PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR
SCHOOL OF TECHNOLOGY
COURSE STRUCTURE FOR B TECH IN INFORMATION & COMMUNICATION TECHNOLOGY

Semester III			B Tech in Information and Communication Technology										
Sr. No.	Course Code	Course Name	Teaching Scheme					Examination Scheme					
			L	T	P	C	Hrs/ Wk	Theory			Practical		Total
								CE	MS	ES	CE	ES	Marks
1	CP 201T	Data & File Structures	4	0	0	4	4	25	25	50	-	-	100
2	IC 201T	Signals & Systems	3	1	0	4	4	25	25	50	-	-	100
3	IC 202T	Analog and Digital Electronics	3	1	0	4	4	25	25	50	-	-	100
4	MA 206T	Discrete Mathematics	3	1	0	4	4	25	25	50	-	-	100
5	MA 201T	Mathematics III	3	1	0	4	4	25	25	50	-	-	100
6	CP 201P	Data & File Structures Lab	0	0	2	1	2	-	-	-	25	25	50
7	IC 202P	Analog & Digital Electronics Lab	0	0	2	1	2	-	-	-	25	25	50
8	18IC 201P	Signals & Systems Lab	0	0	2	1	2	-	-	-	25	25	50
9		CSSI	-	-	-	1	-						
		TOTAL	16	4	6	24	26						650

CE- Continuous Evaluation, MS-Mid Semester; ES – End Semester Exam

Course Code: CP 201T					Course Name: Data & File Structures			
Teaching Scheme					**Examination Scheme**			
L	**T**	**P**	**C**	**Hrs/ Wk**	**Theory**			**Total**
					Continuous Evaluation	**Mid Semester**	**End Semester**	**Marks**
4	0	0	4	4	25	25	50	100

Prerequisites: Computer Programming

Learning objectives:

- To understand function of linear and non-linear data structures
- To learn implementation of linear and non-linear data structures
- To use suitable data structure in variety of applications

Unit wise allocation of course content

UNIT 1 (12 L)

Introduction to Data Structure: Data types: primitive and non-primitive, Types of Data Structures: Linear & Non Linear Data Structures.

Linear Data Structures Stack & Queue: Representation of arrays; Applications of arrays; Sparse matrix and its representation; Stack: Stack-Definitions & Concepts, Operations On Stacks, Applications of Stacks, Polish Expression, Reverse, Polish Expression, Infix to postfix conversion and evaluation of postfix expression, Recursion, Tower of Hanoi,

Queue: Representation Of Queue, Operations On Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue.

UNIT 2 (14 L)

Linear Data Structure Linked List: Singly; Doubly and Circular linked list; Implementation of Stack and Queue using linked list; Applications of linked list

Performance Analysis and Measurement: Time and space analysis of algorithms-Average; best and worst case analysis; Asymptotic Notations

Nonlinear Data Structures: Tree-Definitions and Concepts; Representation of binary tree; Binary tree traversal (Inorder, Postorder, Preorder); Threaded binary tree;

UNIT 3 (14 L)

Nonlinear Data Structures: Binary search trees; Conversion of General Trees to Binary Trees; Applications Of Trees; Some balanced tree mechanism; e.g. Heap, AVL trees; 2-3 trees; Height Balanced; Weight Balance; Red black tree; Multi-way search tree: B and B+ tree; Graph: Adjacency Matrices and List Representations of Graphs; Elementary Graph Operations: Depth First Search & Breadth first Search.

UNIT 4 (12 L)

Data Structures for Strings: Tries and compressed Tries, Dictionaries allowing errors in queries, suffix trees and arrays

Hashing and File Structures: Hashing: The symbol table, Hashing Functions, Collision Resolution Techniques , File Structure: Concepts of fields, records and files, Sequential, Indexed and Relative/Random File Organization, Indexing structure for index files, hashing for direct files, Multi-Key file organization and access methods

Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)

Lecture: 52 Hrs
Tutorial: 0 Hrs
Approximate Total: 52 Hrs

Texts and References:

1. Tanenbaum, “Data Structures using C & C++”, Prentice-Hall International
2. Jean-Paul Tremblay & Paul G. Sorenson, “An Introduction to Data Structures with Applications”, Tata McGraw Hill
3. Sartaj Sahani, “Fundamentals of Data Structures in C++”, Galgotia.Publishers
4. Peter Brass, Advanced Data Structures, Cambridge University Press
5. Gilberg & Forouzan, “Data Structures: A Pseudo-code approach with C”, Thomson Learning
6. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein , ”Introduction to Algorithms”, PHI
7. Sanjeev Sofat, “Data Structures using C & C++”, Khanna Book Publishing Pvt. Ltd.

