Lovely Professional University, Punjab

Course Code	Course Title	Course Planner	Lectures	Tutorials	Practicals	Credits
MTH116	MATHEMATICAL FOUNDATION-II	12348::Monika Kalani	3	2	0	5
Course Weightage	ATT: 5 CA: 25 MTT: 20 ETT: 50	**Exam Category: 13: Mid Term Exam: All MCQ – End Term Exam: MCQ + Subjective**				
Course Orientation	COMPETITIVE EXAMINATION (Higher Education), KNOWLEDGE ENHANCEMENT, PLACEMENT EXAMINATION					

	TextBooks (T)		
Sr No	**Title**	**Author**	**Publisher Name**
T-1	DISCRETE MATHEMATICS (SCHAUM'S OUTLINES) (SIE)	SEYMOUR LIPSCHUTZ, MARC LIPSON, VARSHA H. PATIL	MCGRAW HILL EDUCATION

	Reference Books (R)		
Sr No	**Title**	**Author**	**Publisher Name**
R-1	DISCRETE MATHEMATICS & ITS APPLICATIONS	KENNETH H ROSEN	MCGRAW HILL EDUCATION

Relevant Websites (RW)		
Sr No	**(Web address) (only if relevant to the course)**	**Salient Features**
RW-1	http://www.personal.kent.edu/~rmuhamma/GraphTheory/graphTheory.htm	Graph Theory Notes
RW-2	http://www.geom.uiuc.edu/~zarembe/grapht1.html	Graph Coloring
RW-3	http://lcm.csa.iisc.ernet.in/dsa/node184.html	Kruskal's Algorithm
RW-4	http://www.me.utexas.edu/~jensen/exercises/mst_spt/spt_demo/spt1.html	Shortest Path
RW-5	http://sites.millersville.edu/bikenaga/math-proof/truth-tables/truth-tables.html	Truth Tables and logical equivalence
RW-6	http://staff.scem.uws.edu.au/cgi-bin/cgiwrap/zhuhan/dmath/dm_readall.cgi?page=21&part=2	Recurrence Relation

Audio Visual Aids (AV)		
Sr No	**(AV aids) (only if relevant to the course)**	**Salient Features**
AV-1	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-fall-2010/video-lectures/lecture-10-graph-theory-iii/	Euler and Hamiltonian Graphs

LTP week distribution: (LTP Weeks)	
Weeks before MTE	7

Weeks After MTE	7
Spill Over (Lecture)	7

Detailed Plan For Lectures

Week Number	Lecture Number	Broad Topic(Sub Topic)	Chapters/Sections of Text/reference books	Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs	Lecture Description	Learning Outcomes	Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned	Live Examples
Week 1	Lecture 1	Functions and Logic Calculus(Types of Function)	T-1		Lecture-1 will be Lecture Zero as introduction of course and Lecture-2 will be One-one function, Onto function and invertible function	Student will be given the information about the entire syllabus, its applications and various assessment tools through zero lecture. student will learn about different types of functions and their properties	PPT for zero lecture, Discussion	
	Lecture 2	Functions and Logic Calculus(Types of Function)	T-1		Lecture-1 will be Lecture Zero as introduction of course and Lecture-2 will be One-one function, Onto function and invertible function	Student will be given the information about the entire syllabus, its applications and various assessment tools through zero lecture. student will learn about different types of functions and their properties	PPT for zero lecture, Discussion	
	Lecture 3	Functions and Logic Calculus(Introduction to logic)	T-1 R-1		Logic Introduction, Different types of propositions.	Student learn about the concept of Logic	Discussion	Logic gates are used to store data. These logic circuits are known as computer memory
		Functions and Logic Calculus(Propositions and compound propositions)	T-1 R-1		Logic Introduction, Different types of propositions.	Student learn about the concept of Logic	Discussion	Logic gates are used to store data. These logic circuits are known as computer memory

