LINGAYA'S VIDYAPEETH

SCHEME OF STUDIES

SESSION: 2022-23

School: School of & Technology	**Batch:2022-2024**
Department: CSE	**Year:1st**
Course: M.Tech	**Semester: I**

SN	Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme					Subject Total Marks
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	CS-501	Big Data Analytics	3	0	0	3	15	25	60	-	-	100
2	SEC	CS-503	Object oriented Design and Analysis	3	0	0	3	15	25	60	-	-	100
3	PCC	CS-505	Object Data Structure & Algorithm	3	0	0	3	15	25	60	-	-	100
4	PCC	AM-501	Advanced Engineering Mathematics	3	0	0	3	15	25	60	-	-	100
5	PCC	RM-501	Research Process & Methodology	3	0	0	3	15	25	60	-	-	100
6	PCC	CS-557	Advanced Data Structure Lab	0	0	4	2				60	40	100
			Total---->	**15**	**0**	**8**	**19**						

Abbreviations:

PCC:	Programme Core Courses	ABQ:	Assignment Based Quiz
PEC:	Programme Elective Courses	MSE:	Mid Semester Examination
PROJ:	Project	ESE:	End Semester Examination
PDP:	Personality Development Programme	IP:	Internal Practical
L:	Lecture	EXP:	External Practical
T:	Tutorial	SEC:	Skill Enhancement Course
AECC:	Ability Enhancement Elective Course	P:	Practical

LINGAYA'S VIDYAPEETH

SCHEME OF STUDIES
SESSION: 2022-23

School: School of Engineering & Technology	Batch: 2022-2024
Department: CSE	Year:1st
Course: M.Tech	Semester: II

SN	Cate-gory	Course Code	Course Name	Periods			Credits	Evaluation Scheme					Subject Total Marks
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	CS-502B	Trends in AI & Soft Computing	3	0	0	3	15	25	60	-	-	100
3	PCC	CS-506B	Data Mining & Data Warehousing	3	0	0	3	15	25	60	-	-	100
4	PCC		**Elective - I**	3	0	0	3	15	25	60	-	-	100
5	PCC	CS-552B	Soft Computing & Artificial Intelligence Lab	0	0	4	2	-	-	-	60	40	100
6	PCC	CS-556	Data Mining& Data Warehousing Lab	0	0	4	2	-	-	-	60	40	100
7	PROJ	CS-558	Project with Seminar-I	0	0	8	4					100	100
			Total---->	**12**	**0**	**16**	**20**						

Abbreviations:

PCC:	Programme Core Courses
PEC:	Programme Elective Courses
PROJ:	Project
PDP:	Personality Development Programme
L:	Lecture
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AECC:	Ability Enhancement Elective Course
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P:	Practical

LINGAYA'S VIDYAPEETH
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LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES

SESSION: 2023-24

School: School of Engineering & Technology													Batch: 2022-2024	
Department: CSE													Year: 2nd	
Course: M.Tech													Semester: III	
SN	Cat e-gor y	Course Code	Course Name	Periods			Cre dit s	Evaluation Scheme						Sub To Ma
								Theory			Practical			
				L	T	P		ABQ	MSE	ESE	IP	EXP		
1	PCC	CS-601	Digital Image Processing	3	0	0	3	15	25	60	-	-		1
2	SEC	CS-603	Data Science using python	3	0	0	3	15	25	60	-	-		1
3	SEC	CS-605	Machine Learning	3	0	0	3	15	25	60	-	-		1
4	PCC	CS-607	Introduction to Blockchain Technology	3	0	0	3	15	25	60	-	-		1
5	AECC		**Elective - II**	3	0	0	3	15	25	60	-	-		1
6	SEC	CS-653	Data Science using python lab	0	0	4	2	-	-	-	60	40		1
7	PCC	CS-655	Dissertation Preliminary	0	0	4	2	-	-	-	-	100		1
8	PCC	CS-657	Seminar II	0	0	38	19	-	-	-	-	100		1
			Total---->	**15**	**0**	**42**	**38**							

Abbreviations:

PCC:	Programme Core Courses
PEC:	Programme Elective Courses
PROJ:	Project
PDP:	Personality Development Programme
L:	Lecture
T:	Tutorial
P:	Practical
AECC:	Ability Enhancement Elective Course

