

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme			Credits
				L	T	P	
1.	BSC	MA04	Discrete Structure	2	1	-	3
2.	PCC	CS04	Computer Network	2	1	-	3
3.	PCC	CS05	Analysis and Design of Algorithm	2	1	-	3
4.	PCC	CS06	Object Oriented Programming and Methodology	2	1	-	3
5.	HSMC	HS03	Innovation and Creativity	1	-	-	1
6.	IFC	CB01	Interdisciplinary Foundation Course-I	2	-	-	2
7.	LC	CS04(P)	Computer Network Lab	-	-	2	1
8.	LC	CS05(P)	Analysis and Design of Algorithm Lab	-	-	2	1
9.	LC	CS06(P)	Object Oriented Programming and Methodology	-	-	2	1
10.	SBC	CS02(P)	Programming in PYTHON	-	-	4	2
11.	LLC	LLC02	Liberal Learning Course –II	-	-	2	1
12.	MLC	MLC02	Constitution of India	1	-	-	Audit
Total Academic Engagement and Credits				12	4	12	21
				28			

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

BSC-MA04	Discrete Structure	2L: 1T: 0P (3 hrs.)	Credits: 03
-----------------	---------------------------	----------------------------	--------------------

Prerequisite: Nil

Course Objective:

This course introduces the applications of discrete mathematics in the field of computer science. It covers sets, logic, proving techniques, combinatory, functions, relations, Graph theory and algebraic structures.

Course Content:

Module 1:

(10 hrs.)

Set Theory, Relation, Function, Theorem Proving Techniques : Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets
Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job- Scheduling problem
Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction.

Module 2:

(08 hrs.)

Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.

Module 3:

(08 hrs.)

Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers.

Module 4:

(08 hrs.)

Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs.

Module 5:

(10 hrs.)

Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Combinatorics: Introduction, Permutation and combination, Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions.

IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
Scheme Based on AICTE Flexible Curriculum
Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.) [Computer Science & Engineering]
IV-Semester

Course Outcomes:

1. Describe sets, relations, functions and mathematical induction.
2. Formulate and solve Groups and Rings problems.
3. Apply Propositional logic and finite state automata to solve problems.
4. Apply the Concepts of Graph theory to Solve real world problems.
5. Formulate and solve Poset and recurrence relations.

List of Text Books / Reference Books:

1. C.L.Liu, "Elements of Discrete Mathematics" Tata McGraw-Hill Edition.
2. J Trembley, R Manohar; "Discrete Mathematical Structure with Application CS", 2001 McGraw Hill.
3. Kenneth H. Rosen, "Discrete Mathematics and its applications", 7th Ed., McGraw Hill.
4. R K Bisht, H S Dhami, "Discrete Mathematics", 2015, Oxford University Press.
5. P C Biswal, "Discrete Mathematics & Graph Theory", 4th Ed. , PHI.

IPS Academy, Institute of Engineering & Science
 (A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
Scheme Based on AICTE Flexible Curriculum
Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.) [Computer Science & Engineering]
IV-Semester

PCC- CS04	Computer Network	2L: 1T: 0P (3 hrs.)	Credits:03
------------------	-------------------------	----------------------------	-------------------

Prerequisite: Data Communication

Course Objective:

This course provides a foundation to understand computer networks using layered architectures.

Course Contents:

Module 1: (06 hrs)

Introduction to computer networks: Network – Component and Categories – Topologies Reference Models: ISO/OSI Model and TCP/IP Protocol suite. Principals of physical layer: Transmission Media, Bandwidth, Multiplexing, Switching.

Module2: (08 hrs)

Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Protocol verification: Finite State Machine Models & Petri net models. ARP/RARP.

Module 3: (10 hrs)

MAC Sub layer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA), Collision Free Protocols: Basic Bit Map, Binary Count Down, Adaptive Tree Walk, Performance Measuring Metrics. IEEE Standards 802 series & their variant.