Week 2	Lecture 4	Functions and Logic Calculus(Basic logical operations (Conjunction, Disjunction, Negation))	T-1		Discussion on Basic Logical Operations	Students will learn a logical connective (also called a logical operator) which is a symbol or word used to connect two or more sentences	Discussion	
	Lecture 5	Functions and Logic Calculus(Propositions and truth tables)	T-1	RW-5	Truth Tables of Logical operations	Student will learn the truth table of all the logical operations and Logical equivalence of various Statements, Tautologies and contradiction.	Discussion	
		Functions and Logic Calculus(Tautologies and contradiction)	T-1	RW-5	Truth Tables of Logical operations	Student will learn the truth table of all the logical operations and Logical equivalence of various Statements, Tautologies and contradiction.	Discussion	
	Lecture 6	Functions and Logic Calculus(Logical equivalence)	T-1	RW-5	Logical equivalence of various Statements and Algebra of propositions. Conditional and Biconditional Statements.	Student will learn when the two statements are logically Equivalent. Also Students learn about laws of the algebra of propositions.	Discussion	
		Functions and Logic Calculus(Conditional and biconditional statements.)	T-1	RW-5	Logical equivalence of various Statements and Algebra of propositions. Conditional and Biconditional Statements.	Student will learn when the two statements are logically Equivalent. Also Students learn about laws of the algebra of propositions.	Discussion	
Week 3	Lecture 7	Logic Gates and Recurrence Relations(Introduction to Logic Gates)	T-1 R-1		Basic Concepts of Logic gates	Students will learn about the logic circuits	Discussion	
		Logic Gates and Recurrence Relations(Combinations of Gates)	T-1 R-1		Basic Concepts of Logic gates	Students will learn about the logic circuits	Discussion	

Week 3	Lecture 8	Logic Gates and Recurrence Relations(Implementation of Logic Expressions with Logic Gates and Switching circuits)	T-1 R-1		Formation of Logic Expressions with logic gates	Student will learn about the Expressions with logic gates	Discussion	
	Lecture 9	Logic Gates and Recurrence Relations(Introduction to Recursion)	T-1 R-1	RW-6	Recurrence Relations, Recursion.	Students will learn recurrence relations which are useful in counting, also they will learn recursive definition, how to find new terms from existing terms.	Discussion	Fibonacci numbers which are best suited example of recurrence relations are used to model population
		Logic Gates and Recurrence Relations(Recurrence Relation)	T-1 R-1	RW-6	Recurrence Relations, Recursion.	Students will learn recurrence relations which are useful in counting, also they will learn recursive definition, how to find new terms from existing terms.	Discussion	Fibonacci numbers which are best suited example of recurrence relations are used to model population
Week 4	Lecture 10				Test 1			
	Lecture 11	Logic Gates and Recurrence Relations(Solving Recurrence Relation)	T-1	RW-6	Solving Recurrence Relation and Linear Homogenous Relation and solution of this recurrence relation	Student will learn to find an explicit function f(n) for a function for solving relation and about the methods for solving linear homogeneous Recurrence relation.	Discussion	
		Logic Gates and Recurrence Relations(Linear Homogenous Recurrence Relation with constant coefficient and their solution.)	T-1	RW-6	Solving Recurrence Relation and Linear Homogenous Relation and solution of this recurrence relation	Student will learn to find an explicit function f(n) for a function for solving relation and about the methods for solving linear homogeneous Recurrence relation.	Discussion	
	Lecture 12	Graph Theory(Introduction and Basic terminology)	T-1 R-1	RW-1	Introduction to graphs and trees. Basic terms with their definitions and terminology will be discussed.	Student learn graphs and trees which appear in many areas of mathematics and computer science.	Discussion	

Week 4	Lecture 12	Graph Theory(Graphs, Multigraphs, Degree of a vertex)	T-1 R-1	RW-1	Introduction to graphs and trees. Basic terms with their definitions and terminology will be discussed.	Student learn graphs and trees which appear in many areas of mathematics and computer science.	Discussion	
Week 5	Lecture 13	Graph Theory(Handshaking theorem, Sub graphs)	T-1 R-1		Hand shaking theorem and sub -graphs of a graph will be discussed.	The student will learn to apply hand-shaking lemma in various practical problems.	Brainstorming and Discussion	
	Lecture 14	Graph Theory (Homeomorphic and Isomorphic graphs)	T-1 R-1		Lecture 14- Homeomorphic Graphs and Lecture 15- Isomorphic graphs and Lecture 16- Important relationship between graphs.	Student will learn Homeomorphic Graphs, Isomorphic graphs and will learn the important relationship between graphs.	Discussion	Generation of molecular graphs for computer synthesis
	Lecture 15	Graph Theory (Homeomorphic and Isomorphic graphs)	T-1 R-1		Lecture 14- Homeomorphic Graphs and Lecture 15- Isomorphic graphs and Lecture 16- Important relationship between graphs.	Student will learn Homeomorphic Graphs, Isomorphic graphs and will learn the important relationship between graphs.	Discussion	Generation of molecular graphs for computer synthesis
Week 6	Lecture 16				Test 2			
	Lecture 17	Graph Theory(Paths, Connectivity, Connected Components)	T-1 R-1		Lecture 17- Introduction of paths and in Lecture 18- connectivity in graph will be discussed.	Student will learn the connected graphs and how to find connected component of a graph.	Discussion	
	Lecture 18	Graph Theory(Paths, Connectivity, Connected Components)	T-1 R-1		Lecture 17- Introduction of paths and in Lecture 18- connectivity in graph will be discussed.	Student will learn the connected graphs and how to find connected component of a graph.	Discussion	
Week 7	Lecture 19	Graph Theory(Distance and Diameter, Cut points and bridges)	T-1 R-1		Distance,diameter cut-points and bridges will be discussed for a connected graph.	Students will learn to find the distance between two vertices for a connected graph and will also solve the practical problems based on this concept.	Discussion	
		SPILL OVER						
Week 7	Lecture 20				Spill Over			

