



Shri. Shamrao Patil(Yadravkar)Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering
(An Autonomous Institute)

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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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Head of Department,
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SHARAD INSTITUTE OF TECHNOLOGY
COLLEGE OF ENGINEERING,
Yadrav (Ichalkaranji) Dist. Kolhapur.

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Dr. S. V. Ambekar



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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	Program 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	23ADMDDXX	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
Program 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
Semester V	Security Analysis and portfolio Management (23ADMDDA3)	Medical data analytics (23ADMDDB3)	Innovation, Business Models and Entrepreneurship (23ADMDDC3)



Verified
Dr. Jyoti Kumbhar

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23AD3501	PCC	Data Science and Visualization	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
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 the fundamental concepts of Data Science and Python programming used in the data science lifecycle.
CO2	Demonstrate data manipulation techniques using NumPy and Pandas.
CO3	Apply data preprocessing methods to prepare datasets for analysis.
CO4	Apply basic statistical and probability concepts on data
CO5	Make a use of Python libraries for data visualization.
CO6	Develop interactive visualizations for effective data storytelling.

Course Contents:

Unit I: Introduction to Data Science and Python Essentials Introduction to Data Science – Importance of Data Science, Real Life Example of Data Science, Applications of Data Science, Important Data Science Skills, Jobs and Career in Data Science, setting up Python Environment for Data Science, Data Types, Variables, Control Structures, and Functions in Python, Python Libraries Overview: NumPy, Pandas, Matplotlib, Working with Files (CSV, Excel), Simple Python Programming and Platform Overview	[6]
Unit II: Data Handling with NumPy and Pandas NumPy Arrays: Creation, Indexing, Slicing, Operations, Pandas Series and Data Frames: Creation, Indexing, Manipulation, Data Loading and Exporting (CSV, Excel) Data Inspection: Head, Tail, Info, Describe, Merging, Joining, and Concatenating Data Frames, Matrix Operations using NumPy, Introduction to Data Indexing & Alignment in Pandas	[6]



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Unit III: Data Preprocessing and Feature Engineering Data Pre-processing, Steps in Data Pre-processing, Uses of Data Pre-processing, Advantages/Disadvantages of Data Pre-processing, Data Cleaning, Handling Missing Data, Handling Outliers, Feature Selection, Feature Engineering, Splitting Data into Training and Testing Sets, Data Encoding (One-Hot, Label Encoding).	[6]
Unit IV: Statistical Analysis and Probability for Data Science Statistical Analysis, Importance of Statistical Analysis, Descriptive Statistics: Mean, Median, Mode, Variance, Std. Dev, Probability Concepts and Distributions, Correlation and Covariance, Data Sampling Techniques, Hypothesis Testing: Z-Test, T-Test, Chi-Square (Intro Level), Use of Scipy and Statsmodels, P-value and Significance Level, Statistical Correlation Matrix and Interpretation.	[6]
Unit V: Exploratory Data Analysis & Visualization with Matplotlib and Seaborn Introduction to Data Visualization, Line, Bar, Histogram, and Pie Charts using Matplotlib, Plot Customization: Titles, Labels, Legends, Subplots, Seaborn for Statistical Visualization: Boxplot, Violin, Countplot, Pairplot, Heatmaps and Visual Correlation Matrix, Saving and Exporting Visualizations, Introduction to EDA and its Workflow, Visualizing Relationships, Distributions, and Trends, basics of Time-Series Plots and Decomposition, Case Study on Real-World Datasets (e.g., Titanic, Iris)	[6]
Unit IV: Advanced Data Visualization Interactive time-series visualization, Interactive Plots using Plotly, Geographical Data Visualization using Folium, Word Clouds and Bubble Charts, Dashboards using Plotly/Bokeh Dash (Basic Overview), Creating Dashboards using Streamlit (Intro), Geographical Visualization using GeoPandas, Sentiment Analysis and Visualization (e.g., Tweets/Reviews), Data Storytelling Project (e.g., COVID-19 or IPL Dataset)	[6]
Text Books: - <ol style="list-style-type: none">1. Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking by Foster Provost and Tom Fawcett2. The Art of Data Science by Roger D. Peng and Elizabeth Matsui3. Data Preparation for Machine Learning by Jason Brownlee	
Reference Books: - <ol style="list-style-type: none">4. Storytelling with Data: A Data Visualization Guide for Business Professionals by Cole Nussbaumer Knaflic5. Fundamentals of Data Visualization by Claus O. Wilke	



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23AD3502	PCC	Advanced JAVA Programming	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Java Programming.

