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(Data Science)]
VIII Semester (A) (Scheme & Syllabus)

S.No.	Course Type	Course Code	Course Title	Hrs./Week			Credits
				L	T	P	
1	PEC	DS05	Elective-V	2	1	-	3
2	PEC	DS06	Elective-VI	2	1	-	3
3	LC-PEC	DS06(P)	Elective-VI Laboratory	-	-	2	1
4	PROJ	CS06(A)	Major Project Phase-II	-	-	16	8
Total Credits				4	2	18	15
				24			

VIII Semester (B) (Scheme & Syllabus)

S.No.	Course Type	Course Code	Course Title	Hrs./Week			Credits
				L	T	P	
1	PEC	DS05	Elective-V	2	1	-	3
2	PEC	DS06	Elective-VI	2	1	-	3
3	LC-PEC	DS06(P)	Elective-VI Laboratory	-	-	2	1
4	PROJ	CS06(B)	Project /Internship (Industry/Corporate/Academia)	-	-	16	8
Total Credits				4	2	18	15
				24			

Note:

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

Professional Elective Course(PEC)–V,DS05 (Any One Course)	Professional Elective Course(PEC)–VI,DS06 (Any One Course)
(A) Knowledge Management	(A) Quantum Computing
(B) Web & Information Retrieval	(B) Tensor flow
(C)Cognitive Modeling*	(C)Computational Intelligence
(D)Bio Informatics	(D)Tableau

IPS Academy, Institute of Engineering & Science
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VIII Semester(A)Syllabus

PEC-DS05(A)	**Knowledge management**	**2L:1T:0P(3hrs)**	**Credits:03**

Prerequisite: NA

Course Objective:

Learn the Evolution of Knowledge management, familiar with tools, exposed to Applications, familiar with some case studies.

Course Contents:

Module1:

Introduction: An Introduction to Knowledge Management–The foundations of knowledge management- including cultural issues-technology applications organizational concepts and processes-management aspects-and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management–Key Challenges Facing the Evolution of Knowledge Management–Ethics for Knowledge Management.

Module2:

Organization and Knowledge Management–Building the Learning Organization. Knowledge Markets: Cooperation among Distributed Technical Specialists–Tacit Knowledge and Quality Assurance.

Module3:

Tele communications and Networks in Knowledge Management–Internet Search Engines and Knowledge Management–Information Technology in Support of Knowledge Management–Knowledge Management and Vocabulary Control–Information Mapping in Information Retrieval–information Codinging the Internet Environment–Repackaging Information.

Module4:

Components of a Knowledge Strategy–Case Studies (From Library to Knowledge Center, Knowledge ,Management in the Health Sciences, Knowledge Management in Developing Countries).

Module5:

Advanced topics and case studies in knowledge management– Development of acknowledge management map/plan that is integrated with an organization's strategic and business plan–A case study on Corporate Memories for supporting various aspects in the process life-cycles of an organization.

Course Outcome:

1. Describe how valuable individual, group and organizational knowledge is managed throughout the knowledge management cycle.
2. Define the different knowledge types and explain how they are addressed by knowledge management.
3. Describe the major role sand responsibilities in knowledge management implementations.
4. Identify some of the key tools and technique used in knowledge management applications.
5. Identify and evaluate major KM issues such as ethics, knowledge ownership vs. authorship, copyright, intellectual property and knowledge sharing incentives.

List of Text / Reference Books:

1. Srikantaiah,T.K., Koenig, M.," Knowledge Management for the Information Professional" Information Today,Inc.,2000.

2.Nonaka,I., Takeuchi,H.," The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation",Oxford University Press,1995.

IPS Academy, Institute of Engineering & Science
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VIII Semester(A)

PEC-DS05(B)	**Web & Information Retrieval**	**2L:1T:0P(3hrs)**	**Credits:03**

Prerequisite: Hypertext Markup Language

Course Objective:

This course aims at introducing the area of Information Retrieval and at examining the theoretical and practical issues involved in designing, implementing and evaluating Information Retrieval systems.

Course Contents :(40 Hrs)

Module 1:

Introduction: Information versus data retrieval, the retrieval process, taxonomy of Information Retrieval Models.

Module 2:
Classic Information Retrieval Techniques: Boolean Model, Vector model, Probabilistic Model, comparison of classical models. Introduction to alternative algebraic models such as Latent Semantic Indexing etc.