ABQ:	Assignment Based Quiz
MSE:	Mid Semester Examination
ESE:	End Semester Examination
IP:	Internal Practical
EXP:	External Practical
SEC:	Skill Enhancement Course
P:	Practical

SCHEME OF STUDIES
SESSION: 2023-24

School: School of Engineering & Technology	Batch: 2022-2024
Department: CSE	Year: 2nd
Course: M.Tech	Semester: IV

SN	Cate-gory	Course Code	Course Name	Periods			Credits	Evaluation Scheme					Subject Total Marks
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	AECC	CS-614B	**Elective III (Cryptography and Cyber Security)**	3	0	0	3	15	25	60	-	-	100
2	CC	CS-604B	Dissertation	0	0	2	1	-	-	-	-	100	100
3	CC	CS-606B	Seminar III	0	0	30	15	-	-	-	-	100	100
			Total---->	**3**	**0**	**32**	**19**						

Abbreviations:

PCC:	Programme Core Courses	ABQ:	Assignment Based Quiz
PEC:	Programme Elective Courses	MSE:	Mid Semester Examination
PROJ:	Project	ESE:	End Semester Examination
PDP:	Personality Development Programme	IP:	Internal Practical
L:	Lecture	EXP:	External Practical
T:	Tutorial	SEC:	Skill Enhancement Course
P:	Practical	P:	Practical
AECC:	Ability Enhancement Elective Course		

LINGAYA'S VIDYAPEETH

SCHEME OF STUDIES

SESSION: 2020-22

Elective I Courses		
S.No	**Course Code**	**Course Name**
1	CS-508B	Cloud Computing
2	CS-510B	Network Security Management
3	CS-512B	Computer Vision
Elective II Courses		
S.No	**Course Code**	**Course Name**
1	CS- 609	Natural Language Processing
2	CS- 611	Advanced Operating System
3	CS- 613	Agile Technology
Elective III Courses		
S.No	**Course Code**	**Course Name**
1	CS-614B	Cryptography and Cyber Security
2	CS-616B	Recommender System
3	CS-618B	Evolutionary Computing

Syllabus

Of

M.Tech(CSE)

1st Year

1st Semester

CS-501	BIG DATA ANALYTICS	L-T-P	Cr
		3-0-0	3

OBJECTIVES

This course brings together several key big data technologies used for storage, analysis and manipulation of data and recognize the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL and a sample project in Hadoop API.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Learn the basic concepts of big data

CO2: Handle the big data as well as get familiar with the Hadoop

CO3: Get deeper knowledge of Hadoop as well as map reduce

CO4: Know about the architecture for real time applications

CO5: Learn about the Pig

UNIT I

Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications, Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and Trans-Firewall Analytics - Information Management.

UNIT-II

Integrating disparate data stores - Mapping data to the programming framework - Connecting and extracting data from storage - Transforming data for processing - Subdividing data in preparation for Hadoop Map Reduce, Hadoop Map Reduce - Creating the components of Hadoop

UNIT-III

Map Reduce jobs - Distributing data processing across server farms -Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce - Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

UNIT-IV

Real-Time Architecture – Orchestration and Synthesis Using Analytics Engines – Discovery using Data at Rest – Implementation of Big Data Analytics – Big Data Convergence – Analytics Business Maturity Model,

UNIT V

Installing and Running Pig – Comparison with Databases – Pig Latin – UserDefine Functions – Data Processing Operators – Installing and Running Hive – Hive QL – Tables – Querying Data – User-Defined Functions – Oracle Big Data.

TEXT BOOK

Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.

REFERENCE BOOKS

1. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
2. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.
3. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012

CS-503	OBJECT ORIENTED DESIGN AND ANALYSIS	L-T-P	Cr
		3-0-0	3

OBJECTIVES

This course brings together several key features of object oriented related to design and analysis.

COURSE OBJECTIVES

After undergoing this course, the students will be able to:

CO1: Know about the fundamentals of object oriented design
CO2: Analyze the object oriented key features like behavior, design etc
CO3: Learn the basic concepts of UML
CO4: Learn about the USE-CASES, their designs as well as their implementation
CO5: Know about the testing and coding for design of object-oriented

UNIT I

OBJECT ORIENTED DESIGN FUNDAMENTALS: The object model - Classes and Objects, Complexity ,Classification, Notation, Process - Pragmatics - Binary and entity relationship, Object types - Object state, OOSD life cycle, Frameworks and design patterns, design for reusability, advanced object-oriented programming techniques, design using object-oriented databases and distributed object architectures, design of software agents.

