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Semester VIII (SCHEME A)

S.No.	Course Type	Course Code	Course Title	Hrs./ Week			Credits
				L	T	P	
1	PEC	CS04	Professional Elective Course-IV	3	-	-	3
2	PEC	CS05	Professional Elective Course-V	3	-	-	3
3	SBC	CS04(P)	Data Analytics using Tableau/PowerBi	-	-	4	2
4	PROJ	CS07(A)	Project III	-	-	16	8
						Total Credits	16

Semester VIII (SCHEME B)

S.No.	Course Type	Course Code	Course Title	Hrs./ Week			Credits
				L	T	P	
1	PEC	CS04	Professional Elective-IV	3	-	-	3
2	PEC	CS05	Professional Elective-V	3	-	-	3
3	SBC	CS04(P)	Data Analytics using Tableau/PowerBi	-	-	4	2
4	PROJ	CS07(B)	Project /Internship (Industry/Corporate/Academia)	-	-	16	8
						Total Credits	16

Note:

- **In Eighth Semester, students may opt for 'SCHEME A' or 'SCHEME B'**

ProfessionalElective Course (PEC)–IV, CS04 (Any One Course)	ProfessionalElective Course (PEC)–V, CS05 (Any One Course)
(A)DataMining&Warehousing	(A) Big Data & Hadoop
(B)Deep and Reinforcement Learning	(B) Agile Software Development
(C)DigitalImageProcessing	(C) Computational Intelligence
(D) QuantumComputing	(D) Data Visualization

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PEC CS 04(A)	**Data Mining and Warehousing**	**3L: 0T: 0P (3 hrs.)**	**3 credits**

Course Objectives: 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, Delivery 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 Marts, Meta Data, Example of a Multidimensional Data model. 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.)**

ntroduction to Data & Data Mining: Data Types, Quality of data, Data Preprocessing, Similarity measures, Summary statistics, Data distributions, Basic data mining tasks, Data Mining V/s knowledge discovery in databases. Issues in Data mining. Introduction to Fuzzy set sand fuzzy logic.

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

Supervised Learning: Classification: Statistical-based algorithms, Distance-based algorithms, Decision tree-based algorithms, neural network-based algorithms, Rule-based algorithms, and Probabilistic Classifiers

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

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

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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. As certain 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. Pennington, Steinbach &Kumar, “Introduction to Datamining”, Pearson Edu,2019.
2. Jaiwei Han, Micheline Kamber, “Datamining: Concepts and Techniques”, Morgan Kaufmann Publishers.
3. Margaret H. Dunham, “Datamining: Introductory and Advanced topics”, PearsonEdu.2009.
4. Anahory& Murray, “Data Warehousing i n t h e Real-world”, Pearson Edu. 2009.

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PEC- CS 04(B)	Deep and Reinforcement Learning	3L: 0T: 0P (3 hrs.)	3 credits

Course Objectives:

1. To introduce the foundational concepts and mathematical principles behind deep learning models and architectures.
2. To equip students with practical skills to design, train, and evaluate neural networks using modern deep learning frameworks such as TensorFlow or PyTorch.
3. To explore advanced deep learning architectures including CNNs, RNNs, and transformers for solving complex tasks in computer vision and natural language processing.
4. To explain the core concepts of reinforcement learning, including agent-environment interaction, reward systems, and policy optimization.
5. To enable students to implement and apply deep reinforcement learning algorithms to real-world problems involving sequential decision-making and control.

Course Contents: (40 hrs.)

Module 1: **(8hrs.)**

History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Activation functions, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalue Decomposition. Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention overimages.

Module 2: **(8hrs.)**

Autoencoders and relation to PCA, Regularization in autoencoders, Denoisingautoencoders, Sparse autoencoders, Contractive autoencoders, Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Batch Normalization, Instance Normalization, Group Normalization.

Module 3: **(6hrs.)**

Greedy Layer wise Pre-training, Better activation functions, Better weight initialization methods, Learning Vectorial Representations Of Words, Convolution Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolution Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Recent Trends in Deep Learning Architectures.

