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]

VIII Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work / Lab Work & Sessional		L	T	P	
1.	**PEC-CSIT801**	PEC	**Elective-V**	70	20	10	–	–	**100**	3	–	–	**3**
2.	**PEC-CSIT802**	PEC	**Elective-VI**	70	20	10	60	40	**200**	3	–	2	**4**
3.	**OEC-CSIT801**	OEC	**Open Elective-IV**	70	20	10	–	–	**100**	3	–	–	**3**
4.	**PROJ-CSIT801**	PROJ	**Project-III**	–	–	–	120	80	**200**	–	–	12	**6**
5.	**PROJ-CSIT802**	PROJ	**Seminar-II**	–	–	–	–	50	**50**	–	–	2	**1**
		Total		**210**	**60**	**30**	**180**	**170**	**650**	**9**	**–**	**16**	**17**

Electives-V	**Electives-VI**	**Open Electives-IV**
PEC-CSIT801(A) Data Mining & Warehousing	PEC-CSIT802(A) Big Data & Hadoop	OEC-CSIT801(A) Wireless & Mobile Computing
PEC-CSIT801(B) Bio Informatics	PEC-CSIT802(B) Cloud Computing	OEC-CSIT801(B) Electrical & Hybrid Vehicle
PEC-CSIT801(C) Digital Image Processing	PEC-CSIT802(C) Quantum Computing	OEC-CSIT801(C) Disaster Preparedness & Planning
PEC-CSIT801(D) Block Chain Technology	PEC-CSIT802(D) Data Visualization	OEC-CSIT801(D) Process Modeling & Simulation

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

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VIII-Semester

PEC-CSIT801 (A)	Data Mining and Warehousing	3L : 0T : 0P (3 hrs.)	3 credits

Prerequisite: Computer Organization & Architecture

Course Objective:

Student should understand the value of Historical data and data mining in solving real-world problems.

Course Contents: (40 hrs.)

Module 1: **(10 hrs.)**

Data Warehousing: Introduction, Deliver y Process, Data warehouse Architecture, Data Preprocessing: Data cleaning, Data Integration and transformation, Data reduction. Data warehouse Design: Data warehouse schema, Partitioning strategy Data Warehouse Implementation, Data M a r t s , M e t a D a t a , Example o f a Multidimensional D a t a m o d e l . Introduction to Pattern Warehousing.

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

OLAP Systems: Basic concepts, OLAP queries, Types of OLAP servers, OLAP operations etc. Data Warehouse Hardware and Operational Design: Security, Backup and Recovery,

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

Introduction to Data& Data Mining: D a t a Types, Quality of data, Data Preprocessing, Similarity measures, Summarystatistics, Data distributions, Basic data mining tasks, Data Mining V/s knowledge discovery in databases. Issues in Data mining. Introduction to Fuzzy sets and fuzzy logic.

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

Supervised L e a r n i n g : Classification: Statistical-based algorithms, Distance-based algorithms, Decision tree-based algorithms, Neural network-based algorithms, Rule-based algorithms, Probabilistic Classifiers

Module 5: **(04 hrs.)**

Clustering & Association Rule mining: Hierarchical algorithms, Partitional algorithms, Clustering large databases – BIRCH, DBSCAN, CURE algorithms. Association rules: Parallel and distributed algorithms such as Apriori and FP growth algorithms.

Course Outcomes:

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

1. Understand the need of designing Enterprise data warehouses and will be enabled to approach business problems analytically by identifying opportunities to derive business.
2. Compare and contrast, various methods for storing & retrieving data from different data sources/repository.
3. Ascertain the application of data mining in various areas and Preprocess the given data and visualize it for a given application or data exploration/mining task
4. Apply supervised learning methods to given data sets such as classification and its various types.
5. Apply Unsupervised learning methods to given data sets such as clustering and its various types. Also apply Association Rule Mining to various domains.

List of Text / Reference Books:

1. Pang – ningTan , Steinbach & Kumar, "Introduction to Data Mining", Pearson Edu, 2019.
2. Jaiwei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers.
3. Margaret H. Dunham, "Data Mining: Introductory and Advanced topics", Pearson Edu. 2009.
4. Anahory & Murray, "Data Warehousing in the Real World", Pearson Edu.,2009.