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

CO1	Develop a GUI application using swing components.
CO2	Make use of event Handling concepts by using appropriate event classes, listener interfaces.
CO3	Construct applications that interact with relational databases using JDBC for data connectivity, manipulation, and retrieval.
CO4	Take part in Servlets with HTML forms and databases for dynamic content generation.
CO5	Make use of Java Server pages to implement dynamic web pages.
CO6	Design database-driven applications using Hibernate ORM framework by applying concepts of object-relational mapping, annotations.

Course Contents:

Unit I: GUI Programming Using Swing

Introduction to JFC and Swing, Difference between AWT and Swing, Features of the Java Foundation Classes, Swing Components: Swing Classes Hierarchy, Commonly used Methods of Component class (add(), setSize(), setLayout(), and setVisible()), JApplet, JFrame, JLabel, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JComboBox, JMenu, Advanced Swing Components(JTabbedPane, JScrollPane, JTree, JTable, JProgressBar, JSlider, JDialog) Layout Management: Flow Layout, Border Layout, Card Layout, Box Layout, Grid Layout, Gridbag Layout

[6]

Unit II: Event Handling

Event Handling: Introduction, Action Events, Key Events, Focus Events, Window Event, Mouse Event, Item Events, TextEvent, ActionListener Interface: ActionListener, KeyListener, FocusListener, WindowListener, MouseListener, MouseMotionListener, ItemListener, Event Handling using Adapter Classes.

[6]

Unit III: JDBC Programming

Two-Tier Database Design, Three-Tier Database Design JDBC- advantages and disadvantages, JDBC drivers, The JDBC API: The API components, Steps to Establish JDBC Connection (DriverManager, Connection, Statement), database operations like, CRUD(Create, Read, Update, Delete) operations using SQL Queries

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using Statement and PreparedStatement, Retrieving Data using ResultSet Develop java program using JDBC	
Unit IV: Servlet API and Overview Introduction to servlet, The life cycle of a servlet, Developing and deploying servlets, ServletRequest, ServletResponse Interfaces, Handling HTTP methods(GET, POST), Servlet config and Servlet context, Session Management using Cookies and HttpSession	[6]
Unit V: Java Server Pages Introduction to JSP: problem with Servlet, lifecycle of JSP, JSP Scripting elements (Scriptlets, Expressions, Declarations), JSP Directives (page, include, taglib), JSP Actions(Standard Actions), Implicit objects in JSP, Custom tags, Integrating JSP with Servlets	[6]
Unit VI: Hibernate Introduction to Hibernate, Exploring the architecture of Hibernate, Hibernate O/R mapping (ORM), Hibernate Annotation, CRUD operation using Hibernate API.	[6]
Text Books:- 1. "JAVA: The Complete Reference", Herbert Schildt, Ninth Edition, Oracle Press. 2. "Internet & Java Programming", R.Krishnamoorthy and S.Prabhu, New Age Publication.	
Reference Books:- 1. "Beginning JAVA", Ivor HortonWileyIndia. 2. "Java: The Complete Reference" , Eleventh Edition by Herbert Schildt Oracle. 3. "JAVA 8 Programming: Black Book", DreamtechPress. 4. "Core Java Volume I - Fundamentals", Cay S. Horstmann, Gray Connell, Pearson. 5. "Core Java Volume II - Fundamentals", Cay S. Horstmann, Gray Connell, Pearson. 6. "Advanced Java Programming", Uttam K.Roy, Qxford. 7. "Java Persistence with Hibernate", Christian Bauer, Gavin King, Dreamtech Press	