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Module 4: **(8hrs.)**

Introduction to reinforcement learning (RL), Bandit algorithms – UCB, PAC, Median Elimination, Policy Gradient, Full RL & MDPs, Bellman Optimality, Dynamic Programming - Value iteration, Policy iteration, and Q-learning & Temporal Difference Methods, Temporal-Difference Learning, Eligibility Traces, Function Approximation, Least Squares Methods

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

Fitted Q, Deep Q-Learning, Advanced Q-learning algorithms, learning policies by imitating optimal controllers, DQN & Policy Gradient, Policy Gradient Algorithms for Full RL, Hierarchical RL, POMDPs, Actor-Critic Method, Inverse reinforcement learning, Maximum Entropy Deep Inverse Reinforcement Learning, Generative Adversarial Imitation Learning, Recent Trends in RL Architectures.

Course Outcomes:

1. Understand and explain the fundamental concepts of deep learning, including neural networks, activation functions, optimization techniques, and loss functions.
2. Design and implement deep learning models using frameworks like TensorFlow or PyTorch for tasks such as classification, object detection, and sequence modeling.
3. Analyze and optimize neural network architectures, including convolution neural networks (CNNs) and recurrent neural networks (RNNs), for real-world data.
4. Explain the principles of reinforcement learning, including Markov Decision Processes (MDPs), policy/value iteration, and Q-learning.
5. Develop and apply reinforcement learning algorithms (such as DQN and policy gradient methods) to solve control and decision-making problems.

List of Text / Reference Books:

1. Deep Learning, An MIT Press book, Ian Goodfellow and YoshuaBengio and Aaron Courville
2. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.
3. Reinforcement Learning: An Introduction, Sutton and Barto, 2nd Edition.
4. Reinforcement Learning: State-of-the-Art, Marco Wiering and Martijn van Otterlo, Eds.

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PEC CS 04(C)	**Digital Image Processing**	**3L: 0T: 0P (3 hrs.)**	**3 credits**

Course Objectives:

1. Describe and explain basic principles of digital image processing.
2. Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
3. Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
4. Assess the performance of image processing algorithms and systems.

Course Contents: (40 hrs.)

Module 1: **(6hrs.)**

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: **(8hrs.)**

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

Module 3: **(8hrs.)**

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: **(10hrs.)**

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

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Module 5: **(8hrs.)**

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, CengageLearning
4. Jayaraman, Digital Image Processing, TMH.
5. Pratt, Digital Image Processing, Wiley India

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PEC CS 04(D)	Quantum Computing	3L: 0T: 0P (3 hrs.)	3 credits

Course Objectives:

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: (40 hrs.)

Module 1: (6hrs.)

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

Module 2: (8hrs.)

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: (10hrs.)

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.

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Module 4: **(6hrs.)**

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: **(8hrs.)**

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, on Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.

Course Outcomes:

1. Understand the fundamental principles of quantum mechanics relevant to computing.
2. Differentiate between classical and quantum computation models.
3. Apply quantum logic gates and circuits to simple computational problems.
4. Analyze basic quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's algorithm.
5. Evaluate the potential and limitations of quantum computing in real-world applications.

List of Text / Reference Books:

1. Quantum Computing Explained: David McMahon, Wiley Interscience (IEEE Computer Science).
2. Quantum Computing without Magic Devices: ZdzislawMeglicki; PHI.
3. Quantum Computation and Quantum Information: M.A. Nielsen & Isaac L. Chuang, Cambridge University Press.
4. Quantum Computing and communications: An Engineering Approach: Sandor Imre and Ferenc Balazs, Wiley.

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PEC CS05(A)	Big Data and Hadoop	3L: 0T: 0P (3 hrs.)	3 credits

Course Objectives:

1. Provide an understanding of Big Data concepts, challenges, and tools.
2. Introduce Hadoop ecosystem and its core components like HDFS and MapReduce.
3. Enable students to develop solutions using Hadoop for real-time big data problems.
4. Familiarize with tools like Hive, Pig, and HBase for big data analytics.
5. Expose students to the practical use cases of big data in various industries.

Course Contents: (40 hrs.)

Module 1: **(8hrs.)**

Introduces Big Data concepts, its characteristics (5 Vs), challenges, and how it differs from traditional systems, along with real-world applications in industries like healthcare and finance.

Module 2: **(8hrs.)**

Covers Hadoop architecture, including HDFS for distributed storage, YARN for resource management, and the overall functioning of a Hadoop cluster with fault tolerance.

Module 3: **(8hrs.)**

Focuses on MapReduce programming, explaining the map and reduce phases, and teaching how to write basic MapReduce jobs with performance tuning.

Module 4: **(8hrs.)**

Explores Hadoop ecosystem tools like Pig (data flow scripting), Hive (SQL-like querying), HBase (NoSQL storage), and introduces Sqoop and Flume for data integration.