Module 4: (08 hrs)

Network Layer: Need, Services Provided, Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing. IP Addresses, Header format, Packet forwarding, Fragmentation and reassembly, ICMP, Comparative study of IPv4 & IPv6.

Module 5: (10 hrs)

Transport Layer: Design issues, UDP: Header Format, Per-Segment Checksum, Carrying Uncast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Application Layer: WWW and HTTP, FTP, SSH, DHCP, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).

IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
Scheme Based on AICTE Flexible Curriculum
Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.) [Computer Science & Engineering]
IV Semester

Course Outcomes:

1. Describe basics of computer network, network architecture, TCP/IP protocol suite, OSI reference models & fundamentals of physical layer.
2. Classify data link protocol like flow control, error control, bit oriented protocol and solve ARQ techniques.
3. Paraphrase multi-channel access protocol, IEEE 802 standards & use Ethernet standards.
4. Solve routing, congestion problems, addressing & subnet. Discuss IP protocol.
5. Distinguish various transport & application layer protocols.

List of Text / Reference Books:

1. Andrew S.Tanenbaum, David J. Wetherill, “Computer Networks” Pearson New International Edition, 5thEdition, 2013.
2. Douglas E Comer, “Internetworking with Tcp/Ip Principles, Protocols, and Architecture- Volume I” 6thEdition, Prentice Hall of India.
3. Dimitri Bertsekas, Robert Gallager, “Data Networks”, PHI Publication, Second Edition.
4. Kaveh Pahlavan, Prashant Krishnamurthy, “Networking Fundamentals”, Wiley Publication. First Edition, 2009.
5. Uyles Black, “Computer Networks”, PHI Publication, Second Edition.
6. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGrawHill. 2011.
7. Behrouz A. Forouzan, “Data Communication and Networking”, McGrawHill, 5th Edition, 2013.
8. William Stallings, “Data and Computer Communication” 8th Edition, 2007.
9. W. Richard Stevens. “TCP/IP Illustrated, Volume 1”, Addison-Wesley, United States of America.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

PCC-CS05	Analysis and Design of Algorithm	2L: 1T : 0P (3 hrs.)	Credits:03
----------	----------------------------------	----------------------	------------

Prerequisite: Data Structure & Algorithm

Course Objective:

To understand different algorithm design techniques and Analyze the asymptotic performance of algorithms.

Course Contents:

Module 1: (06 hrs)

Algorithms, Designing algorithms, analyzing algorithms, asymptotic notations, heap and heap sort. Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, strassen's matrix multiplication.

Module 2: (10 hrs)

Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm

Module 3: (08 hrs)

Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm, Sum of subset problem, Matrix Chain Multiplication, Longest common subsequence.

Module 4: (10 hrs)

Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc. Introduction to branch & bound method, examples of branch and bound method like traveling salesman problem etc. Meaning of lower bound theory and its use in solving algebraic problem, introduction to parallel algorithms.

Module 5: (10 hrs)

Hashing: Hash Function, Address calculation Technique , Common Hashing Function , Collision resolution, Linear probing, Quadratic Double Hashing , Bucket Hashing , Deletion and Rehashing Non Deterministic algorithms, The classes: P, NP, NP Complete, NP Hard, Satisfiability problem, Proofs for NP Complete Problems: Clique, Vertex Cover. Introduction to approximate and randomized algorithms.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

Course Outcomes:

1. Analyze the asymptotic performance of recursive and non recursive algorithms.
2. Identify different algorithm design techniques for problem solving.
3. Design algorithms using Greedy method & Dynamic programming techniques.
4. Interpreting Backtracking, Branch and Bound strategy, and evaluate various algorithms.
5. Able to describe the classes P, NP, and NP Complete and be able to prove that a certain problem is NP-Complete.

