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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

Sr. No.	Course Type	Course Code	Course Title	Scheme			Credits
				L	T	P	
1	PCC	CB12	Web Technology	2	1	–	3
2	PCC	CB13	Theory of Computation	2	1	–	3
3	PCC	CB14	Block Chain Technology	2	1	–	3
4	HSMC	HS06	Humanities and Social Sciences Open	2	–	–	2
5	PEC	CB01	Professional Elective–I	3	–	–	3
6	IOC	--	Interdisciplinary Open Course-I	3	–	–	3
7	LC	CB13(P)	Theory of Computation Lab	–	–	2	1
8	PROJ	CB02	Minor Project	–	–	4	2
9	PROJ	CB03	Evaluation of Internship-I	–	–	4	2
10	LLC	LLC03	Liberal Learning Course –III	–	–	2	1
11	MLC	MLC04	Intellectual Property Rights	1	–	–	0
12	PROJ	–	Internship-II	Credit to be added in Seventh Semester.			
Total Academic Engagement and Credits				15	3	12	**23**
				30			

Professional Elective–I	Humanities and Social Sciences Open Courses–II	Interdisciplinary Open Course-I
(A)Distributed Operating System	(A) Industrial Safety Psychology	(MA-01) (A) Scientific Aptitude
(B)Data Analytics in IoT and Blockchain	(B) Project Management	(B)Robotics
(C)Adhoc & Wireless Sensor Network	(C) Business Communication	(C)Operation Research
(D)Information Storage Management		(D)Industrial Electronics

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Bachelor of Technology (B.Tech.)

[Computer Science & Engineering (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

PCC-CB-12	Web Technology	2L: 1T: 0P (3hrs.)	3 Credits

Pre-requisite: Nil.

Course Objective: The students will be able to Analyze a webpage and identify its elements and attributes. Create web pages using XHTML and Cascading Style Sheets.

Course Contents:(40hrs.)

Module1: **(04hrs.)**

Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0 Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, display resolution, Look and Feel of the Web site, Page Layout and linking, User centric design, Site map, Planning and publishing website, Designing effective navigation.

Module2: **(08hrs.)**

HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5.

Module3: **(14hrs.)**

Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3 JavaScript : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Java script and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and vali- dations, HTML : Combining HTML, CSS and JavaScript, Events and buttons.

Module4: **(04hrs.)**

XML : Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT PHP: Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP.

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 & Engineering (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

Module5: **(10hrs.)**

PHP and MySQL: Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs, Introduction of Bootstrap and j Query.

Course Outcome: Students should be able to:

1. Describe the concepts of WWW including browser and HTTP protocol.
2. List the various HTML tags and use them to develop the user-friendly web pages.
3. Define the CSS with its types and use them to provide the styles to the web pages at various levels.
4. Develop the modern web pages using the XML, HTML, CSS along with php as Per need of applications.
5. Use server-side scripting with PHP to generate the web pages dynamically using the database connectivity.

List of Text/Reference Books:

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India.
2. Web Technologies, Black Book, dream tech Press.
3. HTML 5, Black Book, dream tech Press.
4. Web Design, Joel Sklar, Cengage Learning.
5. Developing Web Applications in PHP and AJAX, Harwani, McGraw Hill.
6. Internet and World Wide Web How to program, P.J. Deitel H.M. Deitel, Pearson.

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

PCC-CB-13	Theory of Computation	2L:1T:0P (3hrs.)	3 Credits

Prerequisite: Discrete structure.

Course Objective: The main objective of this course is to understand fundamental of Theory of Computation.

Course Contents:(40hrs.)

Module 1: **(08hrs.)**

Introduction of Automata Theory: Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and mealy machines, composite machine, Conversion from Mealy to Moore and vice versa.

Module 2: **(08hrs.)**

Types of Finite Automata: Non-Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Meaning of union, intersection, concatenation and closure, 2-wayDFA.

Module 3: **(08hrs.)**

Grammas: Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, ambiguity in grammar, simplification of context free grammar, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, killing null and unit productions. Chomsky normal form and Greibach normal form.

Module 4: **(08hrs.)**

Pushdown Automata: example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA, Petrinet model.

Module 5: **(08hrs.)**

Turing Machine: Techniques for construction. Universal Turing machine Multi tap, multi head and multidimensional Turing machine, N-P complete problems. Decidability and Recursively Enumerable Languages, decidability, decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem.

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Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.)

[Computer Science & Engineering (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

Course Outcomes

1. Explain the basic concepts of switching and finite automata theory & languages.
2. Relate practical problems to languages, automata, computability and complexity.
3. Construct abstract models of computing, check their power to recognize the languages and analyze the grammar, its types, simplification and normal form.
4. Interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.
5. Develop an overview of how automata theory, languages and computation are applicable in engineering application.

List of Text/Reference Books:

1. DanielI. A. Cohen, "Introduction to Computer Theory", Wiley India, 2nd Edition, 2003.
2. John E Hopcroft, Jeffrey D. Ullman and Rajeev Motwani, "Introduction to Automata Theory, Languages and Computation", Pearson Education, 2nd Edition, 2001.
3. K.L.P Mishra &N. Chandra sekaran, "Theory of Computer Science", PHI Learning, 3rdEdition, 2006.
4. Peter Linz, "Introduction to Automata Theory and Formal Languages", Narosa Publishing. 3rd Edition, 2007.
5. John C Martin, "Introduction to languages and the theory of computation", TATA McGraw Hill, 3rd Edition 2013.
6. Harry R. Lewis and Christos H. Papadimitriou, "Elements of the Theory of Computation", Pearson Education Asia, 2nd edition, 1998.
7. Dexter C. Kozen, "Automata and Computability", Undergraduate Texts in Computer Science, Springer, 1st edition,2012.
8. Michael Sipser, "Introduction to the Theory of Computation", PWS Publishing., 3rd edition,2012.

IPS Academy, Institute of Engineering & Science

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

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Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.)

[Computer Science & Engineering (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

PCC-CB-14	Block Chain Technology	2L:1T:0P (3hrs.)	3 Credits

Prerequisite: understanding of computer science.

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:(40hrs.)

Module 1: **(08hrs.)**

Introduction and crypto foundation: Elliptic curve cryptography, ECDSA, Cryptographic hash function, SHA-256, Merkle trees, Cryptocurrencies.

Module 2: **(10hrs.)**

Bitcoin, Bitcoin addresses, Bitcoin blockchain, block header, mining proof of work (PoW) algorithm, difficulty adjustment algorithm, mining pools, transactions, double spending attack, The 51% attacker, block format, transaction format, Smart contacts (escrow, micropayments, decentralized lotteries), payment channels.

Module 3: **(10hrs.)**

Ethereum: Overview of differences between Ethereum and bitcoin, block format, mining algorithm, proof-of-stake (PoS) algorithm, account management, contracts and transactions, Solidity language, decentralized application using Ethereum.

Module 4: **(04hrs.)**

Smart Contracts Different Blockchains and Consensus mechanisms.

Module 5: **(08hrs.)**

Blockchain and Security R3, CORDA and Hyperledger System architecture, ledger format, chain code, transaction flow and ordering, private channels, membership service providers, case studies.

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

Course Outcomes:

1. Understand blockchain architecture and requisite crypto foundation.
2. Understand various consensus protocol and their usage for their specific application.
3. Understand and Resolve security concern in blockchain.
4. Explore blockchain advances and upcoming platforms.
5. Learn to write smart contracts.

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.

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

PEC-CB-01(A)	Distributed Operating Systems	3L:0T:0P (3hrs.)	3 Credits

Prerequisite: Understanding of operating systems concept is essential.

Course Objective:

1. To provide hardware and software issues in modern distributed systems.
2. To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
3. To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
4. Methods of understanding clock synchronization protocols.

Course Contents:(40hrs.)

Module1: **(06hrs.)**

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. **System Models**: Introduction, Architectural Models, Fundamental Models.

Module2: **(11hrs.)**

Review of Network Operating System and Distributed Operating System, Issue in the design of Distributed Operating System, Overview of Computer Networks. Inter process communication, Linux, IPC Mechanism, Remote Procedure calls, RPC exception handling, Security issues, RPC in Heterogeneous Environment (case study Linux RPC).

Module3: **(11hrs.)**

Clock Synchronization, Logical clocks, Physical clocks, clock synchronization algorithms, Mutual Exclusion, Election Algorithms, Dead locks in Distributed Systems. Thrashing, Heterogeneous DSM, Resource Management (Load Balancing approach, Load Sharing approach), Process Management: process Migration, Thread. Module.

Module 4: **(06hrs.)**

Overview of shared memory, consistency model, Page based Distributed Shared Memory, Shared – variable Distributed Memory, Object -based Distributed Memory.

Module5: **(06hrs.)**

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

File models, File access, File sharing, file-caching, File Replication, fault Tolerance, Network File System, (Case study, 8NFS on Linux Directory Services, Security in Distributed File system).

Course Outcomes:

After the completion of this course, the students will be able to:

1. To provide hardware and software issues in modern distributed systems.
2. To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
3. To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
4. To know about Shared Memory Techniques.
5. Have Sufficient knowledge about file access.

List of Text/Reference Books:

1. M. Beck et al," Linux Kernel Programming",3rd edition, 2002.
2. B.W. Kernighan and R Pide, "The Unix Programming Environment ", Prentice Hall of India-2000.
3. Distributed Systems, Concepts and Design, George Coulouris, J Dollimore and Tim Kindberg, Pearson Education, Edition. 2009
4. Silberschatz, P. B. Garvin, Gagne," Operating System Concepts", 2009.
5. Andrew S. Tanenbaum & Maarten van Steen, Distributed Systems: Principles and Paradigms, Prentice Hall(2002) ISBN0-13-088893-1
6. D. L. Galli, Distributed Operating Systems, Prentice-Hall(2000) ISBN0-13-079843-6.
7. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Prentice Hall International.
8. Distributed Operating Systems and Algorithms, Randy Chow, T. Johnson, Addison Wesley.
9. Distributed Systems Concepts and Design, G. Coulouris, J. Dollimore, Addison Wesley.

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

PEC-CB-01(B)	Data Analytics in IoT and Blockchain	3L:0T:0P (3hrs.)	3 Credits

Prerequisite: Programming in Python with basic SQL and Excel proficiency.

Course Objective:

1. Optimize resource use in blockchain with IoT data analysis.
2. Ensure IoT device and blockchain transaction security via analytics.
3. Predict IoT device behavior for scalable blockchain networks.
4. Communicate IoT data insights visually within blockchains.
5. Prepare IoT data for blockchain integration using cleansing methods.

Course Contents:(40hrs.)

Module 1: (06hrs.)

DESCRIPTIVE STATISTICS: Probability Distributions, Inferential Statistics, Inferential Statistics through hypothesis tests Regression &ANOVA , Regression ANOVA(Analysis of Variance).

Module 2: (11hrs.)

INTRODUCTION TO BIG DATA: Big Data and its Importance, Four V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications. BIG DATA TECHNOLOGIES: Hadoop's Parallel World, Data discovery, Open-source technology for Big Data Analytics, cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics, Information Management.

Module 3: (11hrs.)

PROCESSING BIG DATA: Integrating disparate data stores, Mapping data to the programming framework, Connecting and extracting data from storage, Transforming data for processing, subdividing data in preparation for Hadoop Map Reduce.

Module 4: (06hrs.)

HADOOP MAPREDUCE: Employing Hadoop Map Reduce, Creating the components of Hadoop Map Reduce jobs, Distributing data processing across server farms, Executing Hadoop Map Reduce jobs, monitoring the progress of job flows, The Building Blocks of Hadoop Map Reduce

Distinguishing Hadoop daemons, Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

Module 5: **(06hrs.)**

BIG DATA TOOLS AND TECHNIQUES: Installing and Running Pig, Comparison with Databases, Pig Latin, User- Define Functions, Data Processing Operators, Installing and Running Hive, Hive QL, Querying Data, User-Defined Functions, Oracle Big Data.

Course Outcomes:

1. Gain expertise in analyzing IoT data for informed decisions in blockchain.
2. Apply advanced analytics to ensure IoT and blockchain security.
3. Optimize IoT device performance in blockchain networks using predictive analytics.
4. Visualize IoT data for strategic decision-making in blockchains.
5. Prepare and integrate IoT data seamlessly into blockchain platforms.

List of Text/Reference Books:

1. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
2. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
3. Rajaraman, A., Ullman, J. D., Mining of Massive Datasets, Cambridge University Press, United Kingdom, 2012.
4. Berman, J.J., Principles of Big Data: Preparing, Sharing and Analyzing Complex Information, Morgan Kaufmann, 2014.
5. Barlow, M., Real-Time Big Data Analytics: Emerging Architecture, O Reilly, 2013.
6. Schonberger, V.M. , Kenneth Cukier, K., Big Data, John Murray Publishers, 2013.

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

PEC-CB-01(C)	**Adhoc and Wireless Sensor Networks**	**3L:0T:0P (3hrs.)**	**3 Credits**

Pre-requisite: Computer Networking and Protocol Basics.

Course Objective: The objective of this course is to learn Adhoc network and Sensor Network fundamentals and have an in-depth knowledge on sensor network architecture and design issues.

Course Contents: (40hrs.)

Module 1: (09hrs.)

ADHOC NETWORKS INTRODUCTION AND ROUTING PROTOCOLS: Elements of Adhoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols - Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV).

Module2: (08hrs.)

SENSOR NETWORK INTRODUCTION & ARCHITECTURES: Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture - Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

Module3: (09hrs.)

WSN NETWORKING CONCEPTS AND PROTOCOLS: MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Contention based protocols - PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

Module4: **(08hrs.)**

SENSOR NETWORK SECURITY: Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.

Module5: **(06hrs.)**

SENSOR NETWORK PLATFORMS AND TOOLS 9 Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

Course Outcome:

1. Describe the basics of Adhoc networks and Wireless Sensor Networks.
2. Apply this knowledge to identify the suitable routing algorithm based on the network and user requirements.
3. Apply the knowledge to identify appropriate physical and MAC layer protocols.
4. Understand the transport layer and security issues possible in Ad hoc and sensor networks.
5. Familiar with the OS used in Wireless Sensor Networks and build basic modules.

List of Text/ Reference Books:

1. C. Siva Ram Murthy and B. S. Manoj, ―AdHoc Wireless Networks Architectures and Protocols, Prentice Hall, PTR, 2004.
2. Holger Karl, Andrea Willig, Protocol and Architecture for Wireless Sensor Networks, John wiley publication, Jan 2006.
3. Feng Zhao, Leonidas Guibas,―Wireless Sensor Networks: an information processing approach, Elsevier publication, 2004.
4. Charles E.Perkins ,―AdHoc Networking, Addison Wesley, 2000.
5. I. F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci,―Wireless sensor networks: a survey, computer networks, Elsevier, 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 & Engineering (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

PEC-CB-01(D)	**Information Storage and Management**	**3L:0T:0P (3hrs.)**	**3 Credits**

Pre-requisite: Basic understanding of Computer Architecture, Operating Systems.

Course Objective: To introduce solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.

Course Contents:(40hrs.)

Module1:` **(08hrs.)**

Introduction to Storage Technology: Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

Module2: **(08 hrs.)**

Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrate d vs Modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Module3: **(08 hrs.)**

Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison. Applications, Elements, connectivity, standards, management, security and limitations of DAS, NAS,CAS &SAN.

Module4: **(08hrs.)**

Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data center concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

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 & Engineering (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

Module5: **(08 hrs.)**

Information storage on cloud: Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

Course Outcomes:

After the completion of this course, the students will be able to:

1. To Understand the Concept of Information Storage and Data centre Environment.
2. To understand about Data Protection.
3. To understand Fiber Channel SAN.
4. To describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
5. To understand Cloud Computing.

List of Text/Reference Books:

1. G. Somasundaram & Alok Shrivastava (EMC Education Services) editors, “Information Storage and Management: Storing, Managing, and Protecting Digital Information”, Wiley India, 2009.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein, “Storage Network explained: Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE”, Wiley India.
3. John W. Ritting house and James F. Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, Taylor Frances Pub.1st Edition, 2017.
4. Nick Antonopoulos, Lee Gillam, “Cloud Computing: Principles, System & Application”, Springer.
5. Anthony T. Velete, To by J.Velk,and Robert Eltenpeter, “Cloud Computing: A practical Approach”, McGraw-Hill Education (India) Pvt Limited, 2009.
6. Dr. Kumar Saurabh, “Cloud Computing: Insight into New Era I”, Wiley India Pvt. Limited, 2011.