UNIT II

OVERVIEW OF OBJECT ORIENTED ANALYSIS: Shaler/Mellor, Coad/Yourdon, Rumbagh, Booch's Approach towards the analysis, UML ,Usecase, Conceptual model, Behaviour ,Class, Analysis patterns, Overview, Diagrams, Aggregation.

UNIT III

UNIFIED MODELING LANGUAGE: UML –static view, Dynamic view, Model Management View, UML Diagrams, Collaboration - Sequence - Class - Design patterns and frameworks - Comparison with other Design methods

UNIT IV

USE CASE DRIVEN, ARCHITECTURE CENTRIC, ITERATIVE, AND INCREMENTAL THE FOUR PS: people, project, product, and process Use case driven process: why use case, capturing use cases, analysis, design, and implementation to realize the use cases, testing the use cases Architecture-centric process: architecture in brief, why we need architecture, use cases and architecture, the steps to architecture, an architecture description.

UNIT V

MANAGING OBJECT ORIENTED DEVELOPMENT MANAGING ANALYSIS AND DESIGN - Evaluation testing - Coding - Maintenance Metrics, case Studies In Object Oriented Development Design of foundation class libraries - Object Oriented databases - Client/Server computing - Middleware.

TEXT BOOKS

1. Craig Larmen, Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development, Prentice Hall (2004)
2. Booch G., Rambaugh J., Jacobson Ivar, The Unified Modeling Language User Guide, Pearson Education (2003)
3. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson 2nd Edition, Pearson Education.
4. UML 2 Toolkit by Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado WILEYDreamtech India Pvt. Ltd.
5. The Unified Software Development Process by Ivar Jacobson, Grady Booch, James Rumbaugh, Pearson Education

REFERENCE BOOKS

Yogesh Singh, RuchikaMalhotra , Object oriented software engineering, PHI 2012

CS-505	OBJECT DATA STRUCTURE AND ALGORITHMS	L T P	Cr
		3 0 0	3

OBJECTIVES

To learn about the time complexity of algorithms and understand the representations used in heap data structures, different types of search structures and various algorithm design techniques. Understand the advanced data structures.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Know about the data types as well as measures of complexity of algorithms
CO2: Get knowledge about heaps and its different types
CO3: Get familiar with the BST and its types
CO4: learn about the dynamic programming
CO5: learn about the approaches used for parallel algorithms

UNIT I

ABSTRACT DATA TYPES - Time and Space Analysis of Algorithms - Big Oh and Theta Notations - Average, best and worst case analysis - Simple recurrence relations – Mappings.

UNIT II

MIN-MAX HEAPS - Heaps - Leftist heaps -Binomial heaps - Fibonacci heaps - Skew heaps - Lazybinomial heaps.

UNIT III

BINARY SEARCH TREES - AVL trees - 2-3 trees - 2-3-4 trees - Red-black trees - B-trees - splay trees - Tries.

UNIT IV

DIVIDE AND CONQUER AND GREEDY: Quicksort - Strassen's matrix multiplication - Convex hull - Treevertex splitting - Job sequencing with deadlines - Optimal storage on tapes Dynamic Programming and Backtracking: Multistage graphs - 0/1 knapsack - 8- queens problem - graph coloring.

UNIT V

PARALLEL ALGORITHMS: Basic Techniques- Work & Efficiency - Distributed Computation - Heuristic & Approximation Approaches.

TEXT BOOKS

Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Third Edition, Pearson Education, Asia.2007.

REFERENCE BOOKS

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, University Press, 2009.
2. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms/C++, Second Edition, University Press, 2007.

3. Jean-Paul Tremblay, Paul .G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill second edition , 1991.
4. Thomas H.Coremen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein , "Introduction to algorithms", Third edition, MIT press.

AM-501	ADVANCED ENGINEERING MATHEMATICS	L- T- P	Cr
		3- 1 - 0	4

COURSE OUTCOMES

The undergoing this course will be able to:

CO1: Know about integration as well as differential equations
CO2: Learn about the Laplace transform, its inverse as well as applications
CO3: State different statistical methods like interpolation, extrapolation etc.
CO4: Learn about the different numerical methods for integration
CO5: Key aspects used in differential equations

UNIT I

Integration in series, ordinary and singular points, power series, frobenius method to find the general solution of higher order linear ordinary differential equation with constant variable coefficients, Legendre and Bassels equation, Legendre polynomials, Bessel functions, Boundary value, Strum-Liouville problem, Orthogonal eigen function expansions.