Module 5: **(8hrs.)**

Discusses Big Data applications through case studies, an introduction to Spark, ethical issues, and includes a mini-project to apply the learned concepts.

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Course Outcomes:

1. Define Big Data and describe its characteristics, challenges, and applications.
2. Understand and explain Hadoop architecture including HDFS and MapReduce.
3. Develop MapReduce programs for parallel processing of large data sets.
4. Use Hadoop ecosystem tools like Hive, Pig, and HBase for data analytics.
5. Analyze case studies and real-world applications using Big Data technologies.

List of Text / Reference Books:

1. Tom White, Hadoop: The Definitive Guide, 4th Edition, O'Reilly Media.
2. Vignesh Prajapati, Big Data Analytics with R and Hadoop, Packt Publishing.
3. Chuck Lam, Hadoop in Action, Manning Publications.
4. Arshdeep Bahga, Vijay Madisetti, Big Data Science & Analytics: A Hands-On Approach, Universities Press.
5. Alex Holmes, Hadoop in Practice, Manning Publications.
6. Michael Minelli, Michele Chambers, Big Data, Big Analytics, Wiley.

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PEC CS05(B)	**Agile Software Development**	**3L: 0T: 0P (3 hrs.)**	**3 credits**

Course Objective:

To learn best practices and methods of software development

Course Contents: (40 hrs.)

Module 1: **(8hrs.)**

Fundamentals of Agile Process: Introduction and background, Agile Manifesto and Principles, Stakeholders and Challenges, Overview of Agile Development Models: Scrum, Extreme Programming, Feature Driven Development, Crystal, Kanban, and Lean Software Development.

Module 2: **(8hrs.)**

Agile Projects: Planning for Agile Teams: Scrum Teams, XP Teams, General Agile Teams, Team Distribution; Agile Project Lifecycles: Typical Agile Project Lifecycles, Phase Activities, Product Vision, Release Planning: Creating the Product Backlog, User Stories, Prioritizing and Estimating, Creating the Release Plan; Monitoring and Adapting: Managing Risks and Issues, Retrospectives.

Module 3: **(8hrs.)**

Introduction to Scrum: Agile Scrum Framework, Scrum Artifacts, Meetings, Activities and Roles, Scrum Team Simulation, Scrum Planning Principles, Product and Release Planning, Sprinting: Planning, Execution, Review and Retrospective; User story definition and Characteristics, Acceptance tests and Verifying stories, Burn down chart, Daily scrum, Scrum Case Study.

Module 4: **(8hrs.)**

Introduction to Extreme Programming (XP): XP Lifecycle, The XP Team, XP Concepts: Refactoring, Technical Debt, Timeboxing, Stories, Velocity; Adopting XP: Pre-requisites, Challenges; Applying XP: Thinking- Pair Programming, Collaborating, Release, Planning, Development; XP Case Study.

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Module 5: **(8hrs.)**

Agile Software Design and Development: Agile design practices, Role of design Principles, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control; Agility and Quality Assurance: Agile Interaction Design, Agile approach to Quality Assurance, Test Driven Development, Pair programming: Issues and Challenges.

Course Outcomes:

1. Describe the fundamental principles and practices associated with each ofthe agile development methods.
2. Compare agile software development model with traditional development models and identify the benefits and pitfalls.
3. Use techniques and skills to establish and mentor Agile Teams for effective software development.
4. Apply core values and principles of Agile Methods in software development.
5. Evaluate project performance and process improvement through Agile metrics and feedback cycles.

List of Text / Reference Books:

1. Robert C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013.
2. Kenneth S. Rubin, Essential Scrum: A Practical Guide to the Most PopularAgile Process, Addison Wesley, 2012.
3. James Shore and Shane Warden, The Art of Agile Development, O'Reilly Media, 2007.
4. Craig Larman, ―Agile and Iterative Development: A manager's Guide, Addison-Wesley, 2004.
5. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson, 2001.
6. Cohn, Mike, Agile Estimating and Planning, Pearson Education, 2006.
7. Cohn, Mike, User Stories Applied: For Agile Software Development Addison Wisley, 2004.

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PEC- CS05(C)	Computational Intelligence	3L: 0T: 0P (3 hrs.)	3 credits

Course Objectives:

1. Understand the fundamentals of neural networks, fuzzy logic, and evolutionary algorithms.
2. Learn the theoretical foundations of intelligent learning and adaptation.
3. Explore soft computing models for handling uncertainty and approximation.
4. Analyze and compare various CI techniques.
5. Apply CI methods to solve complex real-world problems.

