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

Sr.	Course	Course Code	Course Name		rse Code Course Name Scheme		ng Ie	g Credits	
No.	Type			L	Τ	P			
1	BSC	MA04	Discrete Structure	3	-	-	3		
2	PCC	CL06	Computer Network	2	1	-	3		
3	PCC	CL07	Analysis & Design of Algorithm	2	1	-	3		
4	PCC	CL08	Operating System	2	1	-	3		
5	HSMC	HS03	Innovation and Creativity	1	-	-	1		
6	IFC	BC01	Interdisciplinary Foundation Course-I	2	-	-	2		
7	LC	CL06 (P)	Computer Network Lab	I	-	2	1		
8	LC	CL07 (P)	Analysis & Design of Algorithm Lab	-	-	2	1		
9	LC	CL08 (P)	Operating System Lab	-	-	2	1		
10	LC	CL09 (P)	Advanced Python Lab	-	-	4	2		
11	LLC	LLC02	Liberal Learning Course –II (NCC/NSO/NCA)	I	-	2	1		
12	SBC	CL01 (P)	Web Development Technology	-	-	2	1		
13	MLC	MLC02	Constitution of India 1	1	-	-	Audit		
Total Academic Engagement and Credits			13	3	14	22			
				30					

### Interdisciplinary Foundation Course-I, IFC-BC01

(Block Chain Technology)

Note:

Liberal Learning Course-II, LLC-401(Any One Course from NCC/NSO/NCA) NCC

NSO

Anyone Sports at State Level

NCA

Music Dance Photography Cinematography Podcasting Theatre Painting

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### Department of Computer Science & Engineering Bachelor of Technology (B.Tech.)

Computer Science & Engineering (AIMI

[Computer Science & Engineering (AIML)]

**IV Semester** 

BSC-MA04	Discrete Structure	3L: 0T: 0P(3hrs.)	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:**

### Module1:

Set Theory, Relation, Function, and 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, pigeon hole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction.

### Module2:

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.

### Module3:

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.

### Module4:

Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multi graphs 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:

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.

### (08 hrs.)

(08 hrs.)

### (10 hrs.)

### (10 hrs.)

#### (08 hrs.)

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#### **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 Textbooks/ Reference Books:

- 1. C.L.Liu, "Elements of Discrete Mathematics" Tata McGraw-Hill Edition.
- 2. JTrembley, R Manohar; "Discrete Mathematical Structure with ApplicationCS",2001 McGraw Hill.
- 3. Kenneth H.Rosen, "Discrete Mathematics and its applications",7thEd.,McGrawHill.
- 4. RK Bisht, HS Dhami, "Discrete Mathematics", 2015, Oxford University Press.
- 5. PC Biswal," Discrete Mathematics & GraphTheory",4<sup>th</sup> Ed., PHI.

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

PCC-CL06 Computer Network 2	2L: 1T: 0P (4 hrs.)	Credits:03
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#### **Prerequisite:**

#### **Course Objective:**

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

### **Course Contents:**

### Module 1:

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:

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:

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:

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:

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).

## (**08** hrs)

### (10 hrs)

### (06 hrs)

#### (10 hrs)

(08 hrs)

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### **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, IEEE802standards & 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, DavidJ. Wetherill, "Computer Networks" Pearson New International Edition, 5thEdition, 2013.
- 2. Douglas E Comer, "Internetworking with TCP/IP Principles, Protocols ,and Architecture-VolumeI"6thEdition, Prentice Hall of India.
- 3. Dimitri Bertsekas, RobertGallager, "Data Networks", PHI Publication, Second Edition.
- 4. KavehPahlavan,PrashantKrishnamurthy,"NetworkingFundamentals", Wiley Publication. First Edition,2009.
- 5. Ying-DarLin, Ren-Hung Hwang, FredBaker, "Computer Networks: An Open Source Approach", McGrawHill.2011.
- 6. Behrouz A.Forouzan, "Data Communication and Networking", McGrawHill, 5thEdition, 2013.
- 7. William Stallings,"Data and Computer Communication"8thEdition,2007.
- 8. W. Richard Stevens ."TCP/IP Illustrated, Volume1", AddisonWesley, United States of America.

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

Analysis & Design of PCC-CL07 2L: 1T: 0P(4 hrs.) Credits:03 Algorithm

Prerequisite : Data Structure & Algorithm

#### **Course Objective:**

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

### **Course Contents:**

#### Module 1:

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 ,quicksort , strassen 'smatrix multiplication.

