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 & Information Technology]

IV- Semester

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme			Credits
				L	T	P	
1.	BSC	MA03	Probability and Statistics	2	1	-	3
2.	PCC	CI04	Computer Network	2	1	-	3
3.	PCC	CI05	Analysis and Design of Algorithm	2	1	-	3
4.	PCC	CI06	Object Oriented Programming System	2	1	-	3
5.	HSMC	HS04	Entrepreneurship and Principles of Management	1	-	-	1
6.	IFC	EC01	Interdisciplinary Foundation Course-I	2	-	-	2
7.	LC	CI04(P)	Computer Network Lab	-	-	2	1
8.	LC	CI05(P)	Analysis and Design of Algorithm Lab	-	-	4	2
9.	LC	CI06(P)	Object Oriented Programming System Lab	-	-	2	1
10.	SBC	CI02(P)	Programming in PYTHON	-	-	4	2
11.	MLC	MLC02	Constitution of India	*1	-	-	Audit
Total Academic Engagement and Credits				11	4	12	21
				27			

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 & Information Technology]

IV- Semester

MA03	**Probability and Statistics**	**2L: 1T: 0P (3 hrs.)**	**3 credits**

Prerequisite:

Course Objective: The objective of this course is two familiarize the students with statistical techniques, develop statistical skills and increase students' thinking power. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling various problems in the discipline.

Course Contents:

Module 1: Data Collection & Analysis
Introduction and importance of Statistics, Types of Data, Methods of Collecting Primary Data, Methods of Sampling, Merits and Limitations of Sampling, Types of Classification, Formation of Frequency Distribution, Tabulation of Data, Frequency Distribution, Types of graphs and diagrams, Histogram, Bar diagram, Frequency Polygon, Frequency curve, Ogive, Pie diagram, Pictogram.

Module 2: Statistical Measures
Measures of central Tendency, Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean, Measures of Absolute Dispersion, Range, Quartile Deviation, Average Deviation, Standard Deviation, Skewness & Kurtosis.

Module 3: Correlation & Regression Analysis
Introduction, Significance, Types, Scatter Diagram, Karl Pearson's Correlation Coefficient, Coefficient of correlation, Rank Correlation Coefficient, Regression Lines, Regression Equations, Standard Error of Estimate.

Module 4: Probability Theory
Definition of probability, Mutually exclusive events, Additive Law of Probability, Compound Events, Dependence and Independence events, Multiplicative law of Probability, Conditional probability, Total probability, Baye's theorem, Random variables and random variables properties, Probability mass function, Probability density function.

Module 5: Discrete and Continuous Probability Distributions
Introduction, Discrete distribution: Binomial and Poisson's distribution, Continuous distribution: Normal distribution, Exponential distribution, Gamma & Beta Distribution.

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 & Information Technology]
IV- Semester

Course Outcomes:

CO1: The goal of a statistical analysis is to find the distribution behind data.
CO2: The basic ideas of statistics including measures of Central tendency.
CO3: To explain and apply the concepts of correlation and regression.
CO4: To define the principal concepts about probability and its features.
CO5: To explain and apply the concepts of probability distribution in evaluation of engineering problems. Express the features of discrete and continuous random variables.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2018.
2. B. V. Ramanna, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 2017.
3. Chandrika Prasad & Reena Garg, Advanced Engineering Mathematics, Khanna Book Publishing Co. (P) Ltd., Delhi, 2018.
4. D. C. Montgomery and G. C. Runjer, Applied Statistics & Probability for Engineers, Wiley Publication, 6th Edition.
5. T.T. Soong, Fundamental of Probability & Statistics for Engineers, John Wiley & Sons Ltd, 2004.

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 & Information Technology]

IV- Semester

CI04	Computer Network	2L: 1T: 0P (3 hrs.)	3 credits

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 L a y e r : 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 & Information Technology]
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, 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.FirstEdition,2009.
5. Uyless Black, "Computer Networks", PHI Publication, Second Edition.
6. Ying-DarLin, Ren-Hung Hwang, FredBaker,"Computer Networks: An Open Source Approach", McGrawHill.2011.
7. Behrouz A. Forouzan, "Data Communication and Networking", McGrawHill, 5th Edition, 2013.
8. WilliamStallings,"DataandComputerCommunication"8thEdition,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 & Information Technology]
IV-Semester

CI05	**Analysis & 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: **(10 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: **(12 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, 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.

Module 3: **(8 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.

Modul 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: **(6 hrs)**

Hashing: Hash Function, Address calculation Technique , Common Hashing Function , Collision resolution, Linear probing, Quadratic Double Hashing , Bucket Hashing , Deletion and Rehashing .