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23AD3503	PCC	Design and Analysis of Algorithm	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

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 an 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 algorithms	[6]
Unit II: Greedy Method The general method, Activity Selection Problem, Huffman Coding Knapsack problem, Job sequencing with deadlines Minimum-cost spanning trees-Prim's and Kruskal's Algorithms, Optimal storage on tapes, Optimal merge patterns analysis Single source shortest paths notations.	[6]
Unit III: Dynamic Programming Introduction, Characteristics of Dynamic Programming, Shortest paths: Bellman Ford, Floyd, Warshall, Multistage graphs, All-pairs shortest paths, Optimal binary search trees, 0/1 knapsack, Reliability design, Traveling Salesperson problem.	[6]
Unit IV: Basic Traversal and Search Techniques and Backtracking 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-Queens Problem, Hamiltonian Cycle, Sum of Subsets Problem, Graph Coloring Problem.	[6]



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Unit V: NP-Hard and NP-Complete Problems Basic Concepts: NP Complete Problems, Hard Graph Problems.	[6]
Unit VI: Branch and Bound Introduction, Traveling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking and dynamic programming, Comparisons between Backtracking and greedy programming, Branch and Bound.	[6]
Textbooks: - <ol style="list-style-type: none">1. Fundamentals of Computer Algorithms – Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press, Second Edition2. Fundamentals of Algorithmics – Gilles Brassard, Paul Bratley (Pearson Education)3. Computer Algorithms: Introduction to Design and Analysis – Sara Baase, Allen Van Gelder (Pearson Education / Addison-Wesley, 2nd Edition)4. Introduction to Algorithms – Thomas H. Cormen et al., PHI Publication, 2nd Edition, 2002	
Reference Books: - <ol style="list-style-type: none">1. Mastering Algorithms with C – Kyle Loudon (O'Reilly)2. Algorithm Design: Foundations, Analysis & Internet Examples – Michael Goodrich, Roberto Tamassia, Wiley Publication, 2nd Edition, 20063. Computer Algorithms: Introduction to Design and Analysis – Sara Baase, Addison-Wesley Publication, 2nd Edition (<i>This one is repeated in your list; keep it as a reference if already used as a textbook</i>)	




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Elective-I

23AD3504A	PEC	Computer Networks and Security	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2:10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites:

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

CO1	Illustrate the fundamentals of computer networks.
CO2	Analyze the layered architecture of network protocols and compare the OSI and TCP/IP model, functionalities of key protocols across the Application, Transport, and Network layers
CO3	Explain Computer security and Information hazard in various situations.
CO4	Apply cryptographic algorithms to maintain security.
CO5	Analyze various authentication mechanisms.

Course Contents:

Unit I: Building Blocks of Computer Networks Fundamentals of Computer Network- Definition, Need of Computer Network, Network Benefits, Computer Network Classifications, Network Topologies - Introduction, Definition, Types of Topologies, Network Control Devices - Need of Network Control devices, Role of Network Control devices in a Network.	[6]
Unit II: Layered Network Architecture: OSI and TCP/IP Models Protocol Hierarchies- Layered Approach, -Interfaces, Services. Protocols and Packets, -Design issues for layering-OSI reference Model: Layers and their functions. TCP/IP Protocol: Layers and their functions, -OSI Model Vs. TCP/IP	[7]
Unit III: Core Network Protocols Application layer name system (DNS), Dynamic Host Configuration Protocol (DHCP), File Transfer Protocol (FTP), Hypertext Transfer Protocol(HTTP), Simple Mail Transfer Protocol (SMTP).Transport layer-TCP, UDP. Network Layer- IP, ICMP, ARP, RARP.	[5]
Unit IV: Introduction to Computer Security Introduction, The Need for Security, Principles of Security-Confidentiality, Integrity, Availability, Authentication, Non-repudiation, Access Control. Types of Attacks-Passive attacks, Active attacks.	[6]