Module 3:

Keyword based Queries, User Relevance Feedback: Query Expansion and Rewriting, Document preprocessing and clustering, Indexing and Searching: Inverted Index construction, Introduction to Pattern matching.

Module 4:

Web Search: Crawling and Indexes, Search Engine architectures, Link Analysis and ranking algorithms such as HITS and Page Rank, Meta searches, Performance Evaluation of search engines using various measures, Introduction to search engine optimization.

Module 5:

Introduction to online IR Systems, Digital Library searches and web Personalization.

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VIII Semester (A)

Course Outcomes:

1. To identify basic theories and analysis tools as they apply to information retrieval.
2. To develop understanding of problems and potentials of current IR systems.
3. To learn and appreciate different retrieval algorithms and systems.
4. To apply various indexing, matching, organizing and evaluating methods to IR problem.
5. To become aware of current experimental and theoretical IR research.

List of Text / Reference Books:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, " Modern Information Retrieval" Pearson.
2. Education.C.Manning, P.Raghvan and H.Schutze," Introduction to Information Retrieval",Cambridge University Press.
3. Amy N.Langville and CarlD.Meyer, " Google's Page Rank and Beyond: The Science of Search Engine Rankings", Princet on University Press.
4. Pierre Baldi, Paolo Frasconi and Padhraic Smythe, " Modeling the internet and the web: Probabilistic methods and Algorithms",JohnWiley

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VIII Semester (A)

PEC-DS05(C)	**Cognitive Modeling**	**2L:0T:0P(3hrs)**	**Credits:03**

Prerequisite: Consent of the faculty member

Course Objective: The objective of this course is to scientifically explain the basic cognitive processes of perception, thinking, problem solving, decision making and moving in the environment and how these processes interact.

Course Contents:

Module1:
Introduction to Cognitive Modeling :What are cognitive models? Advantages of cognitive models, Practical uses of cognitive models, The steps involved in cognitive modeling Qualitative Model Comparisons: Category learning experiment, Two models of category learning, Qualitative comparisons of Models

Module2:

Basic Parameter Estimation Techniques: Linear and Nonlinear parameter estimation, Retention Experiment and Model, Aggregate modeling versus individual modeling, Objective function and searching for optimal parameters.

Module3:

Application to Choice and Response Time Measures (Signal detection task; Dynamic signal detection model; parameter estimation; goodness of fit; lack of fit tests) Quantitative model comparisons: Maximum likelihood estimation, Bechara's Simulated Gambling Task (BSGT), Three Cognitive Models on BSGT.

Module4:

Parameter estimation, Quantitative model comparisons using AIC and BIC, Cross-validation and Generalization Connectionist versus Rational Approaches: (Rational) Instance-based Learning (Instances; K- nearest neighbor learning; Case-based reasoning; Similarity; Activation).

Module5:

(Connectionist) Neural Networks (neural networks, Rescorla -wagner /delta rule, Multi-layer feed forward networks, Discuss the relative theoretical merits of either approach.

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 (Data Science)]
VIII Semester (A)

Course Outcomes:

1. Getting introduced to the basics of cognitive modeling & comparison between different models.
2. Learning about parameter estimation, finding optimal parameters etc.
3. Discussing response time measures& BSGT.
4. Demonstrate Quantitative model comparisons and Instance-based Learning
5. Understanding neural network approach & its merits.

List of Text / Reference Books:

1.J. Busemeyer & A.Diederich.CognitiveModeling.2009. Sage Publications, Inc.[BD]

2. S.Farrel & S.Stephan Lewandowsky. Computational Modeling in Cognition: Principles and Practice. 2010.Sage Publications, Inc.[FL]

3. R.Sun. Cognition and Multi-Agent Interaction.2006.Cambridge University Press.[RS]

4. Konar. Artificial Intelligence and Soft Computing: Behavioral and Cognitive Modeling of the Human Brain.1999.CRC Press;1 edition [AK]

4. T. Mitchell.Machine Learning.1997.McGraw-HillScience.[TM]

5. B. Hahn. Essential Matlab for Engineers and Scientists(4thEdition).2009.Academic Press[BH]

IPS Academy, Institute of Engineering & Science
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Department of Computer Science & Engineering
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VIII Semester (A)

PEC-DS05(D)	Bio Informatics	2L:1T:0P(3hrs)	Credits:03

Prerequisite: NA

Course Objective:

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

Course Contents:

Module1:

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

Module2:

Bio informatics 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.

Module3:

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.

Module4:

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:

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, flow charts for protein structure prediction.