UNIT II

Laplace Transform, Laplace Inverse Transform, Application of Laplace Transform and Inverse Laplace Transform in the particular solution of integral equation and integro-differential equations, Infinite Fourier sine and cosine transforms and its applications, Fourier-Legendre series, Fourier-Bessel series.

UNIT III

Interpolation, Extrapolation, Lagrangs method, Missing-terms problems, Hermite interpolation, Spline interpolation, Cubic spline, Fitting of a curve in given sub-interval using cubic spline interpolation, Representation of a tabulated function in power of (x-a) using Newtons divided difference formula.

UNIT IV

Numerical integration using Romberg method, Gauss-Legendre and Lobatto methods, Gaussian integration and numerical; double integration, Numerical solution of a system of non-linear equations using Newton Raphson method, Solution of system of linear equations in four variables using Gauss-Jordan and Crout's methods.

UNIT V

Partial Differential Equations, Modeling, Vibrating String, Wave Equations. Product solutions o1'Laplaceequations, heat conduction equations, wave equations, Poisson'sequations by the method of separation of valiables and its applications in boundary value problems, Conversiou of a differeirtial equation into integral equation and vice versa, Solutions of Fredholur and Volterra integral equations of first and second kind.

TEXT BOOKS

Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers

REFERENCE BOOKS

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern-lndia.
2. Numerical Methods for Scientific and Engineering Computation, M. K. Jain, S. R. K. Iyengar and R.K..Jain, New Age International (P) Ltd.
3. **E-Resources:** https://nptel.ac.in/courses/111/105/111105035/

4. **Latest Journals: https://www.springer.com/journal/10665**
5. **Ethical Things: https://soaneemrana.org/onewebmedia/ADVANCED%20ENGINEERING%20MATHEMATICS%20BY%20ERWIN%20ERESZIG1.pdf**
6. **Latest Things: https://www.wolfram.com/books/profile.cgi?id=8784**

RM-501	RESEARCH PROCESS AND METHODOLOGY	L- T- P	Cr
		3- 1 - 0	4

COURSE OBJECTIVES

The students undergoing this course will be able to:

CO1: Know about the research problem, its objectives and approaches of research
CO2: Learn about plagiarism and ethics of research
CO3: How to create a good research proposal
CO4: Learn about the patents as well as copyrights
CO5: Know about the patents deeply

UNIT I

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

Effective literature studies approaches, analysis Plagiarism, Research ethics,

UNIT III

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 IV

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 V

PATENT RIGHTS: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs

TEXT BOOKS

1. "Research Methodology: An Introduction" by Ranjit Kumar, 2nd Edition,
2. "Research Methodology: A Step by Step Guide for beginners & engineering students" by Wayne Goddard and Stuart Melville.

REFERENCE BOOKS

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science.
2. "Resisting Intellectual Property", Taylor & Francis Ltd .
3. E-Resources: https://nptel.ac.in/courses/121/106/121106007/
4. Latest Journals: https://ijrm.humanjournals.com/
5. Ethical Things: https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/1471-2288-14-127
6. **https://www.researchgate.net/publication/334519601_Modern_Trends_in_Research_Methodology**

CS-557	ADVANCED DATA STRUCTURE LAB	L T P	Cr
		0 0 4	2

OBJECTIVES

Implement advanced data structures and advanced algorithm concepts. Calculate the time complexity of algorithms and express it using appropriate notations and implement different algorithm design techniques.

