Shri ShamraoPatil (Yadravkar) Educational & Charitable Trust's
Sharad Institute of Technology College of Engineering
(An Autonomous Institute)
Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

Teaching and Evaluation Scheme for TY B. Tech.

Department of Artificial Intelligence & Data Science Engineering

NEP Structure

(2024-25)

Semester: V

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SHARAD INSTITUTE OF TECHNOLOGY COLLEGE OF ENGINEERING
Dept. of Artificial Intelligence & Data Science

Shri ShamraoPatil (Yadravkar) Educational & Charitable Trust's

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Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

Department: AI&DS **Rev:** Course Structure/00/2023-24

Class:T.Y. B.Tech. **Semester:**V

Sr No	Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
1	23AD3501	PCC	Data Science and Visualization	3	--	--	3	10	10	30	50	100	3
2	23AD3502	PCC	Advanced Java Programming	3	--	--	3	10	10	30	50	100	3
3	23AD3503	PCC	Design and Analysis of Algorithm	3	--	--	3	10	10	30	50	100	3
4	23AD3504	PEC	Elective I	3	--	--	3	10	10	30	50	100	3
5	23AD3505	PCC	Data Science and Visualization Laboratory	--	--	2	2	15	15	--	20	50	1
6	23AD3506	PCC	Advanced Java Programming Laboratory	--	--	2	2	15	15	--	20	50	1
7	23AD3507	PCC	Design and Analysis of Algorithm Laboratory	--	--	2	2	15	15	--	20	50	1
8	23AD3508	CEP	Mini Project – IV	--	--	2	2	25	25	--	--	50	1
9	23ADMDXX	MDM	Multidisciplinary Minor	3	--	--	3	10	10	30	50	100	3
10	23OEAD33	OE	Open Elective-III	3	--	--	3	10	10	30	50	100	3
11	23HSSM05	VEC	Aptitude Skills-III	1	--	--	1	25	25	--	--	50	Audit
12	23HSSM06	VEC	Language Skills-III	--	--	2	2	25	25	--	--	50	Audit
13	23AD3509	IFT	Industrial/Field Training-I	--	--	--	--	--	--	--	50	50	Audit
Total				19	--	10	29	180	180	180	410	950	22

Elective-I:
23AD3504A: Computer Networks and Security
23AD3504B: Optimization Techniques
23AD3504C: Data Warehousing and Mining

Open Elective III:
23OEAD33:Introduction to Data Science

Multidisciplinary Minor-

Basket	Finance & Management	Health Sciences/Science & Technology/Environment	Management & Entrepreneur Development
Sem V	Security Analysis and portfolio Management	Medical data analytics	Innovation, Business Models and Entrepreneurship

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Course Category	PCC	OE	PEC	MDM	CEP	VSEC	Project	VEC	Total
Cumulative Credits	20	3	9	6	1	2	2	-	43
NEP Guideline	18-22	2	12	6	-	2	2	-	40-44

Multidisciplinary Minor(MDM):

Semester	Basket 1 (Finance & Management)	Basket 2 (Health Sciences/ Science & Technology/Environment)	Basket 3 Management & Entrepreneur Development
Sem. III	Fundamentals of Finance and Management	Introduction to Healthcare system	Entrepreneurship
Sem. IV	Introduction to AI for Finance& Management	Applications of AI in health care	Leadership and Team Effectiveness
Sem. V	Security Analysis and portfolio Management	Medical data analytics	Innovation, Business Models and Entrepreneurship
Sem.VI	Data Science for business	Medical image processing	Engineering Econometrics
Sem. VII	Business Analytics and ML Modelling	IOT in healthcare	Management Accounting

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23AD3501	PCC	Data Science and Visualization	3-0-0	3Credits

TeachingScheme	ExaminationScheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2 : 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Familiarity with Python, Basics of mathematics, Problem-solving and analytical thinking abilities

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain basics of data science.
CO2	Explain the basics of statistical analysis and data mining for data science
CO3	Apply preprocessing and feature Engineering on data
CO4	Explain different data visualization techniques to understand the data.
CO5	Apply different techniques to create interactive visualizations
CO6	Analyze Real-World Applications and Use Cases of data science

Course Contents:

Unit I:Introduction to Data Science Overview of Data Science, Data Science Process: Data Collection, Cleaning, and Transformation, Types of Data (Structured vs Unstructured), Big Data Technologies and Concepts (Hadoop, Spark), Introduction to Python for Data Science, Data Science Use Cases and Applications	[6]
Unit II:Statistical Analysis and Data Mining Descriptive Statistics: Mean, Median, Mode, Variance, Standard Deviation ,Inferential Statistics: Hypothesis Testing, Confidence Intervals, Introduction to Data Mining, Data Mining Techniques: Classification, Clustering, Association Rule Mining, Supervised vs Unsupervised Learning ,Model Evaluation: Precision, Recall, F1-score, ROC Curve	[6]