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 (Data Science)]
VIII Semester (A)

Course Outcomes:

1. 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."Bioinformatics: Sequence and Genome Analysis" By David W. Mount , Second Edition: Released on August 16, 2004, also by Cold Spring Harbor Laboratory Press.
2. "Bioinformatics for Dummies" By Jean-Michel Claverie & Cedric Notredame, 2nd Edition: December 18, 2006 published by For Dummies (an imprint of Wiley).
3. "Introduction to Bioinformatics" By Arthur Lesk, 5th Edition: July 21, 2019 by Oxford University Press.
4. "Essential Bioinformatics" By Jin Xiong (Texas A&M University), 1st Edition, March 13, 2006 by Cambridge University Press.

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VIII Semester (B)

PEC-DS06(A)	**Quantum Computing**	**2L:1T:0P(3hrs)**	**Credits:03**

Prerequisite:

Proficiency in: Linear algebra (core requirement), complex numbers and probability**,** basic quantum mechanics**,** programming in Python and classical algorithms**,** and, optionally, advanced mathematics such as calculus, Fourier analysis, and abstract algebra, with more advanced study in quantum information theory and error correction**.**

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 with in the course.

Course Contents:

Module1

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.

Module2:

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, and Positive Operator Valued Measures.

Module3:

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 ZY 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.

Module4:

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

Module5:

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, Entanglements a physical resource.

Course Outcomes:

1. Analyze the behavior of basic quantum algorithms.
2. Apply measurement theories such as projective measurements, POVMs, and composite system measurements.
3. Prove basic facts about quantum information channels.
4. Implement simple quantum algorithms and Information channels in the quantum circuit model.
5. Simulate a simple quantum error-correcting code.

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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VIII Semester(B)

PEC-DS06(B)	Tensor flow	2L:1T:0P(3hrs)	Credits:03

Course Objective: This course provides a foundation of machine learning using Tensor Flow

Course Contents:

Module1

Overview of Tensor flow & Machine Learning, Steps in Machine Learning Process, Loss Functions in Machine Learning, Gradient Descent, Gradient Descent Variations, Model Selection and Evaluation, Machine Learning Visualization.

Module2:

Introduction to Tensors, Mathematical Foundations of Deep Learning- Building Data Pipelines for Tensor flow-Part, Text Processing with Tensor flow.

Module3:

Classify Images, Regression, Classify Structured Data, Text Classification, Under fitting and Over fitting, Save and Restore Models, CNNs, Transfer learning with retrained CNNs, Transfer learning with TF hub, Image classification and visualization, Estimator API.

Module4:

Logistic Regression, Boosted Trees, Introduction to word embeddings, Recurrent Neural Networks ,Time Series Forecasting with RNNs, Text Generation with RNNs.,

Module5:

Tensor Flow Customization, Customizing tf. keras, Tensor Flow Distributed Training.

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(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 (Data Science)]
VIII Semester(B)

Course Outcomes:

1. Understand the concept of Tensor Flow and Machine learning
2. State the concept of Text Processing with Tensor flow
3. Explain classification and visualization.
4. Explain RNN.
5. State the concept of Keras.

List of Text / Reference Books:

1. Pramod Singh and Avish Manure, "Implement Machine Learning and Deep Learning Models with Python", A press 2019.
2. Rowel Atienza,"Advanced Deep Learning with Tensor Flow2 and Keras", Packt Publishing Limited,2020.
3. Josh Patterson and Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media,2017
4. Seth Weidman," Deep Learning from Scratch: Building with Python from First Principles" O'Reilly Media,2019.
5. NPTEL Course Link:https://nptel.ac.in/courses/106/106/106106213/

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 (Data Science)]
VIII Semester(B)

PEC-DS06(C)	**Computational Intelligence**	**2L:1T:0P(3hrs)**	**3 credits**

Prerequisite: NA

Course Objective:
The objective of this course is to provide a strong foundation on fundamental concepts in Computational Intelligence and its application.

Course Contents:

Module 1
Introduction to Computational Intelligence; types of Computational Intelligence, components of Computational Intelligence. Concept of Learning/ Training model. Parametric Models, Non parametric Models. Multilayer Networks: Feed Forward network, Feedback network.

Module2:
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, Fuzzification, Rule Based Design & Inferencing, Defuzzyfication.

Module3:
Genetic Algorithms: Basic Genetics, Concepts, Working Principle, Creation of Off springs, Encoding, Fitness Function, Selection Functions, Genetic Operators-Reproduction, Crossover, Mutation; Genetic Modeling, Benefits.