COURSE OUTCOMES

CO1 Be able to design and analyze the time and space efficiency of the data structure
CO2 Be capable to identity the appropriate data structure for given problem
CO3 Have practical knowledge on the applications of data structures

LIST OF EXPERIMENTS

1. Implement min - max heap and calculate the efficiency of the algorithms.
2. Implement Heap data structure.
3. Implement splay trees.
4. Implement the insertion of AVL trees with rotations.
5. Implement B-Tree.
6. Implement vertex cover problem using approximate algorithms.
7. Implement and calculate the time complexity of quick sort
8. Implement Convex hull
9. Implement 0/1 Knapsack using Dynamic Programming
10. Implement Graph coloring using backtracking

Syllabus
Of
M.Tech(CS)
1st Year 2nd
Semester

CS-502B	TRENDS IN ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING	L	T	P	Credit
		3	0	0	3

OBJECTIVES

1. To introduce the concepts and techniques of building blocks of Artificial Intelligence and Soft Computing techniques and their difference from conventional techniques.
2. To generate an ability to design, analyze and perform experiments on real life problems using various Neural Network algorithms.
3. To conceptualize Fuzzy Logic and its implementation for various real-world applications.
4. To provide the understanding of Genetic Algorithms and its applications in developing solutions to real-world problems.
5. To introduce the need and concept of hybrid soft computing algorithms.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Understand AI concepts used to develop solutions that mimic human like thought process on deterministic machines for real-world problems.

CO2: Analyze and evaluate whether a problem can be solved using AI techniques and analyze the same using basic concepts of AI.

CO3: Understand the fundamental concepts of Neural Networks, different neural network architectures, algorithms, applications and their limitations.

CO4: Apply Fuzzy Logic, the concept of fuzziness and fuzzy set theory in various systems.

5. **CO5**: Apply Genetic Algorithms in problems with self-learning situations that seek global optimum.

CO6: Create solutions to real-world problems using Neural Network, Genetic Algorithms, Fuzzy Logic or their Hybrid systems.

UNIT I

FOUNDATIONS OF ARTIFICIAL INTELLIGENCE: Introduction to artificial intelligence; Application areas of artificial intelligence; State space search: Depth first search, Breadth first search;

HEURISTIC SEARCH: Best first search, Hill Climbing, Beam Search, Tabu Search; Introduction to randomized search: Simulated annealing, Genetic algorithms, Ant colony optimization; Introduction to expert systems; Introduction to AI-related fields like game playing, speech recognition, language detection machine, computer vision, robotics Supervised and unsupervised learning.

UNIT II

INTRODUCTION TO SOFT COMPUTING: Importance of soft computing; Soft computing versus hard computing; Introduction to main components of soft computing: Fuzzy logic, Neural networks, Genetic algorithms. Basic concepts of neural network; Overview of learning rules and parameters; Activation functions; Single layer perceptron and multilayer perceptron; Multilayer feed forward network;

BACKPROPAGATION NETWORKS: Architecture, Algorithm, Variation of standard backpropagation neural network; Radial basis function network; Recurrent neural network; Introduction to Associative Memory; Recent applications.

UNIT III

GENETIC ALGORITHMS: Difference between traditional algorithms and Genetic Algorithm (GA); Basic concepts of GA; Working principle; Encoding methods; Fitness function; GA Operators: Reproduction, Crossover, Mutation; Convergence of GA; Detailed algorithmic steps; Adjustment of parameters; Multi-criteria optimization; Solution of typical problems using genetic algorithm; Recent applications.

UNIT IV

FUZZY LOGIC: Concepts of uncertainty and imprecision; Concepts, properties and operations on classical sets and fuzzy sets; Classical & fuzzy relations; Membership functions and its types; Fuzzification; Fuzzy rule-based systems; Defuzzification; Fuzzy propositions; Fuzzy extension principle; Fuzzy inference system; Recent applications.

INTRODUCTION TO HYBRID SYSTEMS: Fuzzy-neural systems, Genetic fuzzy systems, Neuro-genetic systems; Details of any one method for each hybrid system.

UNIT V

RESEARCH-BASED STUDY: The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of latest research published in IEEE/ACM transactions, SCI/SCIE/Web of Science/SCOPUS indexed journals and Tier-1 conference of this area. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered.

TEXT-BOOKS

1. Artificial Intelligence: A Modern Approach by S. Russell and P. Norvig, Prentice Hall.
2. S. Rajasekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, PHI.
3. S. N. Sivanandam and S. N. Deepa, Principles of Soft Computing, 2 nd ed., Wiley India.