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Unit III: Data Preprocessing and Feature Engineering Data Cleaning Techniques: Handling Missing Values, Outliers ,Data Transformation: Normalization, Standardization ,Feature Engineering and Selection ,Encoding Categorical Variables, Dimensionality Reduction: PCA, LDA, Handling Imbalanced Datasets	[6]
Unit IV: Data Visualization Techniques Introduction to Data Visualization Principles, Visualizing Univariate and Multivariate Data, Types of Visualizations: Histograms, Bar Charts, Pie Charts, Box Plots, Scatter Plots, Visualizing Correlations and Relationships, Interactive Visualizations (e.g., Plotly, Dash), Designing Effective Visualizations for Data Communication	[6]
Unit V Advanced Data Visualization with Tools Advanced Visualization with Python Libraries: Matplotlib, Seaborn, Plotly, Data Visualization using Tableau, Geospatial Visualization and Mapping (using Folium, GeoPandas), Dashboards and Reporting for Business Intelligence, Case Studies: Visualization of Time-Series, Network Data, Storytelling with Data: Best Practices for Presentation	[6]
Unit V:Real-World Applications and Use Cases Introduction to Real-World Applications of Data Science, Case Study: Financial risk analysis using data science, Smart Cities and IoT (Internet of Things): Case Study: Traffic prediction and congestion analysis using data science. Environment and Climate Science: Case Study: Climate change predictions using data science. Data Science in Government and Policy-Making: Case Study: Data science in public health during a pandemic (e.g., COVID-19 data analysis).	[6]

Reference/Textbooks:-

1. "Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett.
2. "The Art of Data Science" by Roger D. Peng and Elizabeth Matsui
3. "Storytelling with Data: A Data Visualization Guide for Business Professionals" by Cole Nussbaumer Knaflic
4. "Fundamentals of Data Visualization" by Claus O. Wilke "Data Preparation for Machine Learning" by Jason Brownlee

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23AD3502	PCC	Advanced JAVA Programming	3-0-0	3Credits

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10Marks CAII: 0Marks Mid Semester Exam:30 End Semester Exam: 50

Pre-Requisites: Java Programming.

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop programs using GUI Framework with AWT controls and Swing controls.
CO2	Develop program to handle events in java programming.
CO3	Demonstrate networking concepts by using in built classes.
CO4	Develop programs to establish connection between database and application.
CO5	Develop programs using servlet.
CO6	Develop programs using JSP.

Course Contents:

Unit I: Graphical User Interface (GUI) Programming AWT Controls: Component, container, window, frame, panel. AWT controls: labels, buttons, text area, layout managers: flow Layout, border Layout (), grid Layout, card Layout. Swing features, Swing Components:JFrame, JPanel,JTextFields, Combo Boxes, JButton, Check Boxes, Radio Buttons,Jmenu, JDialogboxes, TabbedPanes, ScrollPanes, Trees, Tables, Progressbar.	[6]
Unit II: Event Hnadling AWT Event Classes: ActionEvent, MouseEvent, KeyEvent, WindowEvent, ItemEvent, TextEvent, Listener Interfaces: ActionListener, MouseListener, MouseMotionListener, KeyListener, WindowListener, ItemListener, Event Handling using **Adapter Classes.**	[6]

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Unit II: Introduction to JDDC,ODBC Role of JDBC and ODBC, JDBC Architecture and Components, Types of JDBC Drivers, Setting up JDBC with MySQL/Oracle, Steps to Establish JDBC Connection (DriverManager, Connection, Statement) CRUD Operations: Executing SQL Queries using Statement and PreparedStatement- Insert, Update, Delete, and Select Operations , Retrieving Data using ResultSet	[6]
Unit IV:Socket Socket Overview: Client/Server, Reserved Sockets, ProxyServers, Networking Classes. InetAddress class and Methods: FactoryMethods, InstanceMethods.URL; Format, URIClass. URLConnection, TCP Server and TCP Client using Socket and ServerSocket, UDP Server and UDP Client using DatagramSocket and DatagramPacket	[6]
Unit V: Servlet Servlet Life Cycle: init(), service(), destroy(),Creating a Simple Servlet: Overview of the Servlet API, Core Interfaces and Classes: Servlet, GenericServlet, HttpServlet, ServletRequest, ServletResponse, HttpServletRequest, HttpServletResponse, HttpSession, Cookie Class (Session Tracking), Handling HTTP Requests and Responses: Processing GET and POST Requests, Session Management using Cookies and HttpSession	[6]
Unit VI : JSP Programming JSP vs. Servlet: Differences and Advantages , JSP Life Cycle , JSP Architecture, Simple JSP Program, JSP Tags and Form Handling: JSP Directives: <%@ page %>, <%@ include %>, JSP Implicit Objects: request, response, session, Form Handling in JSP (GET & POST Requests)	[6]
Reference/Textbooks:- 1. **Java: The Complete Reference – Herbert Schildt** 2. **Java for Programmers – Paul Deitel, Harvey Deitel**	