Course Outcomes (COs):

At the end of this course students will be able to

1. Differentiate linear and non-linear data structures
2. Enhance logical reasoning and programming skills
3. Implement linear and non-linear data structures
4. Identify suitable data structures to solve complex computing problems
5. Apply the algorithms on the small and large data sets
6. Design and implement an appropriate hashing function for an application

Lab Code CP 201P					Lab Name: Data & File Structures Lab		
Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Wk	Practical		Total
					Continuous evaluation	End Semester Exam	Marks
0	0	2	1	2	25	25	50

Prerequisites: Computer Programming

Course objectives:

1. To understand function of linear and non-linear data structures
2. To learn implementation of liner and non-linear data structures
3. To use suitable data structure in variety of applications

List of Experiments:

1. Study and implementation of Stack data structure and its applications
2. Study and implementation of various types of Queue data structure and their applications
3. Study and implementation of various types of Linked list data structure and their applications
4. Study and Implementation of binary tree and its traversals
5. Study and Implementation of Threaded binary tree, Binary search tree
6. Memory representation of General trees and their conversion to Binary trees
7. Study and Implementation of Balanced trees: AVL trees, 2-3 trees, Height Balanced, Weight Balance, Red black tree
8. Study and Implementation of B and B+ tree
9. Memory representation of Graph data structure, DFS & BFS traversals
10. Study and implementation of the data Structures for Strings
11. Study and implementation of Hash functions and tables
12. Study and implementation of file structures: indexing and hashing for file organization

Details of Assessment Instruments under LW Practical Component:

- Experiments during lab sessions and record-keeping of lab work (Term Work)
- Assignments / Mini project / Quiz / Practical Test

Course Outcomes (COs):

At the end of this course students will be able to

1. Differentiate linear and non-linear data structures
2. Enhance logical reasoning and programming skills
3. Implement linear and non-linear data structures
4. Identify suitable data structures to solve complex computing problems
5. Apply the algorithms on the small and large data sets
6. Design and implement an appropriate hashing function for an application

Course Code: IC 201T					Course Name: Signals & Systems			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/Wk	Theory			Total
					Continuous Evaluation	Mid Semester	End Semester	Marks
3	1	0	4	4	25	25	50	100

Prerequisites: Maths- II

Learning objectives:

- To understand classification of signals and systems
- To learn applications of mathematical tools like Laplace Transform, Fourier Transform and Z-Transform in analysis of signals and systems
- To understand the importance of different domain representation of signals and systems

Unit wise allocation of course content

UNIT 1 (9 L, 3T)

Continuous and discrete time signals and systems: Signal: Definition and Examples, Classification of Signals, Size of Signals, Periodicity of Signals, Signal Operations, Elementary Signals, Sampling of continuous time signals, Sampling theorem, Reconstruction of a signal from its samples, Aliasing, Discrete time processing of continuous time signals, Concept of quantization and quantization error, Concept of Analog to Digital Conversion and Digital to Analog conversion, System: Definition, Interconnections, Classification, Examples, Signal processing concept.

UNIT 2 (10 L, 3T)

Analysis of continuous time signals and systems: Time and Laplace domain

Time domain representation and convolution integral of continuous time LTI systems, Unit impulse response, Interconnections and properties of continuous time LTI systems, Stability and causality, Initially relaxed and non-relaxed systems, Linear constant co-efficient differential equation and block diagram representation of causal LTI systems, Laplace Transform: Definition, Elementary pairs, Basic properties, Region of convergence (ROC), Inverse Laplace Transform, Application to LTI systems, Eigen values, System transfer function, poles and zeros: stability and causality.