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Week 7	Lecture 21				Spill Over			
		MID-TERM						
Week 8	Lecture 22	Euler Graphs(Eulerian Graphs)	T-1 R-1	AV-1	Lecture 22- Basic concepts of Euler paths, circuits, Euler graphs, Lecture 23- Euler Theorem	Student learn how to construct an Euler circuit and how to identify euler graphs and practice questions on the same.	Discussion	
		Euler Graphs(Euler theorem)	T-1 R-1	AV-1	Lecture 22- Basic concepts of Euler paths, circuits, Euler graphs, Lecture 23- Euler Theorem	Student learn how to construct an Euler circuit and how to identify euler graphs and practice questions on the same.	Discussion	
	Lecture 23	Euler Graphs(Eulerian Graphs)	T-1 R-1	AV-1	Lecture 22- Basic concepts of Euler paths, circuits, Euler graphs, Lecture 23- Euler Theorem	Student learn how to construct an Euler circuit and how to identify euler graphs and practice questions on the same.	Discussion	
		Euler Graphs(Euler theorem)	T-1 R-1	AV-1	Lecture 22- Basic concepts of Euler paths, circuits, Euler graphs, Lecture 23- Euler Theorem	Student learn how to construct an Euler circuit and how to identify euler graphs and practice questions on the same.	Discussion	
	Lecture 24	Euler Graphs(Hamiltonian Graphs)	T-1 R-1	AV-1	Basic concepts of Hamilton paths and circuits.	Student will learn hamiltonian graphs	Discussion	
Week 9	Lecture 25	Euler Graphs(Planar Graphs)	T-1 R-1		Basic idea of Planar representation of graphs, Maps and regions. Euler formula and results related to planar graphs will be discussed.	Student will learn a new representation of graphs known as planar which divide the graphs into regions	Discussion	
	Lecture 26	Euler Graphs(Maps, Regions)	T-1 R-1		Basic idea of Planar representation of graphs, Maps and regions. Euler formula and results related to planar graphs will be discussed.	Student will learn a new representation of graphs known as planar which divide the graphs into regions	Discussion	

Week 9	Lecture 26	Euler Graphs(Euler Formula)	T-1 R-1		Basic idea of Planar representation of graphs, Maps and regions. Euler formula and results related to planar graphs will be discussed.	Student will learn a new representation of graphs known as planar which divide the graphs into regions	Discussion	
	Lecture 27	Euler Graphs(Non planar graphs)	T-1 R-1		Non Planar Graphs and Kuratowski Theorem	Student will learn about the non planar graphs	Discussion	
		Euler Graphs(Kuratowski's Theorem (without proof).)	T-1 R-1		Non Planar Graphs and Kuratowski Theorem	Student will learn about the non planar graphs	Discussion	
Week 10	Lecture 28	Graph Coloring and Shortest Paths(Graph Coloring)	T-1 R-1	RW-2	Introduction to graph Coloring	Student will learn to solve the coloring problem of maps of regions	Discussion	
	Lecture 29	Graph Coloring and Shortest Paths(Chromatic Number of a Graph)	T-1 R-1	RW-2	Chromatic number of various graphs	Student will learn the chromatic number of complete, regular and bipartite graphs	Discussion	
	Lecture 30	Graph Coloring and Shortest Paths(Complete graph and its coloring)	T-1 R-1		Regular,Complete and complete bipartite graph and their coloring	Students will be able to understand the different type of special graph and their chromatic number	Discussion	Distribution of test among the students such that no two adjacent get same paper
		Graph Coloring and Shortest Paths(Regular and Bipartite Graphs and their coloring)	T-1 R-1		Regular,Complete and complete bipartite graph and their coloring	Students will be able to understand the different type of special graph and their chromatic number	Discussion	Distribution of test among the students such that no two adjacent get same paper
Week 11	Lecture 31	Graph Coloring and Shortest Paths(Labelled and Weighted Graph)	T-1 R-1		Labelled and Weighted Graph and shortest path problems in weighted graphs	Student will relate it to real life situations	Discussion	
		Graph Coloring and Shortest Paths(Shortest Path in weighted Graphs)	T-1 R-1		Labelled and Weighted Graph and shortest path problems in weighted graphs	Student will relate it to real life situations	Discussion	