REFERENCE BOOKS

1. Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill.
2. Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Pearson Education.
3. J. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House.
4. D. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, AddisonWesley
5. G. Klir, B. Yuan, Fuzzy Sets & Fuzzy Logic: Theory and A: Theory & Applications, Pearson

CS-506B	DATA MINING & DATA WAREHOUSING	L	T	P	Credit
		3	0	0	3

COURSE OUTCOMES

CO1: Understand the functionality of the various data mining and data warehousing component

CO2: Appreciate the strengths and limitations of various data mining and data warehousing models

CO3: Explain the analyzing techniques of various data

CO4: Describe different methodologies used in data mining and data ware housing.

CO5: Compare different approaches of data ware housing and data mining with various technologies.

UNIT I

DATA WAREHOUSE FUNDAMENTALS: Introduction to Data Warehouse, OLTP Systems; Differences between OLTP Systems and Data Warehouse, Characteristics of Data Warehouse; Functionality of Data Warehouse, Advantages and Applications of Data Warehouse; Top- Down and Bottom-Up Development Methodology, Tools for Data warehouse development: Data Warehouse Types, Components of Data warehouse Architecture: Different Data warehouse architectures

DIMENSIONAL MODELING: Introduction: E-R Modeling: Dimensional Modeling: E-R Modeling VS Dimensional Modeling: Data Warehouse Schemas; Star Schema, Inside Dimensional Table, Inside Fact Table, Fact Less Fact Table, Granularity, Star Schema Keys: Snowflake Schema: Fact Constellation Schema:

UNIT II

EXTRACT, TRANSFORM AND LOAD: ETL Overview or Introduction to ETL: ETL requirements and steps: Data Extraction; Extraction Methods, Logical Extraction Methods, Physical Extraction Methods: Data Transformation; Basic Tasks in Transformation, Major Data Transformation Types: Data loading; Data Loading Techniques: ETL Tools

UNIT II

DATA WAREHOUSE & OLAP: Introduction: What is OLAP, Characteristics of OLAP, Steps in the OLAP Creation Process, Advantageous of OLAP: What is Multidimensional Data: OLAP Architectures; MOLAP, ROLAP, HOLAP: Data Warehouse and OLAP: Hypercube & Multicubes

META DATA MANAGEMENT IN DATA WAREHOUSE: Introductions to Metadata: Categorizing Meta data: Meta data management in practice; Meta data requirements gathering, Meta data classification, Meta data collection strategies: Meta Data Management in Oracle and SAS: Tools for Meta data management:

UNIT IV

INTRODUCTION TO DATA MINING: Introduction, categories of web mining – web content mining, web structure mining, web usage mining, Scope of Data Mining, How does Data Mining Works, Data Mining VS Data Warehousing: Architecture for Data Mining, Applications of Web Mining, and Web mining Software.

DATA MINING TECHNIQUES I- An Overview, Classification and Prediction – Basic Concepts – Decision Tree Induction , Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods and Prediction.

UNIT V

DATA MINING TECHNIQUES II- Introduction of Cluster Analysis, Categorization of Major Clustering Methods: K-means, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint – Based Cluster Analysis & Outlier Analysis, Agglomerative clustering, Divisive clustering, clustering and segmentation software, evaluating clusters.

REFERENCES

1. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.
4. K.P. Soman, Shyam Diwakar and V. Aja, "Insight into Data Mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India, 2006.
5. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.
6. Daniel T.Larose, "Data Mining Methods and Models", Wiley-Interscience, 2006.

CS - 508B	Elective – I (CLOUD COMPUTING)	L T P	Cr
		3-0-0	3

OBJECTIVE

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To learn the basic concepts of CLOUD computing.

CO2: To aware about the.Cloud Insights Architectural influences

CO3: To know about the Cloud Architecture .

CO4: To aware about Cloud Simulators

CO5: To learn about the basic of VMWare.

UNIT I

CLOUD COMPUTING OVERVIEW : Origins of Cloud computing – Cloud components - Essential characteristics – On-demand selfservice, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT II

CLOUD INSIGHTS ARCHITECTURAL INFLUENCES :High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT III

CLOUD ARCHITECTURE : Layers and Models Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT IV

CLOUD SIMULATORS : CloudSim and GreenCloud Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud .

UNIT-V

Introduction to VMWare Simulator : Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

TEXT BOOK :

1. Architecting the Cloud: Design Decisions for Cloud Computing Service Models(SaaS, PaaS, and IaaS) (Wiley CIO) by Michael J. Kavis(Author)
2. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile,Security and More by Kris Jamsa(Author)

REFERENCES :

1. Cloud Computing ñ An Introduction bySubuSangameswar
2. Mastering Cloud Computing Paperback by Buyya (Author), Vecchiola (Author),Selvi (Author)
3. Cloud Computing for Complete Beginners: Building and Scaling High-PerformanceWeb Servers on the Amazon Cloud by IkramFatah

To identify a problem and write the PEAS description and problem formulation.	18-08-2021	
02 Implementation of Kinship problem using PROLOG.	25-08-2021	

03 Problem Implementation of Tic Tac toe problem. 08-09-2021
15-09-2021
04 To Implement search algorithms to reach the goal State. 15-09-2021
22-09-2021
05 To study McCulloch-Pitts Model for AND gate. 22-09-2021

29-09-
2021
06 To study Linear regression using single layer perceptron. 29-09-2021
06-10-
2021
07 To design and implement fuzzy logic for a washing machine system.
06-10-
2021
13-10-
2021

08 Case study on Hybrid Systems. To study the designing of
Neuro Fuzzy systems.
13-10-2021
17-10-2021
09 Case study of an Application such as Face Recognition
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08 Case study on Hybrid Systems. To study the designing of Neuro Fuzzy systems.
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17-10-2021

09 Case study of an Application such as Face Recognition System.

CS-552B	SOFT COMPUTING & ARTIFICIAL INTELLGENCE LAB	L	T	P	Credit
		0	0	4	2

COURSE OUTCOMES

CO1: Implement the AI concepts used to develop solutions that mimic human like thought process on deterministic machines for real-world problems.

CO2: Analyze and evaluate whether a problem can be solved using AI techniques and analyze the same using basic concepts of AI.

CO3: Implement the the fundamental concepts of Neural Networks, different neural network architectures, algorithms, applications and their limitations.

LIST OF EXPERIMENTS

- Case based lab sessions will be conducted in this laboratory.
- Implementation of AI and Soft Computing techniques to understand, analyse, compare and visualize the performance of the induced models will be done using Python with Pytorch, Numpy, NLTK, Scikit-learn, etc.
- Packages and MATLAB.
- The research based real problems will be decided by the course faculty and students.

CS-556	DATA MINING & DATA WAREHOUSIG LAB	L T P	CR
		0-0-4	2

COURSE OUTCOMES

CO1: Use and Demonstrate the Data Mining Tools : Tanagra, Weka

CO2: Learn the counterparts of the business intelligence like data warehouse, Tanagra, Weka, ERP etc.

CO3: Visualization of the data and dashboards

LIST OF EXPERIMENT

1 Study Of Tanagra As A Data-Mining Tool

2 Study Of Weka As A Data-Mining Tool

3 Importing and viewing data in TANAGRA

4 Defining status of data using Tanagra

5 Program to apply instance selection on given data using Tanagra.

6 Program to apply clustering algorithms on given data by using Tanagra tool.

7 Program to apply A Priori algorithms on given data using Tanagra:

8 Program to generate decision tree using Weka tool

9 Program to use Weka tool to perform clustering:

10 Program to visualize all attributes of Preprocess using Weka

11 Program for processing the data using Weka

12 Program for Classification of Data using Neural Network

13 Program for Classification of Data using Bayesian Network

14 What attributes do you think might be crucial in making the analysis of diabetes? Come up with some simple rules in plain English using your selected attributes using diabetes. arff database

15 What attributes do you think might be crucial in making the analysis of contact-lenses? Come up with some simple rules in plain English using your selected attributes using contact Lenses. arff

CS-558	PROJECT WITH SEMINAR-I	L T P	CR
		0-0-8	4

OBJECTIVES

The objective of the seminar is to impart training to the students in collecting materials on a specific topic in the broad domain of Engineering/Science from books, journals and other sources, compressing and organizing them in a logical sequence, and presenting the matter effectively both orally and as a technical report.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

CO1: Organize and illustrate technical documentation with scientific rigor and adequate literal standards on the chosen topic strictly abiding by professional ethics while reporting results and stating claims

CO2: Demonstrate communication skills in conveying the technical documentation via oral presentations using modern presentation tools.

CO3: To impart training to students to face audience and present their ideas and thus creating in them self esteem and courage that are essential for engineers.

CO4: To assess the debating capability of the student to present a technical topic.

CO5: To learn real working condition and technologies of Industry.