UNIT 3 (10 L, 4T)

Analysis of discrete time signals and systems: Time and Z-domain

Time domain representation and convolution sum of discrete time LTI systems, Unit impulse (sample) response, Computation of convolution sum and unit impulse response, Interconnections and Properties of discrete time LTI systems, Stability and causality, FIR and IIR systems, Linear constant co-efficient difference equation representation, Solution: Recursive method, close form solution: Homogeneous and particular solution, Initially relaxed and non-relaxed systems, Block diagram representation, Z-transform, region of convergence (ROC), properties of ROC, Properties of z-transform, Poles and Zeros, Inverse z-transform -Power Series expansion and Partial fraction expansion, Solution of difference equation using Z-transform, Convolution and LTI system analysis using Z-transform: Causality and stability, Unilateral Laplace and Z- Transform and their applications, Concept of Linear feedback systems, applications and consequences.

UNIT 4 (10 L,3T)

Frequency domain analysis:

Determination of Fourier series representation of continuous time periodic signals – Trigonometric and Complex Exponential Fourier series representation. Important properties of Fourier series. Continuous time Fourier transform with examples, Properties of the continuous time Fourier transform, Parseval's relation, Convolution in time and frequency domains. Application to analysis of continuous time LTI systems, Relationship between Laplace and continuous time Fourier transform, Fourier series representation of discrete time periodic signals and important properties, Discrete Time Fourier Transform, Properties of Discrete Time Fourier Transform, Discrete time system analysis using Discrete Time Fourier Transform, Frequency response of discrete time systems, Effect of periodicity and discretization on spectra.

Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)

Lecture: 39 Hrs
Tutorial: 13 Hrs
Approximate Total: 52 Hrs

Texts and References:

1. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, Signals & Systems, Pearson Education.
2. John G.Proakis and Dimitris G.Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, PHI.
3. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH.
4 Moman .H. Hays," Digital Signal Processing ", Schaum's outlines, Tata McGraw-Hill Co Ltd..
5. B. P. Lathi, "Signal Processing and Linear System", Berkeley Cambridge Press.
6. Matthew N. O. Sadiku, Warsame Hassan Ali, "Signals and Systems: A Primer with MATLAB", CRC Press.

Course Outcomes (COs):

At the end of this course students will be able to

1. Understand the signals and their mathematical interpretations.
2. Model signal and system mathematically.
3. Analyze signals and system in transform domain.
4. Understand the applications of transforms.
5. Develop the background for signal processing techniques.
6. Correlate solution of common engineering problems to system analysis.

Lab Code 18IC 201P					Lab Name: Signals & Systems Lab		
Teaching Scheme					Examination Scheme		
					Practical		Total
L	T	P	C	Hrs/Wk	Continuous evaluation	End Semester Exam	Marks
0	0	2	1	2	25	25	50

Prerequisites: Basic Electronics

Course objectives:

1. To understand continuous time and discrete time signals.
2. To understand response of different continuous time and discrete time systems.
3. To understand signals & systems in transform domain.

List of Practicals:

1. Introduction to the simulation software package and its working.
2. Experiment on signal as a data and data handling in software package.
3. Experiment on various signal generations.
4. Experiment on response of systems like accumulator, differentiator, moving average etc.
5. Experiments on Laplace and Z-transforms.
6. Experiments on frequency response of continuous time systems.
7. Experiments on frequency response of discrete time systems.
8. Experiment on linearity, time invariance and stability of systems.
9. Experiment on convolution.
10. Experiment on differential and difference equation and implementations.
11. Experiment on essential bandwidth determination.

Details of Assessment Instruments under LW Practical Component:

- Experiments during lab sessions and record-keeping of lab work (Term Work)
- Assignments / Mini project / Quiz / Practical Test

Course Outcomes (COs):

At the end of this course students will be able to

1.Understand the working of simulator.

2.Understand the frequency response.