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23AD3503	PCC	Design and Analysis of Algorithm	3-0-0	3Credits

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10Marks CAII: 0Marks Mid Semester Exam:30 End Semester Exam: 50

Pre-Requisites: Basics of data structure

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand basics of algorithm and analyze performance of different algorithms using Divide and conquer.
CO2	Understand greedy Approach and Analyze the performance by taking different examples
CO3	Understand dynamic approach and Analyze the performance by taking different examples.
CO4	Design algorithm by applying backtracking technique.
CO5	Understand and Design NPHard and NPComplete Problems
CO6	Understand concepts of branch and bound, compare performance with backtracking.

Course Contents:

Unit I:Divide and Conquer What is algorithm, Algorithm Specification, Performance Analysis, and Randomized Algorithm, Divide and Conquer-The general method, Binary search finding the maximum and minimum, Merge sort Quick sort Selections or analysis of the sealgorithms	[6]
Unit II:GreedyMethod The general method, Activity Selection Problem, Huffman Coding Knapsack problem, Job sequencing with deadlines Minimum-costs panning trees–Prim's and Kruskal's Algorithms Optimal storage on tapes Optimal merge patterns analysis Single source shortest paths notations.	[6]

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Unit III:DynamicProgramming Introduction, Characteristics of Dynamic Programming, Shortest paths: Bellman Ford, Floyd , Warshall, Multistage graphs, All pair shortest paths, Optimal binary search trees, 0/1 knapsack, Reliability design,TravelingSales person problem.	[6]
UnitIV :BasicTraversalandSearchTechniquesandBacktracking Techniques for Binary Trees, Techniques for Graphs – Breadth First Search & Traversal, Depth First Search &Traversal, AND/OR graphs; Backtracking Concept, N–Queens Problem, Four–Queens Problem, Eight–QueenProblem,Hamiltonian Cycle, Sumof Subsets Problem,Graph ColoringProblem.	[6]
Unit B:NPHardandNPComplete Problems BasicConceptsNPCompleteProblems,HardGraphProblems.	[6]
Unit6:BranchandBound Introduction, Traveling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking anddynamicprogramming,Comparisons betweenBacktrackingandgreedyprogramming,BranchandBound.	[6]

Reference/Textbooks:-

1. Fundamentals of Computer Algorithms- Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaran, Universities Press, Second Edition
2. Fundamentals of Algorithmics –Gilles Brassard, Paul Bratley (Pearson Education).
3. Mastering Algorithms with C– KyleLoudon (SPDO'Reilly).
4. Computer Algorithms- Introduction to Design and Analysis–SaraBaase, Allen VanGelder(Pearson Education).
5. Michel Goodrich, Rober to Tamassia, Algorithm Design–Foundation, Analysis & Internet Examples, Wiley Publication, 2nd Edition, 2006
6. Cormen, Introduction to Algorithms, PHI Publication, 2ndEdition,2002.2. Sara Base,
7. Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2nd Edition

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23AD3504A	PEC	Computer Networks and Security (Elective-I)	3-0-0	3Credits

TeachingScheme	ExaminationScheme
Lecture:2hrs/week	CA I: 10 MarksCAII:10Marks Mid Semester Exam: 30 MarksEndSemesterExam:50Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify risks related to Computer security and Information hazard in various situations.
CO2	Apply user Identification and authentication methods.
CO3	Demonstrate and apply cryptographic algorithms to maintain security
CO4	Make use of preventive measures to avoid attacks on network using firewall.
CO5	Examine different security protocols and cyber crimes.
CO6	Explain Cyber Laws and Compliance Standards

Course Contents:

Unit1: Introduction to Computer Security **Foundations of Computer Security**: Definition and Need of computer security, Security Basics: Confidentiality, Integrity, Availability, Accountability, Non-Repudiation and Reliability. **Risk and Threat Analysis**: Assets, Vulnerability, Threats, Risks, Counter measures. **Threat to Security**: Viruses, Phases of Viruses, Types of Virus, Dealing with Viruses, Worms, Trojan horse, Intruders, Insiders. **TypeofAttacks**: Activeand Passive attacks, Denial of Service, DDOS, Backdoors and Trapdoors, Sniffing, Spoofing, Man in the Middle, Replay, TCP/IP Hacking, Encryptionattacks. **Operating system security:** Operating system updates HotFix, Patch, ServicePack.	[6]