List of Experiments:

(All Experiments Performed on WEKA Tool)

1. Create an Employee Table with the help of Data Mining Tool WEKA.
2. Create a Weather Table with the help of Data Mining Tool WEKA.
3. Apply Pre-Processing techniques to the training data set of Weather Table
4. Apply Pre-Processing techniques to the training data set of Employee Table
5. Normalize Weather Table data using Knowledge Flow.
6. Normalize Employee Table data using Knowledge Flow.
7. Finding Association Rules for Buying data.
8. Finding Association Rules for Banking data.
9. Finding Association Rules for Employee data.
10. To Construct Decision Tree for Weather data and classify it.

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VIII-Semester

PEC-CSIT801 (B)	Bio Informatics	3L : 0T : 0P (3 hrs.)	3 credits

Prerequisite: NA

Course Objective:

The course has been designed to be an entry level in Bioinformatics. It is introductory in nature and will provide an overview of the concepts and practices in Bioinformatics.

Course Contents: (40 hrs.)

Module 1: **(06 hrs.)**

Introduction: Introduction to bioinformatics, objectives of bioinformatics, Basic chemistry of nucleic acids, structure of DNA & RNA, Genes, structure of bacterial chromosome, cloning methodology, Data maintenance and Integrity Tasks.

Module 2: **(12 hrs.)**

Bioinformatics Databases & Image Processing**:** Types of databases, Nucleotide sequence databases, Protein sequence databases, Protein structure databases, Normalization, Data cleaning and transformation, Protein folding, protein function, protein purification and characterization, Introduction to Java clients, CORBA, Using MYSQL, Feature Extraction.

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

Sequence Alignment and database searching: Introduction to sequence analysis, Models for sequence analysis, Methods of optimal alignment, Tools for sequence alignment, Dynamics Programming, Heuristic Methods, Multiple sequences Alignment

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

Gene Finding and Expression: Cracking the Genome, Biological decoder ring, finding genes through mathematics & learning, Genes prediction tools, Gene Mapping, Application of Mapping, Modes of Gene Expression data, mining the Gene Expression Data

Module5: **(08 hrs.)**

Proteomics & Problem solving in Bioinformatics: Proteome analysis, tools for proteome analysis Genetic networks, Network properties and analysis, complete pathway simulation: E-cell, Genomic analysis for DNA & Protein sequences, Strategies and options for similarity search, flowcharts for protein structure prediction

Course Outcomes:

After Completing the course student should be able to:

1. To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis.
2. Describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics.
3. Explain about the methods to characterize and manage the different types of Biological data.
4. Classify different types of Biological Databases.
5. Introduction to the basics of sequence alignment and analysis.

List of Text / Reference Books:

1. Gopal & Jones, BIOINFORMATICS with fundamentals of Genomics & Proteomics, TMH Pub
2. Rastogi , Bioinformatics –Concepts , skills & Applications , CBS Pub
3. Claverie , Bioinformatics , Wiley pub
4. Stekel , Micrarray BioInformatics , Cambridge

List of Experiments:

1. To find information in online databases.
2. To retrieve the sequence of the Human keratin protein from UniProt database and to interpret the results.
3. To retrieve the sequence of the Human keratin protein from Genbank database and to interpret the results.
4. To find the similarity between sequences using BLAST.
5. To find the similarity between sequences using FASTA
6. To align more than two sequences and find out the similarity between those sequences using Cluster W

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VIII-Semester

PEC-CSIT801 (A)	**Digital Image Processing**	**3L : 0T : 0P (3 hrs.)**	**3 credits**

Prerequisite: Computer Graphics, Laplas Transform, Fourier Transform

Course Objective:

Describe and explain basic principles of digital image processing. Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).

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

Digital Image fundamentals, a simple image model, Sampling and Quantization. Relationship between pixels, Imaging geometry, Image acquisition systems, Different types of digital images

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

Image transformations, Introduction to Fourier transforms, Discrete Fourier transforms, Fast Fourier transform, Walsh transformation, Hadmord transformation, Discrete Cosine transformation

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

Image enhancement, Filters in spatial and frequency domains, Histogram based processing. Image subtraction, Averaging, Image smoothing, Nedion filtering, Low pass filtering, Image sharpening by High pass filtering.