Week 11	Lecture 32	Graph Coloring and Shortest Paths(Dijkstra's Algorithm to find shortest path)	T-1 R-1	RW-4	Discuss the Dijkstra Algorithm to find the shortest path of the weighted graph	Student will learn the concept to solve the problems related to shortest path and will practice the applications of the algorithm in weighted graphs like assigning flight time to edges.	Discussion	
	Lecture 33				Test 3			
Week 12	Lecture 34	Trees(Introduction to Tree)	T-1 R-1		Introduction to tree graphs	Student will learn how graphs can be used to model and solve many problems	Discussion	PDF is a tree based format. It has a root node followed by a catalog node followed by a pages node which has several child page nodes
	Lecture 35	Trees(Rooted Tree, Binary Tree)	R-1		Types of trees Rooted and binary tree	Student will learn the important types of trees	Discussion	
	Lecture 36	Trees(Spanning Tree, Minimum Spanning Tree)	T-1		Spanning Trees and problems related to Minimum Spanning Trees	student will learn to solve spanning trees problems like road systems	Discussion	

Week 13	Lecture 37	Trees(Kruskal and Prims Algorithms to find minimum spanning tree)	T-1 R-1	RW-3	Minimum Spanning Trees Problems	LECTURE 37- Student will learn the algorithm of Kruskal's method. LECTURE 38- Students will solve the applied form of questions on minimum spanning trees by using kruskal Algorithms. LECTURE 39 - Students will learn the algorithm of Prim's Algorithm. LECTURE 40 - Students will solve the problems related in finding the shortest path in real life problems	Discussion	
	Lecture 38	Trees(Kruskal and Prims Algorithms to find minimum spanning tree)	T-1 R-1	RW-3	Minimum Spanning Trees Problems	LECTURE 37- Student will learn the algorithm of Kruskal's method. LECTURE 38- Students will solve the applied form of questions on minimum spanning trees by using kruskal Algorithms. LECTURE 39 - Students will learn the algorithm of Prim's Algorithm. LECTURE 40 - Students will solve the problems related in finding the shortest path in real life problems	Discussion	

Week 13	Lecture 39	Trees(Kruskal and Prims Algorithms to find minimum spanning tree)	T-1 R-1	RW-3	Minimum Spanning Trees Problems	LECTURE 37- Student will learn the algorithm of Kruskal's method. LECTURE 38- Students will solve the applied form of questions on minimum spanning trees by using kruskal Algorithms. LECTURE 39 - Students will learn the algorithm of Prim's Algorithm. LECTURE 40 - Students will solve the problems related in finding the shortest path in real life problems	Discussion	
Week 14	Lecture 40	Trees(Kruskal and Prims Algorithms to find minimum spanning tree)	T-1 R-1	RW-3	Minimum Spanning Trees Problems	LECTURE 37- Student will learn the algorithm of Kruskal's method. LECTURE 38- Students will solve the applied form of questions on minimum spanning trees by using kruskal Algorithms. LECTURE 39 - Students will learn the algorithm of Prim's Algorithm. LECTURE 40 - Students will solve the problems related in finding the shortest path in real life problems	Discussion	
		SPILL OVER						
Week 14	Lecture 41				Spill Over			
	Lecture 42				Spill Over			
Week 15	Lecture 43				Spill Over			

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Week 15	Lecture 44				Spill Over			
	Lecture 45				Spill Over			

Scheme for CA:

CA Category of this Course Code is:A0203 (2 best out of 3)

Component	Weightage (%)
Test	50
Test	50
Test	50

Details of Academic Task(s)