Course Contents: (40 hrs.)

Module 1: **(8hrs.)**

Introduction to Computational Intelligence: types of Computational Intelligence, components of Computational Intelligence. Concept of Learning/Training model. Parametric Models, Nonparametric Models. Multilayer Networks: Feed Forward network, Feedback network.

Module 2: **(8hrs.)**

Fuzzy Systems: Fuzzy set theory: Fuzzy sets and operations, Membership Functions, Concept of Fuzzy relations and their composition, Concept of Fuzzy Measures; Fuzzy Logic: Fuzzy Rules, Inferencing; Fuzzy Control - Selection of Membership Functions, Fuzzyfication, Rule Based Design & Inferencing, Defuzzyfication.

Module 3: **(8hrs.)**

Genetic Algorithms: Basic Genetics, Concepts, Working Principle, Creation of Offsprings, Encoding, Fitness Function, Selection Functions, Genetic Operators-Reproduction, Crossover, Mutation; Genetic Modeling, Benefits.

Module 4: **(8hrs.)**

Rough Set Theory - Introduction, Fundamental Concepts, Set approximation, Rough membership, Attributes, Optimization. Hidden Markov Models, Decision tree model.

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Module 5: **(8hrs.)**

Introduction to Swarm Intelligence, Swarm Intelligence Techniques: Ant Colony Optimization, Particle Swarm Optimization, Bee Colony Optimization etc. Applications of Computational Intelligence.

Course Outcomes:

1. Understand the core concepts and theoretical foundations of computational intelligence techniques such as neural networks, fuzzy logic, and evolutionary computation.
2. Analyze the behavior and learning capabilities of various neural network architectures including perceptrons, multi-layer networks, and self-organizing maps.
3. Understand the principles of fuzzy set theory and fuzzy inference systems for reasoning under uncertainty and imprecision.
4. Evaluate the mechanisms and performance of nature-inspired optimization techniques such as Genetic Algorithms and Swarm Intelligence.
5. Compare and assess the suitability of different computational intelligence techniques for solving complex real-world problems across diverse domains.

List of Text / Reference Books:

1. Russell C. Eberhart and Yuhui Shi, Computational Intelligence: Concepts to Implementations, Morgan Kaufmann Publishers.
2. Andries P. Engelbrecht, Computational Intelligence: An Introduction, Wiley Publishing.
3. Simon Haykin, Neural Networks: A Comprehensive Foundation, Prentice Hall.
4. David E. Goldberg, Genetic Algorithm in Search Optimization and Machine Learning, Pearson Education.
5. Jagdish Chand Bansal, Pramod Kumar Singh, Nikhil R. Pal, Evolutionary and Swarm Intelligence Algorithms, Springer Publishing, 2019.
6. S. Rajeskaran, G.A. VijaylakshmiPai, “Neural Networks, Fuzzy Logic, GeneticAlgorithms Synthesis and Applications”.
7. J.S. Roger Jang, C.T.Sun, E. Mizutani, “Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning & Machine Intelligence”, PHI, 2002

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PEC- CS05(D)	Data Visualization	3L: 0T: 0P (3 hrs.)	3 credits

Course Objectives:

1. To understand the various types of data, apply and evaluate the principles of data visualization.
2. Acquire skills to apply visualization techniques to a problem and its associated dataset.
3. To apply structured approach to create effective visualizations thereby building visualization dashboard to support decision making

Course Contents: (40 hrs.)

Module 1: **(8hrs.)**

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

Module 2: **(8hrs.)**

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: **(8hrs.)**

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: **(8hrs.)**

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

Module 5: **(8hrs.)**

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.

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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.
5. Develop dashboards and storytelling visualizations to derive insights and support decision-making in real-world applications.

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) 3 rd 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.

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SBC-CS04(P)	**Data Analytics using Tableau/PowerBi**	**0L: 0T: 4P (4 hrs.)**	**2 credits**

Course Objectives:

1. Master the fundamentals of PowerBI/Tableau for data analytics, from setup to connecting various data sources and preparing data for analysis.
2. Develop proficiency in creating insightful visualizations and interactive dashboards using advanced techniques and analytical tools in PowerBI/Tableau.

