RATHINAM COLLEGE OF ARTS AND SCIENCE

(AUTONOMOUS)

Rathinam Tech Zone, Eachanari, Coimbatore – 641021.

DEPARTMENT OF INFORMATION TECHNOLOGY

Syllabus for

M.Sc.INFORMATION TECHNOLOGY

(I Semester)

2024 – 2025 Batch onwards

Vision and Mission of the Institution

Vision

To emerge as a world-renowned Institution that is integrated with industry to impart Knowledge, Skills, Research Culture and Values in youngsters whocanaccelerate the overall development of India

Mission

To provide quality education at affordable cost, build academic and research excellence, maintain eco-friendly and robust infrastructure, and to create a team of well qualified faculty who can build global competency and employability among the youth of India.

Motto

Transform the youth into National Asset

Vision and Mission of the Department

Vision

To become a globally recognized and deeply connected with the tech industry, fostering a culture of knowledge, skills, research, and values in aspiring computer scientists, empowering them to drive India's holistic technological advancement.

Mission

To empower students and cultivate academic and research brilliance and provide them to leverage Technology as a tool for innovation and fostering global competitiveness and employability in diverse field

Motto

Industry – Ready Education

Program Educational Objectives (PEO)

PEO1	Pursue a career as a globally competent and universally employable professionalin core and related fields in diverse sectors who accelerates the overall development of India.
PEO2	Pursue lifelong learning opportunities including graduate degrees to improve and expand domain specific and professional skills.
PEO3	Advance personally and professionally by accepting professional and societal responsibilities, and pursuing leadership roles.

Mapping of Institute's Mission to PEO

Institute's Mission	PEO's
To provide quality education at affordable cost, build academic and research excellence maintain eco-friendly and robust infrastructure, and	PEO1, PEO2
To create a team of well qualified faculty who can build global competency and employability among the youth of India.	PEO2, PEO3

Mapping of Department Mission to PEO

Department Mission	PEO's
To empower students and cultivate academic and research brilliance	PE01, PE02
Provide them to leverage Technology as a tool for innovation	PEO3
Fostering global competitiveness and employability in diverse field	PE04, PE05
To empower students and cultivate academic and research brilliance	PE01, PE02

Program Outcomes (PO):

PO1	**:**	Demonstrate knowledge competency in core discipline
PO2	**:**	Apply the appropriate knowledge and suitable skills in solving the complex problems
PO3	**:**	Conduct investigations of complex problems through various scientific approaches
PO4	**:**	Design solutions for complex and open ended real-life or real-time problems
PO5	**:**	Use appropriate and advanced tools for a wide range of practices with an understanding on its associated limitations
PO6	**:**	Work effectively and responsibly as a member or a leader in a team
PO7	**:**	Express complex concepts within the profession and with society at large
PO8	**:**	Understand the professional roles and responsibilities
PO9	**:**	Analyze social and environmental aspects of the professional practices
PO10	**:**	Practice higher moral and ethical standards during the discharge of professional duties
PO11	**:**	Incorporate finer finance and business practices in all professional engagements
PO12	**:**	Identify and address their professional development through lifelong learning

Program Specific Outcomes (PSO):

PSO1	**:**	Graduates will be able to apply computational thinking and algorithmic problem-solving techniques to solve complex problems in various domains of computer science.
PSO2	**:**	Graduates will be able to design, implement, and evaluate computing systems, components, or processes to meet specified requirements, considering ethical, social, and environmental implications
PSO3	**:**	Graduates will demonstrate the ability to manage, store, retrieve, and analyze data effectively using appropriate data structures, databases, and information retrieval techniques.
PSO 4	**:**	Graduates will possess a solid understanding of computer networks, protocols, and security principles, and will be able to design, implement, and manage secure networked systems
PSO5 :		The course syllabi will provide students with a solid foundation with the necessary knowledge and skills to pursue Research Level specialized areas of computer science.

Correlation between the PO/PSO and the PEOs

Program Outcomes		PEO 1	PEO 2	PEO 3
PO1	:	3	1	3
PO2	:	3	2	3
PO3	:	1	2	3
PO4	:	3	1	3
PO5	:	3	3	2
PO6	:	2	3	3
PO7	:	2	3	1
PO8	:	3	2	1
PO 9	:	2	2	3
PO 10	:	3	2	1
PO 11	:	2	1	1
PO 12	:	3	2	2
PSO1	:	2	3	1
PSO2	:	3	2	2
PSO3	:	2	3	3
PSO4	:	3	2	2
PSO5		2	3	3

3 – Strong correlation; 2-moderate correlation; 1-Less correlation; Blank-no correlation

Components considered for Course Delivery is listed below:

a. Class room Lecture
b. Laboratory class and demo
c. Assignments
d. Mini Project
e. Project
f. Online Course
g. External Participation
h. Seminar
i. Internship

Mapping of POs with Course Delivery:

Program Outcome	Course Delivery								
	a	**b**	**C**	**D**	**e**	**f**	**G**	**h**	**i**
PO1	3	3	1	1	2	1	3	3	1
PO2	3	3	2	3	3	1	1	2	3
PO3	3	3	1	3	1	1	1	2	3
PO4	2	3	2	3	3	1	1	3	1
PO5	3	2	1	3	1	3	3	3	3
PO6	2	3	1	3	3	1	2	3	3
PO7	2	3	1	3	1	1	2	3	3
PO8	2	2	1	2	3	3	2	3	3
PO9	1	1	2	3	3	3	2	3	3
PO10	2	1	2	3	2	2	2	2	2
PO11	1	1	2	2	2	3	3	3	3
PO12	1	2	3	2	2	2	3	3	3
PSO1	2	3	1	3	2	3	1	3	3
PSO2	3	2	2	3	3	2	2	3	2
PSO3	2	3	3	2	2	3	3	2	3
PSO4	3	2	2	1	3	2	2	1	2

3 – Strong correlation; 2-moderate correlation; 1-Less correlation; Blank-no correlation

RATHINAM COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)

Scheme of Curriculum for M.Sc Information Technology for the Batch admitted during 2024-2025 Onwards

Sem	Part	Type	Sub Code	Subject	Credit	Per Week	CIA	ESE	Total	Exam Hours
1.1	3	C1		Core-I- Advanced Data Structures and Algorithms	4	5	50	50	100	3
1.2	3	C2		Core-II- Advance RDBMS and SQL	4	5	50	50	100	3
1.3	3	C3		Core-III- Advance Data Science	4	5	50	50	100	3
1.4	3	C4		Core Practical - Advance Data Science	4	5	50	50	100	3
1.5	3	SEC 1		Skill - I (Practical / Training)- Advance RDBMS Lab	4	5	50	50	100	3
1.6	3	ELE 1		Elective-1-Industraial Internet of Things (IIOT)	4	5	50	50	100	3
2.1	3	C5		Core-V- Cloud Computing	4	5	50	50	100	3
2.2	3	C6		Core-VI- Machine Learning	4	5	50	50	100	3
2.3	3	C7		Core-VII- Data Visualization	4	5	50	50	100	3
2.4	3	C8		Core-VIII-gNetwork Security and Cryptography	4	5	50	50	100	3
2.5	3	SEC 2		Skill - II (Practical / Training) - Information Security TV	4	5	50	50	100	3
2.6	3	ELE 2		Elective-2- Block Chain Technology	4	5	50	50	100	3
3.1	3	C9		Core-IX- Sentiment Analytics	4	6	50	50	100	3
3.2	3	C10		Core-X- Deep Learning	4	6	50	50	100	3
3.3	3	C11		Core – XI-- Vue JS	4	6	50	50	100	3
3.4	3	SEC 3		Skill - III (Practical / Training)- Mobile Computing TV	4	6	50	50	100	3
3.5	3	ELE 4		Elective-3- Research Methodology & IPR	4	6	50	50	100	3
3.6	3	ITR		Internship / Industrial Training (Summer vacation at the end of II semester activity)	2		50	0	100	3
4.1	3	C12		Core-XII- Artificial Intelligence	4	6	50	50	100	3
4.2	3	SEC 4		Skill - IV (Practical / Training)- Cyber Security TV	4	6	50	50	100	3
4.3	3	ELE 5		Elective-4-Bio Informatics	4	6	50	50	100	3
4.4	3	PRJ		Project with Viva-Voce	8	12	100	100	100	3

SEMESTER I

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Advanced Data Structures and Algorithms	4	5	-	-	**Core Theory**

Course Introduction
This course covers the various data structures, including arrays, structures, stacks and queues. It includes sorting and searching techniques and effective search methods in Binary trees. This course also deals with graph data structures.