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Unit2: User Authentication and Access Control **Identification and Authentication**: User name and Password, Guessing password, Password attacks-Piggybacking, Shoulder surfing, Dumpster diving. **Biometrics:** Finger Prints, Hand prints, Retina, patterns, Voice patterns, Signature and Writing patterns, Keystrokes. **Access controls**: Definition, Authentication Mechanism, principle-Authentication, Authorization, Audit.	[6]
Unit3: Cryptography **Introduction:** Plain Text, Cipher Text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption. **Substitution Techniques**: Caesar's cipher, Modified Caesar's Cipher, Transposition Techniques: SimpleColumnar Transposition. **Steganography:**Procedure **Symmetric and Asymmetric cryptography**: Introduction toSymmetric encryption, DES (Data encryption Standard) algorithm, Asymmetric key cryptography: Digital Signature.	[6]
Unit 4: Firewalland Intrusion Detection System **Firewall**Need of Firewall, types of firewall- Packet Filters, Stateful Packet Filters, Application Gateways, Circuit gateways.Firewall Policies, Configuration, limitations, DMZ. IntrusionDetectionSystem VulnerabilityAssessment,Misuse detection,AnomalyDetection,Network- Based IDS, Host-BasedIDS, Honey pots. Kerberos:Working,AS, TGS,SS.	[6]
Unit5: Network Security and Cyber Crime **IP Security**- Overview, Protocols- AH, ESP, Modes- transport and Tunnel.**Emailsecurity**- SMTP,PEM,PGP. **Public key infrastructure (PKI):** Introduction, Certificates, Certificate authority, Registration Authority, X.509/PKIX certificate format. **Cyber Crime:** Introduction,Hacking ,Digital Forgery, Cyber Stalking/Harassment, Pornography IdentityTheftandFraud, cyber terrorism, Cyber defamation	[6]
Unit6: CyberLaws and Compliance Standards CyberLaws:Introduction,need Categories: Crime against Individual, Government, Property. Compliance standards: Implementing and Information Security Management System,ISO27001,ISO20000,BS25999,PCIDSS,ITILframework, COBITframework	[6]
Reference/Textbooks:- 1. ComputerSecurity -DieterGollmann 2. Cryptography and Network Security-AtulKahate 3. Cyber Laws And IT Protection-HarishChander	

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23AD3504B	**PEC**	**Optimization Techniques (Elective-I)**	**3-0-0**	**3 Credits**

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10marks CAII:10marks Mid Semester Exam:30marks End Semester Exam:50marks

Pre-Requisites: Basic knowledge of mathematics, calculus, and linear algebra.

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the fundamental concepts of optimization techniques.
CO2	Identify and apply different types of optimization methods.
CO3	Implementoptimizationtechniquesinreal-worldAI&DataScienceproblems.
CO4	Compare heuristic and metaheuristic approaches for problem-solving.
CO5	Apply optimization algorithms in machine learning and deep learning models.
CO6	Analyze the impact of optimization technique in various domains.

Course Contents:

Unit I: Introduction to Optimization *(Basic Concepts &Foundations)* **Basics of optimization**—Definition and Scope of Optimization, how to formulate the problem, Applications in AI & Data Science TypesofOptimizationProblems:LinearvsNonlinear,ConstrainedvsUnconstrained Mathematical Background: Functions, Gradients, and Hessians	6
Unit II:ClassicalOptimizationTechniques UnconstrainedOptimization:GradientDescent,Newton'sMethod,Constrained, Optimization: Lagrange Multipliers, Kuhn-Tucker Conditions, Convex vs Non-Convex Optimization Examples from Regression and Neural Networks	6

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Unit III:HeuristicandMetaheuristicOptimization IntroductiontoHeuristics:HillClimbing,SimulatedAnnealing,GeneticAlgorithms (GA) and Evolutionary Computation, Particle Swarm Optimization (PSO) and Ant Colony Optimization (ACO), Comparison of Heuristic vs Exact Methods	6
Unit IV:Optimization in Machine Learning and Deep Learning OptimizationinTrainingNeuralNetworks,Gradient-BasedOptimization:SGD, Adam, RMS prop, Hyperparameter Optimization: Grid Search, Random Search, Bayesian Optimization, Reinforcement Learning and Policy Optimization	6
Unit V:Real-WorldApplicationsofOptimization OptimizationinAIandDataScienceApplications,PortfolioOptimizationinFinance, Supply Chain and Logistics Optimization, Optimization in Natural Language Processing (NLP)	6
Unit VI:AdvancedOptimization Techniques and Future Trends Quantum Optimization & Evolutionary Strategies, Swarm Intelligence & Deep Reinforcement Learning Optimization, Multi-Objective Optimization **Case Studies**: Optimization in Robotics and Healthcare	6

