brookshear, Theory of Computation, Benjamin Cummings, Redwood city, CA, 1989

Textbook	1	M. Huth and M. Ryan, Logic in Computer Science, 2nd ed, Cambridge university Press, Cambridge, England, 2004	
	2	R. A. Brualdi, Introductory Combinatorics, 5th ed., Prentice-Hall, Englewood Cliffs, NJ,2009	
	3	S. Baase and A. Van Gelder, Computer Algorithms: Introduction to Design and Analysis, 3rd ed., Adisson-Wesley, Reading, MA, 1999	
	4	Richard Crandall and Carl Pomerance, 2nd ed., Prime Numbers: A Computational Perspective, Springer-Verlag, New York, 2010	
	5	Kenneth H. Rosen, 7th ed., Discrete Mathematics and its Applications, MC Graw Hill, 2012	
	6	D. A. Gunderson, Handbook of Mathematical Induction, Chapman and Hall/CRC, Boca Raton, Florida, 2010	
	7	R.B.J.T Allenby and A. Slomson, How to Count: An Introduction to Combinatorics, 2nd ed., Chapman and Hall/CRC, Florida, 2010	
	8	Sheldon M. Ross, A First Course in Probability Theory, 7th ed., Prentice-Hall, Englewood Cliffs, NJ, 2009	
	9	G. Agnarsson and R Greenlaw, Graph Theory: Modeling, Applications, and Algorithms, Prentice Hall, Englewood Cliffs, NJ, 2006	
	10	J. G. Brookshear, Theory of Computation, Benjamin Cummings, Redwood city, CA, 1989	