3 Understand the stability analysis.

4. Understand the basic systems.

5. Understand various transforms.

6. Understand the concept related to bandwidth.

Course Code: IC 202T					Course Name: Analog & Digital Electronics			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/Wk	Theory			Total
					Continuous Evaluation	Mid Semester	End Semester	Marks
4	0	0	4	4	25	25	50	100

Prerequisites: Basic Electronics

Learning objectives:

- To become familiarize with commonly used analog and digital circuits.
- To facilitate the understanding of the principles and to cultivate the art of analog circuit designing using BJT, FET and OPAMP.
- To facilitate the understanding of the principles and to cultivate the art of digital circuit designing using Combinational and Sequential Circuits.

Unit wise allocation of course content

UNIT 1 (15 L)

BJT and FET Amplifiers:

Overview of BJT characteristics and biasing methods, Bias Stabilization Techniques for BJT, Thermal Stability, JFET and MOSFETs (working and characteristics), DC and AC Load lines, Operating Point, Various Biasing Methods for FETs. Small signal Analysis of Common Emitter, Common collector and common base amplifiers, FET amplifiers, Darlington Amplifier, Cascode Amplifier, Multistage Amplifiers: cascaded amplifier, RC coupled amplifier. Concept of Feedback in amplifiers - advantages and disadvantages –Types of Feedback Topologies, Effect on gain, impedance and bandwidth.

UNIT 2 (11 L)

OPAMP and its Applications:

Overview of OPAMP and its building blocks, OPAMP DC and AC parameters, Limitations of OPAMP, Linear and Non-linear applications of OPAMP: Clipping and clamping circuits, Comparators and Limiters, Schmitt trigger, monostable and astable multivibrators, triangular wave generator, precision rectifiers, log and antilog amplifiers, sample and hold circuit, peak detector, Active filters, Simple filter circuits, Oscillators, VCO and PLL, Multivibrators using 555 Timer IC.

UNIT 3 (15 L)

Combinational and Sequential Logic Circuits: Introduction to Logic Gates, Boolean Algebra and K-Map, NAND and NOR implementation – Don't-Care conditions, Decoders, encoders, multiplexers, demultiplexers and their applications, Parity circuits and comparators, Arithmetic modules- adders, subtractors, multipliers.

Sequential circuits, latches, flip-flops, analysis of clocked sequential circuits, design of sequential circuits. Registers, Shift registers, ripple counter, synchronous counters, ring /Johnson counters, RAM and its types, Introduction to PAL, CPLD, FPGA, ALU, ROM and PLA.

UNIT 4 (11 L)

Analog To Digital and Digital To Analog Converters: Digital to Analog Conversion, R-2R ladder type DAC, Weighted resistor type DAC, Analog to Digital Conversion, Counter type A/D Converter, Flash type A/D converter, Dual slope A/D converter, Successive approximation ADC, Use of Sample and Hold circuit in ADC.

Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)

Lecture: 52 Hrs

Approximate Total: 52 Hrs

Texts and References:

1. J. Millman, C. Halkias and C. Parikh, "Integrated Electronics", Tata McGraw Hill.
2. R. A. Gayakwad, "Opamp and Linear Integrated Circuits" PHI.
3. Boylestad and Nashlesky, "Electronic Devices and Circuit Theory", PHI
4. Salivahanan, "Electronic Devices and Circuits", Tata McGraw Hill.
5. M Morris Mano, "Digital Logic and Computer Design", Prentice Hall Publication
6. Malvino and Leach, "Principle of Digital Electronics"; McGraw-Hill Education
7. R.P. Jain, "Modern Digital Electronics"; McGraw-Hill
8. Taub and Schilling, "Digital Integrated Electronics", McGraw-Hill

Course Outcomes (COs):

At the end of this course students will be able to

1. Understand the bias stabilization circuits and their significance.
2. Understand the frequency response and its effect in the circuit designing.
3. Design Circuits using OPAMPs.
4. Analyze and design combinational and sequential circuits.
5. Understand the basic memory systems.
6. Understand the difference and interface between analog and digital world.