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 & Information Technology]
IV-Semester

Course Outcomes:

1. Analyze the asymptotic performance of recursive and non recursive algorithms.
2. Discuss different algorithm design techniques for deterministic and non-deterministic problems.
3. Solve problems using Greedy method &Dynamic programming techniques.
4. Demonstrate Backtracking, Branch and Bound strategy.
5. Describe different types hashing techniques.

List of Text Books / Reference Books:

1. Coremen 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, Robarto Tamassia, "Algorithm Design", Wiely 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 & Information Technology]

IV-Semester

CI-06	**Object Oriented Programming System**	**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: Chatbot 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 & Information Technology]

IV-Semester

Course Outcomes:

1. Describe the object oriented programming concepts using core JAVA .
2. Illustrate data abstraction and message passing.
3. Apply fundamentals of inheritance and polymorphism.
4. Explain about packages and exception handling.
5. Discuss the concept of multithreading.

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 & Information Technology]

IV-Semester

HS04	Entrepreneurship and Principles of Management	1L: 0T: 0P (1 hrs.)	Credits: 01

Pre requisite(s): Nil

Course Objectives:

- Explain Entrepreneurship and its importance
- Describe the importance E-commerce
- Explain the importance Digital Marketing in current scenario.
- Describe the importance of planning and organization Structure.
- Discuss the control process and its elements

Course Content:

Module 1 **(08 Hrs)**

Entrepreneurship: Definition, requirements to be an entrepreneur, entrepreneur and intrapreneur, entrepreneur and manager, growth of entrepreneurship in India, Types of Enterprises and Ownership Structure**.**

Module 2

(10 Hrs)

E-commerce and its Technological Aspects: Overview of developments in Information Technology and Defining E-Commerce: The scope of E commerce, Benefits and limitations of E-Commerce

Module 3 **(08 Hrs)**

Introduction to Digital Marketing: Evolution of Digital Marketing from traditional to modern era, Role of Internet, Search Engine Advertising, Display marketing, Social Media Marketing

Module 4 **(08 Hrs)**

Business Management: Definition, Functions, Process, Scope and Significance of Management. Nature of Management, Managerial Roles, Managerial Skills and Activities, Propritership, Ltd., Pvt. Ltd., Company act registration, Startup India, DPIIT, Yukti Portal, Gumasta Lisences, Indian startup policy, MP startup policy, Closing a company, Leadership aspects.

Module 5 **(10 Hrs)**

Management Functions: Nature, Scope, Objective and Significance, Elements and Steps of Planning & organizing, Delegation and Decentralization. Formal and Informal Organizations

Directing: Effective Directing, Supervision, Different Theories of Motivation, **Controlling and Coordinating:** Elements of Managerial Control, Control Systems, Management Control Techniques, Coordination Concept, Importance, Principles andTechniques of Coordination.

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 & Information Technology]
IV-Semester

Course Outcomes:

After completion of the course student will be able to:

1. Understanding of basic concepts, principles and practices entrepreneurship.
2. Understanding of basic concepts & Importance of e-commerce.
3. Understanding of basic concepts of digital marketing
4. Understanding the planning and organizing & organization Structures.
5. Importance of Management Control Techniques

Text Books:

1 Chhabra T.N., Principles and Practice of Management. 10th ed Year 2018.

2 Murton- Gulab, Management Today. 3th ed.1998

3 KoontzH. and O"DonnelH., Essential of Management, 8th ed., McGraw-Hill, New Delhi, 2009.

4 Robbins, S. Fundamentals of Management. 5th ed., Pearson Education, Canada, 2008.

5 Mohanty SK; Fundamental of Entrepreneurship; PHI, 2005.

Reference Book:

1 Prasad L M, Principles and Practices of Management, S. Chand and Sons, New Delhi ,2018

2 Terry & Francklin, Principles of Management, Richard– Erwin.18th Ed. 1982

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 & Information Technology]

IV-Semester

EC01	**Interdisciplinary Foundation Course-I (Sensor & Automation)**	**2L: 0T: 0P (2 hrs.)**	**Credits: 02**

Prerequisite: Basic Electronics, Electronics & Computer Workshop (ECW).

Course Objective:

1. Able to Identify and Select Appropriate Sensor for a given Application.
2. Analyze & Design a basic circuit building block of Sensor System.
3. Train the students to suggest appropriate solution for Industrial automation.

Course Content:

Module 1 **(4 Hrs.)**

Fundamental of Sensing:

Basic Sensor Technology, Sensor classifications and characteristics, Measurement Issues and Criteria, Introduction to various Signal & Conditioning models, Introduction & Classification of Transducer, Applications of Sensor & Transducer.

Module 2 **(4 Hrs.)**

Motion, Proximity and Ranging Sensor

Introduction to Capacitive and Inductive Displacement Sensors, LVDT, RVDT, Introduction to GPS, Bluetooth, Ultrasonic and Microwave Sensors, Laser Range Sensor (LIDAR). Optical and Radiation Sensors.