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

LC-CB-13	Theory of Computation Lab	0L:0T:2P (2hrs.)	1 Credit

Prerequisite: Discrete structure.

Course Objective: The main objective of this course is to understand fundamental of Theory of Computation.

Module 1: **(04hrs.)**

Introduction of Automata Theory: Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and mealy machines, composite machine, Conversion from Mealy to Moore and vice versa.

Module 2: **(04hrs.)**

Types of Finite Automata: Non-Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Meaning of union, intersection, concatenation and closure, 2-way DFA.

Module 3: **(04hrs.)**

Grammas: Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, ambiguity in grammar, simplification of context free grammar, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, killing null and unit productions. Chomsky normal form and Greibach normal form.

Module 4: **(04hrs.)**

Pushdown Automata: example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA, Petrinet model.

Module 5: **(06hrs.)**

Turing Machine: Techniques for construction. Universal Turing machine Multi tap, multi head and multidimensional Turing machine, N-P complete problems. Decidability and Recursively Enumerable Languages, decidability, decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem.

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 (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

Course Outcomes

1. Explain the basic concepts of switching and finite automata theory & languages.
2. Relate practical problems to languages, automata, computability and complexity.
3. Construct abstract models of computing, check their power to recognize the languages and analyze the grammar, its types, simplification and normal form.
4. Interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.
5. Develop an overview of how automata theory, languages and computation are applicable in engineering application.

List of Text/Reference Books:

1. Daniel I. A. Cohen, "Introduction to Computer Theory", Wiley India, 2nd Edition, 2003.
2. John E Hopcroft, Jeffrey D. Ullman and Rajeev Motwani, "Introduction to Automata Theory, Languages and Computation", Pearson Education, 2nd Edition, 2001.
3. K.L.P Mishra & N. Chandra sekaran, "Theory of Computer Science", PHI Learning, 3rd Edition, 2006.
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List of Experiments:

Design a Program for:

1. Creating machine that accepts three consecutive one.
2. Creating machine that accepts the string always sending with 101.
3. Mode 3 Machine.
4. Accepting decimal number divisible by 2.
5. Creating a machine which accepts string having equal no. of 1's and 0's.

6. Creating a machine which countnumberof1's and0'sinagiven string.
7. Find 2's complement of a given binary number.
8. Increment the given binary number by 1.
9. Convert NDFA to DFA.
10. PDA machine that accepts the well-formed parenthesis.
11. PDA to accept WCWR where w is any string and WR is reverse of that string and C is a Special symbol.
12. Turing machine that's accepts the following language an bn cn where n>0.

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Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.)

[Computer Science & Engineering (IOT and Cyber Security Including Block Chain Technology)] (CSITCS)

VI-Semester

PROJ-CB-02	Minor Project	0L:0T:4P (4hrs.)	2 Credit

Pre-requisite: Knowledge of subjects of respective stream.

Course Objective: To develop ability in the students to apply some of the theoretical concepts and programming knowledge, in real life engineering problems.

Course outcome:

1. Acquire practical knowledge within the chosen area of technology for project development.
2. Identify, analyze and handle programming projects with a comprehensive and systematic approach.
3. Contribute as an individual or in a team in development of technical projects.
4. Develop effective communication skills for presentation of project related activities.
5. Formulate and propose a plan for creating a solution for the problems identified.
6. Report and present the finding of the study conducted in the preferred domain.

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VI-Semester

PROJ-CB-03	Evaluation of Internship-I	0L:0T:4P (4hrs.)	2 Credits

Prerequisite: Nil

Course Objective:

The primary purpose of doing an academic internship is to better understand the theories, ideas, and practices of discipline or major by actively engaging in a "hands-on," work-based, learning experience.

Course Outcome:

1. To explore career alternatives prior to graduation.
2. To Develop communication, interpersonal and other critical skills in the job interview process.
3. To Assess interests and abilities in their field of study.
4. To Identify, write down, and carry out performance objectives related to their job assignment
5. To Integrate theory and practice.