Module 4:
Rough Set Theory-Introduction, Fundamental Concepts, Set approximation, Rough membership, Attributes, Optimization. Hidden Markov Models, Decision tree model.

Module5:
Introduction to Swarm Intelligence, Swarm Intelligence Techniques: Ant Colony Optimization, Particle Swarm Optimization, Bee Colony Optimization etc. Applications of Computational Intelligence.

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 (Data Science)]
VIII Semester (B)

Course Outcome:

1. Describe in-depth about theories, methods, and algorithms in computation Intelligence.
2. Compare and contrast traditional algorithms with nature inspired algorithms.
3. Examine the nature of a problem at hand and determine whether a computation intelligent technique / algorithm can solve it efficiently enough.
4. Design and implement Computation Intelligence algorithms and approaches for solving real-life problems.
5. Learn and apply swarm intelligence—including Ant Colony, Particle Swarm, and Bee Colony Optimization.

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. Simon Haykin, Neural Networks: A Comprehensive Foundation, Prentice Hall. David E.Goldberg, Genetic Algorithm in Search Optimization and Machine Learning, Pearson Education.
3. Jagdish Chand Bansal, Pramod Kumar Singh, Nikhil R. Pal, Evolutionary and swarm Intelligence Algorithms, Springer Publishing, 2019.
4. S. Rajeskaran, G.A.Vijaylakshmi Pai, "Neural Networks, Fuzzy Logic, Genetic Algorithms Synthesis and Applications".
5. J.S.Roger Jang, C.T. Sun, E.Mizutani," Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning & Machine Intelligence", PHI, 2002.

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 (Data Science)]
VIII Semester(B)

LC-PEC-DS06(P)	**Quantum Computing**	**02P (2hrs.)**	**Credits:1**

Module 1
Quantum Teleportation Protocol
(Entanglement & Communication)
Objective: Implement and verify quantum teleportation using Qiskit.
Tasks:
• Prepare an arbitrary qubit state on qubit A.
• Entangle qubits B and C, perform Bell measurement on A and B.
• Apply conditional gates on C and verify state transfer via tomography.

Module2
Super dense Coding
Modules: 2 (Distributed Quantum Communication)
Objective: Transmit two classical bits using one qubit and entanglement.
Tasks:
• Prepare a Bell pair.
• Encode two classical bits by applying I , X, Z, X Z on one qubit.
• Decode by Bell measurement and verify message fidelity.

Module 3:
Quantum Fourier Transform & Phase Estimation
Modules: 3 (QFT & Phase Estimation)
Objective: Perform QFT on a small register and estimate an unknown phase.
Tasks:
• Implement the 3-qubit Quantum Fourier Transform circuit.
• Use it as a subroutine in the phase estimation algorithm.
• Estimate a phase ϕ encoded in a controlled-U operation and compare to true value.

Module 4:
Grover's Search Algorithm on a 2-Qubit Database
Modules: 4 (Grover's Algorithm)
Objective: Implement Grover's algorithm to find a marked element.
Tasks:
• Prepare the equal superposition over 4 entries.
• Construct the oracle marking one "winner" state.
• Apply the Grover diffusion operator and measure the result.

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Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.)
[Computer Science & Engineering (Data Science)]
VIII Semester(B)

Module 5:

Stabilizer States and Syndrome Extraction

Modules: 5 (Stabilizer Codes & Fault Tolerance)

Objective: Prepare and verify a 4-qubit GHZ stabilizer state and extract its syndrome.

Tasks:• Build the circuit for the 4-qubit GHZ state.

• Measure stabilizer generators (e.g. Z Z I I , I I Z Z , X XXX).

• Analyze measurement outcomes to check code properties.

IPS Academy, Institute of Engineering & Science
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Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.)
[Computer Science & Engineering (Data Science)]

VIII Semester (B)

LC-PEC DS06(P)	**Tensor flow**	**02P (2hrs.)**	**Credits:1**

Module 1

Linear Regression with Gradient Descent Variations
Module: 1 (Gradient Descent & Variations)
Objective: Fit a simple linear model using plain GD, Momentum, RMSProp and Adam.
Tasks:
• Create asynthetic dataset $y = 3x + 2 + \varepsilon$.
• Implement training loops in Tensor Flow using different optimizers.
• Plot loss curves and compare convergence behavior.
Building a Tensor Flow Data Pipeline (Tensors &Data Pipelines)
Objective: Load, preprocess and batch data efficiently with tf.data.
Tasks:
• Load the MNIST dataset from TF Datasets.
• Apply map transformations: normalization, shuffling, batching.
• Measure pipeline throughput and visualize a batch of images