Module 3 **(4 Hrs.)**

Force, Magnetic and Heading Sensors:

Shock and Vibration Sensors, Flow and Level Sensors, Force, Load and Weight Sensors, Humidity Sensors, Machinery Vibration Monitoring Sensors, Pressure Sensors, Strain Gauge, Temperature Sensors.

Module 4 **(4 Hrs.)**

Advanced Sensor Technologies:

Introduction to LASER, Characteristics of LASER, Types of LASER Sensors, Bar Code Sensors, Benefits of Bar Coding, RFID (Radio Frequency Identification), Biosensors, Chemical Sensors.

Module 5 **(4 Hrs.)**

Industrial Automation:

Concept, Automation Components, Necessity and Working Principle, Block Schematic of Programmable Logic Controller (PLC). Input & Output Modules (AI, DI, AO, DO), Introduction to Ladder Programming, Introduction to Distributed Control Systems (DCS). Industrial Automation Leads to Industrial IoT and Industry 4.0.

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 & Information Technology]
IV-Semester

Course Outcomes:

Students earning credits will develop ability to:

1. To understand the general principles of sensors.
2. To describe the working principle and characteristics Motion, Proximity and Ranging Sensors.
3. To describe the working principle and characteristics of force, magnetic and heading sensors.
4. To understand the working principle & application of advanced sensor and itstechnology.
5. To apply the advanced sensor technology for industrial automation.

Text/ Reference Books:

1. Jon S. Wilson, "Sensor Technology: Handbook", Elsevier, 2005
2. Patranabis D, Sensors and Transducers, 2nd Edition, PHI, New Delhi, 2011.
3. Smart Sensors, Measurement and Instrumentation by Subhas Chandra Mukhopadhyay, Springer Book Series.
4. Nikolay Kirianaki, Sergey Yurish, Nestor Shpak, Vadim Deynega, "Data Acquisitionand Signal Processing for Smart Sensors", John Wiley & Sons Ltd, 2002.

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 & Information Technology]

IV-Semester

CI04(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 L a y e r : 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 & Information Technology]
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, 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.FirstEdition,2009

5. Uyless Black, "Computer Networks", PHI Publication, Second Edition.

6.Ying-DarLin, 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. WilliamStallings,"DataandComputerCommunication"8thEdition,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 implement Dijkstra's shortest path algorithm. (CO3)
9. Configuring IP addresses and Subnet Mask Using CICSO 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 & Information Technology]
IV-Semester

CI05(P)	**Analysis & Design of Algorithm Lab**	**0L: 0T: 4P (2 hrs.)**	**Credits:02**

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 & Information Technology]
IV-Semester

Course Outcomes:

1. Solve and analyse the problems using divide and conquer method.
2. Solve and analyse the problems using greedy methods.
3. Solve and analyse the problems using dynamic programming.
4. Apply backtracking and branch & bound method to solve various problems.
5. Develop programs for Tree and Graph traversal and analyze its time complexity.

List of Text Books / Reference Books:

1. Coremen 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, Robarto Tamassia, "Algorithm Design", Wiely 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 & Information Technology]

IV-Semester

CI06(P)	**Object Oriented Programming System 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 inmultiple 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 & Information Technology]
IV-Semester

Course Outcomes:

1. Demonstrate the concept of classes and object.
2. Apply the concepts of data abstraction and message passing.
3. Apply fundamentals of inheritance and polymorphism.
4. Demonstrate packages and exception handling.
5. Practice the concept of threading.

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

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Scheme Based on AICTE Flexible Curriculum

Department of Computer Science &Engineering

Bachelor of Technology (B.Tech.)

[Computer Science & Information Technology]

IV-Semester

CI02(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. Python- Functions, Syntax for defining a function, Calling a Function, Function Arguments, Anonymous Functions Python- Applications & Further Extensions, Data analysis packages.

Module 5:

Python File Operations: Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations. Database Programming: Connecting to a database, Creating Tables,INSERT, UPDATE,

IPS Academy, Institute of Engineering &Science

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Scheme Based on AICTE Flexible Curriculum

Department of Computer Science &Engineering

Bachelor of Technology (B.Tech.)

[Computer Science & Information Technology]

IV-Semester

DELETE and READ operations, Transaction Control,Disconnecting from a database, Exception Handling in Databases.

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:

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. .(CO5)
12. Python program to read the contents of a file in reverse order. (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 & Information Technology]

IV-Semester

MLC02	**Constitution of India**	**1L: 0T: 0P (1 hrs.)**	**Audit**

Prerequisite: Nil

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: **(08 hrs)**

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

MODULE 3: **(08 hrs)**

Parliamentary democracy: Loksabha, Rajyasabha, central exclusive 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.

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 & Information Technology]
IV-Semester

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

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.