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Unit V: Cryptography Introduction: Plain Text, Cipher Text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption. Substitution Techniques, Transposition Techniques. Steganography: Symmetric and Asymmetric cryptography- Introduction to Symmetric Encryption, Asymmetric key cryptography- Digital Signature.	[7]
Unit VI: User Authentication Authentication Basics, Passwords, Authentication Tokens, Certificate-based Authentication, Biometrics Authentication, Kerberos.	[5]
Text Books: - 1. Cryptography and Network Security-Atul Kahate 2. Cyber Laws And IT Protection-Harish Chander	
Reference Books: - 1. Computer Networks- Andrew S. Tanenbaum 2. Cryptography and Network Security- S.Bose, P.Vijayakumar	




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Elective-I

23AD3504B	PEC	Optimization Techniques	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture: 3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

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	Implement optimization techniques in real-world AI & Data Science problems.
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 Basics of optimization —Definition and Scope of Optimization, how to formulate the problem, Applications in AI & Data Science Types of Optimization Problems: Linear vs. Nonlinear, Constrained vs. Unconstrained Mathematical Background: Functions, Gradients, and Hessians	[6]
Unit II: Classical Optimization Techniques Unconstrained Optimization: Gradient Descent, Newton's Method, Constrained Optimization: Lagrange Multipliers, Kuhn-Tucker Conditions, Convex vs Non-Convex Optimization, Examples from Regression and Neural Networks	[6]
Unit III: Heuristic and Metaheuristic Optimization Introduction to Heuristics: Hill Climbing, Simulated Annealing, Genetic Algorithms (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 Optimization in Training Neural Networks, Gradient-Based Optimization: SGD, Adam, RMS Prop, Hyperparameter Optimization: Grid Search, Random Search, Bayesian Optimization, Reinforcement Learning, and Policy Optimization	[6]



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Unit V: Real-World Applications of Optimization Optimization in AI and Data Science Applications, Portfolio Optimization in Finance, Supply Chain and Logistics Optimization, Optimization in Natural Language Processing (NLP)	[6]
Unit VI: Advanced Optimization 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: - <ol style="list-style-type: none">1. Fundamentals of Optimization, Author: Olvi L.Mangasarian, Edition:2nd Edition (2008), Publisher: Springer2. Numerical Optimization, Author: Jorge Nocedal and Stephen J. Wright, Edition: 2nd Edition (2006), Publisher: Springer3. Introduction to Evolutionary Algorithms, Author: A. E. Eiben, J. E. Smith, Edition: 1st Edition (2003), Publisher: Springer	
Reference Books: - <ol style="list-style-type: none">1. Introduction to Optimization, Author: Pablo Pedregal, Edition:2ndEdition (2014), Publisher: Springer,2. Optimization for Machine Learning, Author: Suvrit Sra, Sebastian Nowozin, and Stephen J. Wright, Edition: 1st Edition (2011), Publisher: MIT Press.3. Handbook of Optimization in Complex Networks, Author: Mostafa H. El-Nashar, Yang Shi, Edition:1st Edition (2021), Publisher: Wiley-IEEE Press.4. Swarm Intelligence, Author: Eric Bonabeau, Marco Dorigo, and Guy Theraulaz, Edition:1st Edition (1999), Publisher: Oxford University Press	




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Elective-I

23AD3504C	PEC	Data Warehousing and Mining	3-0-0	3Credits
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Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs./week	CA 1: 10 Marks CA 2:10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

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:

Unit I: 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]
Unit II: 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]
Unit III: 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]



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Unit IV: 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]
Unit V: Classification: Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.	[6]
Unit VI: Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph- Based Clustering, Scalable Clustering Algorithms.	[6]
Text Books: - 1. Jiawei Han, Micheline Kamber, Jian Pei (2012), Data Mining: Concepts and Techniques, 3 rd edition, Elsevier, United States of America.	
Reference Books: - 1. Margaret H Dunham (2006), Data Mining Introductory and Advanced Topics, 2nd edition, Pearson Education, New Delhi, India. 2. Amitesh Sinha (2007), Data Warehousing, Thomson Learning, India. 3. Xingdong Wu, Vipin Kumar (2009), The Top Ten Algorithms in Data Mining, CRC Press, UK.	