Module 1: **(5 hours)**

Overview of Data Analytics and Visualization Tools, Installation and Setup of PowerBI / Tableau Getting Started with the Interface, Connecting PowerBI/Tableau to Various Data Sources (CSV, Excel, SQL, etc.), Importing and Preparing Data for Analysis.

Module2: **(5 hours)**

Data Cleaning and Transformation in PowerBI/Tableau: Techniques for Cleaning and Preparing Data, Data Transformation Functions and Tools, Creating Calculated Fields and Columns: Introduction to Calculated Fields and Columns, Using Formulas and Functions for Data Transformation.

Module 3: **(5 hours)**

Creating Basic Visualizations: Overview of Basic Visualization Types (Bar Chart, Line Chart, Pie Chart, etc.), Building Simple Visualizations in PowerBI/Tableau, Using Filters and Slicers: Applying Filters and Slicers to Visualizations, Enhancing Interactivity of Reports.

Module 4: (5 hours)

Creating Advanced Visualizations: Advanced Visualization Techniques (Heat Maps, Tree Maps, Scatter Plots, etc.), Customizing Visualizations for Better Insights, Building Dashboards: Introduction to Dashboards, Combining Multiple Visualizations into a Dashboard.

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Module 5: **(5 hours)**

Performing Data Analysis: Using Analytical Tools and Functions in PowerBI/Tableau, Conducting Descriptive and Inferential Analysis, Exporting and Publishing Reports, Sharing Reports with Stakeholders.

Course Outcomes:

1. Able to Set up and connect data in PowerBI/Tableau for effective analysis.
2. Student can Clean and transform data in PowerBI/Tableau for meaningful insights.
3. Able to create basic visualizations with filters and slicers for interactive datarepresentation.
4. Customize advanced visualizations and integrate them into dashboards for thoroughdata exploration.
5. Use analytical tools in PowerBI/Tableau for descriptive and inferential analysis,enabling insightful reporting.

List of Experiments:

1. Install PowerBI/Tableau and explore the interface.
2. Connect to different data sources and import data into PowerBI/Tableau.
3. Perform data cleaning and transformation on a sample dataset.
4. Create calculated fields and columns in PowerBI/Tableau.
5. Create basic visualizations for a given dataset.
6. Apply filters and slicers to visualizations in PowerBI/Tableau.
7. Create advanced visualizations in PowerBI/Tableau.
8. Build a dashboard with multiple visualizations in PowerBI/Tableau.
9. Perform data analysis on a given dataset using PowerBI/Tableau.
10. Publish and share a report created in PowerBI/Tableau.

List of Text / Reference Books:

1. Milligan, J. N. (2022). Learning Tableau 2022: Create effective data visualizations, build interactive visual analytics, and transform your organization. Packt Publishing.
2. Powell, B. (2021). Mastering Microsoft Power BI: Expert techniques for effective data analytics and business intelligence. Packt Publishing.
3. Monsey, M., & Sochan, P. (2015). Tableau for Dummies. Wiley.
4. Hyman, J. A. (2022). Power BI for Dummies. Wiley.
5. Nussbaumer Knaflic, C. (2015). Storytelling with Data: A data visualization guide for business professionals. Wiley.

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Semester VIII (CSE & CSE-RL)

PROJ-CS07(A)	**Project-III**	**0L: 0T: 16P (16hrs.)**	**8 credits**

Course Objectives:

To carry out a medium/large scale project to develop hands-on experience of working in a project. During the course, the student will also develop knowledge of application development platforms and tools (Java /C# dotnet / Visual C++/PHP /Python or any platform of current trend). The students will learn working as a team and basic collaboration and project management skills. The student will also learn about formulating project documentations.

1. Project ideas and proposal guidance (4 hours)

2. Application development (10 hours)

1. Visual programming (object oriented)
    1. Language basics
    2. Frameworks and APIs
2. Programming basics and design patterns

3. Project management, team work and collaboration (6 hours)

1. Project management techniques
2. Collaborative development environment

4. Project guidance & Project work (20 hours)

5. Project documentation guidance (3 hours)

Course Outcomes:

1. Understanding the problem identification process and design a proposal for particular problem handling.
2. Design a solution model using any programming language.
3. Learn about different types of project management techniques.
4. Develop a complete project with deployment.
5. Learn about team work and documentation process.

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PROJ-CS07(B)	**Internship and Project (Industry/Corporate/Academia)**	**0L: 0T: 16P (16hrs.)**	**8 credits**

Course Outcomes:

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