Module2

Text Tokenization and Word Embeddings
Module: 2 (Text Processing& Embeddings)
Objective: Preprocess raw text and learn embeddings with tf.keras. layers.Embedding.
Tasks:
• Tokenize a small corpus (e.g., Shakespeare excerpts) using Text Vectorization.
• Build and train a model that projects tokens into a 16-dim embedding space.
• Visualize embeddings with Tensor Board's Embedding Projector.

Module 3:

Binary Image Classification with a Simple CNN
Module: 3 (CNNs & Image Classification)
Objective: Implement and train a small convolutional network on cats vs. dogs.
Tasks:
• Load a subset of the Dogs vs. Cats dataset.
• Define a CNN with two conv+pool blocks and a dense head.
• Train andreport accuracy; display sample predictions.

Module 4:

Transfer Learning with TensorFlow Hub
Module: 4 (Transfer Learning)
Objective: Fine-tune a pre-trained image feature extractor for flower classification.
Tasks:

- Load a TF Hub MobileNetV2 feature vector module.
- Freeze the base, add a new classification head and train on the Flowers102 dataset.
- Unfreeze top layers and fine-tune; report improvements.

Module 5:

Text Generation with LSTM Networks
Module: 5 (RNNs &Text Generation)
Objective: Train an LSTM to generate Shakespeare-style text.
Tasks:

- Tokenize a corpus of Shakespeare's plays.
- Build a character-level LSTM model.
- Generate sample text after training for several epochs.

IPS Academy, Institute of Engineering & Science
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Scheme Based on AICTE Flexible Curriculum
Department of Computer Science & Engineering
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[Computer Science & Engineering (Data Science)]

VIII Semester (B)

LC-PEC-DS06(P)	**Computational Intelligence**	**02P (2hrs.)**	**Credits:1**

Course Objective:

1. Implement and compare a simple multilayer perception (MLP) and a recurrent feedback network on the XOR problem.
2. Build a fuzzy controller that maps temperature error to heater power.
3. Use a GA to maximize the one-dimensional function f (x) = sin(x) x over [0, 10].
4. Train a simple HMM to model weather sequences.
5. Build and visualize a CART decision tree for species classification.

Module 1

Feed-Forward vs. Feedback Networks on XOR Module: 1 (Multilayer Networks)

• Design a 2–2–1 MLP with sigmoid activations; train by back propagation.
• Design a simple Hopfield-style feedback network; observe its convergence.
• Compare training time, convergence behavior, and classification accuracy

Module2

Fuzzification and Defuzzification of Temperature Control
Module: 2 (Fuzzy Systems)

• Define linguistic variables "Error" (Negative, Zero, Positive) and "Power" (Low, Medium, High) with triangular MFs.
• Implement fuzzification, rule base (e.g. IF Error isPositive THEN Power is Low), and Mamdani inference.
• Apply centroid defuzzification and simulate controller response to step changes.

Module 3:

Genetic Algorithm for Function Optimization
Module: 3 (Genetic Algorithms)

• Encode x as a binary string; define fitness = f (x).
• Implement selection (roulette wheel), single-point crossover, and bit-flip mutation.
• Track best fitness per generation and plot convergence

Module 4:

Hidden Markov Model for Weather Prediction

Module: 4 (HMM)

• Define states {Sunny, Rainy} and observations {Dry, Wet}.

• Use Baum–Welch to estimate transition and emission matrices from a toy dataset.

• Decode unseen observation sequences via Viter bi algorithm.

Module 5:

Decision Tree Induction on Iris Dataset

Module: 5 (Decision Trees)

• Load the Iris dataset.

• Train a decision tree classifier; prune by setting max depth.

• Plot the tree and report accuracy and feature importance.

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 (Data Science)]

VIII Semester (B)

LC-PEC-DS06(P)	**Tableau**	**02P (2hrs.)**	**Credits:1**

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 Power BI /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.

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Bachelor of Technology (B.Tech.)
[Computer Science & Engineering (Data Science)]

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-CS06(A)	**Major Project Phase-II**	**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)
2. Language basics
3. Frameworks and APIs
4. 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.

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PROJ-CS-06(B)	**Project/Internship (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.