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VIII Semester

VIII Semester (Scheme-A)

Sr. No.	Course Type	Course Code	Course Title	Scheme			Credits
				L	T	P	
1	PEC	IO04	Professional Elective -IV	3	–	–	3
2	PEC	IO05	Professional Elective-V	3	–	–	3
3	SBC	IO03(P)	Data Analytics (Tableau/PowerBi)	–	–	4	2
4	PROJ	IO06(A)	Project-III	–	–	16	8
						Total Credits	16

VIII Semester (Scheme-B)

Sr. No.	Course Type	Course Code	Course Title	Scheme			Credits
				L	T	P	
1	PEC	IO04	Professional Elective -IV	3	–	–	3
2	PEC	IO05	Professional Elective-V	3	–	–	3
3	SBC	IO03(P)	Data Analytics (Tableau/PowerBi)	–	–	4	2
4	PROJ	IO06(B)	Internship and Project (Industry/Corporate/Academia)	–	–	16	8
						Total Credits	16

Note: In Eighth Semester, students may opt for 'Scheme A' or 'Scheme B'

Professional Elective Course (PEC)–IV, IO04 (Any One Course)	Professional Elective Course (PEC)–V, IO05 (Any One Course)
(A)Data Mining &Warehousing	(A) Wireless & Mobile Computing
(B) Quantum Computing	(B) Agile Software Development
(C) Natural Language Processing	(C) Data Visualization
(D) Relational Data Base Management	(D) Process Modeling & Simulation

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PEC-IO04(A)	Data Mining and Warehousing	3L:0T:0P (3hrs.)	3 Credits

Pre-requisite: Computer Organization & Architecture

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

Module 1: (06hrs.)
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: (08hrs.)
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: (10hrs.)
Introduction 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: (10hrs.)
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: (06hrs.)
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

Course Outcome: 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-IO04(B)	**Quantum Computing**	**3L:0T:0P (3hrs.)**	**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.

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.)

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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: Zdzislaw Meglicki; 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-IO04(C)	Natural Language Processing	3L:0T:0P (3hrs.)	3 Credits

Prerequisite: Engineering Mathematics, Theory of Computation

Course Objective: To gain the knowledge for developing advanced technology of computer systems like speech recognition and machine translation.

Module 1: (07 hrs.)
Introduction to Natural Language Understanding- Levels of language analysis-Syntax, Semantics, Pragmatics, Applications, Ambiguity, Morphology, Parsing with Finite State Transducers, Regular Expressions, Stemmer, Spelling errors.

Module 2: (10 hrs.)
Computational Phonology: speech sound, phonetic transcription, text to speech, Pronunciation Variations, Bayesian Method to spelling and pronunciations, Minimum Edit Distance, Weighted Automata, N-grams.

Module 3: (08 hrs.)
HMM and speech recognition, Viterbi algorithm, Acoustic processing of speech, Feature Extraction, Speech Synthesis; Part-of-Speech Tagging: rule based, stochastic, transformation based.

Module 4: (08 hrs.)
Syntax Processing: Parsing with CFG, CKY parsing and the Earley parser, Probabilistic parsing; Semantic Processing: Meaning representation, First Order Predicate Calculus. Lexical Semantics: Internal structure of words, thematic roles, Primitive decomposition, WordNet.

Module 5: (08 hrs.)

Word sense disambiguation; Information Retrieval: Vector space model, Improving user queries; Pragmatic Processing: Discourse; Natural Language Generation, Machine Translation.

Course Outcome:
1. To tag a given text with basic Language features
2. To design an innovative application using NLP components
3. To implement a rule based system to tackle morphology/syntax of a language
4. To design a tag set to be used for statistical processing for real-time applications

5. To compare and contrast the use of different statistical approaches for different types of NLP applications

List of Text Books / Reference Books:

1. D. Jurafsky and J.H. Martin, "Speech and Language Processing; Processing", Prentice Hall, 2000.
2. C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press.
3. James Allen ."Natural Language Understanding", Addison Wesley,1994.
4. Richard M Reese, "Natural Language Processing with Javall", OReilly Media,2015.
5. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford
University Press, 2008

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PEC-IO-04(D)	Relational Database Management	3L:0T:0P (3hrs.)	3 Credits

Prerequisite: Basic of Database and Security.

Course Objective: Gain a good understanding of the architecture and functioning of Database Management Systems and use of relational model and PL/SQL commands.

Module 1: (08 Hrs)
Introduction to DBMS, Data and Information, Database Management System Objectives, Advantages, Components, Architecture. ER Model: Building blocks of ER Diagram – Relationship, Degree, Classification, ER diagram to Tables, ISA relationship, Constraints, Aggregation and Composition Advantages.

Module 2: (10 Hrs)
Relational Model: CODD"s Rule, Relational Data Model: Key, Integrity , Relational Algebra Operations , Advantages and limitations ,Relational Calculus, Domain Relational Calculus , QBE. Structure of Relational Database. Introduction to Relational Database Design, Objectives, Tools, Redundancy and Data Anomaly, Functional Dependency, Normalization:1NF, 2NF , 3NF, BCNF. Transaction Processing – Database Security.

Module 3: (10 Hrs)
SQL: Commands, Data types, DDL, Selection, Projection, Join, DML: Modification, Truncation, Constraints, Sub query. Functions: aggregate functions, Built-in functions, numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. Transaction control commands – Commit, Rollback, Save point.

Module 4: (04Hrs)
PL/SQL: Structure , Elements ,Operators Precedence ,Control Structure, Iterative Control, Cursors, Procedure , Function , Packages , Exceptional Handling, Triggers.