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23AD3505	PCC	Data Science and Visualization Laboratory	0-0-2	1 Credits
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Teaching Scheme	Evaluation Scheme
Practical: 2hr/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Basics of Python Programming

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


CO1	Demonstrate the ability to perform statistical analysis
CO2	Experiment comprehensive exploratory data analysis,
CO3	Demonstrate the capability to integrate data science and visualization techniques
CO4	Develop interactive data dashboards using tools like Dash

List of Experiments:

- Any 10 experiments.

1. To study basics of data science. Load a dataset (e.g., CSV, Excel) and perform basic data exploration (head, tail, info, describe).
2. Handle missing data by applying different strategies (mean/mode/median imputation, dropping rows/columns).
3. Perform data normalization/standardization.
4. Perform data transformation (log transformation, one-hot encoding, etc.).
5. Compute basic statistical measures (mean, median, mode, standard deviation, and variance) for a given dataset.
6. Perform hypothesis testing (t-test, chi-square test) on a sample dataset.
7. Explore correlations between different features using a correlation matrix.
8. Create basic plots (line plot, bar chart, histogram) using Matplotlib/Seaborn.
9. Visualize distributions using box plots, violin plots, and pair plots.
10. Create a heatmap to visualize correlations between variables.
11. Use Plotly or Bokeh to create interactive visualizations.
12. Perform a complete EDA on a real-world dataset (e.g., Titanic, Iris) using Pandas, Seaborn, and Matplotlib.
13. Perform Statistical Analysis and Matrix Operations Using NumPy.
14. Create a time-series plot and perform time-series decomposition.
15. Use Geopandas/Folium to create geographical visualizations.
16. Create a dashboard using Dash or Streamlit to visualize multiple aspects of a dataset.




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|--|
| 17. Choose a real-world dataset and perform end-to-end data analysis, from data cleaning to visualization. |
| 18. Analyze sentiment in text data (e.g., tweets, reviews) and visualize the sentiment distribution. |




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23AD3506	PCC	Advanced Java Programming Laboratory	0-0-2	1Credit
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Teaching Scheme	Evaluation Scheme
Practical:2hrs/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Java Programming

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

CO1	Develop a GUI application using swing components.
CO2	Make use of event-handling concepts by using appropriate event classes, listener interfaces.
CO3	Construct applications that interact with relational databases using JDBC for data connectivity, manipulation, and retrieval.
CO4	Take part in Servlets with HTML forms and databases for dynamic content generation.
CO5	Make use of Java Server pages to implement dynamic web pages.
CO6	Design database-driven applications using Hibernate ORM framework by applying concepts of object-relational mapping, annotations.

List of Experiment:

1.	Develop a program to create login form using Swing Components.
2.	Develop a program to demonstrate a progressbar showing progress value in percentage by using set values.
3.	Develop a program to Implement Traffic signal(Red, Green and Yellow) by using Swing components (Using JFrame, JRadioButton, ItemListener etc.)
4.	Develop a program to mouse motion adapter class to implement only one method, mouse dragged.
5.	Develop a program using JDBC to display student's record (Enroll No, Name, Address, Mobile No,and Email-ID) into table 'StuRec'
6.	Develop a program using JDBC to edit (insert, update, delete) Student's profile stored in the database
7.	Develop a program simple servlet to display "Welcome to Servlet Programming".
8.	Develop a program servlet that handles GET and POST methods differently.
9.	Develop a servlet for demonstrating the concept of session and cookies.
10.	Create a form that accepts the user's name and age. Display the submitted data on the next JSP page
11.	Develop a JSP page that demonstrates the use of declaration, scriptlet, and expression.



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12.

Develop an application to store, update, fetch and delete data of Employee (NAME, AGE, SALARY and DEPARTMENT) using Hibernate CRUD operations.