Module 4: **(10 hrs.)**

Image encoding and segmentation, Encoding: Mapping, Quantizer, Coder, Error free compression, Lossy Compression schemes. JPEG Compression standard, Detection of discontinuation by point detection, Line detection, edge detection, Edge linking and boundary detection, Local analysis, Global processing via Hough transforms and graph theoretic techniques

Module 5: **(10 hrs.)**

Mathematical morphology- Binary, Dilation, crosses, Opening and closing, simple methods of representation, Signatures, Boundary segments, Skeleton of a region, Polynomial approximation

Course Outcomes:

1. State the Image representation and modeling.
2. Describe the various Fourier transformation techniques.
3. Identify the various Image enhancements and filter techniques.
4. Recognize the Image encoding and segmentation techniques
5. Illustrate the various morphology operations.

List of Text / Reference Books:

1. Rafael C Gonzalez, Richard E Woods 3rd Edition, Digital Image Processing Pearson.
2. Rafael C Gonzalez, Richard E Woods 3rd Edition, Digital Image Processing using Matlab – TMH.
3. Sonka, Digital Image Processing & Computer Vision, Cengage Learning

4 Jayaraman, Digital Image Processing, TMH.

5. Pratt, Digital Image Processing, Wiley India

List of Experiments:

1. To create a program to display grayscale image using read and write operation.
2. To obtain histogram equalization image.
3. To Implement smoothing or averaging filter in spatial domain.
4. Program for opening and closing of the image.
5. To fill the region of interest for the image.
6. Program for edge detection algorithm.
7. Program of sharpen image using gradient mask.
8. Program for morphological operation: erosion and dilation
9. Program for DCT/IDCT computation.
10. To create a program for segmentation of an image using watershed transforms.

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VIII-Semester

PEC-CSIT801 (D)	**Block Chain Technology**	**3L : 0T : 0P (3 hrs.)**	**3 credits**

Prerequisite: NA

Course Objectives:

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

Course Contents: (40 hrs.)

Module 1: **(06 hrs.)**

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

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

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: **(08 hrs.)**

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

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

Smart Contracts Different Blockchains and Consensus mechanisms.

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

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

Course Outcomes:

After Completing the course student should be able to:

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.

6.Understand use cases.

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.

List of Experiments:

1. To Create a first block in blockchain.
2. To encrypt a block using Sha 256 Encryption Algorithm.
3. To Mine a Block in Blockchain.
4. To authenticate a mined block using consensus algorithm.
5. To implement proof of work.
6. To secure a block using encryption.
7. To create a simple cryptocurrency.
8. To write a smart contract in solidity.

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VIII-Semester

PEC-CSIT802 (A)	Big Data & Hadoop	3L : 0T : 2P (5 hrs.)	4 credits

Prerequisite: Basic of Statistics

Course Objectives:

Understand the various parts of Hadoop condition, for instance, Hadoop2.7, Impala, Yarn, Map Reduce, Pig, Hive, HBase, Sqoop, Flume, and Apache Spark. Learn Hadoop Distributed File System (HDFS) and YARN building, and make sense of how to function with them for limit and resource organization.

Course Contents: (40 hrs.)

Module 1: **(06 hrs.)**

Introduction to BigData Platform, Traits of Big data, Challenges of Conventional Systems, Web Data, Evolution of Analytic Scalability, Analysis vs Reporting, Statistical Concepts: Sampling Distributions, Re-Sampling, Statistical Inference, Prediction Error.

Module 2: **(05 hrs.)**

Need of Hadoop, Data centers and Hadoop Cluster overview, Overview of Hadoop Daemons, Hadoop Cluster and Racks, Learning Linux required for Hadoop, Hadoop ecosystem tools overview, Big data Hadoop Opportunities.

Module 3: **(12 hrs.)**

HDFS Daemons – Namenode, Datanode, Secondary Namenode, Hadoop FS and Processing Environment's UIs, Fault Tolerant, High Availability, Block Replication, Hadoop Processing Framework: YARN Daemons – Resource Manager, NodeManager, Job assignment & Execution flow, MapReduce Architecture, MapReduce life cycle, Word Count Example(or) Election Vote Count.