Text books:-

1. FundamentalsofOptimization,Author:OlviL.Mangasarian,Edition:2nd Edition (2008), Publisher: Springer
2. Numerical Optimization, Author: Jorge Nocedal and Stephen J. Wright, Edition: 2nd Edition (2006), Publisher: Springer
3. Introduction to Evolutionary Algorithms, Author: A. E. Eiben, J. E. Smith, Edition: 1st Edition (2003), Publisher: Springer

Reference books:-

1. IntroductiontoOptimization,Author:PabloPedregal,Edition:2ndEdition (2014), Publisher: Springer,
2. Optimization for Machine Learning, Author: SuvritSra, Sebastian Nowozin, and Stephen J. Wright, Edition: 1st Edition (2011), Publisher: MIT Press.
3. Handbook of Optimization in Complex Network, Author: Mostafa H. El- Nashar, Yang Shi,Edition:1stEdition(2021),Publisher: Wiley-IEEE Press.
4. Swarm Intelligence, Author: Eric Bonabeau, Marco Dorigo, and Guy Theraulaz,Edition:1stEdition(1999),Publisher:OxfordUniversityPress

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23AD3504C	PEC	Data Warehousing and Mining (Elective-I)	3-0-0	3Credits

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10 CAII:10 MidSemesterExam:30 EndSemesterExam: 50

Pre-Requisites: Basic Statistics, Database Management:

Course Outcomes:

CO1	Demonstrate Data warehouse and modeling.
CO2	Develop Data warehouse design, usage and Implementation.
CO3	Demonstrate Data mining concepts.
CO4	Analyze the concept of association-based rules technique and usage of association algorithm.
CO5	Analyze the concept of classification algorithms.
CO6	Analyze the concept of clustering and clustering algorithm.

Course Contents:

Unit1: Data Warehouse: Basic Concepts and Modeling. **Basic Concepts:** Introduction, A multitier Architecture, Data warehouse. **Models:** Enterprise warehouse, data mart and virtual warehouse, Extraction, Transformation and Loading, Metadata Repository. **Data Cube:** A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP operations, Star net Query Model for Querying multidimensional databases.	6

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Unit2: Data Warehouse: Design, Usage Implementation. **Design, Usage:** A Business Analysis Framework for data warehouse design, Data warehouse design process, Data warehouse usage for information processing, Online analytics processing to multidimensional data Mining. **Implementation:** Efficient. Data cube Computation: An Overview, Indexing OLAP Data: Bitmap Index and Join Index, Efficient Processing of OLAP Queries, OLAP server architectures: ROLAP versus MOLAP versus HOLAP.	6
Unit3: Data Mining Introduction: What is data mining, Challenges, Data Mining Tasks, Data: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity,	6
Unit4: Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.	6
Unit5: Classification: Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.	6
Unit6:Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph- Based Clustering, Scalable Clustering Algorithms.	6

Reference/Textbooks: -

1. The Data Warehouse Toolkit Ralph Kimball, Wiley 1996
2. Principles of Data Mining D. Hand, H. Mannila and P. Smyth MIT Press 2001
3. Data Mining: Introductory and Advanced Topic M. H. Dunham, Prentice Hall 2003

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23AD3505	PCC	Data Science and Visualization Laboratory	0-0-2	1Credits

Teaching Scheme:	Examination Scheme:
Practical: 2hr/week	CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks

Pre-Requisites:

Course Outcomes:

CO1	Explain basics of data science.
CO2	Explain the basics of statistical analysis and data mining for data science
CO3	Apply preprocessing and feature Engineering on data
CO4	Explain different data visualization techniques to understand the data.
CO5	Apply different techniques to create interactive visualizations
CO6	Analyze Real-World Applications and Use Cases of data science

List of Experiment:

1.	Collect a dataset from an open-source platform (e.g., Kaggle) and perform data cleaning operations like handling missing values and duplicates.
2.	Use Python to compute measures like mean, median, mode, variance, and perform hypothesis testing.
3.	Train a classification model (e.g., Decision Tree) on a sample dataset and evaluate it using precision, recall, and F1-score.
4.	Apply normalization and standardization techniques on raw data to prepare it for analysis.
5.	Perform PCA (Principal Component Analysis) on a high-dimensional dataset to visualize the reduced feature space.
6.	Create histograms, box plots, and scatter plots to analyze data distributions and relationships.
7.	Design an interactive dashboard using Plotly or Dash to visualize correlations in a dataset.

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8.	Create interactive maps using Folium, adding markers, pop-ups, and layers
9.	Analyze COVID-19 data to draw actionable insights a)Visualize trends in infection rates and recoveries across regions. b)Use dashboards to track key metrics (e.g., R-value, vaccination rates).
10.	Analyze COVID-19 data to draw actionable insights a)Predict future trends using regression or time-series models.