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23AD3507	PCC	Design and Analysis of Algorithm Laboratory	0-0-2	1 Credit
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Teaching Scheme	Evaluation 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 the 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 Experiments:

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 the 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 the All-Pairs Shortest Paths Problem using Floyd's algorithm.
8	Implement 0/1 Knapsack problem using Dynamic Programming.
9	Implement N Queens problem using Backtracking.



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23AD3508	CEP	Mini Project - IV	0-0-2	1 Credits
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Teaching Scheme	Evaluation Scheme
Practical: 2hrs/week	CA-I: - 25Marks CA-II: -25Marks

Pre-Requisites: Mini Project, Mini Project II

About Hackathon

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms where students will solve real world challenges. This Course focuses on the selection of methods/engineering tools/analytical techniques for problem solving.

Through this course, students will gain the understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills and responsibility


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

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the methods /tools used to develop the solution
CO4	Design / simulate the model/ project work
CO5	Describe the solution with help of a project report and presentation
CO6	Conclude the outcomes of project.

Course Contents:

Week 1: Survey Design-1 <ul style="list-style-type: none"> Ensure case study group students have made necessary communication and done a preparatory visit. Watch the lecture on survey design and study the notes. Prepare a questionnaire and try it out with your group members as mock. 	[2]
Week 2: Survey Design-2 <ul style="list-style-type: none"> Review survey questionnaire prepared by case study groups. Decide sampling strategy. Prepare a detailed schedule for fieldwork 	[2]




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Week 3: Fieldwork <ul style="list-style-type: none">• Data Collection: Collect quantitative data (e.g., statistics, usage metrics) and qualitative data (e.g., user stories, testimonials).• Use data collection tools like questionnaires, observation checklists, and digital analytics.• Ensure data accuracy and reliability through proper sampling and recording methods.• 25% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 4: Trails and Experimentation-1 <ul style="list-style-type: none">• Initial Setup and Configuration• Concept Validation• Feasibility Testing	[2]
Week 5: Trails and Experimentation-2 <ul style="list-style-type: none">• Prototyping• Functionality Testing	[2]
Week 6: Trails and Experimentation-3 <ul style="list-style-type: none">• Bug Identification and Fixing• Integration Testing• Security Testing• 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 7: Results <ul style="list-style-type: none">• Coordinator has to check and verify below points in term of result:• Functional Performance• Accuracy and Precision• Efficiency• Safety	[2]
Week 8: Validation <ul style="list-style-type: none">• Coordinator has to check and verify below points in term of validation:• Testing and Verification• Compliance with Standards• 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 9: Integration Testing <ul style="list-style-type: none">• Validate that the hardware integrates seamlessly with other systems or components as intended• Perform compatibility tests with software, other hardware, and network systems.	[2]
Week 10: Documentation and Reporting <ul style="list-style-type: none">• Maintain comprehensive documentation of design, development, testing, and validation processes• Provide detailed reports on test results, issues found, and corrective actions taken.	[2]




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Week 11: Final Presentation <ul style="list-style-type: none">100% Presentation has to be conducted by mentor/guide based on above activity.Prototype/Final Software solution is mandatory at the time of final presentation along with report	[2]
Week 12: Exhibition <ul style="list-style-type: none">Mini project exhibition will be scheduled with interdepartmental evaluation.	[2]




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Multidisciplinary Minor

23ADMDA3	MDM	Security Analysis and Portfolio Management	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2:10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

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 I: 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]
UNIT II: 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 III: 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]



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6 High-Frequency Trading & Machine Learning in Market Predictions	
UNIT IV: 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 V: 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 VI: 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: 1. "Security analysis and portfolio management", Kevin S. Edition: third edition 2. "Technical Analysis of the Financial Markets" by John J. Murphy 3. "Modern Portfolio Theory and Investment Analysis" by Edwin J. Elton, Martin J. Gruber, Stephen J. Brown, and William N. Goetzmann	
Reference Books: - 1. "Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk" by Richard C. Grinold and Ronald N. Kahn 2. 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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Multidisciplinary Minor

23ADMDB3	MDM	Medical Data Analytics	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