Module 4: **(09 hrs.)**

Introducing Hadoop Hive, Detailed architecture of Hive, Comparing Hive with Pig and RDBMS, working with Hive Query Language, Creation of a database, table, group by and other clauses, Various types of Hive tables, HCatalog, Storing the Hive Results, Hive partitioning, and Bucket

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

Introduction to Hadoop Framework: Spark and Scala, Apache Pig: Advantage of Pig over Map Reduce, Pig vs Hive Use case, Introduction to HBASE, Fundamentals of HBase, SQL vs. NOSQL, Application of Sqoop, Flume, Oozie

Course Outcomes:

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

1. Explain the statistics of Big Data
2. Identify Hadoop Eco System
3. Understand HDFS and Map reduce algorithm
4. Articulate innovative insights of Hive
5. Identify and utilize various Hadoop tools

List of Text / Reference Books:

1. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to data Science and its Applications”, Wiley publications
2. RadhaShankarmani, M. Vijaylakshmi, " Big Data Analytics", Wiley, Secondedition
3. Seema Acharya, SubhashiniChellappan, " Big Data and Analytics", Wiley, Firstedition

List of Experiments:

1. Installation of Single Node and Cluster in Hadoop
2. Write a Word Count program in MapReduce and Yarn?
3. Database CURD operation in Hive.
4. Hands-on with Visual Data Analysis tools

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VIII-Semester

PEC-CSIT802 (B)	**Cloud Computing**	**3L : 0T : 2P (5 hrs.)**	**4 credits**

Prerequisite: NA

Course Objective:

The objective of this course is to provide students with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications.

Course Contents: (40 hrs.)

Module 1: **(10 hrs.)**

Introduction of Grid and Cloud computing, characteristics, components, business and IT perspective, cloud services requirements, cloud models, Security in public model, public verses private clouds, Cloud computing platforms: Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing.

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

Cloud services- SAAS, PAAS, IAAS, cloud design and implementation using SOA, conceptual cloud model, cloud stack, computing on demand, Information life cycle management, cloud analytics, information security, virtual desktop infrastructure, storage cloud.

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

Virtualization technology: Definition, benefits, sensor virtualization, HVM, study of hypervisor, logical partitioning- LPAR, Storage virtualization, SAN, NAS, cloud server virtualization, virtualized data center.

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

Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud, Cloud computing security architecture: Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access Control-Identity management, Access control, Autonomic Security, Cloud computing security challenges: Virtualization security management-

virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.

Module 5: (06 hrs.)

SOA and cloud, SOA and IAAS, cloud infrastructure benchmarks, OLAP, business intelligence, e-Business, ISV, Cloud performance monitoring commands, issues in cloud computing. QOS issues in cloud, mobile cloud computing, Inter cloud issues, Sky computing, Cloud Computing Platform, Xen Cloud Platform, Eucalyptus, Open Nebula, Nimbus, TPlatform, nApache Virtual Computing Lab (VCL), Anomaly Elastic Computing Platform.

Course Outcomes:

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

1. Explain the core concepts of the cloud computing paradigm
2. Demonstrate knowledge of virtualization
3. Explain the core issues of cloud computing such as security, privacy, and interoperability.
4. Choose the appropriate technologies, algorithms, and approaches for the related issues.
5. Identify problems, and explain, analyze, and evaluate various cloud computing solutions.

List of Text / Reference Books:

1. Dr.Kumar Saurabh, “Cloud Computing”, Wiley India.
2. Ronald Krutz and Russell Dean Vines, “Cloud Security”, Wiley-India.
3. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, “Computing for Dummies”, Wiley India Edition.
4. Anthony T.Velte Toby J.Velte, “Cloud Computing – A Practical Approach”, TMH.
5. Barrie Sosinsky, ‘Cloud Computing Bible”, Wiley India.

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VIII-Semester

PEC-CSIT802 (C)	Quantum Computing	3L : 0T : 2P (5 hrs.)	4 credits

Prerequisite: NA

Course Objective:

The objective of this course is to provide the students an introduction to quantum computation. Much of the background material related to the algebra of complex vector spaces and quantum mechanics is covered within the course.