List of Text Books / Reference Books:

1. Cormen Thomas, Leiserson CE, Rivest RL, "Introduction to Algorithms" 3rd Ed, 2009 PHI.
2. Horowitz & Sahani, "Analysis & Design of Algorithm" Computer Science Press
3. Ullmann, "Design & Analysis of Computer Algorithms" Pearson
4. Michael T Goodrich, Roberto Tamassia, "Algorithm Design", Wiley India
5. Rajesh K Shukla, "Analysis and Design of Algorithms: A Beginner's Approach", Wiley

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

PCC-CS06	Object Oriented Programming and Methodology	2L: 1T: 0P (3 hrs.)	Credits:03
-----------------	--	----------------------------	-------------------

Prerequisite: Programming for Problem Solving

Course Objective:

The course is designed to provide complete knowledge of Object Oriented Programming through and to enhance the programming skills of the students by giving practical assignments to be done in labs. Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm.

Course Content:

Module 1:

(08 hrs)

Introduction to Object Oriented Programming, Comparison with Procedural Programming, features of Object oriented paradigm, merits and demerits of OO methodology; Introduction to Java Development Kit (JDK) & Java virtual machine (JVM); Linker & Loader; Data Encapsulation: Concept of Classes & Objects; State, Behavior & Identity of an object.

Module 2:

(08 hrs)

Data Abstraction and Message Passing: Methods, Calling of constructors, Decision making constructs, Control loops, Keywords: this, static; Access modifiers, Arrays within a class, String Class.

Module 3:

(10 hrs)

Relationship between classes: Generalization- Inheritance, Types of Inheritance, Ambiguity in multiple inheritances, Concept of interfaces; Specialization- Association, Aggregation and Composition; Static and Dynamic Binding; Polymorphism, Method Overriding & Overloading; Keywords: super, abstract, final.

Module 4:

(08 hrs)

Concept of Packages, Need of package; Basic idea of exception handling, stack based execution and exception propagation, Exception types: Exception Handling Try, Catch, Finally, Throw statement, Assertions.

Module 5:

(08 hrs)

Overview of Simple threads, Basic idea of Multithreaded Programming, Thread synchronization: Locks, synchronized methods, synchronized block, thread scheduling, Producer-consumer relationship, Daemon thread, Case Study: Chabot implementation etc.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

Course Outcomes:

1. Understand object oriented programming concepts, core JAVA and apply them in solving Problems.
2. Develop skill in data abstraction and message passing.
3. Understand fundamentals of relationship amongst objects.
4. Learn about the need of exception and errors.
5. Develop ability to write a computer program to solve specified problems.

List of Text Books / Reference Books:

1. G. Booch, "Object Oriented Analysis & Design", Pearson.
2. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001.
3. James Martin, "Principles of Object Oriented Analysis and Design", Prentice Hall/PTR.
4. Peter Coad and Edward Yourdon, "Object Oriented Design", Prentice Hall/PTR.
5. Herbert Schildt, "Java 2: The Complete Reference", 7th Edition, McGraw-Hill.

IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
Scheme Based on AICTE Flexible Curriculum
Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.) [Computer Science & Engineering]
IV Semester

HSMC-HS03	Innovation and Creativity	1L: 0T: 0P (1 hrs.)	Credits: 01
------------------	----------------------------------	----------------------------	--------------------

Prerequisite: Nil

Course Objectives:

1. To give an insight into creativity and innovation
2. To develop an appreciation for innovation among students, and
3. To enhance sensitivity to creativity and innovation

UNIT I: Overview of Creativity

Meaning and concept of creativity, Process, Nature and characteristics of creativity, Factors affecting creativity.

UNIT II: Overview of Innovation

Difference between Invention & Innovation, Importance & Principles of Innovation, Process of Innovation, Domain wise Innovations, How to safe guard innovations.

UNIT III: Tools for Innovation

Traditional V/s Creative Thinking, Individual Creativity Techniques: Meditation, Self- Awareness, & Creative Focus Group Creative Techniques: Brain Storming, off The Wall Thinking.