Lab Code IC 202P					Lab Name: Analog & Digital Electronics Lab		
Teaching Scheme					**Examination Scheme**		
					Practical		**Total**
L	**T**	**P**	**C**	**Hrs/Wk**	**Continuous evaluation**	**End Semester Exam**	**Marks**
0	0	2	1	2	25	25	50

Prerequisites: Basic Electronics

Course objectives:

1. To understand function of different analog circuits
2. To understand function of different digital circuits
3. To design analog and digital circuits

List of Practicals:

1. Experiment on use of different test and measurement equipment: DC Power Supply, Digital Multimeter Function Generator, CRO etc.
2. Experiment on PN junction diode and Zener diode characteristics
3. Experiment on various rectifier, filter and regulator circuits
4. Experiment on BJT, JFET and MOSFET characteristics in various configurations
5. Experiments on biasing techniques
6. Experiments on frequency response of BJT and FET amplifier circuits
7. Experiment on Feedback and Multistage amplifiers
8. Experiment on OPAMP applications: Adder, Subtractor, Integrator, Differentiator etc.
9. Experiment on OPAMP active filters
10. Experiment on OPAMP oscillators
11. Experiment on 555 Timer multivibrator circuits
12. Experiment on Logic Gates and Boolean Algebra
13. Experiment on Adders and Subtractors
14. Experiment on Encoders and Decoders
15. Experiment on Multiplexer and Demultiplexer
16. Experiment on Flipflops
17. Experiments on Counters and Registers
18. Experiments on A to D and D to A convertors
19. Experiment on characteristics of TTL and CMOS logic gates
20. Simulation of Analog and Digital Circuits using software tools

Details of Assessment Instruments under LW Practical Component:

- Experiments during lab sessions and record-keeping of lab work (Term Work)
- Assignments / Mini project / Quiz / Practical Test

Course Outcomes (COs):

At the end of this course students will be able to

1.Understand the bias stabilization circuits and their significance

2.Understand the frequency response and its effect in the circuit designing.

4. Design Circuits using OPAMPs.

5. Understand the designing of combinational and sequential circuits using logic gates.

6. Understand the concept related to interfacing of analog and digital circuits.

Course Code: MA 201T					Course Name: Mathematics III			
Teaching Scheme					**Examination Scheme**			
L	**T**	**P**	**C**	**Hrs/ Wk**	**Theory**			**Total**
					Continuous Evaluation	**Mid Semester**	**End Semester**	**Marks**
3	1	0	4	4	25	25	50	100

Prerequisites: Maths II

Learning objectives:

- To impart knowledge of basic and applied sciences.
- To connect linear algebra to other fields both within and without mathematics.
- To introduce students the theory and concepts of linear algebra, Fourier Series, Special Functions and Applications of Partial Differential Equations which will equip them with adequate knowledge of mathematics to formulate and solve problems analytically.
- Apply Fourier series expansion to different kind of wave forms and solve some partial differential equations using Fourier series
- To impart the knowledge of matrices, vector space, transformation, etc and develop the capability of logic development and find solutions by different methods.

Unit wise allocation of course content

UNIT I (8 L, 3 T)

Systems of linear equations : Matrices, Matrix Operations, Special matrices, Elementary Matrices, Elementary transformation, Rank, Introduction to systems of Linear Equations, Conditions for consistency of the system of equations, Solution by Gauss Elimination and Gauss Jordan Method, Solving system of equation using inverse of a Matrix and Cramer's rule.

UNIT II (13 L, 4 T)

Vector spaces: Euclidean n - space, Linear Transformations from Rn to Rm; Properties of Linear Transformations from Rn to Rm, Matrices of General Linear Transformations, Similarity; Isomorphisim, Vector space and Subspaces, Linear dependence and Independence of vectors; Basis, Dimension, Row space; null space; column space and rank of a matrix, Rank and Nullity, Dimension Theorem, Inner product spaces, Eigen values and Eigen vectors, Inner product , Angle and Orthogonality in Inner Product Spaces, Orthonormal Bases; Gram-Schmidt process; Least squares approximation, Orthogonal Matrices, Eigen values and Eigen vectors, Diagonalization.

UNIT III (13 L, 4 T)

Fourier Series: Periodic functions, Euler's formulae, Dirichlet's conditions, expansion of even and odd functions, half range Fourier series, Perseval's formula, complex form of Fourier series.

Special Functions: Power series method to solve the equation, Frobenius method for solution near regular singular points, Legendre's equation, Legendre polynomials, Rodrigue's formula, Bessel's equation and Orthogonality.