Academic Task	Objective	Detail of Academic Task	Nature of Academic Task (group/individuals)	Academic Task Mode	Marks	Allottment / submission Week
Test 1	To check the understanding of students about the basics of functions and logic operations	Test will be of 30 marks and questions will be in multiple of 5 Marks Topics::Types of Function, Introduction to logic, Propositions and Compound propositions, Basic logical operations (Conjunction,Disjunction, Negation), Propositions and truth tables, Tautologies and contradiction,Logical equivalence, Conditional and biconditional statements.	Individual	Offline	30	2 / 3
Test 2	To check the understanding of students about the logic gates and recurrence relation	Test will be of 30 marks and questions will be in multiple of 5 Marks Topics::Introduction to Logic Gates,Combinations of Gates, Implementation of Logic Expressions with Logic Gates and Switching circuits, Introduction to Recursion, Recurrence Relation, Solving Recurrence Relation, Linear Homogeneous Recurrence Relation with constant coefficient and their solution.	Individual	Offline	30	5 / 6

Test 3	To check the understanding of students about the graphs and graph coloring	Test will be of 30 marks and questions will be in multiple of 5 Marks Topics:: Eulerian Graphs, Hamiltonian Graphs, Euler theorem, Complete, Regular and Bipartite Graphs, Planar Graphs, Maps, Regions, Euler Formula, Non planar graphs, Kuratowski's Theorem (without proof).Graph Coloring, Chromatic Number of a Graph, Labelled and Weighted Graph, Shortest Path in weighted Graphs, Dijkstra Algorithm to find shortest path.	Individual	Offline	30	11 / 12

Plan for Tutorial: (Please do not use these time slots for syllabus coverage)

Tutorial No.	Lecture Topic	Type of pedagogical tool(s) planned (case analysis,problem solving test,role play,business game etc)
Tutorial1	Types of Function	Problem Solving
Tutorial2	Introduction to logic, Propositions and compound propositions	Problem Solving
Tutorial3	Basic logical operations (Conjunction, Disjunction, Negation), Propositions and truth tables)	Problem Solving
Tutorial4	Tautologies and contradiction, Logical equivalence, Conditional and biconditional statements	Problem Solving
Tutorial5	Introduction to Logic Gates, Combinations of Gates	Problem Solving
Tutorial6	Implementation of Logic Expressions with Logic Gates and Switching circuits	Problem Solving
Tutorial7	Implementation of Logic Expressions with Logic Gates and Switching circuits	Problem Solving
Tutorial8	Introduction to Recursion, Recurrence Relation, Solving Recurrence Relation,	Problem Solving
Tutorial9	Linear Homogenous Recurrence Relation with constant coefficient and their solution	Problem Solving
Tutorial10	Introduction and Basic terminology, Graphs, Multigraphs, Degree of a vertex	Problem Solving
Tutorial11	Handshaking theorem, Sub graphs	Problem Solving
Tutorial12	Homeomorphic and Isomorphic graphs	Problem Solving
Tutorial13	Paths, Connectivity, Connected Components	Problem Solving
Tutorial14	Distance and Diameter, Cut points and bridges	Problem Solving

After Mid-Term		
Tutorial15	Eulerian Graphs, Hamiltonian Graphs	Problem Solving
Tutorial16	Euler theorem, Complete, Regular and Bipartite Graphs,	Problem Solving
Tutorial17	Planar Graphs, Maps, Regions, Euler Formula, Non planar graphs, Kuratowski's Theorem (without proof).	Problem Solving
Tutorial18	Graph Coloring, Chromatic Number of a Graph	Problem Solving
Tutorial19	Labelled and Weighted Graph	Problem Solving
Tutorial20	Shortest Path in weighted Graphs	Problem Solving
Tutorial21	Dijkstra’s Algorithm to find shortest path	Problem Solving
Tutorial22	Dijkstra’s Algorithm to find shortest path	Problem Solving
Tutorial23	Introduction to Tree	Problem Solving
Tutorial24	Rooted Tree, Binary Tree	Problem Solving
Tutorial25	Spanning Tree, Minimum Spanning Tree	Problem Solving
Tutorial26	Kruskal and Prims Algorithms to find minimum spanning tree	Problem Solving
Tutorial27	Kruskal and Prims Algorithms to find minimum spanning tree	Problem Solving
Tutorial28	Kruskal and Prims Algorithms to find minimum spanning tree	Problem Solving