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, Skewness and Kurtosis	[6]
Unit II: Introduction to healthcare data analytics Overview -History of Healthcare Analysis Parameters on medical care systems, Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning, Bayes Theorem, Weighted sum approach, Electronic Health Records–Components of EHR, Benefits of EHR	[6]
Unit III: Analytics on machine learning Machine Learning– Pre-processing, Visualization, Feature Selection – Training model parameter – Evaluation model: Sensitivity, Specificity, PPV, NPV, FPR, Accuracy, ROC, Precision, Recall Curves, Python: Variables and types, Data Structures, Pandas Data Frame: Operations, Scikit –Learn: Pre-processing, Feature Selection.	[6]
Unit IV: Healthcare 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	[6]



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Prediction Models – Visual Analytics for Healthcare.	
Unit V: 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 VI: 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]
Text Books: <ol style="list-style-type: none">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, Arno D. B. Meysman, Mohamed Ali	
References Book: <ol style="list-style-type: none">1. Nilanjan Dey, Amira Ashour, Simon James Fong, Chintan Bhatl, “Health Care Data Analysis and Management, First Edition, Academic Press, 20182. 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.	




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Multidisciplinary Minor

23ADMDC3	MDM	Innovation, Business Models and Entrepreneurship	3-0-0	3Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CAI:10marks CAII:10marks Mid Semester Exam:30marks End Semester Exam:50marks

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.

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, Prototyping to Incubation. What is a Business Model, who is an Entrepreneur, Social Entrepreneurship, 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,	[6]



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Future markets and Innovation needs for India.


Text Books:

1. 8 Steps to Innovation: Going from Jugaad to Excellence- Book by Rishikesh T. Krishnan and Vinay Dabholkar
2. Innovation and Entrepreneurship Book by Peter Drucker
3. HBS series on Innovation and Entrepreneurship

Reference Books:

1. "Managing Innovation: Integrating Technological, Market and Organizational Change", by Joe Tidd & John Bessant, Wiley publications
2. "The Innovator's DNA: Mastering the Five Skills of Disruptive Innovators", by Jeff Dyer, Hal Gregersen, and Clayton M. Christensen, Harvard Business Review Press.




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23HSSM05	VEC	Aptitude Skills-III	1-0-0	Audits
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Teaching Scheme	Evaluation Scheme
Lecture:1hrs/week	CA I: 25marks CAII: 25mark

Pre-Requisites: Aptitude Skills I and II

Course Outcomes:

CO1	Solve the problems on system of equation
CO2	Solve the problems on seating arrangement
CO3	Solve the logical reasoning problems
CO4	Solve the critical analysis problems
CO5	Solve the problems of Data interpretation
CO6	Solve the problems, permutations, and combinations

Course Contents:

Unit I: System of equations Quadratic equations, Surds and indices, solution of equations, Ages,	[2]
Unit II: Seating Arrangements Linear seating Arrangement, Circular seating arrangement, Complex seating arrangement	[2]
Unit III: Logical Reasoning Numerical based on sense of direction, Blood relations, odd man out	[2]
Unit IV: Critical analysis Clocks and Calendar based problems, Cryptarithmic, heights and distances	[2]
Unit V: Data Interpretation Table form, Bar form, Line for Pi chart form	[2]
Unit VI: Permutation and Combination Permutations and combinations	[2]
Text Books: 1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Evaluation", S.Chand Publisher;2016 edition. 2. Quantitative Aptitude for CATTMH Publications Vedic Math's Made Easy By Dhaval Bhatiya, Jaico Publication House.	



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Reference Books:

1. Rao N.D.V. Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press; Second edition
3. RS Aggarwal, Objective General English, S. Chand Publisher; 2016 edition




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23HSSM06	VEC	Language Skills-III	0-0-2	Audits
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Teaching Scheme	Evaluation Scheme
Lecture:2hrs/week	CAI: 25 marks CAII: 25 marks

Pre-Requisites: Language Skill I &II

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

CO1	Develop a program to read input and return output.
CO2	Develop a program using data types, Strings and variables
CO3	Develop a program using Unary, Binary and Ternary operator
CO4	Develop a program using Conditional and Logical statements.