Course Focus on:Skill Development/ Entrepreneurship / Employability / Research

Course Outcomes	On completion of this course, students will
CO 1:	Understand the concepts of arrays, strings and algorithms for basic operations
CO 2:	Apply concept of stacks, queues, linked list and algorithms for basic operations
CO 3:	Identify the familiarity with major algorithms and data structures
CO 4:	Analyse appropriate algorithms and data structures for various applications
CO 5:	Formulate the computational complexity of various algorithms

Unit I:	**Data structures and Algorithms**	**[12 Periods]**

Algorithms - Performance analysis - time complexity and space complexity - Asymptotic Notation - Big Oh - Omega and Theta notations - Complexity Analysis Examples - Data structures - Linear and nonlinear data structures - ADT concept - Linear List ADT - Array representation - Linked representation – Vector representation - singly linked lists- insertion – deletion - search operations - doubly linked lists - insertion,deletion operations, circular lists - Representation of single - two dimensional arrays - Sparse matrices and their representation.

Unit II:	**Stack and Queue**	**[12 Periods]**

Stack and Queue ADTs - array and linked list representations - infix to postfix conversion using stack - implementation of recursion - Circular queue - insertion and deletion - Dequeue ADT - array and linked list representations - Priority queue ADT - implementation using Heaps - Insertion into a Max Heap – Deletion from a Max Heap - java.util package – Array List - Linked List - Vector classes - Stacks and Queues in java.util - Iterators in java.util.

Unit III:	**Searching Algorithms**	**[12 Periods]**

Searching - Linear and binary search methods - Hashing-Hash functions - Collision Resolution methods – Open Addressing – Chaining - Hashing in java.util - HashMap – HashSet - Hashtable. Sorting – Bubble sort - Insertion sort - Quick sort - Merge sort - Heap sort - Radix sort - comparison of sorting methods

Unit IV:	**Binary Tree**	**[12 Periods]**

Trees - Ordinary and Binary trees terminology - Properties of Binary trees - Binary tree ADT- recursive and non recursive traversals - Java code for traversals -Threaded binary trees - Graphs- Graphs terminology - Graph ADT – graph traversals/search methods - dfs and bfs - Java code for graph traversals - Applications of Graphs - Minimum cost spanning tree using Kruskal's algorithm - Dijkstra's algorithm for Single Source Shortest Path Problem.

Unit V:	**AVL trees**	**[12 Periods]**

Search trees - Binary search tree - Binary search tree ADT – insertion - deletion and searching operations - Balanced search trees - AVL trees - Red Black trees – Definition and examples only - B-Trees – definition - insertion and searching operations - Trees in java.util – TreeSet - Tree Map Classes - Tries(examples only) - Comparison of Search trees - Text compression - Huffman coding and decoding - Pattern matching – KMP algorithm.

Text Books:

1. S. Sahni, "Data structures, Algorithms and Applications in Java", Universities Press.[ISBN:0-07-109217]
2. Adam Drozdek, "Data structures and Algorithms in Java", 3rd edition, CengageLearning. [ISBN:978-9814239233

Reference Books:

1. R.Lafore "Data structures and Algorithms in Java", Pearson education.
2. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press, 2011.
3. Advanced Data Structures, ReemaThareja, S. Rama Sree, Oxford University Press, 2018.

Web Resources:

1. http://www.coursera.org/learn/advanced-data-structures
2. https://nptel.ac.in/courses/106/106/106106133/
3. https://www.mooc-list.com/search/node?keys=Advanced+Data+Structures

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	1	1	2	2	1	2	3	2	3
CO2	1	2	2	3	3	1	2	3	2	2	3	1
CO3	1	2	3	2	3	2	2	1	1	3	2	2
CO4	2	3	1	2	1	1	1	3	3	1	2	3
CO5	3	2	3	1	3	2	3	2	3	2	1	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Big data Frame Work	4	5	-	-	**Core Theory**

Course Introduction

This course enables the student to explore the foundational principles of grounding in basic and advanced methods to big data technology and tools like MapReduce and Hadoop and its ecosystem. And alsoto Understand the Big Data Platform , web analyticsand graph database and also introduction to NOSQL .

Course Focus on:Skill Development/ Entrepreneurship / Employability / Research

Course Outcomes	On completion of this course, students will
CO 1:	To provide grounding in basic and advanced methods to big data technology ecosystem.Study the historical events that led to the discoveries.To Understand the Big Data Platform and web analytics
CO 2:	To Provide an overview of Apache Hadoop and the Design of HDFS. To Understand Map Reduce features.
CO 3:	Understand the variousHBASEData model and implementations.
CO 4:	Explain the principles and working mechanism of different To Exposethe Graph databases Neo4J
CO 5:	Understand the concept of asepsis and modes of sterilization and disinfectants.

Unit I:	**Introduction to Bigdata**	**[12 Periods]**

IntroductiontoBigdata: Introduction–BigData-CharacteristicsofBigData–Bigdatamanagement architecture-Examining Big Data Types – Big Data Technology Components -– Bigdataanalytics–Bigdataanalyticsexamples-WebDataOverview– WebDatainAction- big data and healthcare – big data in medicine – advertising and big data – big data technologies - open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics .

Unit II:	**Introduction to Hadoop**	**[12 Periods]**

Hadoop : Introduction – History of Hadoop - Hadoop Ecosystem-Analyzing data with Hadoop - HadoopDistributedFileSystem-Design-HDFSconcepts-Hadoopfilesystem–Dataflow–HadoopI/O-Dataintegrity–Serialization-SettingupaHadoopcluster-Clusterspecification-clustersetupandinstallation–YARN.Understanding Hadoop Ecosystem -The Hadoop Distributed File System – Components of Hadoop-Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFSHow Map Reduce Works-Anatomy of a Map Reduce Job run-Failures- - Map Reduce Types and Formats- Map Reduce Features

Unit III:	**HBASE**	**[12 Periods]**

ase clients – Hbase examples – praxis. Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts.

Unit IV:	**GRAPH DATABASES NEO4J**	**[12 Periods]**

GRAPH DATABASES NEO4J Key concept and characteristics-Modelling data for neo4j-Importing data into neo4jVisualizations neo4j-Cypher Query Language-Data visualization- Creating Visual analytics with Tableau-Connecting your data-Creating Calculation-Using maps-Dashboard-Stories

Unit V:	**INTRODUCTION TO NOSQL**	**[12 Periods]**

NoSQL Databases: Introduction to NoSQL- **MongoDB**: Introduction – Data types – Creating,Updating and deleing documents -Querying – Introduction to indexing – Capped collections. **Hbase**:Concepts -Hbase Vs RDBMS - Creating records- Accessing data – Updating and deleting data –Modifyingdata-exportingandimportingdata.

USECASES: Call detail loganalysis,Creditfraudalert,Weatherforecast

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Text Books:

1. Tom White. (2012). Hadoop: The Definitive Guide. 2nd Edition. OReilly.
2. Tom White. (2014). The Definitive Guide to Mongodb. 4th Edition. OReilly.
3. Rik Van Bruggen. (2014). Learning Neo4j. 1st Edition. Packt Publishing Ltd. UK.
4. Daniel G.Murray. (2016). Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software. 2nd Edition. Wiley.
5. GauravVaish. (2013). Getting Started with NoSQL. Packt Publishing Ltd. UK.
6. Pramod J. Sadalage, Martin Fowler. (2013). NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. Pearson Education. 8. Joshua N. Milligan. (2016). Learning Tableau. Packt Publishing Ltd. UK.

Reference Books:

1. Reihaneh H. Hariri, Erik M. Fredericks & Kate M. Bower" Uncertainty in big data analytics: survey, opportunities, and challenges", Journal of Big Data volume 6, Article number: 44 (2019).
2. Boris Dublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN:1, 2015.
3. Chris Eaton, Dirk deroosetal. , "Understanding Big data ", McGraw Hill, 2012.
4. Tom White, "HADOOP: The Definitived Guide" , O Reilly 20126
5. VigneshPrajapati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.
6. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.