Course Contents: (44 hrs.)

Module 1: **(06 hrs.)**

Introduction to quantum mechanics: Postulates of quantum mechanics, Quit and quantum states, Vector Spaces, Single Qubit Gates, multiple Qubit Gates, Controlled Gates, Composite Gates, Matrices and operators.

Module 2: **(14 hrs.)**

Density operators: Density Operator for a Pure State, Density Operator for a Mixed State,Properties of a Density Operator, Characterizing Mixed States, Completely Mixed States, Partial Trace and Reduced Density Operator.

Quantum measurement theory: Distinguishing Quantum States and Measurement, Projective Measurements, Measurements on Composite Systems, Generalized Measurements, Positive Operator Valued Measures.

Module 3: **(12 hrs.)**

Entanglement: Quantum state entanglement, Bell's Theorem, The Pauli Representation, Using Bell States For Density Operator Representation, Quantum gates and circuits: Single Qubit Gates, The Z Y Decomposition, Basic Quantum Circuit Diagrams, Controlled Gates, Application of Entanglement in teleportation and supper dense coding., Distributed quantum communication Quantum Computer: Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance**.**

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

Quantum Algorithm: Hadamard Gates, The Phase Gate, Matrix Representation of Serial and Parallel Operations, Quantum Interference, Quantum Parallelism and Function Evaluation, Deutsch-Jozsa Algorithm, Quantum Fourier Transform, Phase Estimation, Shor's Algorithm, Quantum Searching and Grover's Algorithm.

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

Quantum Error Correction: Introduction, Shor code, Theory of Quantum Error Correction, Constructing Quantum Codes, Stabilizer codes, Fault Tolerant Quantum Computation, Entropy and information –Shannon Entropy, Basic properties of Entropy,Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.

Course Outcomes:

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

1. Analyze the behavior of basic quantum algorithms Implement simple quantum algorithms
2. Information channels in the quantum circuit model.
3. Simulate a simple quantum error-correcting code.
4. Prove basic facts about quantum information channels.

List of Text / Reference Books:

1. Quantum Computing Explained: David McMahon, Wiley Interscience (IEEE Computer Science
2. Quantum Computing without Magic Devices: Zdzislaw Meglicki; HI
3. Quantum Computation and Quantum Information: M.A. Nielsen & Isaac L .huang, Cambridge University Press .
4. Quantum Computing and communications: An Engineering Approach: Sandor Imre and FerencBalazs, Wiley.

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VIII-Semester

PEC-CSIT802 (D)	Data Visualization	3L : 0T : 2P (5 hrs.)	4 credits

Prerequisite: Computer Graphics and Multimedia

Course Objective:

To understand the various types of data, apply and evaluate the principles of data visualization. Acquire skills to apply visualization techniques to a problem and its associated dataset.

Module 1: **(06 hrs.)**

Introduction to Data Visualization: Overview of data visualization - Data Abstraction -Analysis: Four Levels for Validation- Task Abstraction - Analysis: Four Levels for Validation.

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

Visualization Techniques: Scalar and point techniques Color Maps Contouring Height Plots - Vector visualization techniques Vector Properties Vector Glyphs Vector Color Coding Stream Objects.

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

Visual Analytics: Visual Variables- Networks and Trees - Map Color and Other Channels- Manipulate View, Arrange Tables Geo Spatial Data Reduce Items and Attributes.

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

Visualization Tools and Techniques: Introduction to data visualization tools- Tableau - Visualization using R.

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

Diverse Types of Visual Analysis: Time- Series data visualization Text data visualization Multivariate data visualization and case studies. Dashboard creation using visualization tools for the use cases: Finance-marketing- insurance healthcare etc.,

Course Outcomes:

1. Identify the different data types, visualization types to bring out the insight. Relate the visualization towards the problem based on the dataset.
2. Identify the different attributes and showcasing them in plots. Identify and create various visualizations for geospatial and table data.
3. Ability to visualize categorical, quantitative and text data. Illustrate the integration of visualization tools with hadoop.
4. Ability to visualize categorical, quantitative and text data.