### Module 2:

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:

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

### Module 4:

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 the or yand its use involving algebraic problem, introduction to parallel algorithms.

#### Module 5:

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

### (08 hrs)

#### (10 hrs)

### (06 hrs)

(10 hrs)

### (10 hrs)

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### **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, RivestRL, "Introduction to Algorithms" 3rd Ed, 2009PHI.
- 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

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

PCC-CL08	Operating System	2L:1T:0P (4hrs.)	Credits:03

**Prerequisite:** Computer Organization & Architecture

### **Course Objective:**

This Course provides a comprehensive introduction of Operating System, Process Management, Memory Management, File Management and I/O management.

### **Course Outcomes:**

Module 1:

Introduction to Operating Systems: Function, Evolution, Different Types, Desirable Characteristics and features of an O/S, Operating Systems Services: Types of Services, Different ways of providing these Services – Utility Programs, System Calls, Operating System Structure, and Spooling & Buffering.

### Module 2:

CPU Scheduling: Process Concept, Scheduling Concepts, Types of Schedulers, Scheduling Criteria, Process State Diagram, Scheduling Algorithms, Operation on Process, Algorithms Evaluation, System calls for Process Management; Multiple Processor Scheduling; Concept of Threads.

### Module 3:

Concurrent Processes: Real and Virtual Concurrency, Mutual Exclusion, Synchronization, Inter-Process Communication, Critical Section Problem, Solution to Critical Section Problem: Semaphores -Binary and Counting Semaphores, WAIT & SIGNAL Operations, and their implementation. Deadlocks: Deadlock Problems, Characterization, Prevention, Avoidance, Recovery.

### Module 4:

Memory Management: Different Memory Management Techniques - Partitioning, Swapping, Segmentation, Paging, Paged Segmentation, Comparison of these techniques, Techniques for supporting the execution of large programs: Overlay, Dynamic Linking and Loading, Virtual Memory - Concept, Implementation by Demand Paging etc., Page replacement algorithms.

### Module 5:

File Systems: File Concept, User's and System Programmer's view of File System, Disk Organization, Tape Organization, Different Modules of a File System, Disk Space Allocation Methods – Contiguous, Linked and Indexed. Directory Structures, File Protection, System Calls for File Management, Disk Scheduling Algorithms. Introduction to Network, Distributed and Multiprocessor Operating Systems. Case Studies: Unix/Linux, WINDOWS, and other Contemporary Operating Systems.

### (11 hrs.)

### (11 hrs.)

#### (06 hrs.)

### (06 hrs.)

(06 hrs.)

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

### **Course Outcomes:**

- 1. State the core concepts of operating system, evolution and types of operating system.
- 2. Illustrate CPU &process scheduling concepts.
- 3. Illustrate various input output concepts, inter process communication and deadlock.
- 4. Describe the concept of memory management techniques.
- 5. State the core concepts of file, disk management and various types of operating system.

### List of Text / Reference Books:

- 1. Avi Silberschatz, Peter Galvin, Greg Gagne, "Operating System Concepts Essentials", Wiley Asia Student Edition, 10<sup>th</sup> Edition, 2018.
- William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall of India, 5<sup>th</sup> Edition, 2005.
- 3. Charles Crowley, "Operating System: A Design-oriented Approach", Irwin Publishing, 1<sup>st</sup> Edition.
- 4. Gary J. Nutt, "Operating Systems: A Modern Perspective", Addison-Wesley, 2nd Edition.
- 5. Maurice Bach, "Design of the Unix Operating Systems", Prentice-Hall of India, 8th
- 1. Edition.
- 6. Daniel P. Bovet, Marco Cesati, "Understanding the Linux Kernel", O'Reilly and Associates, 3rd Edition.
- 7. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall, 3rd Edition, 2007.
- 8. Bovet & Cesati, "Understanding the Linux Kernel", O'Reily, 3rd Edition.

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

### IV Semester

HSMC-HS03	nnovation and Creativity	1L: 0T:0P (1hrs.)	Credits:01
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### Prerequisite(s): Nil

### **Course Objectives:**

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

### **Course Contents**

### Module 1:

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

### Module 2:

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

### Module 3:

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.

### Module 4:

Evaluation of Effectiveness of Innovation- Legal Aspects like IPR, patent filing, copyright, Patenting Procedures, Design patents etc.

### Module 5:

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.

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### **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 & Reference 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.
- 3. Michael G. Luchs, Scott Swan, Abbie Griffin, "Design Thinking New Product Essentials from PDMA", Wiley, 2015.
- 4. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", 2012.

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

IFC-BC- 01Block Chain Technology2L : 0T : 0P (2 h
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#### **Prerequisite: NA**

#### **Course Objective:**

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:**

#### Module 1:

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

### Module 3:

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:

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

### **Module 5: Application Areas of Blockchain**

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, case studies.

### (05 hrs.)

(05 hrs.)

(05 hrs.)

#### (05 hrs.)

#### (05 hrs.)

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### **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: Unblocking 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.

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## Department of Computer Science & Engineering Bachelor of Technology (B.Tech.)

### [Computer Science & Engineering (AIML)]

**IV Semester** 

LC-CL06 (P)	Computer Network Lab	0L: 0T: 2P(2hrs.)	Credits:01
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### **Prerequisite:**

### **Course Objective:**

The course offers fundamental computer network knowledge, tailored for aspiring network engineers, designers, and administrators. Learning outcomes include understanding network basics and proficiency in design and troubleshooting.

### 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, Sub netting and super netting, 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.

### **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 wire shark.
- 5. Distinguish various internetworking devices and study of application layer protocols.

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

### List of Text / Reference Books:

- 1. 1.Andrew S.Tanenbaum, David J. Wetherill, "Computer Networks" Pearson New International Edition, 5thEdition, 2013.
- 2. Douglas E Comer, "Internet working with TCP/IP Principles, Protocols, and Architecture-Volume I" 6<sup>th</sup> Edition, Prentice Hall of India.
- 3. 3. Dimitri Bertsekas, Robert Gallager, "Data Networks", PHI Publication, Second Edition.
- 4. 4.Kaveh Pahlavan , Prashant Krishnamurthy, "Networking Fundamentals", Wiley Publication.FirstEdition,2009
- 5. Uyless Black, "Computer Networks", PHI Publication, Second Edition.
- 6. 6.Ying-DarLin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill.2011.
- 7. Behrouz A. Forouzan, "Data Communication and Networking", McGraw Hill, 5th Edition, 2013.
- 8. William Stallings, "Data and Computer Communication " 8<sup>th</sup> 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 & Networks Equipment.
- 2. Study of various transmission media.
- 3. LAN installations and Configurations.
- 4. Installation of Cisco Packet Tracer.
- 5. Design various Network Topologies using packet tracer.
- 6. Write a program to implement various types of error detection and correcting techniques.
- 7. Write a program to implement Bit stuffing.
- 8. Write a program to implement Dijkstra's shortest path algorithm.
- 9. Configuring IP addresses and Subnet Mask Using CICSO Packet Tracer.
- 10. Simulate TCP: Transmission Control Protocol 3-way handling using Wireshark.
- 11. Write a program to implement client server using socket programming.
- 12. Study of application layer protocols-DNS, FTP, SMTP, SNMP and HTTP.
- 13. Configure various networking devices using CISCO Packet Tracer.

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

LC-CL07 (P)Analysis & Design of Algorithm0L: 0T: 2P(2hrs.)Credits:0
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### Prerequisite: Data Structure & Algorithm

### **Course Objective:**

Gain problem analysis and solution design skills, implement efficient algorithms for specific applications, and enhance the ability to identify and apply appropriate algorithms in real-world scenarios, emphasizing the importance of algorithms and their complexities.

### **Course Contents:**

### Module1:

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 ,post order ,DFS ,BFS).

### **Course Outcomes:**

- 1. Solve and analyze the problems using divide and conquer method.
- 2. Solve and analyze the problems using greedy methods.
- 3. Solve and analyze 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.

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

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

LC-CL08 (P) Operating System Lab	0L:0T:2P(2hrs.)	Credits:01
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### **Prerequisite:**

### **Course Objective:**

This Course provides an idea to implement Process Management, Memory Management, File Management and I/O management.

### **Course Contents:**

### Module1:

Introduction to Operating Systems: Function, CPU Scheduling: Process Concept, Scheduling Concepts, Types of Schedulers, Scheduling Criteria, Process State Diagram, Scheduling Algorithms.

### Module2:

Mutual Exclusion, Critical Section Problem, Solution to Critical Section Problem: Semaphores – Binary and Counting Semaphores, WAIT & SIGNAL Operations, and their implementation, Classical Problems of Synchronization

### Module3:

Deadlocks: Deadlock Problems, Characterization, Prevention, Avoidance, Recovery. Virtual Memory – Concept, Implementation by Demand Paging etc., Page replacement algorithms. Disk Scheduling Algorithms.

### **Course Outcome:**

- 1. Understand important concepts like Expert Systems, AI applications.
- 2. Solve basic AI based problems.
- 3. Define the concept of Artificial Intelligence.
- 4. Apply AI techniques to real-world problems to develop intelligent systems.
- 5. Select appropriately from a range of techniques when implementing intelligent systems.

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

### List of Text/ Reference Books:

- 1. 1.Avi Silberschatz, Peter Galvin, Greg Gagne, "Operating System Concepts Essentials ", Wiley Asia Student Edition, 10th Edition, 2018.
- 2. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall of India, 5th Edition, 2005.
- 3. Charles Crowley, "Operating System: A Design-oriented Approach", Irwin Publishing, 1st Edition.
- 4. Gary J. Nutt, "Operating Systems: A Modern Perspective", Addison-Wesley, 2nd Edition.
- 5. Maurice Bach, "Design of the Unix Operating Systems", Prentice-Hall of India, 8thEdition.
- Daniel P. Bovet, Marco Cesati, "Understanding the Linux Kernel", O'Reilly and Associates, 3<sup>rd</sup> Edition.
- 7. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall, 3rd Edition, 2007.
- 8. Bovet & Cesati, "Understanding the Linux Kernel", O'Reily, 3rd Edition.

### List of Experiment:

Write a program:

- 1. To implement FCFS CPU scheduling algorithm.
- 2. To implement SJF CPU scheduling algorithm.
- 3. To implement Priority CPU Scheduling algorithm.
- 4. To implement Round Robin CPU scheduling algorithm.
- 5. To compare various CPU Scheduling Algorithms over different Scheduling Criteria.
- 6. To implement classical inter process communication problem (producer consumer).
- 7. To implement classical inter process communication problem (Reader Writers).
- 8. To implement classical inter process communication problem (Dining Philosophers).
- 9. To implement &Compare various page replacement algorithms.
- 10. To implement & Compare various Disk & Drum scheduling Algorithms.
- 11. To implement Banker's algorithms.

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

LC-CL09 (P)	<b>Advanced Python</b>	0L:0T:4P(4 hrs.)	Credits:02
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**Prerequisite**: Fundamental of Python

**Course Objective:** The students will try to learn:

- 1. The programming skills in advanced Python.
- 2. The Object-oriented programming skills in Python.
- 3. An ability to utilize libraries of Python to solve real life problems.

### **Course Contents:**

### Module 1:

Advanced Functions: Introduction to Functional Programming, functions as Objects, Lambda Functions, List Comprehensions, List Comprehensions with Sequence Processing: Map, Filter and reduce Function, Iterators, Generators, Recursion, Closed Function and Function Annotators or Decorators.

### Module 2:

Object Oriented Programming: Classes and Objects, Class Attributes, Methods in class: private methods, Constructor, Destructor. Built-ins: Built-in methods in class, Built-in Attributes in Objects.

### Module 3:

Modules in Python : Introduction to Modules and Packages in Python, Creation of a Modules, Importing Modules, Uses of Standard Modules in Python: Math and Sympy Packages, os Module, sys Module, py\_compile, Packages.

### Module 4:

Errors and Exceptions: Introduction to Errors and Exceptions, Handling Exceptions, Multiple Exceptions, Raising Exceptions, Exceptions Chaining, Built-In Exceptions, User- Defined Exceptions, Clean-Up Actions.

### Module 5:

Introduction to Data Analytics with Python: Introduction to Data Analysis, Dataset and Data Anatysis, Arrays in Python, Introduction to NumPy, Pandas, Data Visualization Using Pandas and Matplotlib, Scikit-Learn and Data Analysis.

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### **Course Outcome:**

- 1. Apply Collection modules for the data types.
- 2. Implement Object Oriented concepts in programming.
- 3. Develop Module(s) and Package(s) in python.
- 4. Apply exception handling and user defined exception(s).
- 5. Make use of Pandas and Numpy Libraries.

### List of Text / Reference Books:

- 1. Python Programming (Pearson), S. Sridhar, J. Indumathi, V.M. Hariharan.
- 2. Martin C. Brown (Author), "Python: The Complete Reference" McGraw Hill Education, Fourth edition, 2018
- 3. R. Nageswara Rao, "Core Python Programming" Dreamtech Press India Pvt Ltd 2018.
- 4. Michael H Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.
- 5. Dainel Y.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019.

### List of Experiment:

- 1. Generate prime numbers in the range 0-20 using list comprehension.
- 2. Write a recursive program to find the Greatest Common Divisor of the two integer numbers.
- 3. Write a program to read, add, display and subtract two matrices suing OOP
- 4. Write a program to calculate area, perimeter and height of the triangle using the concept of classes and objects
- 5. Create a module that holds the functions for finding the number of different ways the various combinations of words can be given with a single word.
- 6. Construct a python script that finds the lam for the input numbers through the command line arguments.
- 7. Write a python program to demonstrate raising exceptions for a ZeroDivisionError
- 8. Write a python script for handling FileNotFoundError Exceptions.
- 9. Write a python program to implement Pandas Series with labels.
- 10. Using Numpy, find the five-point summary of the following list of numbers. A=[10 40 60 100 120 140]

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

SBC-CL01 (P) Web Development Technology	0L:0T:2P (2 hrs.)	Credits:01
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### Prerequisite:

**Course Objective:** 

- 1. Capable of applying and implementing concepts of HTML in the web page.
- 2. Apply concepts of CSS to provide effective presentation to the HTML pages.

### **Course Contents:**

### Module 1:

The basics of Internet, Web Client vs Web Servers, World Wide Web, FTP, HTTP vs HTTPS, Introduction to HTML, History, HTML Tags and Attributes, HTML Tag vs Element, HTML: Basic Tags, Lists, Images, Hyperlink, Table, Introduction and Advantages of HTML 5, HTML5 Web Forms, HTML5 Media (Video & Audio)

### Module 2:

Introduction to Cascading Style Sheets, Creating Style Sheet, CSS Selectors, Introduction to CSS3: Border and box effects, Background Images, 2D & 3D Transformation, Transition and animation, Multi Column Layout, Introduction to CSS library framework.

### Module 3:

CSS2-Introduction: Benefits of CSS, CSS Versions History, CSS Syntax, External Style Sheet using, Multiple Style Sheets, Value Lengths and Percentages. Linking to a CSS, Creating an Internal Style Sheet, ID and Class CSS-Syntax: CSS Syntax, single Style Sheets Multiple Style Sheets, Value Lengths and Percentages.

### Module 4:

CSS-Selectors: ID Selectors, Class Selectors, Grouping Selectors, Universal Selector, Descendant / Child Selectors, Attribute Selectors, CSS – Pseudo Classes, CSS Background and Text Properties: Image, Color, CSS Cursor, Inline Styling, Linking external style sheet: Box model, CSS Tables.

### Module 5:

Introduction to Bootstrap : What is Bootstrap Framework, History of Bootstrap, Advantages of Bootstrap Framework, What is Responsive web page, How to remove Responsiveness, Major Features of Bootstrap, What is Mobile-First Strategy, Setting up Environment, How to apply Bootstrap to Applications.

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### **Course Outcome:**

- 1. Create the HTML documents using syntax of HTML.
- 2. Construct and design HTML pages.
- 3. Understand the concept of CSS.
- 4. Learn about different Selectors through CSS.
- 5. learn about Bootstrap Introduction, how to design web page look and feel good by using Bootstrap and the basics of Bootstrap Framework using which you can create web projects.

### List of Experiments:

- 1. Create Web Page with HTML 5 & CSS 3.
- 2. Study anchor tag (<a> tag/Hyperlink) with other page and same page. Write an HTML page for Image Formatting. Use image as a Hyperlink.
- 3. Create HTML page with list and also some of nested list.
- 4. Create HTML page to study <form> tag and all form input tags.
- 5. Create Simple HTML page with a DIV and Span tag. Also understand the difference between div and span.
- 6. Write a CSS using inline CSS, Embedded CSS, External CSS.
- 7. Study the concept of selectors (HTML tag selector, Class selector and ID selector).
- 8. Implement CSS 2.0 with all types with Background, Display, Font, Position, Text, Floating, Table, List properties.
- 9. Implement Box model using properties like Border, Margin, Padding, Height, and Width.
- 10. How to apply Bootstrap to Application.

### List of Text / Reference Books:

- 1. HTML & CSS: The Complete Reference, Fifth Edition by Thomas Powell.
- 2. Beginning HTML5 and CSS3: The Web Evolved.
- CSS Pocket Reference, 5th Edition by Eric Meyer Released April 2018 Publisher(s): O'Reilly Media, Inc. ISBN: 9781492033394.
- 4. Unraveling Bootstrap 3.3, Istvan Novak.

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

MLC 02 Constitution of India 1L:0T:0P (1 hrs.) Cre	edits:Audit
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### 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:

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:

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

### Module 3:

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:

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

### **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.

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