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23AD3506	PCC	Advanced Java Programming Lab	0-0-2	1Credit

Teaching Scheme	Examination Scheme
Practical:2hrs/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites:

Course Outcomes:

CO1	Develop programs using GUI Framework with AWT controls.
CO2	Develop programs to create GUI Framework with Swing controls.
CO3	Develop program to handle events in java programming.
CO4	Demonstrate networking concepts by using inbuilt classes.
CO5	Develop programs to establish connection between database and application.
CO6	Develop programs using servlet.

List of Experiment:

1.	Develop aprogramtodemonstrateuseofAWT controls.
2.	Develop aprogramtodemonstratedifferent layouts.
3.	Develop a programtomake use ofswingcontrols.
4.	Develop a programto handledifferentevents.
5.	Develop aprogramtodemonstrateuseofAdapterclass.
6.	Develop a program to retrieve hostname and IP address in InetAddress class.
7.	Develop aprogramthat demonstratesTCP/IPbasedcommunicationbetweenclientandserver.
8.	Develop a programto establish successfulconnectiontodatabase.
9.	Develop aservlettodisplaytheusernameandpasswordacceptedfromtheclient.
10.	Develop aservletfordemonstratingtheconceptofsessionandcookies.

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11.	Develop a basic JSP page that displays "Welcome to JSP Programming"
12.	Develop a JSP program that demonstrates the use of the <%@ page %> directive to define page properties

Tools Required:

- **JDK 8+**
- **Apache Tomcat (for Servlets & JSP)**
- **MySQL Database**
- **Eclipse / NetBeans / IntelliJ IDEA**

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23AD3507	PCC	Design and Analysis of Algorithm Laboratory	0-0-2	1Credit

Teaching Scheme	Examination Scheme
Practical:2hrs/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites:

Course Outcomes:

CO1	Design and implement algorithm by taking simple problems.
CO2	Implement algorithm on greedy Approach and Analyze the performance.
CO3	Develop an algorithm on dynamic approach and Analyze the performance.
CO4	Implement algorithm by applying backtracking technique.
CO5	Design and Implement algorithm on NPHard and NPComplete Problems
CO6	Implement algorithm on branch and bound technique.

List of Experiment:

1	Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements.
2	Implement Quick Sort algorithm and determine the time required to sort the elements
3	Implement Insertion Sort algorithm and determine the time required to sort the elements
4	Implement Heap Sort algorithm and determine the time required to sort the elements
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm
6	Find the Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm
7	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
8	Implement 0/1 Knap sack problem using Dynamic Programming.

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9	Implement N Queen's problem using Back Tracking.

23ADMDA3	MDM	Security Analysis and Portfolio Management	3-0-0	3Credits

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10marks CAII:10marks Mid Semester Exam:30marks End Semester Exam:50marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the Basics of Security Analysis
CO2	Interpret Fundamental Analysis for Investment Decision-Making
CO3	Understand Technical Analysis for Market Trends and Trading Strategies
CO4	Understand and Manage Investment Portfolios Using AI & ML
CO5	Understand and Manage Risk Using Derivatives & AI Techniques
CO6	Understand Ethical, Legal, and Compliance Aspects in Finance

Course Contents:

UNIT 1: Introduction to Security Analysis 1 Basics of Investment, Speculation, and Gambling 2 Financial Markets: Stock Market, Bond Market, Forex, and Derivatives 3 Types of Securities: Equity, Debt, Mutual Funds, ETFs, Derivatives 4 Risk & Return Concepts: Measuring Investment Performance 5 Market Efficiency & Behavioral Finance Basics	6

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UNIT 2: Fundamental Analysis 1 Understanding Financial Statements (Balance Sheet, Income Statement, Cash Flow) 2 Ratio Analysis: Profitability, Liquidity, and Solvency Ratios 3 Economic Analysis: Macroeconomic Factors & Business Cycles 4 Industry & Sector Analysis: Growth vs. Value Investing 5 Valuation Models: DCF (Discounted Cash Flow), P/E Ratio, Price-to-Book Ratio 6 AI-based Fundamental Analysis & Sentiment Analysis	6
UNIT 3: Technical Analysis 1 Introduction to Technical Analysis & Market Psychology 2 Chart Patterns: Candlestick, Head & Shoulders, Double Top/Bottom 3 Technical Indicators: Moving Averages, RSI, MACD, Bollinger Bands 4 Trend Analysis & Momentum Indicators 5 Algorithmic Trading & AI-based Technical Analysis 6 High-Frequency Trading & Machine Learning in Market Predictions	6
UNIT 4: Portfolio Management 1 Portfolio Theory: Diversification & Modern Portfolio Theory (MPT) 2 Risk-Return Tradeoff & Efficient Frontier 3 Capital Asset Pricing Model (CAPM) & Beta Analysis 4 Factor Models: Arbitrage Pricing Theory (APT) 5 Portfolio Performance Evaluation: Sharpe Ratio, Treynor Ratio, Jensen's Alpha 6 AI & Machine Learning in Portfolio Optimization	6
UNIT 5: Derivatives & Risk Management 1 Introduction to Derivatives: Futures, Options, Swaps 2 Options Pricing Models: Black-Scholes Model & Binomial Model 3 Hedging & Speculation Using Derivatives 4 Value-at-Risk (VaR) & Risk Assessment Models 5 AI-driven Risk Management & Predictive Analytics in Finance 6 Case Studies on AI-powered Financial Risk Management.	6
UNIT 6: Ethical & Legal Aspects of Investment & Trading 1 Ethical Considerations in Investment & Trading 2 Insider Trading & Market Manipulation 3 SEBI Regulations & Compliance in Indian Financial Markets 4 AI in Fraud Detection & Financial Security 5 ESG (Environmental, Social, Governance) Investing 6 Future Trends in AI & Data Science for Finance	6
Text Books: SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT.KEVIN, S.Edition : THIRD EDITION "Technical Analysis of the Financial Markets" by John J. Murphy "Modern Portfolio Theory and Investment Analysis" by Edwin J. Elton, Martin J. Gruber, Stephen J. Brown, and William N. Goetzmann	