Course Contents:

1. Write a Python program to print "Hello, World!" ○ Objective: Understand basic syntax, indentation, and output.	[2]
2. Write a program to demonstrate the use of different types of comments in Python. ○ Objective: Single-line and multi-line comments.	[2]
3. Write a Python program that declares different types of variables and displays their data types using the type() function. ○ Objective: Variables, data types, and type identification.	[2]
4. Write a program to demonstrate type casting and type conversion between int, float, and string. ○ Objective: Type conversion, casting functions.	[2]
5. Write a Python script to perform string operations such as slicing, concatenation, upper(), lower(), and len(). ○ Objective: String manipulation and built-in functions.	[2]
6. Write a program to demonstrate the use of all arithmetic, logical, and bitwise operators. ○ Objective: Operator functionality.	[2]
7. Write a Python program to use membership and identity operators with examples. ○ Objective: in, not in, is, is not.	[2]
8. Write a Python program using a ternary operator to find the larger of two numbers. ○ Objective: Conditional (inline) expressions.	[2]



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9. Write a program that takes user input for age and prints whether the person is a child, teenager, adult, or senior citizen using if-elif-else. ○ Objective: Conditional statements and user input.	[2]
10. Write a program to find the sum of the first 10 natural numbers using a while loop. ○ Objective: Looping with while.	[2]
11. Write a Python script to display the multiplication table of a number using a for loop. ○ Objective: Looping with for and range().	[2]
12. Write a program that uses break, continue, and pass statements in appropriate looping scenarios. ○ Objective: Loop control statements.	[2]
Text Books: 1. Python Projects (Author: Laura Cassell, Alan Gauld) Wrox publication 2. Murach's Python Programming. UT.: Michael Urban, Joel Murach, Murach's Publication.	
Reference Books: 1. Fundamentals of Python (First Program) Cengage MINDTAP Publication 2nd Edition. Author: K.A. Kambert	




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23AD3509	IFT	Industrial/Field Training- I	0-0-0	Audit
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Teaching Scheme	Evaluation Scheme
Lecture: NA	End Semester Exam: 50 marks

Course Contents:

Course Description
Internship / Training is educational and career development opportunity, providing practical experience in a field or discipline. At the end of the fourth semester, every student should undergo practical training in an industry / professional organization / Research laboratory with the prior approval of the HoD/TPO/Principal of the college and submit the report along with the completion certification from the Industry/ Organization. The report will be evaluated during the fifth semester by the department.
Course Learning Outcomes: -
After successful completion of the course, students will be able to
1. Verify the Technical knowledge in real industrial situations.
2. Develop interpersonal communication skills.
3. Discuss activities and functions of the industry in which the Internship/training has done.
4. Write the technical report.
Prerequisite: - Basics of Programme Engineering, Good written and Oral Communication.
Guideline for Students: -
1. Arrive at work as per schedule, ready to work and stay for the agreed upon time.
2. Present yourself in a professional manner at all times, including being appropriately dressed at workplace.
3. Communicate any concerns with your supervisor and the internship/Training coordinator in a timely manner and respectfully.
4. Demonstrate enthusiasm and interest in what you are doing, ask questions, and take the initiative as appropriate.
5. Complete and submit assigned tasks by designated timelines. Meet all deadlines.
Student's Diary/ Daily Log
The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.
The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor.



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Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the SITCOE immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

Internship Report

After completing the internship, the student should prepare a comprehensive report to indicate what he/she has observed and learned in the training period. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The competent authority should sign the training report. The Internship report should be evaluated on the basis of following criteria:

- i. Originality.
- ii. Adequacy and purposeful write-up.
- iii. Organization, format, drawings, sketches, style, language etc.
- iv. Variety and relevance of learning experience.
- v. Practical applications, relationships with basic theory and concepts taught in the course.

Evaluation of Internship/Training

The student should be evaluated based on his training report and presentation, before an expert committee constituted by the concerned department as per norms. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report



[Signature]
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