UNIT IV (5 L, 2 T)

Partial Differential Equations and its Applications: Classification of partial differential equations, Solutions of one dimensional wave equation, one dimensional unsteady heat flow equation in Cartesian and polar coordinates by variable separable method with reference to Fourier trigonometric series and by Laplace transform technique.

Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)

Lecture: 39 Hrs

Tutorial: 13 Hrs

Approximate Total: 52 Hrs

Texts and References

1. R. K. Jain & S. R. K. Iyengar, Higher Engineering Mathematics, Narosa.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley.
3. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand Publication
4. H. Anton, Elementary Linear Algebra with Applications, John Wiley.
5. G. Strang, Linear Algebra and its Applications, Thomson.

Course Outcomes:

At the end of the course, the student will be able to:

1. Solve a system of linear equations by gauss elimination method and find the inverse of a matrix.
2. Diagonalize a matrix using its eigenvectors.
3. Formulate Fourier series for various wave forms and solve some partial differential equations using Fourier series.
4. Become familiar with various applications of partial differential equations and their solution methods.

Course Code: MA206T					Course Name: Discrete Mathematics			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/Wk	Theory			Total
					Continuous Evaluation	Mid Semester	End Semester	Marks
3	1	0	4	4	25	25	50	100

Prerequisites: Maths II

Learning objectives:

- To understand the concept of sets, functions, relations and algebraic structures
- To learn graph theory based modeling and applying the same to solve real problems
- To study combinatorics as an analytical method for problem solving

Unit wise allocation of course content

Unit 1 (10L, 3T)

Sets, Relations and Logic: finite and infinite sets, countable and uncountable sets, Mathematical Induction, Functions and relations, Partial Ordered relations, Hasse diagram. Propositions- simple and compound. Basic logical operators. Implication. Truth tables. Tautologies and contradictions. Valid arguments and fallacy. Propositional functions and quantifiers.

Unit 2 (9L, 3T)

Combinatorics: Recursive functions, Recurrence relations, Solutions of recurrence relations by generating function, Structural Induction. Counting principles, permutation, combination, derangement, inclusion-exclusion principle, pigeon hole principle, etc.

Unit 3 (14L, 5T)

Graph Theory: Graphs and related definitions, Subgraphs, homomorphism and isomorphism, paths and connectivity. Bipartite, line and chordal graph. Eulerian graph and Konigsberg problem. Hamiltonian graph. Labeled and weighted graphs. Independent sets, covering, matching. Graph coloring. Four color problem. Planar Graphs. Digraphs and related definitions. Trees. Algebraic expressions and Polish notation. Sequential representation. Adjacency matrix. Shortest path. Binary trees, Strongly and weakly connected graphs.

Unit 4 (6L, 2T)

Algebraic Structures: Groups, order of group and its elements, Subgroups, Lagrange's Theorem, Rings, Fields.

Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)

Lecture: 39 Hrs

Tutorial: 13 Hrs

Approximate Total: 52 Hrs

Texts and References

1. Lipschutz, S., Lipson, M., Discrete Mathematics, Schaum Series (TMH).
2. Rosen and Kenneth H, Discrete Mathematics and Its Applications, Tata Mc-Graw Hill, New Delhi

3. Kolman, B. and Busby, R. C., and Ross S., Discrete Mathematical Structures, Prentice Hall.
4. Koshy, T. Discrete Mathematics with Applications, Academic Press.
5. Gramaldi, R. P., Discrete Combinatorial Mathematics, Pearson Education.
6. Jain, R. K. & Iyenger, S. R. K., Advanced Engineering Mathematics, Narosa Publishing House, New Delhi.
7. C. L. Liu, Elements of Discrete Mathematics, Tata McGraw Hill

Course Outcomes (COs):

At the end of this course students will be able to

1. Understand the concepts of sets, relations, logic, etc.
2. Understand the algebraic structures and apply them suitably in different applications
3. Use formal methods for constructing mathematical proofs
4. Appreciate solutions to various classic problems related to the Graph theory
5. Use graph theory as a modelling tool for solving problems in various domains
6. Understand Combinatorial arguments and use it as an analytical method for problem solving.