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Reference Books:- "Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk" by Richard C. Grinold and Ronald N. Kahn
Artificial Intelligence in Financial Markets: Cutting Edge Applications for Risk Management, Portfolio Optimization, and Economics" edited by Christian L. Dunis, Peter W. Middleton, Andreas Karathanasopolous, and Konstantinos Theofilatos

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23ADMDB3	MDM	Medical data analytics	3-0-0	3Credits

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10marks CAII:10marks Mid Semester Exam:30marks End Semester Exam:50marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the data science processing
CO2	Explain the healthcare data analytics with machine learning and deep learning algorithms for health data analysis
CO3	Apply the data management techniques for healthcare data
CO4	Analyze the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications
CO5	Evaluate health data analytics for real time applications
CO6	Design emergency care system using health data analysis

Course Contents:

Unit I:INTRODUCTION TO DATA SCIENCE: Introduction to Data Science- Evolution of Data Science –Data Science process, Data Collection and Data Pre-Processing- Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning and Munging, Exploratory Data Analysis-Descriptive Statistics – Mean, Median, Mode, Standard Deviation – Categorical Data, ANOVA, Skewness and Kurtosis – Histograms	[6]

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Unit II:INTRODUCTION TO HEALTHCARE DATA ANALYTICS: Overview -History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning, Probabilistic reasoning and Bayes Theorem, Weighted sum approach, Electronic Health Records–Components of EHR- Coding Systems- Benefits of EHR- Barrier to Adopting HER Challenges- Phenotyping Algorithms.	[6]
Unit III : ANALYTICS ON MACHINE LEARNING: Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model:Sensitivity,Specificity,PPV, NPV, FPR, Accuracy,ROC, Precision Recall Curves, Valued target variables –Python: Variables and types, Data Structures and containers, Pandas Data Frame: Operations – Scikit –Learn: Pre-processing, Feature Selection.	[6]
Unit IV: HEALTH CARE MANAGEMENT: IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analyticsfor Healthcare.	[6]
Unit IV: HEALTHCARE AND DEEP LEARNING: Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.	[6]
Unit V:ADVANCED DATA ANALYTICS FOR HEALTHCARE: Review of clinical trials, Prediction Models. Statistical Prediction Models, Alternative Clinical Prediction Models, Survival Models, Predictive Models for Integrating Clinical and Genomic Data, Data Analytics for Pervasive Health, Fraud Detection in Healthcare, Pharmaceutical Discoveries and Clinical Decision Support Systems.	[6]

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TEXT BOOKS:

1. Chandan K.Reddy, Charu C. Aggarwal, "Health Care data Analysis", First edition, CRC, 2015.
2. Vikas Kumar, "Health Care Analysis Made Simple", Packt Publishing, 2018.
3. Introducing Data Science Big Data, Machine Learning, And More, Using Python Tools Davy Cielen, Amo D. B. Meysman, Mohamed Ali

REFERENCES:

1. Nilanjan Dey, Amira Ashour, Simon James Fong, Chintan Bhatl, "Health Care Data Analysis and Management, First Edition, Academic Press, 2018
2. Hui Jang, Eva K.Lee, "HealthCare Analysis : From Data to Knowledge to Healthcare Improvement", First Edition, Wiley, 2016.
3. Kulkarni, Siarry, SinghAbraham, Zhang, Zomaya , Baki, "Big Data Analytics in HealthCare", Springer, 2020.

23ADMDC3	**MDM**	**Innovation, Business Models and Entrepreneurship**	**3-0-0**	**3Credits**

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10marks CAII:10marks Mid Semester Exam:30marks End Semester Exam:50marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Discuss the concepts of Innovation
CO2	Analyze the best practices of Innovation and Entrepreneurship
CO3	Apply concepts of innovation and entrepreneurship for business decision-making.

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Course Contents:

Unit I: An Introduction, Innovation in Current Environment, Types of Innovation, School of Innovation. Challenges of Innovation, Steps of Innovation Management, Idea Management System, Divergent Vs Convergent Thinking, Levers of Idea Management	[6]
Unit II: Experimentation in Innovation Management, Idea Championship, Participation for Innovation, Co-creation for Innovation, Proto typing to Incubation. What is a Business Model, who is an Entrepreneur, SocialEntrepreneurship, Blue Ocean Strategy-I, Blue Ocean Strategy-II	[6]
Unit III: Marketing of Innovation, Technology Innovation Process, Technological Innovation Management Planning, Technological Innovation Management Strategies, Technology Forecasting	[6]
Unit IV: Sustainability Innovation and Entrepreneurship, Types of Sustainable Entrepreneurship, Conditions for Sustainable Innovation, Exploration of business models for material efficiency services.	[6]
Unit V: Management of Innovation, creation of IPR, Management of Innovation, creation of IPR, Types of IPR, Patents in India, Copyrights and other important IP	[6]
Unit VI: Business Models and value proposition, Business Model Failure: Reasons and Remedies, Incubators: Business Vs Technology, Managing Investor for Innovation, Future markets and Innovation needs for India.	[6]
Reference Books: 1. 8 Steps To Innovation : Going From Jugaad To Excellence- Book by Rishikesha T. Krishnan and Vinay Dabholkar 2. Innovation and Entrepreneurship Book by Peter Drucker 3. HBS series on Innovation and Entrepreneurship	

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23OEAD33	**OE**	**Open Elective –III (Introduction to data science)**	**3-0-0**	**3Credits**

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10marks CAII:10marks Mid Semester Exam:30marks End Semester Exam:50marks

Pre-Requisites: Basic programming knowledge (preferably Python), foundational mathematics and statistics

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain basics of data science and data science workflow
CO2	Apply techniques for cleaning and transforming data and visualize data to identify patterns and trends.
CO3	Apply basic statistical methods to analyze data
CO4	Explain the basic concepts of machine learning
CO5	Utilize appropriate visualization techniques to communicate complex data patterns and relationships effectively.
CO6	Apply data science concepts to real-world projects

Course Contents:

Unit I:Introduction to Data Science and Data Science Workflow What is Data Science, Types of Data: Structured, Unstructured, Semi-structured, Overview of Data Science Workflow:Data Collection, Cleaning, Exploration, Modeling, Evaluation, Introduction to Python and R for Data Science, Tools for Data Science: Jupyter Notebooks, Pandas, Matplotlib, Scikit-learn	[6]
Unit II: Data Exploration and Preprocessing Data Cleaning: Handling Missing Data, Outliers, and Duplicates , Data Transformation: Normalization, Scaling, Encoding Categorical Data , Data Wrangling with Pandas, Data Visualization: Using Matplotlib and Seaborn , Descriptive Statistics (Mean, Median, Mode, Variance, Standard Deviation)	[6]
Unit III: Statistical Methods in Data Science Probability Theory Basics, Inferential Statistics: Hypothesis Testing, p-values,Confidence Intervals, Correlation and Causality, Linear Regression and its Statistical Foundations	[6]

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Unit IV: Introduction to Machine Learning Overview of Machine Learning: Supervised vs Unsupervised Learning, Classification Algorithms: Logistic Regression, Decision Trees, Regression Algorithms: Linear Regression, Ridge, Lasso, Model Evaluation: Confusion Matrix, Accuracy, Precision, Recall, F1-score	[6]
Unit V:Data Visualization and Communication Principles of Effective Data Visualization, Creating Interactive Visualizations with Plotly and Dash, Communicating Data Science Findings: Storytelling with Data Visualizing Multivariate Data	[6]
Unit V:Real-World Data Science Applications and Project Case Study 1: Customer Segmentation using K-means Clustering, Case Study 2: Predicting House Prices using Regression, End-to-End Project: From Data Collection to Model Deployment, Ethical Considerations in Data Science	[6]

Reference/Textbooks:-

1. "Python for Data Analysis" by Wes McKinney
2. "Data Science for Business" by Foster Provost and Tom Fawcett
3. "Data Wrangling with Pandas" by Jacqueline Kazil
4. "Practical Statistics for Data Scientists" by Peter Bruce, Andrew Bruce, Peter Gedeck
5. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
6. "Storytelling with Data" by Cole Nussbaumer Knaflic"Data Science from Scratch" by Joel Grus

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