Web Resources:

1. https://www.tutorialspoint.com/big_data_analytics/
2. hadoop.apache.org/
3. https://www.mongodb.com/nosql-explained
4. https://neo4j.com/
5. https://nptel.ac.in/courses/106104189/

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	1	1	2	1	1	1
CO2	3	2	3	1	1	3	2	1	2	1	1	1
CO3	3	3	2	1	2	2	1	3	2	1	2	1
CO4	1	1	3	3	1	3	2	3	1	2	2	2
CO5	3	1	3	1	3	2	2	3	1	2	2	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Advance RDBMS and SQL	**4**	**5**	**0**	**0**	**Theory**

Course Introduction

This course enables the student skills and knowledge to tackle complex database challenges, optimize database performance, and design efficient database solutions using advanced RDBMS and SQL techniques.

Course Focus on:Skill Development/ Entrepreneurship / Employability / Research

Course Outcomes	On completion of this course, students will
CO 1:	Proficiency in writing and optimizing complex SQL queries.
CO 2:	Skills in tuning queries, indexing, and monitoring for optimal performance.
CO 3:	Ability to design efficient and scalable database schemas.
CO 4:	Understanding of transaction management and concurrency control.
CO 5:	Proficiency in database security concepts and implementation.

Unit I:	**File System Vs. DBMS**	**[12 Periods]**

File System Vs. DBMS - Database System Applications - View of Data-Database language - Database design - ER Model _ Relational Model - Network Data Model - Hierarchical Data Model - Data Storage & Querying - Data Architecture.

Unit II:	**Relational Model**	**[12 Periods]**

Relational Model - Structure of Relational Databases - Relational Algebra and Calculus - SQL - Basic Structure - Set Operations - Aggregate Functions - Null Values - Nested Queries - Complex Queries - Views - Modification of the Database - Advanced SQL – Triggers

Unit III:	**Functional Dependencies**	**[12 Periods]**

Functional Dependencies - Features of Relational designs - Decomposition and Normalisation using Functional Dependencies and Multivalued Dependencies - Join dependencies- Domain key Normal form.

Unit IV:	**Physical Storage Media**	**[12 Periods]**

Overview of Physical Storage Media - Magnetic disks - RAID - Teritary Storage - File Organisation - Organisation of records in Files - Indexing and Hashing - Ordered Indices - B+ -Tree Index Files - B-Tree Index Files - multiple Key Access - Static and Dynamic Hashing - Query Processing - Transaction Management - Transactions - Concurrency.

Unit V:	**Distributed Databases**	**[12 Periods]**

Distributed Databases - Homogeneous and Heterogeneous Databses - Distributed Data Storage - Distributed Transactions - Commit Protocols - Concurrency Control - Object Based Databases - Complex Data types - Structured Types and Inheritance in SQL – Object identity and Reference - Types in SQL - XML - structure of XML data - XML Document - Schema - Querying and Transformation - Data Mining and Data Warehousing.

Text Books:

7. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- “Database System Concepts”, FifthEdition,McGraw-Hill,2006.
8. Date CJ (2003). An Introduction to Database Systems,8/e, Pearson Education.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Tata McGraw-Hill Publishing Company, 2003.
2. RamezElmasri and Shamkant B. Navathe, "Fundamental Database Systems", Third Edition, Pearson Education, 2003.
3. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "Database System Implementation"- Pearson Education- 2000.
4. Narang,"Database Management Systems", 2nd ed., PHI.

Web Resources:

1 .https://www.w3schools.com/sql/sql_ref_mysql.asp
2. https://learn.microsoft.com/en-us/sql/?view=sql-server-ver16

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	1	1	2	1	1	1
CO2	3	2	3	1	1	3	2	1	2	1	1	1
CO3	3	3	2	1	2	2	1	3	2	1	2	1
CO4	1	1	3	3	1	3	2	3	1	2	2	2
CO5	3	1	3	1	3	2	2	3	1	2	2	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Advance RDBMS and SQL Lab	**4**	**0**	**0**	**5**	**Practical**

List of Practical Programs:

1. Practical Based on Data Manipulation.
   • Adding data with Insert, • Modify data with Update, • Deleting records with Delete
2. Practical Based on Implementing the Constraints.
   • NULL and NOT NULL, • Primary Key and Foreign Key Constraint • Unique, Check and Default Constraint
3. Practical for Retrieving Data Using following clauses.
   • Simple select clause, • Accessing specific data with Where, Ordered By, Distinct and Group By
4. Practical Based on Aggregate Functions.
   • AVG, • COUNT, • MAX, • MIN, • SUM, • CUBE
5. Practical Based on implementing all String functions.
6. Practical Based on implementing Date and Time Functions.
7. Practical Based on implementing use of union, intersection, set difference.
8. Implement Nested Queries & JOIN operation.
9. Practical Based on performing different operations on a view.
10. Practical Based on implementing use of triggers, cursors & procedures.

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

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CO1	3	3	3	2	2	1	1	1	2	1	1	1
CO2	3	2	3	1	1	3	2	1	2	1	1	1
CO3	3	3	2	1	2	2	1	3	2	1	2	1
CO4	1	1	3	3	1	3	2	3	1	2	2	2
CO5	3	1	3	1	3	2	2	3	1	2	2	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Advanced Data Science	4	5	-	-	**Practical**

Course Introduction

Advanced Data Science," an expertly crafted course tailored for those who possess foundational knowledge in data science and aspire to master more intricate and powerful techniques. This course offers an in-depth exploration of sophisticated methodologies, including cutting-edge machine learning algorithms, advanced statistical models, and big data tools, ensuring a comprehensive understanding and practical skills applicable to real-world challenges. By engaging with real-life case studies and hands-on projects, you will emerge with a robust ability to tackle complex data science problems and drive impactful data-driven decisions in your professional sphere.

Course Focus on: Skill Development/ Entrepreneurship / Employability / **Research**

Course Outcomes	On completion of this course, students will
CO 1:	Deep understanding of complex algorithms for building sophisticated models.
CO 2:	Skills in handling large datasets with modern tools and techniques.
CO 3:	Ability to apply data science to areas like NLP, computer vision, and time series analysis.
CO 4:	Hands-on project work that simulates real-world data science challenges.
CO 5:	Preparation to tackle industry-specific data science problems with advanced analytical skills.

Unit I:	**IPython: Beyond Normal Python**	**[12 Periods]**

Help and Documentation in IPython, Keyboard Shortcuts in the IPython Shell, IPython Magic Commands, Input and Output History, IPython and Shell Commands, Errors and Debugging, Profiling and Timing Code, More IPython Resources.

Unit II:	**Introduction to NumPy**	**[12 Periods]**

Understanding Data Types in Python ,The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and Everything In BetweenComputation on Arrays: Broadcasting, Comparisons, Masks, and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays.

Unit III:	**Data Manipulation with Pandas**	**[12 Periods]**

Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat and Append, Combining Datasets: Merge and JoinAggregation and GroupingPivot Tables, Vectorized String Operations, Working with Time Series, High-Performance Pandas: eval() and query(), Practical Programs.

Unit IV:	**Visualization with Matplotlib**	**[12 Periods]**

Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Plot Legends, Customizing Colorbars, Multiple Subplots, Text and Annotation, Customizing Ticks, Customizing Matplotlib: Configurations and Stylesheets, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap, Visualization with Seaborn, Practical Programs.

Unit V:	**Machine Learning**	[12 Periods]

Machine Learning, Introducing Scikit-Learn, Hyperparameters and Model Validation, Feature Engineering, Naive Bayes Classification, Linear Regression, Support Vector Machines, Decision Trees and Random Forests, Principal Component Analysis, Manifold Learning, k-Means Clustering, Gaussian Mixture Models, Kernel Density Estimation, Application: A Face Detection Pipeline, Further Machine Learning Resources

Text Books:

1. Python Data Science Hand Book by Jake VanderPlas, Published by O'Reilly Media, Inc.,2007.

2. Python for Data Science, 3rd Edition, by Wes McKinney,Published by O'Reilly Media, Inc., 2022.

Reference Books:

1. Practical Statistics for Data Scientists, Peter Bruce, Published by O'Reilly Media, Inc.,2007.
2. Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller, Published by O'Reilly Media, Inc.,2016.
3. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben-David, Cambridge University Press (May 2014)
4. Machine Learning: Theory and Applications, SeyedehLeiliMirtaheri, Reza Shahbazian CRC Press (Sep 2022).
5. Hands-On Machine Learning with Scikit-Learn and TensorFlow, AurélienGéron O'Reilly Media (Oct 2022).

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CO1	3	3	3	2	2	1	1	1	2	1	1	1
CO2	3	2	3	1	1	3	2	1	2	1	1	1
CO3	3	3	2	1	2	2	1	3	2	1	2	1
CO4	1	1	3	3	1	3	2	3	1	2	2	2
CO5	3	1	3	1	3	2	2	3	1	2	2	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Advanced Data Science Lab	4	-	-	5	Practical

Course Introduction

In these courses, you will delve into sophisticated data manipulation, explore predictive modeling using advanced machine learning algorithms, and gain proficiency in high-impact areas like natural language processing and computer vision.Each program is crafted to ensure you master not only the theoretical underpinnings but also the practical application of these technologies in real-world scenarios. Through hands-on projects and case studies, you will learn to harness powerful data science tools and platforms, enhancing your ability to derive actionable insights and make data-driven decisions. Whether you're looking to advance in your current field or spearhead new data initiatives, these programs will empower you with the expertise to excel in the ever-evolving landscape of data science.

Course Focus on:Skill Development/ Entrepreneurship / Employability / **Research**

List of Programs

1. How to handle missing data, remove duplicates, and correct inconsistencies in a dataset using the Pandas library.
2. To create a python program for using visualization tools to explore datasets, identify patterns, outliers, and understand distribution of variables.
3. To Implement a simple linear regression model to predict outcomes based on input features using scikit-learn to python.
4. To apply the K-means clustering algorithm to segment customers based on features like purchasing behavior and demographics.
5. To create a python program for using decision trees to classify data into predefined categories based on learned patterns from input features.
6. To analyze sentiments expressed in tweets or Facebook posts using natural language processing techniques.
7. To create a script to extract data from web pages using Beautiful Soup or Scrapy and prepare it for analysis.
8. To create a python program for historical stock price data to perform time series analysis and identify trends over time.
9. To develop a basic recommender system that suggests items to users based on similarity scores using python program.
10. To create dynamic and interactive charts and graphs for better data presentation and analysis using python environment.

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	1	1	2	1	1	1
CO2	3	2	3	1	1	3	2	1	2	1	1	1
CO3	3	3	2	1	2	2	1	3	2	1	2	1
CO4	1	1	3	3	1	3	2	3	1	2	2	2
CO5	3	1	3	1	3	2	2	3	1	2	2	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Industraial Internet of Things (IIOT)	4	5	-	-	**Core Theory**

Course Introduction

This course enables the student to explore the foundational principles of grounding in basic and advanced methods to of Industraial Internet of Things (IIOT)Course Focus on:Skill Development/ Entrepreneurship / Employability / Research

Course Outcomes	On completion of this course, students will
CO 1:	Understand key skills employed in the IIoT&IoRT space building applications
CO 2:	Design suitable network architecture and use appropriate learning algorithm.
CO 3:	Comprehend IOT protocols
CO 4:	Implement IP and Non IP
CO 5:	Implement IOT systems for robotics

Unit I:	**Introduction IIoT; Market Size and Potential**	**[12 Periods]**

Introduction IIoT –Definition- IoT v IIoT- Next Generation Sensors-Sensor's calibration and validate sensor measurements- placement of IoT devices- sensors, low-cost communication system design- Top application areas include manufacturing-oil & gas, Embedded systems in the Automotive and Transportation market segment.

Unit II:	**IIoT Methodology**	**[12 Periods]**

Introduction- IIoT Methodology -Top operating systems used in IIoT deployments- Networking and wireless communication- protocols used in IIoT deployments- Smart Remote Monitoring Unit-components of monitoring system- control and management- Wireless Sensor Networ(WSN).

Unit III:	**Data driven Analytics of IIoT**	**[12 Periods]**

Data driven Analytics of IIoT- Implementing of industrial IoT Data flow- big data and how to prepare data for machine learning algorithms- Machine Learning algorithms- supervised learning & Un-supervised learning algorithms- Basics of neural network- activation functions,-back-propagation.

Unit IV:	**IP and Non-IP Protocols for IoT**	**[12 Periods]**

Introduction to IP and Non-IP Protocols for IoT- WPAN- IEEE 802.15.4,-Bluetooth- NFC,-LoWPAN- RFID- Zigbee Wireless HART Protocol- MQTT- IP and Non-IP Protocols,-REST,-CoAP.

Unit V:	**Internet of Robotic Things (IoRT)**	**[12 Periods]**

Introduction to stationary and mobile robots- Brief introduction to localization,-mapping, planning, andcontrol of robotic systems- Introduction to cloud-enabled robotics- Applications of IIoT in robotics- Architectures for IoRT-Examples and case studies- Open issues and challenges

Text Books:

1. S. Misra, C. Roy, and A. Mukherjee, Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.2020 3.

2. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies Sensors for the Internet of Things Businesses & Market Trends 2014 -2024',Yole Development Copyrights ,2014 4.
3. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015

Reference Books:

1. "Industry 4.0: The Industrial Internet of Things", Alasdair Gilchrist, Apress, 2016
2. "Introduction to Industrial Internet of Things and Industry 4.0",SudipMisra,ChandanaRoy,AnadarupMukherjee,CRC Press,2021 3
3. "Hands on Industrial Internet of Things",GiacomoVeneri,AntonioCapasso,Packt Press, 2018.

Web Resources:

1 https://www.tutorialspoint.com/iiot/
2 iiot.apache.org/

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	1	1	2	1	1	1
CO2	3	2	3	1	1	3	2	1	2	1	1	1
CO3	3	3	2	1	2	2	1	3	2	1	2	1
CO4	1	1	3	3	1	3	2	3	1	2	2	2
CO5	3	1	3	1	3	2	2	3	1	2	2	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Web Data Analytics	4	-	-	5	Practical

Course Introduction

Web analytics is the process of gathering and analyzing data from a website to understand user behavior and trends. It can help businesses and website owners improve user experience, increase conversions, and optimize their website's performance. The process involves tracking, reviewing, and reporting data on web activity, including how users use the website's components, such as images, videos and Web pages

Course Focus on:Skill Development/ Entrepreneurship / Employability / **Research**

List of Programs

1. To perform data analysis on weather dataset using MapReduce.
2. To count the number of lines in a document using MapReduce Programs. Find the average, max and min temperature for each year in NCDC data set?
3. Write Pig Latin program to sort, group, join, project, and filter your data. Find out Number of Products Sold in Each Country.
4. Implement Linear and logistic Regression
5. Implement SVM / Decision tree classification techniques
6. Implement clustering techniques
7. Visualize data using any plotting framework
8. VISUALIZATIONS find the data distributions using box and scatter plot.
9. VISUALIZATIONS find the outliers using plot.
10. VISUALIZATIONS Plot the histogram, bar chart and pie chart on sample data

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	1	1	2	1	1	1
CO2	3	2	3	1	1	3	2	1	2	1	1	1
CO3	3	3	2	1	2	2	1	3	2	1	2	1
CO4	1	1	3	3	1	3	2	3	1	2	2	2
CO5	3	1	3	1	3	2	2	3	1	2	2	1

SEMESTER II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	CLOUD COMPUTING	**4**	**5**	**4**	**0**	**Theory**

Introduction:

To Gain knowledge on cloud computing, cloud services, architectures and applications. Enable the students to learn the basics of cloud computing with real time usage

Course Focus on: Skill Development/Entrepreneurship/Employability/Research

Course Outcome

CO1	:	Understand the concepts of Cloud and its services
CO2	*:*	*Collaborate Cloud for Event & Project Management*
CO3	:	Analyze on cloud in – Word Processing, Spread Sheets, Mail, Calendar, Database
CO4	:	Analyze cloud in social networks
CO5	:	Explore cloud storage and sharing

Unit I **12Hours**
INTRODUCTION: Cloud Computing Introduction - From, Collaboration to cloud - Working of cloud computing - pros and cons – benefits - developing cloud computing services - Cloud service development - discovering cloud services.
Unit II **12Hours**
CLOUD COMPUTING: Cloud computing for everyone Centralizing email communications - cloud computing for community - collaborating on schedules - collaborating on group projects and events - cloud computing for corporation - mapping – schedules - managing projects - presenting on road.
Unit III **13Hours**
CLOUD SERVICES: using cloud services Collaborating on calendars - Schedules and task management - exploring on line scheduling and planning - collaborating on event management - collaborating on contact management - collaborating on project management - collaborating on word processing – spreadsheets - and databases.
Unit IV **12Hours**
OUTSIDE THE CLOUD: outside the cloud Evaluating web mail services - Evaluating instant messaging - Evaluating web conference tools - creating groups on social networks - Evaluating on line groupware - collaborating via blogs and wikis.

Unit V	**13Hours**
STORING AND SHARING: storing and sharing Understanding cloud storage - evaluating on line file storage - exploring on line book marking services - exploring on line photo editing applications - exploring photo sharing communities - controlling it with web based desktops.	

Textbook:

1. Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.

Reference Books :

1. Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata McGraw Hill Education Private Limited, 2009.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	1	2	1	1	3	3	1	2	1	3	2	3	2
CO2	2	3	3	2	2	3	2	1	2	1	2	2	1
CO3	2	3	1	3	1	2	1	2	3	2	2	1	2
CO4	1	2	3	1	2	2	2	3	2	2	1	2	3
CO5	2	1	1	2	3	1	3	2	1	3	2	2	1

Coursecode		**MACHINELEARNING**	**L**	**T**	**P**	**C**
Core/Elective/Supportive		Elective	**2**	**-**	**2**	**4**
Pre-requisite		**BasicsonStatisticsandLinearAlgebra**	**Syllabus Version**		**1.0**	

CourseObjectives:

1. Tounderstandthe conceptsofMachinelearning algorithms
2. Toapplythemachinelearning algorithmsforvariousapplications.

ExpectedCourseOutcomes:

CO1	Understandthe concepts ofmachinelearning	K1
CO2	Understandthetheoreticalconceptsofprobabilisticandlinearmethods	K2
CO3	DistinguishSupervised,Unsupervisedandsemisupervisedlearning	K2
CO4	Understand and Apply the algorithms for a given specific problem in aspecifictoolusingSupervised,Unsupervisedandsemisupervisedalgorithms	K4,K5
CO5	DesignaMachineLearningmodelsforPredictionforanyspecificdomainapplications	K6

K1-Remember; **K2**-Understand; **K3**-Apply;**K4**-Analyze;**K5** -Evaluate; **K6** –Create

Unit:1	**UnsupervisedModels**	**18—hours**

Introduction :Machine Learning - Machine Learning Foundations –Overview – applications - Types of machine learning - basic concepts in machine learning Examples of Machine Learning -Applications - - Unsupervised Learning Clustering- K-means - EM - Mixtures of Gaussians - TheEM Algorithm in General -Model selection for latent variable models - high-dimensional spaces --The Curse of Dimensionality -Dimensionality Reduction - Factor analysis - Principal ComponentAnalysis-ProbabilisticPCA-Independent components analysis

Unit:2	**LinearModels**	**18-hours**

Supervised LearningLinear Models for Regression - Linear Basis Function Models - The Bias-Variance Decomposition- Bayesian Linear Regression- Bayesian ModelComparison LinearModelsforClassification-DiscriminantFunctions-ProbabilisticGenerativeModels-ProbabilisticDiscriminativeModels-BayesianLogisticRegression.DecisionTrees-Classification Trees- Regression Trees - Pruning. Support Vector Machines - Ensemble methods-Bagging-Boosting – Evaluation Methods

Unit:3	**GraphicalModels**	**18-hours**

Probabilistic Graphical ModelsDirected Graphical Models - Bayesian Networks - ExploitingIndependence Properties - From Distributions to Graphs -Examples -Markov Random Fields -Inference in Graphical Models - Learning –Naive Bayes classifiers-Markov Models – HiddenMarkovModels–decodingstatesfromobservations,learningHMMparameters-Inference–LearningGeneralization–Undirectedgraphicalmodels-Markovrandomfields-Conditionalindependence properties - Parameterization of MRFs - Examples - Learning - Conditional randomfields(CRFs)-Structural SVMs

Unit:4	**AdvancedModels**	**18—hours**

Advanced Learning Sampling – Basic sampling methods – Monte Carlo. Reinforcement Learning-K-Armed Bandit Elements - Model-Based Learning- Value Iteration- Policy Iteration. TemporalDifference Learning Exploration Strategies- Deterministic and Non-deterministic Rewards andActions- Eligibility Traces - Generalization- Partially Observable States- The Setting- Example.Semi - Supervised Learning. Computational Learning Theory - Mistake bound analysis, samplecomplexityanalysis,		
Unit:5	**DeepLearningModels**	**18—hours**
Neural Networks -Feed-forward Network Functions - Error Back propagation - Regularization -Mixture Density and Bayesian Neural Networks - Kernel Methods - Dual Representations - RadialBasis Function Networks – Sequence Models = Recurrent Net – Types – Word Disambiguation –ConvolutionNet – Basics – Applications		
	TotalLecturehours	**90—hours**

TextBooks:

1	ChristopherBishop,"PatternRecognitionandMachineLearning"Springer,2006
2	KevinP.Murphy,"MachineLearning:AProbabilisticPerspective",MITPress,2012
3	EthemAlpaydin,"IntroductiontoMachineLearning3(AdaptiveComputationandMachineLearningSeries)", ThirdEdition, MIT Press,2014
4	TomMMitchell,"MachineLearning",FirstEdition,McGrawHillEducation,2013.

ReferenceBooks

1	JannesKlaas,"MachineLearningforFinance", ISBN:978178936364,2019[Packt]
2	GiuseppeBonaccorso,"MachineLearningAlgorithms",SecondEdition,ISBN:9781789347999,2018 [Packt]
3	StephenMarsland,"MachineLearning–AnAlgorithmicPerspective",CRCPress,2009
4	Hastie,Tibshirani,Friedman,"TheElementsofStatisticalLearning",SecondEdition, Springer,2008
5	YuxiLiu,"PythonMachineLearningByExample",2017[Packt]
6	**JohnPaulMueller**,**LucaMassaron**,"MachineLearning(inPythonandR)ForDummies",First Edition, Wiley Publisher,ISBN:9788126563050, 2016
7	**UDineshKumarManaranjanPradhan**,,"MachineLearningusingPython".)Publisher:Wiley, ISBN:9788126579907, 2019

OnlineCourse:

S. No	**CourseTitle**	**Duration**	**Provider–Free**
1.	MachineLearning	12hours	Simlilearn
2.	MachineLearningfor DataAnalysis	4Weeks	Coursera
3.	MachineLearningFoundations: ACaseStudy Approach	6Weeks	Coursera

4.	MachineLearning:Regression	6Weeks	Coursera
5.	IntroductiontoMachineLearning	12Weeks	Swayam–NPTEL
6	DeepLearningSpecialization	4Courses	Coursera

WebLink-Video:

1. https://www.packtpub.com/data/hands-on-machine-learning-with-scikit-learn-and-tensorflow-2-0-video
2. https://www.packtpub.com/data/machine-learning-projects-with-tensorflow-2-0-video3.https://www.packtpub.com/application-development/complete-machine-learning-course- python-video

MappingwithProgrammeOutcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	-	L	-	-	-
CO2	L	L	S	L	-	S	-	L	-	L
CO3	S	S	S	S	M	S	L	M	-	-
CO4	S	S	S	S	S	S	S	S	S	M
CO5	S	S	S	S	M	S	S	L	M	S

*S-Strong;M-Medium;L-Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	DATAVISUALIZATION	**3**	**3**	**0**	**0**	**Theory**

COURSEOBJECTIVES:

CO1 :Todevelopskillstobothdesignandcritiquevisualizations.

CO2 :Tointroducevisualperceptionandcoreskillsforvisualanalysis.

CO3 :Tounderstandtechnologicaladvancementsofdatavisualization

CO4 :Tounderstandvariousdatavisualizationtechniques

CO5 : Tounderstandthemethodologiesusedtovisualizelargedatasets

UNITI	**INTRODUCTIONANDDATAFOUNDATION**	**4 HOURS**

Basics - Relationship between Visualization and Other Fields -The Visualization Process - Pseudo codeConventions-TheScatterplot.DataFoundation-TypesofData-Structurewithinand betweenRecords-DataPreprocessing-DataSets

UNITII	**FOUNDATIONSFORVISUALIZATION**	**5 HOURS**

Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables – Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson's Affordance theory – A Model of Perceptual Processing.

UNITIII	**VISUALIZATIONTECHNIQUES**	**4 HOURS**

SpatialData:One-DimensionalData-Two-DimensionalData–ThreeDimensionalData-Dynamic Data - Combining Techniques. Geospatial Data : Visualizing Spatial Data - Visualization of Point Data -Visualization of Line Data - Visualization of Area Data – Other Issues in Geospatial Data Visualization Multivariate Data : Point-Based Techniques - LineBased Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks- Displaying Arbitrary Graphs/Networks.

UNITIV	**INTERACTIONCONCEPTSANDTECHNIQUES**	**4 HOURS**

Text and Document Visualization: Introduction - Levels of Text Representations - The VectorSpace Model - Single Document Visualizations -Document Collection Visualizations – Extended Text Visualizations Interaction Concepts: Interaction Operators - Interaction Operands and Spaces
- A Unified Framework. Interaction Techniques: Screen Space - Object-Space –Data Space - Attribute Space- Data Structure Space - Visualization Structure – Animating Transformations - Interaction Control.

UNITV	**RESEARCHDIRECTIONSINVISUALIZATIONS**	**5 HOURS**

Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation , Hardware and Applications

REFERENCES

1.MatthewWard,GeorgesGrinsteinandDanielKeim,"InteractiveDataVisualization Foundations, Techniques, Applications", 2010.

2.ColinWare,"InformationVisualizationPerceptionforDesign",4thedition,MorganKaufmann Publishers, 2021.

3.Robert Spence "Information visualization – Design for interaction", Pearson Education, 2nd Edition, 2007.

4.AlexandruC.Telea,"DataVisualization:PrinciplesandPractice,"A.K.PetersLtd,2008.

CO-POMapping

CO	**Pos**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
1	3	1	2	2	1	2
2	2	1	2	3	2	2
3	1	-	2	2	1	1
4	3	1	3	3	2	2
5	2	1	3	2	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Network Security and Cryptography	**3**	**5**	**3**	**2**	**Theory**

Course Objective

1.To understand basics of Cryptography and Network Security.

2. To be able to secure a message over insecure channel by various means.

3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.

4. To understand various protocols for network security to protect against the threats in the networks.

Course Outcomes:

CO1	:	. Provide security of the data over the network.
CO2	:	Do research in the emerging areas of cryptography and network security
CO3	:	Implement various networking protocols.
CO4	:	Protect any network from the threats in the world.

Unit I(Introduction to Cryptography and Block Ciphers)
Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and blockciphers - Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion anddiffusion - fiestal structure - data encryption standard(DES) - strength of DES - differential and linearcrypt analysis of DES - block cipher modes of operations - triple DES – AES.
Unit II (Confidentiality and Modular Arithmetic)
Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing - Euclid's Algorithm - Chinese Remainder theorem - discrete algorithms.
Unit III: (Public key cryptography and Authentication requirements)
Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Elgamel encryption - Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS
Unit IV: (Integrity checks and Authentication algorithms)
MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication

Applications: Kerberos and X.509 - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME.
Unit V: (IP Security and Key Management)
IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management.

Text Book:

1. William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI. 2. Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", Pearson.

Reference Book:

1. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education. 2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	2	3		1		2		1		3			1
CO2	1		2		3	1	2		2		3	2	
CO3		1		3	2	3		2	1	1	2	1	1
CO4	2		1	2	1		1		3	2		3	3
CO5		2	3				3	2		3	1		2

Skill - II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Information Security TV Lab	**3**	**0**	**2**	**4**	**Theory**

Course Outcome

Information security protects sensitive information from unauthorized activities, including inspection, modification, recording, and any disruption or destruction. The goal is to ensure the safety and privacy of critical data such as customer account details, financial data or intellectual property.

List of Programs:

1. Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) Playfair cipher iii) Hill Cipher iv) Vigenere cipher

2. Perform encryption and decryption using following transposition techniques i) Rail fence ii) row & Column Transformation

3. Apply DES algorithm for practical applications.

4. Apply AES algorithm for practical applications. 5. Implement RSA Algorithm using HTML and JavaScript

6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.

7. Calculate the message digest of a text using the SHA-1 algorithm.

8. Implement the SIGNATURE SCHEME – Digital Signature Standard.

9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.

10. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool

11. Defeating Malware i) Building Trojans ii) Rootkit Hunter

Elective-II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	BLOCKCHAIN TECHNOLOGIES	**3**	**0**	**2**	**4**	**Theory**

COURSE OBJECTIVES:

This course is intended to study the basics of Blockchain technology.

During this course the learner will explore various aspects of Blockchain technology like application in various domains.

By implementing, learners will have idea about private and public Blockchain, and smart contract.

COURSE OUTCOMES:

After the completion of this course, student will be able to

CO1: Understand and explore the working of Blockchain technology
CO2: Analyze the working of Smart Contracts
CO3: Understand and analyze the working of Hyperledger
CO4: Apply the learning of solidity to build de-centralized apps on Ethereum
CO5: Develop applications on Blockchain

UNIT I INTRODUCTION OF CRYPTOGRAPHY AND BLOCKCHAIN 4 Hours

Introduction to Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions and Blocks, P2P Systems, Keys as Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain.

UNIT IIBITCOIN AND CRYPTOCURRENCY 5Hours

Introduction to Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain and Digital Currency, Transactional Blocks, Impact of Blockchain Technology on Cryptocurrency.

UNIT III INTRODUCTION TO ETHEREUM 4 Hours

Introduction to Ethereum, Consensus Mechanisms, Metamask Setup, Ethereum Accounts, , Transactions, Receiving Ethers, Smart Contracts.

UNIT-IV INTRODUCTION TO HYPERLEDGER AND SOLIDITY PROGRAMMING 5 Hours

Introduction to Hyperledger, Distributed Ledger Technology & its Challenges, Hyperledger& Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer. Solidity - Language of Smart Contracts, Installing Solidity &Ethereum Wallet, Basics of Solidity, Layout of a Solidity Source File & Structure of Smart Contracts, General Value Types.

UNIT V BLOCKCHAIN APPLICATIONS 4 **Hours**

Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins.

SUPPLEMENTARY RESOURCES:
NPTEL online course :https://nptel.ac.in/courses/106/104/106104220/#
Udemy: https://www.udemy.com/course/build-your-blockchain-az/
EDUXLABS Online training :https://eduxlabs.com/courses/blockchain-technology-training/?tab=tab-curriculum

REFERENCES:
1.Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.
2. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press, 2016
3.Antonopoulos, Mastering Bitcoin, O'Reilly Publishing, 2014. .
4.Antonopoulos and G. Wood, "Mastering Ethereum: Building Smart Contracts and Dapps", O'Reilly Publishing, 2018.
5.D. Drescher, Blockchain Basics. Apress, 2017.

CO-PO Mapping

CO	**POs**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
1	2	1	3	2	2	3
2	2	1	2	3	2	2
3	2	1	3	1	2	1
4	2	1	2	3	2	2
5	-	-	-	-	-	-
Avg	2.00	1.00	2.50	2.25	2.00	2.00

Practicals-III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	CLOUD COMPUTING Lab	**3**	**0**	**0**	**5**	**Practical**

LIST OF PROGRAMS

1. Working with Google Drive to make spreadsheet and notes.
2. Launch a Linux Virtual Machine.
3. To host a static website
4. Exploring Google cloud for the following :a) Storage b) Sharing of data c) manage your calendar, to-do lists, d) a document editing tool
5. Working and installation of Google App Engine
6. Working and installation of Microsoft Azure
7. To Connect Amazon Redshift with S3 bucket
8. To Create and Query a NoSQL Table

SEMESTER III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Sentiment Analytics	**4**	**4**	**4**	**0**	**Core**

Course Objective

To introduce to computational study of people's opinions, sentiments, emotions, moods, and attitudes

Course Outcomes:

CO1	:	To understand the underlying structure of the problem and the language constructs commonly used to express opinions, sentiments, and emotions
CO2	:	To understand core areas of sentiment analysis
CO3	:	To understand debate analysis, intention mining, and fake-opinion detection

Unit I: Introduction **5 Hours**
Introduction, Sentiment analysis applications, Sentiment analysis research, Sentiment analysis as mini-NLP, The Problem of Sentiment Analysis, Definition of opinion, Definition of opinion summary, different types of opinions, Document Sentiment Classification, Supervised sentiment classification, Unsupervised sentiment classification, Sentiment rating prediction
Unit IISentence Subjectivity and Sentiment Classification **4 Hours**
Sentence Subjectivity and Sentiment Classification, Subjectivity, Sentence Subjectivity
Classification, Sentence Sentiment Classification, Aspect Sentiment Classification, Rules of
Sentiment composition, Negation and Sentiment, Aspect and Entity Extraction, Frequency
based aspect extraction, Exploring syntactic relations, Using supervised learning
Unit III: Sentiment Lexicon Generation **5 Hours**
Sentiment Lexicon Generation, Dictionary based approach, Corpus based approach, Sentiment word embedding, Analysis of Comparative Opinions, Problem definition, Identifying comparative sentences, Identifying the preferred entity set, Special types of comparison, Opinion Summarization and Search, Aspect based opinion summarization, enhancements to aspect based summaries, Traditional summarization.
Unit IV: Analysis of Debates and Comments **4 Hours**
Analysis of Debates and Comments, Recognizing stances in debates, Modeling debates/ Discussions, Modeling comments, Mining Intents, Problem of intent mining, Intent
classification, Fine grained mining of intent.
Unit V: Detecting Fake or Deceptive Opinions **5 Hours**

Detecting Fake or Deceptive Opinions, Different types of Spam, Supervised fake review detection, Automated discovery of abnormal patterns, Model based behavioral analysis, Group spam detection, Quality of Reviews, Quality prediction as a regression problem.

Text Book:

1. Sentiment Analysis: Mining Opinions, Sentiments, and Emotions, by Bing Liu **Reference Book:**
1. Sentiment Analysis in Social Networks By Federico Pozzi, ElisabettaFersini, Enza Messina, Bing Liu · 2016
2. Sentiment Analysis for Social Media, Antonio Moreno, Carlos A. Iglesias, MDPI 2020
3. New Opportunities for Sentiment Analysis and Information Processing, Aakansha Sharaff, G. R. Sinha, Surbhi Bhatia, IGI Global, 2021
4. Sentiment Analysis and Knowledge Discovery in Contemporary Business, Dharmendra Singh Rajput, Ramjeevan Singh Thakur, S. MuzamilBasha, IGI Global, 2018

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	**P02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**PS01**	**PS02**	**PS03**	**PS04**
CO1	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**			**1**
CO2	**3**	**1**	**1**	**3**	**2**	**3**	**1**	**3**	**3**		**3**	**2**	
CO3	**2**	**1**	**1**	**3**	**3**	**3**	**2**	**1**	**3**	**1**	**2**	**1**	**1**
CO4	**1**	**1**	**3**	**2**	**1**	**3**	**1**	**3**	**3**	**2**		**3**	**3**
CO5	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**		**3**	**1**		**2**

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	DEEP LEARNING	**4**	**4**	**4**	**0**	**Core**

Introduction

Deep Learning aims to provide students with a comprehensive understanding of deep neural networks, enabling them to design, train, and implement advanced models to address complex problems in areas such as image recognition, natural language processing, and predictive analytics.

Course Focuses: Skill Development/Entrepreneurship/Employability/**Research**

Course Outcome

CO1	:	Gain a solid understanding of various deep learning models such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), and transformers, and be capable of implementing these models in practical applications.
CO2	:	Develop proficiency in using deep learning frameworks and tools such as TensorFlow, PyTorch, and Keras to build, train, and validate models efficiently.
CO3	:	Apply deep learning techniques creatively to solve complex problems in various domains, including vision, language, and audio, demonstrating an ability to innovate and improve existing solutions.
CO4	:	Critically analyze the performance of deep learning models, understand their limitations, and make informed decisions about how to improve their accuracy and efficiency.
CO5	:	Understand the ethical and social implications of deploying deep learning technologies, including issues related to bias, privacy, and security.

UNIT I DEEP LEARNING CONCEPTS12 Periods

Fundamentals about Deep Learning. Perception Learning Algorithms. Probabilistic modelling. Early Neural Networks. How is Deep Learning different from Machine Learning. Scalars. Vectors. Matrixes, Higher Dimensional Tensors. Manipulating Tensors. Vector Data. Time Series Data. Image Data. Video Data.

UNIT II NEURAL NETWORKS12 Periods

About Neural Network. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions. Data Pre-processing for neural networks, Feature Engineering. Over fitting and Under fitting. Hyperparameters.

UNIT III CONVOLUTIONAL NEURAL NETWORK12 Periods

CNN, Linear Time Invariant. Image Processing Filtering. Building a convolutional neural network. Input Layers, Convolution Layers. Pooling Layers. Dense Layers. Backpropagation Through the Convolutional Layer. Filters and Feature Maps. Backpropagation Through the Pooling Layers. Dropout Layers and Regularization. Batch Normalization. Various Activation Functions. Various Optimizers. LeNet, AlexNet, VGG16, ResNet. Transfer Learning with Image Data. Transfer Learning using Inception Oxford VGG Model, Google Inception Model, and Microsoft ResNet Model. RCNN, Fast R-CNN, Faster R-CNN, Mask-RCNN, YOLO

UNIT VI NATURAL LANGUAGE PROCESSING USING RNN 12 Periods

About NLP & its Toolkits. Language Modeling . Vector Space Model (VSM). Continuous Bag of Words (CBOW). Skip-Gram Model for Word Embedding. Part of Speech (PoS) Global Cooccurrence Statistics–based Word Vectors. Transfer Learning. Word2Vec. Global Vectors for Word Representation GloVe. Backpropagation Through Time. Bidirectional RNNs (BRNN) . Long

Short Term Memory (LSTM). Bi-directional LSTM. Sequence-to-Sequence Models (Seq2Seq). Gated recurrent unit GRU.

UNIT V DEEP REINFORCEMENT & UNSUPERVISED LEARNING 12 Periods

About Deep Reinforcement Learning. Q-Learning. Deep Q-Network (DQN). Policy Gradient Methods. Actor-Critic Algorithm. About Autoencoding. Convolutional Auto Encoding. Variational Tentative Auto Encoding. Generative Adversarial Networks. Autoencoders for Feature Extraction. Auto Encoders for Classification. DenoisingAutoencoders. Sparse Autoencoders

Text Book:

1. Deep Learning A Practitioner's Approach Josh Patterson and Adam Gibson O'Reilly Media, Inc.2017
2. Learn Keras for Deep Neural Networks, JojoMoolayil, Apress,2018
3. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
4. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND,2017
5. Pro Deep Learning with TensorFlow, SantanuPattanayak, Apress,2017.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	2	3		1		2		1		3			1
CO2	1		2		3	1	2		2		3	2	
CO3		1		3	2	3		2	1	1	2	1	1
CO4	2		1	2	1		1		3	2		3	3
CO5		2	3				3	2		3	1		2

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Vue JavaScript	**4**	**4**	**4**	**0**	**Core**

Course Outcome

Use data and data types in JavaScript.Manage program logic in JavaScript (conditions, loops, and errors).Write clean and maintainable code using methods in JavaScript.

UNIT-IJavaScript Core Language Reference

Advanced Functions,Control Structures & Exception Handling,Conditionals and Loops,Expressions and Statements,JavaScriptOperators,Literals in JavaScript,The Array Literal,The Object Literal,The String Object,The Date Object,Cookies,TimingMethods,Object-Oriented JavaScript (OOJS).

UNIT-IIDocument Object Reference

Introduction to Java Scripts, data types and variables, Operators, Statements, functions, Objects in Java Script, event handling, forms with Javascript, DOM, Dynamic HTML with Java Script.

UNIT-IIIIntroduction to Bootstrap, Syntax, Container, Bootstrap component, Advanced Component, Utilities ,Theme Changer with JavaScript's Cookies, Dynamic Forms using DOM Function in JavaScript.

UNIT-IVDocument Object Model Essentials,Generic HTML Element Objects,Location& History Objects,The Document & Body Objects,ImageObject,FormObject,ButtonObject,EventObject,Style Sheet & Style Objects,Ajax& XML,JSON.

UNIT-VJavaScript Form Validation,NavigationDevelopment,JavaScript Basic Games (Just for logic practices),E-learning Applications,AJAX Based Applications - Image Galleries, Websites etc,Slideshows in JavaScript,Image Galleries in JavaScript.

Text Books:

1.JavaScript and JQuery: Interactive Front-End Web Development" by Jon Duckett

2. Functional JavaScript by Michael Fogus.

3.Eloquent JavaScript by MarijnHaverbeke

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	**P02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**PS01**	**PS02**	**PS03**	**PS04**
CO1	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**			**1**
CO2	**3**	**1**	**1**	**3**	**2**	**3**	**1**	**3**	**3**		**3**	**2**	
CO3	**2**	**1**	**1**	**3**	**3**	**3**	**2**	**1**	**3**	**1**	**2**	**1**	**1**
CO4	**1**	**1**	**3**	**2**	**1**	**3**	**1**	**3**	**3**	**2**		**3**	**3**
CO5	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**		**3**	**1**		**2**

Skill – III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Mobile Computing TV Lab	**4**	**6**	**0**	**0**	**Theory**

Course Outcome

Mobile computing is the ability to connect portable devices to wireless-enabled networks to access data and services while on the move. It is a convenient technique to transmit and receive voice, text, audio, and video with no temporal or special constraints.

List of Programs

1. Write a program to Create New Activity in Android Studio.
2. Write a program to Design user interface with views.
3. Creating android application for generating user interface for student Registration and feedback form by using all basic UI controls.
4. Program to demonstrate use of different text control, RadioGroup, RadioButton, Checkbox and Button control by creating Registration form.
5. Program to demonstrate use of Spinner, AutoCompleteTextView, multiline text and TextView control by creating Feedback form
6. Creating android program to demonstrate the use of external Storage
7. Create a new android application using android studio and give name as ExternalStorage.
8. Creating android program to demonstrate the use of Shared preferences.
9. Creating android program to demonstrate the use of Content Provider.
10. Creating android program to perform CRUD operation on SQLite database.

Elective – III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Research Methodology & IPR	**4**	**2**	**0**	**0**	**Core**

COURSE OUTCOMES: The course should enable the students to:

CO1.: Understand research problem formulation.
CO2. Analyze research related information
CO3: Follow research ethics
CO4: It is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
CO5:Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
CO6:Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT-I INTRODUCTION TO RESEARCH METHODOLOGY 5
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations
UNIT-II RESEARCH PROPOSAL 6
Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
UNIT-III NATURE OF INTELLECTUAL PROPERTY, INTERNATIONAL SCENARIO 4
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.
UNIT-IV PATENT RIGHTS 5
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. UNIT-V NEW DEVELOPMENTS IN IPR New Developments in IPR: Administration of Patent System. New developments in IPR; IP of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text books

1. Dipankar Deb • RajeebDey, Valentina E. Balas "Engineering Research Methodology", ISSN 1868-4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13- 2946-3 ISBN 978-981-13-2947-0 (eBook), https://doi.org/10.1007/978-981-13-2947-0

2. Intellectual Property A Primer for Academia by Prof. RupinderTewari Ms. MamtaBhardwa

Reference Book:

1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488- 4 – 2.
3.Intellectual Property Rights by N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	2	3		1		2		1		3			1
CO2	1		2		3	1	2		2		3	2	
CO3		1		3	2	3		2	1	1	2	1	1
CO4	2		1	2	1		1		3	2		3	3
CO5		2	3				3	2		3	1		2

SEMESTER IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Artificial Intelligence	**4**	**2**	**0**	**0**	**Core**

Course Objective: To develop semantic-based and context-aware systems to acquire, organize process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

UNIT-IAI problems	**5**
AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.	
UNIT-IISearching	**6**
Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.	
UNIT-IIIKnowledge representation	**4**
Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and dempstershafer theory.	
UNIT- IVFirst order logic	**6**
Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning,Decisiontrees,Explanationbasedlearning,Statistical Learning methods ,Reinforcement Learning.	
UNIT- V Expert systems	**5**
Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.	

Text Books

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", SecondEdition, Pearson Education

2. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press.

3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education

. 4. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	2	3		1		2		1		3			1
CO2	1		2		3	1	2		2		3	2	
CO3		1		3	2	3		2	1	1	2	1	1
CO4	2		1	2	1		1		3	2		3	3
CO5		2	3				3	2		3	1		2

Skill – IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Cyber Security TV Lab	**4**	**6**	**0**	**0**	**Theory**

Course Outcome:

Cyber security is the application of technologies, processes, and controls to protect systems, networks, programs, devices and data from cyber attacks. It aims to reduce the risk of cyber attacks and protect against the unauthorised exploitation of systems, networks, and technologies.

List of Programs:

1.Study of steps to protect your personal computer system by creating User Accounts with Passwords and types of User Accounts for safety and security.

2 Study the steps to protect a Microsoft Word Document of different version with different operating system.

3 Study the steps to remove Passwords from Microsoft Word 4 Study various methods of protecting and securing databases.

5 Study “How to make strong passwords” and “passwords cracking techniques”.

6 Study the steps to hack a strong password.

7. Write the program to Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts

8. Write the program to Implement the Signature Scheme - Digital Signature Standard

9.Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)

10. Write the program toSetup a honey pot and monitor the honeypot on network (KF Sensor)

ELECTIVE – IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Bio Informatics	**4**	**2**	**0**	**0**	**Core**

Course Outcome
CO1: Demonstrate different biological databases and tools.
CO2: Apply algorithms for searching the biological databases.
CO3: Categorize sequence alignment methods.
CO4: Implement phylogenetic tree construction algorithms.
CO5: Predict gene and protein secondary structure.
CO6: Analyse genomic sequence.

Unit 1 Introduction9
Aim and branches of Bioinformatics, Application of Bioinformatics, Role of internet and www in bioinformatics. Basic biomolecular concepts: Protein and amino acid, DNA & RNA, Sequence, structure and function. Forms of biological information, Types of Nucleotide Sequence: Genomic DNA, Complementary DNA (cDNA), Recombinant DNA (rDNA), Expressed sequence tags (ESTs), Genomic survey sequences (GSSs). DNA sequencing methods: Basic and Automated DNA sequencing, DNA sequencing by capillary array and electrophoresis, Gene expression data.
Unit 2 Bioinformatics Resources 7
NCBI, EBI, ExPASy, RCSB, DDBJ: The knowledge of databases and bioinformatics tools available at these resources, organization of databases: data contents, purpose and utility. Open access bibliographic resources and literature databases: PubMed, BioMed Central, Public Library of Sciences (PloS), CiteXplore.
Unit 3 Sequence databases 8
Nucleic acid sequence databases: GenBank, EMBL, DDBJ; Protein sequence databases: Uniprot-KB: SWISS-PROT, TrEMBL, UniParc; Structure Databases: PDB, NDB, PubChem, ChemBank. Sequence file formats: Various file formats for bio-molecular sequences: GenBank, FASTA, GCG, MSF etc. Protein and nucleic acid properties: Proteomics tools at the ExPASy server, GCG utilities and EMBOSS, Computation of various parameters.
Unit 4 Sequence Analysis 6
Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues and xenologues Scoring matrices: basic concept of a scoring matrix, Matrices for nucleic acid and proteins sequences, PAM and BLOSUM series, matrix derivation methods and principles
Unit 5Sequence alignment 6

Measurement of sequence similarity; Similarity and homology. Pairwise sequence alignment: Basic concepts of sequence alignment, Needleman and Wunsch, Smith and Waterman algorithms for pairwise alignments, gap penalties, use of pairwise alignments for analysis of Nucleic acid and protein sequences and interpretation of results.
Text Books
1. Bioinformatics: Sequence and Genome Analysis by Mount D., Cold Spring Harbor Laboratory Press, New York. 2004
2. Bioinformatics- a Practical Guide to the Analysis of Genes and Proteins by Baxevanis, A.D. and Francis Ouellellette, B.F., Wiley India Pvt Ltd. 2009
Reference Book

1.Introduction to bioinformatics by Teresa K. Attwood, David J. Parry-Smith, Pearson Education. 1999

2. Bioinformatics for Dummies by Jean-michelClaverie Cedric Notredame. Publisher: Dummies (Jan 2007)

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	2	3		1		2		1		3			1
CO2	1		2		3	1	2		2		3	2	
CO3		1		3	2	3		2	1	1	2	1	1
CO4	2		1	2	1		1		3	2		3	3
CO5		2	3				3	2		3	1		2