Module 5: (08Hrs)
Transaction processing: Introduction to Transaction Processing Concepts: Transaction and System concepts, Desirable properties of Transactions, characterizing Schedules based on recoverability and Serializability. Relational Model concepts: Relational Model concepts, Relational Model constraints and Relational Database Schemas.

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Course Outcome:

1. Understanding about Database Management System and ER Model.
2. Describe basic concepts of Relational Model and Normalization.
3. Describe SQL Commands, join, rollback and save point.
4. Understanding about PL/SQL and Exceptional Handling.
5. Define concept of transaction processing and relational model.

List of Text / Reference Books:

1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw Hill 2019, 7th Edition.

2. Alexis Leon & Mathews Leon, "Fundamentals of DBMS", Vijay Nicole Publications 2014, 2nd Edition.

3. S. Sumathi, S. Esakkirajan, "Fundamentals of Relational Database Management System", Springer International Edition 2007.

4. Peter Rob, Carlos Coronel, "Database Systems: Design, Implementation and Management", Cengage Learning.

5. Ramez Elmsari, Shamkant B Navathe, "Fundamentals of Database Systems", Pearson Education, 7th Edition.

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PEC-IO05 (A)	Wireless & Mobile Computing	3L:0T:0P (3hrs.)	3 Credits

Prerequisite: Computer Networking.

Course Objective: 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, Super netting 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, Sockets, Synchronization, Three Way Hand Shaking, Variable window size and Flow control, Time out 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, IEEE802.11-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.

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Module 5: (06 hrs.)

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

Course Outcome:

1. Design and create traditional networks.
2. Understand the different issues in MAC and routing issues in multi hop wireless and adhoc 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, "Internet working with TCP/IP Vol-I",5 th edition, Addison Wesley,2006.
2. Jochen Schiller "Mobile communication",2 nd 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, MartinS.Nicklons and Thomas Stober,"Principles of Mobile Computing", Springer.

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PEC-IO05 (B)	Agile Software Development	3L:0T:0P (3hrs.)	3 Credits

Prerequisite: NA

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.

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-IO05 (C)	**Data Visualization**	**3L:0T:0P (3hrs.)**	**3 Credits**

Prerequisite: Computer Graphics and Multimedia Course

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 Multi variate data visualization and case studies. Dash board create

Course Outcome:
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 show casing the min plots.
3. Identify and create various visualizations for geospatial and table data.
4. Ability to visualize categorical, quantitative and text data.
5. Illustrate the integration of visualization tools with Hadoop. Ability to visualize categorical, quantitative and text data.

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List of Text / Reference Books:

1. Tamara Munzer, Visualization Analysis and Design-, CRC Press 2014
2. Alexandru Telea, Data Visualization Principles and Practice CRC Press 2014.
3. PaulJ.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, WroxPress, 2014.

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PEC-IO05(D)	**Process Modeling & Simulation**	**3L:0T:0P (3hrs.)**	**3 Credits**

Prerequisite: Familiarity with Linear Algebra, Probability and Statistics, Discrete structures, graph theory Object- oriented design and programming.

Course Objective:
This course provides solution alternatives for the problem by modeling and simulation approach System behavior is modeled and simulated for performance analysis.

Module 1 : (08Hrs)
Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing.

Module 2: (8Hrs)
Propagation and System Planning: Radio wave propagation in the mobile environment: Free space propagation, propagation mechanisms, large scale and small scale fading, path loss models, statistical channel models: narrowband and wideband models, System Planning: mobile radio link design, and introduction to radio network planning.

Module 3 : C
Review of terminology and concepts; Useful statistical models; Discrete distributions; Continuous distributions; Poisson process; Empirical distributions. Characteristics of queuing systems; Queuing notation; Long-run measures of performance of queuing systems; Steady state behavior of M/G/1 queue; Networks of queues; Rough-cut modeling: An illustration

Module 4: (8Hrs)
Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique; Special properties.

Module5: (8Hrs)
Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate

and Time-Series input models. Model building, verification and validation; Verification of simulation models; Calibration and validation of models, Optimization via Simulation.

Course outcomes: At the end of the module the student will be able to:

1. Define, describe and apply basic concepts related to modeling, identification and simulation.

2. Simplify a given model using static relations, substitution of variables using constants, neglecting small effects and aggregation of states.

3. Model and simulate mechanical (in one dimension) and electrical systems using the computer tools like Simulink

Text Books:

1. K S Trivedi, Theory of Modeling and Simulation - 3rd Edition, Elsevier.
2. Averill Law, Simulation Modeling and Analysis, McGraw Hill
3. Narsingh Deo, System Simulation with Digital Computer, 2007, PHI Learning.

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SBC-IO-03 (P)	**Data Analytics (Tableau/PowerBi) Lab**	**0L:0T:4P (4hrs.)**	**2 Credits**

Course Objective:

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 hrs)

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 hrs)

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 hrs)

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 hrs)

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.

Module 5: (4 hrs)

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 data representation.
4. Customize advanced visualizations and integrate them into dashboards for thorough data 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.
6. Russo, A., & Ferrari, M. (2020). The Definitive Guide to DAX: Business intelligence with Microsoft Excel, SQL Server Analysis Services, and Power BI. Microsoft Press.

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Proj-IO-06(A)	**Project III**	**0L: 0T: 16P (16hrs.)**	**8 Credits**

Course Objectives:

To carry out a small 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 (Arduino, Raspberry pi, 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 Outcome:

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.

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 (IoT)
Bachelor of Technology (B.Tech.)
VIII Semester

Proj-IO-06(B)	**Internship and Project (Industry/Corporate/Academia)**	**0L: 0T: 16P (16hrs.)**	**8 Credits**

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.