UNIT IV: Evaluation of Effectiveness of Innovation-

Legal Aspects like IPR, patent filing, copyright, Patenting Procedures, Design patents etc.

UNIT V: Innovation Management

Concept, Scope, Characteristics, Evolution of Innovation Management, Significance, Factors Influencing Innovation. Organizational Aspects- Economic Aspects like venture capital, angel investors.

Case Studies on Innovation business ideas i.e. RedBus, Flipcart, Ola, Big Basket, Patented products, Chemical products and Materials, special patents of procedures.

IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
Scheme Based on AICTE Flexible Curriculum
Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.) [Computer Science & Engineering]
IV Semester

Course Outcomes: After completion of the course the student will be able to

1. Analyze creativity concepts and principles & process for problem solving.
2. Understand innovation & apply creativity for innovation.
3. Understand innovative products or services.
4. Apply design thinking tools techniques for IPR.
5. Understand the concept of Innovation Management.

Text Books:

1. S.Salivahanan, S.Suresh Kumar, D.Praveen Sam, “Introduction to Design Thinking”, Tata Mc Graw Hill, First Edition,2019.
2. Kathryn McElroy, “Prototyping for Designers: Developing the best Digital and Physical Products”, O’Reilly, 2017.

Reference Books:

1. Michael G. Luchs, Scott Swan, Abbie Griffin, “Design Thinking – New Product Essentials from PDMA”, Wiley, 2015.
2. Vijay Kumar, “101 Design Methods: A Structured Approach for Driving Innovation in Your Organization”, 2012.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering] IV Semester

IFC-CB01	Block Chain Technology	2L: 0T: 0P (2 hrs.)	2 credits
----------	------------------------	---------------------	-----------

Prerequisite: NA

Course Objectives:

To understand the concept of Blockchain and its platforms- Bitcoin, Ethereum, Hyperledger and Multichain. The course provides an overview of the structure and mechanism of Blockchain.

Course Contents: (40 hrs.)

Module 1: Blockchain (06 hrs.)

Introduction and crypto foundation: Elliptic curve Cryptography, ECDSA, encryption and decryption. Introduction to Blockchain Technology with its Applications, Blockchain Network, Hashing Algorithm, SHA-256, Immutable Ledger, Centralized and Distributed P2P Network.

Module 2: Blockchain Mining (10 hrs.)

Blockchain Mining, Byzantine General Problem, Consensus Protocol and its types- Proof of work (PoW) and proof-of-stake (PoS) algorithm.

Module 3: Cryptocurrency (08 hrs.)

Bitcoin, Bitcoin addresses, Bitcoin Ecosystem, Bitcoin's Monetary Policy, The Halving Problem, Block frequency, The Nonce, difficulty adjustment algorithm, mining pools, transactions, Ethereum, overview of differences between Ethereum and bitcoin, block format, mining algorithm, account management, contracts, Solidity language, decentralized application using Ethereum.

Module 4: Smart Contract (08 hrs.)

Introduction to Smart Contracts, Different Blockchains and Consensus mechanisms. Smart contracts (escrow, micropayments, and decentralized lotteries), payment channels.

Module 5: Application Areas of Blockchain (08 hrs.)

Blockchain and its application with IOT and Cybersecurity, Blockchain and Security R3, CORDA and Hyperledger System architecture, ledger format, chain code, transaction flow and ordering, private channels, membership service providers, casestudies.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

Course Outcomes:

After Completing the course student should be able to:

1. Describe the basic concepts blockchain technology.
2. Understand several types of consensus protocols.
3. Illustrate the concepts of Bitcoin along with different types of cryptocurrencies.
4. Understand the working and importance of smart contracts.
5. Analyze the block chain applications in a structured manner.

List of Text / Reference Books:

1. Mastering Bitcoin:Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos.
2. Mastering Ethereum, Antonopoulos, Andreas M. and Wood, O'Reilly Media, Inc.,2018
3. An Introduction to Bitcoin, V. Saravanan, Lecture Notes.
4. Bitcoin and Cryptocurrencies Technologies: A Comprehensive Introduction, Arvind Narayanan,Princeton University Press (July 19,2016) ISBN-10:0691171696.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

LC- CS04(P)	Computer Network Lab	0L: 0T: 2P (2 hrs.)	Credits:01
-------------	----------------------	---------------------	------------

Prerequisite: Data Communication.

Course Objective:

The course is designed to provide Basic knowledge of Computer Network. Computer Networking is intended for Network engineers, Network designers and Network administrators who wish to aim for telecommunication domain. Learning Outcomes - Understanding of computer network, Network designing and troubleshooting.

Course Content:

Module 1:

Introduction to computer networks: Networking Devices, Network – Component and Categories, Local area networks and Wide area networks. Color coding standard of CAT 5,6,7 and crimping of cable in RJ-45, Principals of physical layer: Transmission Media, Bandwidth.

Module 2:

Introduction to packet tracer simulator, Network topologies, Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Error control, framing. ARP.

Module 3:

Network Layer: Routing algorithms: Dijkstra's algorithm, Bellman-ford algorithm, IP Addresses, classful & classless addressing, IP routing, Subnetting and supernetting, ICMP.

Module 4:

Transport Layer: TCP service protocols, UDP: Header Format, Per-Segment Checksum, Socket programming.

Module 5:

Introduction to the various internetworking devices and their basic configuration, Study of various application layer protocols.

IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
Scheme Based on AICTE Flexible Curriculum
Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.) [Computer Science & Engineering]
IV Semester

Course Outcomes:

1. Demonstrate LAN configuration and discuss various types of transmission media and network equipments.
2. Implement various functionalities of data link layer and build network topology using packet tracer.
3. Analyze the requirements for a given organizational requirement and select the most appropriate networking architecture and technologies.
4. Implement socket programming and simulate TCP using Wireshark.
5. Distinguish various internetworking devices and study of application layer protocols.

List of Text / Reference Books:

1. Andrew S. Tanenbaum, David J. Wetherill, "Computer Networks" Pearson New International Edition, 5th Edition, 2013.
2. Douglas E. Comer, "Internetworking with TCP/IP Principles, Protocols, and Architecture- Volume I" 6th Edition, Prentice Hall of India.
3. Dimitri Bertsekas, Robert Gallager, "Data Networks", PHI Publication, Second Edition.
4. Kaveh Pahlavan, Prashant Krishnamurthy, "Networking Fundamentals", Wiley Publication. First Edition, 2009
5. Uyless Black, "Computer Networks", PHI Publication, Second Edition.
6. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGrawHill, 2011.
7. Behrouz A. Forouzan, "Data Communication and Networking", McGrawHill, 5th Edition, 2013.
8. William Stallings, "Data and Computer Communication" 8th Edition, 2007.
9. W. Richard Stevens. "TCP/IP Illustrated, Volume 1", Addison-Wesley, United States of America.

List of Experiments:

1. Study of different types of LAN & Network Equipments. (CO1)
2. Study of various transmission media (CO1)
3. LAN installations and Configurations. (CO1)
4. Installation of Cisco Packet Tracer. (CO2)
5. Design various Network Topologies using packet tracer. (CO2)
6. Write a program to implement various types of error detection and correcting techniques. (CO2)
7. Write a program to implement Bit stuffing. (CO2)
8. Write a program to implement Dijkstra's shortest path algorithm. (CO3)
9. Configuring IP addresses and Subnet Mask Using Cisco Packet Tracer (CO3)
10. Simulate TCP: Transmission Control Protocol 3-way handling using Wire shark. (CO4)
11. Write a program to implement client server using socket programming. (CO4)
12. Study of application layer protocols-DNS, FTP, SMTP, SNMP and HTTP. (CO5)
13. Configure various networking devices using Cisco Packet Tracer (CO 5)

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

LC- CS05(P)	Analysis and Design of Algorithm Lab	0L: 0T: 2P (2 hrs.)	Credits:01
-------------	--------------------------------------	---------------------	------------

Prerequisite: Data Structure & Algorithm

Course Objective:

- Learn how to analyze a problem and design the solution for the problem.
- Design and implement efficient algorithms for a specified application.
- Strengthen the ability to identify and apply the suitable algorithm for the given real world problem.
- To understand the importance of algorithm and its complexities.

Course Content:

Module 1:

Designing algorithms, analyzing algorithms. Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, Finding maximum and minimum, merge sort, quick sort.

Module 2:

Study of Greedy strategy, examples of greedy method like optimal merge patterns, minimum spanning trees, single source shortest path algorithm.

Module 3:

Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, Sum of subset problems, Floyd-Warshall algorithm.

Module 4:

Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle. Introduction to branch & bound method, examples of branch and bound method like traveling salesman problem etc.

Module 5:

Binary search trees, height balanced trees, basic search and traversal techniques for trees and graphs (In order, preorder, postorder, DFS, BFS).

IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
Scheme Based on AICTE Flexible Curriculum
Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.) [Computer Science & Engineering]
IV Semester

Course Outcomes:

- CO1: Solve and analyse the problems using divide and conquer method.
- CO2: Solve and analyse the problems using greedy methods.
- CO3: Solve and analyse the problems using dynamic programming.
- CO4: Apply backtracking and branch & bound method to solve various problems.
- CO5: Develop programs for Tree and Graph traversal and analyze its time complexity.

List of Text Books / Reference Books:

1. Cormen Thomas, Leiserson CE, Rivest RL, "Introduction to Algorithms" 3rd Ed, 2009 PHI.
2. Horowitz & Sahani, "Analysis & Design of Algorithm" Computer Science Press.
3. Ullmann, "Design & Analysis of Computer Algorithms" Pearson.
4. Michael T Goodrich, Roberto Tamassia, "Algorithm Design", Wiley India.
5. Rajesh K Shukla, "Analysis and Design of Algorithms: A Beginner's Approach", Wiley.

List of Experiments:

1. Write a program to perform Quick Sort for the given list of integer values. (CO1).
2. Write a Program to perform Merge Sort on the given lists of integer values. (CO1).
3. Write a program for finding the maximum and minimum value from list. (CO1).
- 4 Write a program for minimum spanning trees using Kruskal's algorithm. (CO2).
5. Write a program for minimum spanning trees using Prim's algorithm. (CO2).
6. Write a program for Single source shortest path. (CO2).
7. Write a program for 0/1 knapsack problem. (CO3).
8. Write a program for All Pair Shortest Path (CO3).
9. Write a program for Sum of subset problem (CO3).
10. Write a program to solve N-QUEENS problem (CO4).
11. Write a program to solve Hamiltonian cycle problem. (CO4).
12. Write a program to solve Traveling salesman problem. (CO4).
13. Write a program for Tree traversal (Inorder, Preorder, Postorder) (CO5).
14. Write a program for Depth First Search Graph Traversal (CO5).
15. Write a program for Breadth First Search Graph Traversal (CO5).

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

LC- CS06(P)	Object Oriented Programming and Methodology Lab	0L: 0T: 2P (2 hrs.)	Credits:01
-------------	--	----------------------------	-------------------

Prerequisite: Programming for Problem Solving

Course Objective:

This course designed to provide knowledge of Object Oriented Programming. It introduces object-oriented programming using the Java programming language. The course is designed to enhance the programming skills of the students by giving practical assignments to be done in labs. Its main objective is to teach the basic concepts and techniques of object oriented programming paradigm. Students will learn how to program in Java and use some of its most important APIs.