List of Text / Reference Books:

1. Tamara Munzer, Visualization Analysis and Design -, CRC Press 2014
2. AlexandruTelea, Data Visualization Principles and Practice CRC Press 2014.
3. Paul J. Deitel, Harvey Deitel, Java SE8 for Programmers (Deitel Developer Series) 3rd Edition, 2014.
4. Y. Daniel Liang, Introduction to Java programming-comprehensive version-Tenth Edition,Pearson ltd 2015.
5. Paul Deitel Harvey Deitel ,Java, How to Program, Prentice Hall; 9th edition , 2011.
6. Cay Horstmann BIG JAVA, 4th edition,John Wiley Sons,2009
7. Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.

List of Experiments:

1. Acquiring and plotting data
2. Statistical Analysis such as Multivariate Analysis, PCA, LDA, Correlation, regression and analysis of variance.
3. Time-series analysis stock market
4. Visualization on Streaming dataset
5. Dashboard Creation
6. Text visualization

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VIII-Semester

OEC-CSIT801 (A)	**Wireless & Mobile Computing**	**3L : 0T : 0P (3 hrs.)**	**3 credits**

Prerequisite: Computer Networking.

Course Objectives:

To provide an overview of Wireless Communication networks are and its applications**,** understand various traditional Routing & Transport protocol used in wireless communication.

Module 1: **(10 hrs.)**

Review of traditional networks: Review of LAN, MAN, WAN, Intranet, Internet, and interconnectivity devices: bridges, Routers etc. Review of TCP/IP Protocol Architecture: ARP/RARP, IP addressing, IP Datagram format and its Delivery, Routing table format, ICMP Messages, Subnetting, Supernetting and CIDR, DNS. NAT: Private addressing and NAT, SNAT, DNAT, NAT and firewalls, VLANS: Concepts, Comparison with Real LANS, Type of VLAN, Tagging, IPV6: address structure, address space and header.

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

Study of traditional routing and transport: Routing Protocols: BGP- Concept of hidden network and autonomous system, An Exterior gateway protocol, Different messages of BGP. Interior Gateway protocol: RIP, OSPF. Multiplexing and ports, TCP: Segment format, So ckets, Synchronization, Three Way Hand Shaking, Variable window size and Flow control, Timeout and Retransmission algorithms, Connection Control, Silly window Syndrome. Example of TCP: Taho, Reno, Sack etc. UDP: Message Encapsulation, Format and Pseudo header.

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

Wireless LAN: Transmission Medium For WLANs, MAC problems, Hidden and Exposed terminals, Near and Far terminals, Infrastructure and Ad hoc Networks, IEEE 802.11- System arch, Protocol arch, Physical layer, Concept of spread spectrum, MAC and its management, Power management, Security. Mobile IP: unsuitability of Traditional IP; Goals, Terminology, Agent advertisement and discovery, Registration, Tunneling techniques.

Ad hoc network routing: Ad hoc Network routing v/s Traditional IP routing, types of routing protocols, Examples: OADV, DSDV, DSR, ZRP etc.

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

Mobile transport layer: unsuitability of Traditional TCP; I-TCP, S-TCP, M-TCP. Wireless Cellular networks: Cellular system, Cellular networks v/s WLAN, GSM – Services, system architecture, Localization and calling, handover and Roaming.

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

Mobile Device Operating Systems: Special Constraints & Requirements, Commercial Mobile Operating Systems. Software Development Kit: iOS, Android etc. MCommerce : Structure , Pros &Cons, Mobile Payment System, Security Issues.

Course Outcomes:

1. Design and create traditional networks
2. Understand the different issues in MAC and routing issues in multi hop wireless and ad-hoc networks and existing solutions for the same.
3. Evaluate the transport layer issues in wireless networks due to error's and mobility of nodes and understand existing solutions for the same.
4. Explain the architecture of GSM.
5. Discuss the services, emerging issues and future trends in M-Commerce.

List of Text / Reference Books:

1. Comer, "Internetworking with TCP/ IP Vol-I", 5th edition, Addison Wesley, 2006.
2. Jochen Schiller "Mobile communication", 2nd edition, Pearson education, 2008
3. W. Richard Stevens, "TCP/IP Illustrated Vol-I", Addison-Wesley.
4. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education.
5. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer