Scheme of Diploma in Business Analytics 2024-25

Semester - I

Paper Code	Nomenclature of Paper	Credits	Internal Marks	External Marks	Max. Marks
DBA-101	Principles of Business Management	4	30	70	100
DBA-102	Fundamental of Business Analytics	4	30	70	100
DBA-103	Business Statistics	4	30	70	100
DBA-104	Computer Applications in Business	4	30	70	100
DBA-105	Database Management System	4	30	70	100
DBA-106P	Database Management System Lab	4	30	70	100
Total		**24**	**180**	**420**	**600**

Semester – II

Paper Code	Nomenclature of Paper	Credits	Internal Marks	External Marks	Max. Marks
DBA-201	Predictive and Prescriptive Analytics	4	30	70	100
DBA-202	Business Research Methods	4	30	70	100
DBA-203	Big Data Analytics	4	30	70	100
DBA-204	Machine Learning	4	30	70	100
DBA-205	Python Programming	4	30	70	100
DBA-206P	Python Programming Lab	4	30	70	100
Total		**24**	**180**	**420**	**600**

Note: To be eligible for the award of the Diploma in Business Analytics, a student has to complete all the 12 courses as shown in the table. However, a candidate can take exit option after 6 months (Semester I) and upon successful completion he/she will get Certificate in Business Analytics. The question papers for the final examination will be objective type.

DETAILED SYLLABUS:

DBA-101	PRINCIPLES OF BUSINESS MANAGEMENT	
Time Allowed: 90 Minutes		**External Marks: 70** **Internal Marks: 30** **No. of Credits: 04**

Course Objective: *The objective of this course is to develop an understanding of basic management science techniques and their role in managerial decision making.*

Course Outcome

CO1: Students will be able to define the basic concepts in the field of Business Management.

CO2: Students will be able to understand the basic principles of business management related to planning and decision making, HRM and motivation, and leadership.

CO3: Students will be able to apply managerial skills to solve real world business management problems.

CO4: Students will be able to identify leadership roles in various scenarios.

CO5: Students will be able to evaluate the business model based on principles of management.

CO6: Students will be able to formulate the problems and interpret the results produced by the applied models.

Course Contents:

UNIT-I

Business: Nature and scope of Business; Forms of Business, Management: Definition, characteristics, scope and importance of management; Functional areas of management; Management and Administration; Levels of Management; Mintzberg's Managerial Roles.

UNIT-II

Approaches to Management: Classical and Neo classical approach, Behavioral approach, Management science approach, Systems approach and Contingency approach-Highlighting the contributions of Henry Fayol, F.W. Taylor and Peter F. Drucker; Contemporary developments in approaches; Theory Z, McKinsey -7's, Quality Management.

UNIT-III

Planning: Definition, Nature, Objectives and importance, Planning Process, Types of Plans, Barriers to Effective Planning. Organizing: Definition, Nature, Principles of Organisation, Types of Organisation, Organizational Structure, Authority, Delegation and Centralization vs. Decentralization.

UNIT-IV

Staffing: Meaning, importance and scope, Matching job and people. Motivation: concept, objectives & significance. Leadership: concept, significance & functions, Leadership styles, approaches to leadership. Controlling: meaning and characteristics of control, process of control, prerequisites of an effective control system; controlling techniques.

Suggested Readings:

1. Management: Stephen P. Robbins, Pearson

2. Principles of Management: T Ramasamy, Himalaya Publication

3. Management Theory and Practices: P Subba Rao, Himalaya Publishing House

4. Essential of Management: Harold Kontz, McGraw Education

Note: The examiner is required to set a total 70 multiple choice questions minimum 17 questions from each unit. The student shall be required to attempt all the questions. All the questions carry equal marks. Maximum time allotted for the major exam is 90 minutes. The question paper may contains MCQ's (Multiple Choice Questions) of single correct answers, multiple correct answers, ascertaining and reasoning questions, single correct answers with multiple choice and matching type etc. There will be no negative marking.

DBA-102   **FUNDAMENTAL OF BUSINESS ANALYTICS**

External Marks: 70
Internal Marks: 30
Time Allowed: 90 Minutes   **No. of Credits: 04**

Course Objective: *Analytics is the scientific process of deriving business insights from raw data to support decision making. This course aims to provide a basic introduction to the use of analytical techniques to solve business problems and how a business organization can create a competitive advantage by leveraging on data derived from its multiple business processes.*

Course Outcomes:

CO1: Students will be able to recall various terms, tools, techniques and models used in business analytics.
CO2: Students will be able to illustrate the tools, techniques and models used in business analytics
CO3: Students will be able to interpret the different techniques used in different area such as finance, Human resource, marketing etc.
CO4: Students will be able to differentiate the role of statistician, data scientist, data engineers and different techniques.
CO5: Students will be able to select the techniques and models required to analyze a particular data type.
CO6: Students will be able to develop necessary competencies expected from an analyst professional who have the ability of synthesis the model forecasting in business analytics

Course Contents:

UNIT-I

Business analytics: introduction, types of analytics, characteristics of analytics, business analytics, and business intelligence; business analytics process and its relationship with decision making process; Advantage of business analytics: informed decisions, developing distinct capability, creating competitive advantage, key attributes of analytical competitors.

UNIT-II

Analytical methods and models: Descriptive analytics-overview of its tools and techniques, role in business analytics process and its importance in business decision making; Predictive analytics- nature and type of modeling, basics of data mining and machine learning environment, role in business analytics process and its importance in strategic decision making; Prescriptive analytics: basics of its tools and modeling, role in business analytics process.

UNIT-III

Business analytics in action: applicability and importance of business analytics in different areas- financial analytics, human resource analytics, marketing analytics, health care analytics, supply chain analytics, sport analytics and analytics for Government and non profit organization.

UNIT-IV

Developing analytics: statistician, data scientist and data engineer and their key features, skills required for analytics, big data and its analyst, important analytics softwares, major companies providing analytical solutions, job opportunities in business analytics.

Suggested Readings

1. Davenport, H., Harris J.G., *Competing on Analytics: The New Science of Winning,* Harvard Business Review Press.
2. Davenport H., Harris J.G. and Morison R., *Analytics at Work: Smarter Decisions, Better Results,* Harvard Business Review Press.
3. Schniederjans M.J., Schniederjans D.G. and Starkey C.M. *Business Analytics Principles, Concepts, and Applications with SAS: What, Why, and How,* FT Press Analytics.
4. Provost F., Fawcett T. *Data Science for Business: What you need to know about data mining and data-analytic thinking*, O'Reilly Media.
5. Siegel E. *Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die,* Wiley.

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DBA-103	BUSINESS STATISTICS	
		External Marks: 70
Time Allowed: 90 Minutes		**Internal Marks: 30**
		No. of Credits: 04

Course Objective: *The objective of this course is to make students learn about the applications of statistical tools and techniques for decision making.*

Course Outcomes:

CO1: Students will be able to recall different terms used in statistics.
CO2: Students will be able to understand the different methods used in statistics.
CO3: Students will be able to apply the knowledge of statistics in their future studies as well as in corporate sector also.
CO4: Students will be able to analyze the importance of statistics in business.
CO5: Students will be able to evaluate the proficiency of statistical methods in an industry or business.
CO6: Students will be able to assemble the different methods of statistics for the well being of business

Course Contents:

UNIT-I

Univariate analysis: central tendency, dispersion (theoretical concept); Probability: Introduction, addition theorem, multiplication theorem, conditional probability, Bayes Theorem. Theoretical probability distributions: Binomial, Poisson, Normal Distribution; their characteristics and applications.

UNIT-II

Sampling: probability and non-probability sampling methods; Sampling distribution and its characteristics; Hypothesis testing: hypothesis formulation, and testing; Statistical Tests: z-test, t- test, F-test, Analysis of variance, Chi-square test, Wilcoxon Signed-Rank test, Kruskal-Wallis test.

UNIT-III

Correlation analysis: simple, partial and multiple correlations; Regression analysis: simple linear regression model, ordinary least square method. Time series analysis: components of a time series and their measurements and uses.

UNIT-IV

Index numbers: meaning and types, methods for measuring indices, adequacy of indices; Statistical quality control: causes of variation in quality, Control Charts, Acceptance sampling.

Suggested Readings:

1. Levin, Richard I and David S Rubin, *Statistics for Management,* Pearson.
2. Gupta, S.P., *Statistical Methods*, Sultan Chand & Sons
3. Anderson, Sweeney and Williams, *Statistics for Business and Economics,* Cengage Learning.
4. Ken Black, *Business Statistics,* Wiley.

5. Aczeland Sounderpandian, *Complete Business Statistics,* Tata McGraw Hill, New Delhi.
6. Hooda, R.P., *Statistics for Business and Economics* Macmillian, New Delhi.
7. Heinz, Kohler, *Statistics for Business & Economics,* Harper Collins, New York.
8. Lawrence B. Morse, *Statistics for Business & Economics,* Harper Collins, NY

Note: The examiner is required to set a total 70 multiple choice questions minimum 17 questions from each unit. The student shall be required to attempt all the questions. All the questions carry equal marks. Maximum time allotted for the major exam is 90 minutes. The question paper may contains MCQ's (Multiple Choice Questions) of single correct answers, multiple correct answers, ascertaining and reasoning questions, single correct answers with multiple choice and matching type etc. There will be no negative marking.

DBA-104	**COMPUTER APPLICATIONS IN BUSINESS**	
Time Allowed: 90 Minutes		**External Marks: 70** **Internal Marks: 30** **No. of Credits: 04**

Course Objective: *The students are to be provided basic understanding of the computers and basic concepts of information technology in business organizations.*

Course Outcomes:

CO1: Understand the basics of computer; Internal Structure.
CO2: Students will be able to understand office packages including Word, Excel and PowerPoint.
CO3: Understand the concept of Management Information System (MIS).
CO4: Learn the fundamentals of E-commerce.
CO5: Understand basic concept of online payment system

Course Contents:

UNIT-I
Introduction to Computers: Definition, components and characteristics of computers; Input and output devices: memory and mass storage devices; Introduction to modern CPU and processors, Computer software: introduction, types of software: system, application and utility software. Microsoft Word, Excel and Power point.

UNIT-II
Information Technology and Business: concepts of data, information and information system, effects of IT on business; Types of information system: Transaction Processing System (TPS), Management Information System (MIS).

UNIT-III
Introduction to E-commerce; e-commerce and World Wide Web; e-commerce application services; e-commerce models: B2B, B2C, C2C, G2C. M-commerce and e-governance: an overview.

UNIT-IV
Online payment system, Payment gateways, Risk management options for E-payment systems, Plastic money-Debit, Credit card and other Smart cards, Digital certification and Digital signature.

Suggested Readings:

1. Leon, Alexis: Fundamental of Information Technology, Vikas Publication House (P) Ltd., New Delhi.
2. Mansfield, Ron: The Compact Guide to Microsoft Office, BPB Publication, Delhi.
3. E-commerce: Sushil Goyal; Aarti Books.

4. E-commerce: Satyajee srivastva; Anand Publications.

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DBA-105	**DATABASE MANAGEMENT SYSTEM**

Time Allowed: 90 Minutes	**External Marks: 70** **Internal Marks: 30** **No. of Credits: 04**

Course Objective: *The objective of the course is to understand the principles of database design and models. Students learn querying a database using SQL, normalization techniques, transaction processing etc.*

Course Outcomes:

CO1:   Students will be able to describe fundamental elements of Database Management System.
CO2:   Students will be able to discuss principles of relational Database modelling.
CO3:   Students will be able to apply SQL for designing queries for Relational Databases.
CO4:   Students will be able to contrast various concurrency control and recovery techniques with concurrent transactions in DBMS.
CO5:   Students will be able to design models of databases using ER modelling and normalization for real life applications.

Course Contents:

UNIT - I
Overview: Overview of File Systems and Database Systems, Characteristics of the Data Base Approach, Database users, Advantages and Disadvantages of a DBMS, Responsibility of Database Administrator. Data Base Systems Concepts and Architecture: DBMS architecture and various views of Data, Data Independence, Database languages, Data Models: Relational Database Model, Hierarchical Data Model, Network Data Model, Schemas and Instances.

UNIT - II
E-R Model: Entity Types, Attributes & Keys, Relationships, Roles and Structural Constraints, E-R Diagrams, Reduction of an E-R Diagram to Tables. Relational Model and Query Language: Overview of Relational Database, Key Integrity Constraints, Relational Algebra, Relational Calculus, SQL fundamentals, Basic Operators, Missing information and NULL values, Advanced SQL features.

UNIT - III
Relational Database Design: Overview of normalization, Database Anomalies, Candidate and Super Key, Functional Dependencies, Integrity Constraints, Decomposition, Normal forms: First, Second, Third Normal, Boyce Codd, Normal Form, Multi-valued Functional Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Denormalization.

UNIT - IV
Concurrency Control Techniques: Overview of database Transactions, Transaction states, ACID properties of a Transaction, Transaction Recovery, Concurrency Control, Locking Techniques, Time stamp ordering, Multi-version Techniques, Deadlock, Recovery Techniques in centralized DBMS. DDBMS Design: Replication and Fragmentation Techniques.

Suggested Readings:

1. Elmasri, R., and Navathe, S. B., Fundamentals of Database Systems, 7th Edition, Pearson.
2. Silberschatz, A., Korth, H. F., and Sudarshan, S., Database System Concepts, McGraw Hill, 2011.
3. Pannerselvam R., Database Management Systems, 2nd Edition, PHI Learning, 2011.
4. Desai, B. C., An Introduction to Database System, Galgotia Publication, 2010.
5. Leon, A., and Leon, M., Database Management Systems, Ist Edition, Vikas Publishing, 2009.
6. Mata-Toledo, R., Cushman, P., Sahoo, D., Database Management Systems, Schaums' Outline series, TMH, 2007.

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DBA-106P   **DATABASE MANAGEMENT SYSTEM LAB**

External Marks: 70
Internal Marks: 30
Time Allowed: 90 Minutes
No. of Credits: 04

Course Objective: *The objective of the course is to develop proficiency in the execution of commands of the database design and query using SQL.*

Course Outcomes:

CO1:   Students will be able to Implement database problems using DML/DDL commands.
CO2:   Students will be able to enforce integrity constraints on a database using a state-of-the-art RDBMS.
CO3:   Students will be able to analyse the design of a relational database.
CO4:   Students will be able to design a relational database for a given schema.
CO5:   Students will be able to create lab assignment record that includes problem definitions, solutions, results and conclusions.
CO6:   Students will be able to demonstrate ethical practices, self-learning and team spirit.

List of experiments/assignments:

1. Use SQL software and login with valid userid and password. Explore its GUI and practice some basic commands of it.

2. Three assignments related to creation of database with tables having different fields and data types.

3. Two assignments on the creation of table with different types of constraints.

4. Two assignments on insert, delete and modify records from the tables.

5. Two assignments on modifying the table using the alter command.

6. Two assignments on exploring select statement using various clauses like where, order by, group by, having and aggregate functions.

7. Two assignments on the use of set operations to query the tables.

8. Two assignments on creating joins and views on the tables.

9. One assignment on generating sub-queries.

Note: The actual experiments/assignments will be designed by the course coordinator. One assignment should be designed to be done in groups of two or three students. The assignments must meet the objective of the course and the levels of the given course outcomes. The list of assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

DBA-201	**PREDICTIVE AND PRESCRIPTIVE ANALYTICS**	

Time Allowed: 90 Minutes

External Marks: 70
Internal Marks: 30
No. of Credits: 04

Course Objective: *Predictive analytics encompasses a variety of statistical techniques from modeling, machine learning, and data mining that analyze current and historical facts to make predict ions about future, or otherwise unknown, events. In business, predictive models exploit patterns found in historical and transactional data to identify risks and opportunities.*

Course Outcomes:

CO1: Students will be able to define the various terms and basic concepts related to statistical techniques, machine learning and data mining.
CO2: Students will be able to classify the basic statistical techniques, machine learning and data mining techniques that are used to predict about the future.
CO3: Students will be able to apply the predictive techniques.
CO4: Students will be able to do experiments by applying various predictive techniques.
CO5: Students will be able to evaluate the results as they will be able to summarize and visualize datasets in a meaningful way using different plots.
CO6: Students will be able to formulate the solid foundation of predictive analytics.

Course Contents:

UNIT-I
Introduction to Predictive Analytics: overview, business intelligence, predictive analytics in relation to business intelligence, statistics, data mining; Big data, importance in decision making; Setting up problem-CRISP-DM, business understanding, Defining data, target variable and measures of success for predictive modeling; Methodology of predictive modeling.

UNIT-II
Prediction Methods: Linear Regression- best subset selection, forward selection, backward selection, step-wise regression, Cp mallows and adjusted R-square criteria; k-Nearest Neighbors (k-NN); Regression Trees- CART, CHAID; Neural Nets- architecture of neural nets, neurons, input layer, hidden layers, output layer.

UNIT-III
Prescriptive Analyics - Basic concepts and its role in decision-making. Linear programming: meaning, scope & assumptions, Formulation of linear programming problem & solution by graphical & simplex methods and some special cases.

UNIT-IV
Duality and Sensitivity analysis, Transportation - Some special cases like maximization, unbalanced problems, degeneracy in transportation models, Assignment models (HAM). Introduction to Integer programming, Goal programming, Dynamic programming.

Suggested Readings:

1. Miller Thomas W. *Modeling Techniques in Predictive Analytics with Python and R: A Guide to Data Science*. FT Press Analytics/Pearson.
2. Maisel L. and Cokins G. *Predictive Business Analytics: Forward Looking Capabilities to Improve Business Performance.* Wiley.
3. Siegel E. *Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die.* Wiley.
4. Bartlett R. *A Practitioner's Guide to Business Analytics: Using Data Analysis Tools to Improve Your Organization's Decision Making and Strategy*. McGraw-Hill Education.
5. Fitz-enz J. and Mattox II J. *Predictive Analytics for Human Resources.* Wiley.
6. Abbot D. *Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst;* Wiley.
7. Dean J. *Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners*. Wiley and SAS Business Series.

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DBA-202	BUSINESS RESEARCH METHODS	
		External Marks: 70
		Internal Marks: 30
Time Allowed: 90 Minutes		No. of Credits: 04

Course Objective: *This course is designed to introduce the students to the fundamentals of research methods and to equip them to follow scientific methods in solving business problems.*

Course Outcomes:

CO1: Students will be able to relate with the basic understanding of research methodology in the changing business scenario.

CO2: Students will be able to identify and classify the application of analytical techniques to face the tasks aimed at fulfilling the objective of business decision making.

CO3: Students will be able to apply and demonstrate an understanding of ethical dimensions of conducting research.

CO4: Students will be able to distinguish and examine the necessary experimental techniques that help in scientific decision making.

CO5: Students will be able to judge and support best alternatively relating to the practices learnt through research methods.

CO6: Students will be able to assemble and formulate advanced ways of taking decisions in a logical manner.

Course Contents:

UNIT –I
Introduction to Research: Defining Business Research, Types of Research; Scientific Method, Theory Building, Type of Variables; Research Process: Problem Definition, Exploratory Research.

UNIT –II
Research Designs: Concept, Need and Types of Research Designs; Survey Research: Nature of Surveys, Errors in Survey Research, Personal Interview, Telephone Interview, Self-Administered Questionnaire; Observation Methods; Introduction to Experimental Research.

UNIT –III
Sampling Design: Census v/s Sampling, Sampling Methods, Determination of Sample Size; Measurement and Scaling Concepts, Attitude Measurement, Questionnaire Design, Basic Concepts of Reliability and Validity

UNIT –IV
Data Analysis: Descriptive Statistics, Univariate Statistics; Bivariate Analysis: Test of Difference, Measures of Association; Introduction to Multivariate Analysis; Report Writing.

Suggested Readings:

1. Zikmund,W. G. *Business Research Methods*. Thomson.

2. Bajpai, N, *Business Research Methods*, Pearson.
3. Copper, D. R., Schindler P. S. & Sharma, J. K. *Business Research Methods*, McGraw Hill Education.
4. Burns,R. B. & Burns, R. A. *Business Research Methods and Statistics using SPSS*, SAGE Publications Ltd.
5. Chawla, D. & Sondhi N., *Research Methodology: Concepts and Cases*, Vikas Publishing House.
6. Panneerselvam, R, *Research Methodology*, Prentice Hall India.
7. Kothari, C.R. *Research Methodology & Technique*, New Age International Publishers.

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Course Objective: *The objective of this course is to learn tools and techniques to apply analytics on large information and transaction data to identify various business opportunities, better customer service, more effective marketing, better operational efficiency and a competitive edge over rivals.*

Course Outcomes

CO1:   Students will be able to define the concept and challenges of Big data.
CO2:   Students will be able to classify the Big data.
CO3:   Students will be able to apply skills and tools to analyze and manage Big data. Learnvarious Big data frameworks and applications.
CO4:   Students will be able to compare the impact of making Big data decisions on various business problems.
CO5:   Students will be able to judge the techniques and models required to analyze a particulardata type.
CO6:   Students will be able to develop necessary competencies expected from an analyst professional who have the ability to handle big data.

Course Contents:

UNIT-I
Introduction to Big Data and its Value, Issues and challenge in real time Big Data, Features of Big Data - Security, Compliance, auditing and protection. Evolution of Big data and Big data characteristics Volume, Veracity, Velocity, Variety.

UNIT-II
Evolution of analytic scalability, Convergence, parallel processing systems. Cloud computing and Grid computing. Introduction to Streams Concepts – its model, architecture and computing, Sampling data in a stream, Filtering streams, counting distinct elements in a stream.

UNIT-III
Predictive Analytics – Supervised and Unsupervised learning. Neural networks – Kohonen models, Clustering Techniques – Hierarchical and K- Means Clustering. Visual data analysis techniques.

UNIT-IV
Map Reduce Framework, Hadoop, Hive, shading – NoSQL Databases - S3 Hadoop Distributed file systems, Hbase, Impala, Analyzing big data with twitter, Facebook, Instagram – Big data for E-Commerce – Big data for blogs.

Suggested Readings:

1. Ohlhorst, F.J. (2013), Big Data Analytics: Turning Big Data into Big Money, Wileyand SAS Business Series.

2. Rajaraman, A. & Ullman, J.D. (2014), Mining of Massive Datasets, Cambridge University Press.
3. Parjapati, V. (2013), Big Data Analytics with R and Hadoop, Packt Publishing.Provost F., Fawcett T. *Data Science for Business: What you need to know about data mining anddata-analytic thinking*, O'Reilly Media.
4. Rajaraman, A. & Ullman, J.D. (2014), Mining of Massive Datasets, Cambridge University Press.
5. Minelli, M., Chambers, M., Dhiraj, M. (2013), Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications

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Course Objective: *The objective of the course is to learn applications of various machine learning concepts. The course would enable the ability to understand and critically assess available data using machine learning methods.*

Course Outcomes:

CO1:   Students will be able to describe fundamental terminologies and different types of machine learning.

CO2:   Students will be able to interpret the results and pattern obtained for different machine learning algorithms.

CO3:   Students will be able to employ the suitable technique on the data set.

CO4:   Students will be able to analyse the performance of different machine learning algorithms

CO5:   Students will be able to compare various machine learning techniques on different parameters

CO6:   Students will be able to design machine learning algorithms for data classification, pattern recognitions, optimization and searching problems

Course Contents:

UNIT-I
Introduction: What is machine learning? Types of machine learning, Examples of machine learning applications: learning associations, classifications, regression, unsupervised learning, reinforcement learning. Unsupervised learning: k-mean clustering, self organizing feature map (SOM algorithm) Dimensional Reduction: Principal Component Analysis.

UNIT-II
Decision tree: Introduction, decision tree representation, appropriate problem for decision tree learning algorithm, basic decision tree learning algorithm, entropy measures, information gain measures, Example problem for illustrating ID3. Regression: Linear regression, linear regression examples.

UNIT-III
Artificial neural network: Introduction, biological motivation, neural network representation, appropriate problem for neural network learning, perceptron, representation power of perceptron, perceptron training rule, gradient descent and delta rule, multilayer network and backpropagation algorithm, a differentiable threshold unit, the backpropagation algorithm, convergence and local minima, deep learning.

UNIT-IV
Bayesian learning: Introduction, Bayes theorem, Naive Bayes classifiers. Instance based learning-nearest neighbour learning, remarks on k-nearest neighbour algorithm. Support Vector Machines: optimal separation, kernels, extensions to the support vector machine.

Suggested Readings:
1. Tom M. Mitchell, Machine Learning, McGraw-Hill, 1997.
2. Dutt Saikat, Machine Learning, Pearson.
3. Stephen Marsland, Machine Learning, Chapman and Hall /CRC, 2009.
4. Ethem Alpaydin, Introduction to Machine Learning, PHI, 2004.
5. Bishop Christopher, Pattern Recognition and Machine Learning, Springer Verlag, 2006.
6. Gillespie, C., Lovelace, R. (2016), R for Data Science: Import, Tidy, Transform Visualize, and Model Data, O'Reilly Media. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference and Prediction, Springer, 2nd edition, 2009.
7. J. Han and M. Kamber, Data Mining Concepts and Techniques, 3rd Edition, Elsevier, 2012.

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Time Allowed: 90 Minutes	**External Marks: 70** **Internal Marks: 30** **No. of Credits: 04**

Course Objective*: This is introductory course and covers most of the basic concepts required for basic python programming. Some of the contents are advanced may be useful for data analytics purpose.*

Course Outcomes:

CO1: Students will be able to outline various basic programming constructs including operators, character sets, basic data types and control statements.

CO2: Students will be able to explain Python packages and their functionalities for data analysis.

CO3: Students will be able to solve problems using python programming.

CO4: Students will be able to analyse the results of data analysis or machine learning programs

CO5: Students will be able to evaluate solutions according to the problem definition.

CO6: Students will be able to develop database applications in Python.

Course Content
Unit - I

Introduction to Python, History of Python, Features of Python, Python Identifiers, Python Character Set, Keywords and Indentation, Comments, Command Line Arguments, Assignment Operator, Operators and Expressions, print() Function, input() Function, eval() Function, Python Data Types: int, float, complex, Variables, Mutable vs Immutable variables, Namespaces, Decision Statements: Boolean Type, Boolean Operators, if statement, else statement, Nested Conditionals Statements, Multi-way Decision Statements (elseifstatement).

Unit – II

Loop Control Statements: While loop, range() Function, For Loop, Nested Loops, Infinite Loop, Break Statement, Continue Statement, Pass Statement, Introduction to Strings, String Operations: Indexing and Slicing, Lists: Operations on List: Slicing, In-built Functions for Lists, List Processing: Searching and Sorting, Dictionaries: Need of Dictionary, Operations on Directories: Creation, Addition, Retrieving Values, Deletion; Tuples, operations on Tuples, Inbuilt Functions for Tuples, Introduction to Sets, operations onsets.

Python Functions, Inbuilt functions, Main function, User Defined functions, Defining and Calling Function, Parameter Passing, Actual and Formal Parameters, Default Parameters, Global and Local Variables, Recursion, Passing Functions as Data, Lamda Function, Modules, Importing Own Module, Packages.

Unit – III

Operations on File: Reading text files, read functions, read(), readline() and readlines(), writing Text Files, write functions, write() and writelines(),Manipulating file pointer using seek, Appending to Files. Python Object Oriented: Overview of OOP, Classes and objects, Accessing attributes, Built-in Class Attributes, Methods, Class and Instance Variables, Destroying Objects, Polymorphism, Overlapping and Overloading of Operators, Class Inheritance:

super(), Method Overriding, Exception Handling, Try-except-else clause, Python Standard Exceptions, User-Defined Exceptions

Unit – IV

Databases in Python: Create Database Connection, create, insert, read, update and delete Operation, DML and DDL Operation with Databases. Python for Data Analysis: numpy: Creating arrays, Using arrays and Scalars, Indexing Arrays, Array Transposition, Universal Array Function, Array Processing, Array Input and Output Pandas: Series, Data Frame, Panel, Index objects, Re-indexing, Iteration, Sorting. Matplotlib: Python for Data Visualization, Visualization Section, Sklearn: loading of dataset, learning and predicting, Model Persistence.

Suggested Readings:
1. Ashok Namdev Kamthane, Programming and Problem Solving with Python, McGraw Hill Education Publication, 2018.
2. Y. Daniel Liang, Introduction to Programming Using Python, Pearson, 2013.
3. John Guttag, Introduction to Computation and Programming using Python, Springer, Revised and Expanded version (Referred by MIT), 2013.
4. Lutz, M., Learning Python: Powerful Object-Oriented Programming. O'Reilly Media, Inc., 2013.
5. Michael T Goodrich and Robertto. Thamassia, Micheal S Goldwasser, Data Structures and Algorithms in Python, Wiley, 2016.
6. Reema Thareja, Python Programming Using Problem Solving Approach, Oxford Publications,2017.
7. Dr. R. Nageswara Rao, Allen B. Downey, Core Python Programming, Think Python, O'Reilly Media, 2012.
8. Kenneth A. Lambert, The Fundamentals of Python: First Programs, Cengage Learning, 2011.

Note: The examiner is required to set a total 70 multiple choice questions minimum 17 questions from each unit. The student shall be required to attempt all the questions. All the questions carry equal marks. Maximum time allotted for the major exam is 90 minutes. The question paper may contains MCQ's (Multiple Choice Questions) of single correct answers, multiple correct answers, ascertaining and reasoning questions, single correct answers with multiple choice and matching type etc. There will be no negative marking.

PYTHON PROGRAMMING LAB

Course Objective: *Python is referred to as a general purpose language by the greater programming community. The major objective of Python language is to make the students solve real word problem efficiently using python library.*

Course Outcomes:

CO1: Students will be able to implement solutions to the given assignments in Python.

CO2: Students will be able to use various Python packages for solving different programming problems.

CO3: Students will be able to devise solutions for complex problems of data analysis and machine learning.

CO4: Students will be able to evaluate the output of data analysis and machine learning models.

CO5: Students will be able to create lab records of the solutions for the given assignments.

CO6: Students will be able to demonstrate use of ethical practices, self-learning and team spirit.

List of experiments/assignments:

1. Install Python and explore various popular IDE like IDLE, PyCharm, and Anaconda.

2. Assignments to perform various number operations like

    a) Find maximum from a list ofnumbers

    b) GCD of two number

    c) Square root of anumber

    d) Check number is prime ornot.

    e) Print first N primenumbers

    f) Remove duplicate numbers from list

    g) Print the Fibonacci series.

3. Assignments to perform various operations on Strings like creation, deletion, concatenation.

4. Create a List L = [10, 20, 30]. Write programs to perform following operations:

    a) Insert new numbers to list L.

    b) Delete numbers from list L.

    c) Sum all numbers in list L.

    d) Sum all prime numbers in list L.

    e) Delete the list L.

5. Create a Dictionary D= {'Name': 'Allen', 'Age': 27, 5:123456}. Write programs to perform following operations:
   a) Insert new entry inD.
   b) Delete an entry fromD.
   c) Check whether a key present in D.
   d) Update the value of a key.
   e) Clear dictionary D.
6. Two assignments on Sets to perform various operation like union, intersection, difference etc.
7. Two assignments related to searching operation like linear search, binary search.
8. Three assignments related to sorting like selection sort, bubble sort, insertion sort.
9. Demonstrate the use of dictionary for measuring student marks in five subjects and you have to find the student having maximum and minimum average marks.
10. Two assignments on usage of different available packages like random package toper form
    a) Print N random numbers ranging from 100 to500.
    b) Print 10 random strings whose length between 3 and5.
11. Two assignments on usage of package such as Numpy, Pandas.
12. Implement and demonstrate the functions of a simple calculator.
13. One assignment on implementing object oriented concept such as classes, inheritance, and polymorphism.
14. One assignment on file handling that how data is read and written to a file.

Note: The actual experiments/assignments will be designed by the course coordinator. One assignment should be designed to be done in groups of two or three students. The assignments must meet the objective of the course and the levels of the given course outcomes. The list of assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.