Course Content:

Module 1:

Introduction to Object Oriented Programming, Basics of Java programming, Data types, Variables, Operators, Control structures, looping; Introduction to Java Development Kit (JDK) & Java virtual machine (JVM); Linker & Loader; Data Encapsulation: Concept of Classes & Objects.

Module 2:

Data Abstraction and Message Passing: Methods, constructors, Keywords: this, static; Access modifiers, Arrays within a class, String Class.

Module 3:

Relationship between classes: Inheritance, Types of Inheritance, Ambiguity in multiple inheritances, Concept of interfaces; Specialization- Association, Aggregation and Composition; Static and Dynamic Binding: Polymorphism, Method Overriding & Overloading; Keywords: super, abstract, final.

Module 4:

Concept of Packages, Need of package; Basic idea of exception handling, Exception types: Exception Handling Try, Catch, Finally, Throw statement, Assertions.

Module 5:

Overview of Simple threads, thread life cycle and methods, Runnable interface, Thread synchronization, Basic idea of Multithreaded Programming,

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

Course Outcomes:

1. Understand object-oriented programming principles and apply them in solving Problems.
2. Develop skill in data abstraction and message passing.
3. Understand fundamentals of relationship amongst objects.
4. Learn about the need of exception and errors.
5. Understand the concept of threads.

List of Text Books / Reference Books:

1. G. Booch, "Object Oriented Analysis & Design", Pearson.
2. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001.
3. James Martin, "Principles of Object Oriented Analysis and Design", Prentice Hall/PTR.
4. Peter Coad and Edward Yourdon, "Object Oriented Design", Prentice Hall/PTR.
5. Herbert Schildt, "Java 2: The Complete Reference", 7th Edition, McGraw-Hill.

List of Experiments:

1. Write a program to show Concept of CLASS in JAVA.(CO1)
2. Write a program to show Concept of Constructor in JAVA.(CO2)
3. Write a program to show Concept of Arrays in JAVA.(CO2)
4. Write a Program to show Inheritance.(CO3)
5. Write a program to show Polymorphism(method overloading and overriding) (CO3)
6. Write a program to show Interfacing between two classes.(CO4)
7. Write a program to show Exception handling. (CO4)
8. Write a program to Add a Class to a Package(CO4)
9. Write a program to show Life Cycle of a Thread (CO5)
10. Write a program to demonstrate multithreading using Java. (CO5)

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

SBC-CS02(P)	Programming in Python	0L: 0T: 4P (4 hrs.)	Credits:02
--------------------	------------------------------	----------------------------	-------------------

Prerequisite: Nil

Course Objective:

The course is designed to provide Basic knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language. Learning Outcomes: Problem solving and programming capability.

Course Contents:

Module 1:

Introduction, History, Features, Python –Environment Setup Local Environment Setup, Getting Python, Installation of Python, Use of IDE.

Module 2:

Python– Basic Syntax Python Identifiers, Reserved Words, Lines & Indentation, Multiline Statements, Quotation in Python, Comments & other useful constructs, Python –Variables Assigning Values to Variables, Multiple Assignment, Standard Data Types.

Module 3:

Python– Variables, Assigning Values to Variables, Multiple Assignment, Standard Data Types; Python Numbers, Python Strings, Python Lists, Python Tuples, Dictionary, Data Type Conversion.

Module 4:

Python– Basic Operators, Types of Operators, Arithmetic Operators, Comparison Operators, Assignment Operators, Bitwise Operators, Logical Operators, Operator Precedence, Python– Decision Making & Loops, Flowchart, If statement Syntax.

Module 5:

Python- Functions, Syntax for defining a function, Calling a Function, Function Arguments, Anonymous Functions Python- Applications & Further Extensions, Data analysis packages.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

Course Outcomes:

1. Install Python and have knowledge of syntax of Python.
2. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
3. Express different Decision Making statements and Functions.
4. Develop code in Python using functions, loops, etc.
5. Design GUI Applications in Python and evaluate different database operations.

List of Text Books / Reference Books:

1. Eric Matthes, "Python Crash Course: A Hands-On, Project-Based Introduction to Programming", No Starch Press.
2. ZedA. Shaw, "Learn Python the Hard Way" (3rdEdition), Addison Wesley.
3. Paul Barry, "Head-First Python", O'Reilly.
4. John Zelle, Franklin, "Python Programming", Beedle & Associates Inc.

List of Experiments:

Write a Python program:

1. Introduction to python programming and python datatypes. (CO1)
2. Python program to find the union of two lists.(CO1)
3. Python program to find the intersection of two lists.(CO1)
4. Python program to remove the "i" th occurrence of the given word in a list where words repeat. .(CO2)
5. Python program to count the occurrences of each word in a given string sentence. .(CO2)
6. Python program to check if a substring is present in a given string. .(CO2)
7. Python program to map two lists into a dictionary. .(CO3)
- 8 Python program to count the frequency of words appearing in a string using a dictionary. .(CO3)
- 9 Python program to create a dictionary with key as first character and value as words starting With that character. .(CO3)
10. Python program to find the length of a list using recursion. .(CO4)
- 11 Python program to read a file and capitalize the first letter of every word in the file. .(CO4)
- 12 Python program to read the contents of a file in reverse order. .(CO4)
- 13 Python program to create a class in which one method accepts a string from the user and another prints it. .(CO5)
- 14 Study and Implementation of Database, Structured Query Language and database connectivity. .(CO5)

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

LLC-LLC02	Liberal Learning Course-II	0L: 0T: 2P (2 hrs.)	Credits:01
------------------	-----------------------------------	----------------------------	-------------------

- **Liberal Learning Course-II, LLC02 (Any One Course from NCC/NSO/NCA)**
 - A. NCC**
 - B. NSO**
 - Any one Sports at State Level
 - C. NCA**
 - Music
 - Dance
 - Photography
 - Cinematography
 - Podcasting
 - Theatre
 - Painting

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering]

IV Semester

MLC-MLC02	Constitution of India	1L:0T:0P (01 hrs)	Audit
-----------	-----------------------	-------------------	-------

Course Objective: The objective of this course is to familiarize the students with the feature of the Indian constitution, laws, democracy etc.

Course content-

MODULE 1: (08 hrs)

Historical background: Formation and working of constituent assembly, formation and working of drafting committee, commencement of Indian constitution, Dr. Ambedkar's ideas of reservation in constitution.

MODULE 2: (08hrs)

Important feature of the constitution: Preamble, fundamental rights, directive principles of state policy, fundamental duties, centerstate relation.

MODULE 3: (08 hrs)

Parliamentary democracy: Lok Sabha, Rajyasabha, central executive president, prime minister, and central ministry, Vidhansabha, Vidhanparishad and state executive (Governor, Chief minister, Minister of state).

MODULE 4: (08 hrs)

Special provisions in Indian constitution: finance commission contingency fund, consolidated fund, public service commissions, election commission, safeguards for SC, ST and backward classes, provisions for emergency and constitutional amendments, Indian judiciary supreme court and high court.

Course Outcomes:

After completion of this course, the students are able to:

- 1: Commencement of Indian Constitution
- 2: Features of Indian constitution
- 3: Working and functions of Parliamentary house
- 4: Provisions in Indian Constitution

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering] IV Semester

Text/Reference

Book-

1. Austin, G. (1999), The Indian Constitution, Oxford, Oxford University Press
2. Pylee, M. V. (2016), India's Constitution (16 Edition), New, Delhi, S. Chand
Publication
3. Kumar, R. (2011), Ambedkar and Constitution (1st Edition),
New Delhi, Commonwealth Publication Pvt. Ltd.