Individual students are required to choose a topic of their interest. A committee consisting of at least three faculty members preferably Expertise in respective fields shall assess the presentation of the seminar and award marks to the students.

Each student shall submit two copies of a write up of his/her seminar topic. One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

Syllabus
of
M.Tech(CSE) –
1st Year
3rd Semester

CS-601	DIGITAL IMAGE PROCESSING	L T P	Cr
		3-0-0	3

OBJECTIVES

This course will equip the students with understanding of digital image processing, segmentation and feature extraction techniques of images, registration and image fusion, and 3D image visualization.

COURSE OUTCOMES

After completion of course, students would be able to:

CO1: Explain the essentials of digital image processing.
CO2: Describe various segmentation techniques for image analysis.
CO3: Outline the various feature extraction techniques for image analysis.
CO4: Discuss the concepts of image registration and fusion.
CO5: Illustrate 3D image visualization.

UNIT I

REVIEW OF DIGITAL IMAGE PROCESSING: Steps in digital image processing- Elements of visual perception- brightness adaptation, Mach band effect. Image enhancement in spatial and frequency domain, Histogram equalization

UNIT II

SEGMENTATION & FEATURE EXTRACTION: Edge detection, Thresholding, Region growing, Fuzzy clustering, Watershed algorithm, Active contour models, Texture feature based segmentation, Graph based segmentation,Wavelet based Segmentation - Applications of image segmentation. **Feature Extraction:** First and second order edge detection operators, Phase congruency, Localized feature extraction -detecting image curvature, shape features, Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Runlength features, Fractal model based features, Gabor filter, wavelet features.

UNIT III

REGISTRATION AND IMAGE FUSION:N Registration - Preprocessing, Feature selection - points, lines, regions and templates Feature correspondence - Point pattern matching, Line matching, Region matching, Template matching.Transformation functions - Similarity transformation and Affine Transformation. Resampling – NearestNeighbour and Cubic Splines. Image Fusion - Overview of image fusion, pixel fusion, wavelet based fusion - region based fusion.

UNIT IV

3D IMAGE VISUALIZATION: Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiple connected surfaces, Image processing in 3D, Measurements on 3D images.

UNIT V

RESEARCH-BASED STUDY: The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of latest research published in IEEE/ACM transactions, SCI/SCIE/Web of Science/SCOPUS indexed journals and Tier-1 conference of this area. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered.

TEXT-BOOKS

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing',Pearson,Education, Inc.,Second Edition, 2004.
2. Mark Nixon, Alberto Aguado, “Feature Extraction and Image Processing”, Academic Press, 2008.

REFERENCE-BOOKS

1. Ardeshir Goshtasby, “ 2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications”,John Wiley and Sons,2005.
2. John C.Russ, “The Image Processing Handbook”, CRC Press,2007.
3. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson Education, Inc., 2002.

Rick S.Blum, Zheng Liu, “Multisensor image fusion and its Applications“, Taylor&Francis,2006.

CS-603	DATA SCIENCE USING PYTHON	L T P	Cr
		3 0 0	3

OBJECTIVES

It will cover Python programming and its various package such as NUMPY, SCIPY and MATPLOTLIB. This course provides knowledge and expertise to become a proficient data scientist. It helps demonstrate an understand the statistics and machine learning concepts that are vital for data science.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Explain how data is collected, managed and stored for data science.

CO2: Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists.

CO3: Implement data collection and management scripts using Python Pandas.

CO4: Understand how to use the Python standard library to write programs, access the various data science tools, and document and automate analytic processes.

CO5: understand the data science processes, data exploration, data visualization, hypothesis building, and testing; and the basics of statistics.

CO6: analyze data as well as perform data manipulation using data structures and tools provided in the Pandas package.

CO7: Understand an integrated analysis environment for doing data science with Python.

CO8: Understand supervised learning and unsupervised learning models such as linear regression, logistic regression, clustering, dimensionality reduction, K-NN, and pipeline.

UNIT I

PYTHON BASICS AND PROGRAMMING CONCEPTS:N Introducing Python, Types and Operations - Numbers, Strings, Lists, Tuples, Dictionaries, Files, Numeric Types, Dynamic Typing; Statements and Syntax – Assignments, Expressions, Statements, Loops,

iterations, comprehensions; Functions -Function Basics, Scopes, Arguments, Advanced Functions; Modules – Module Coding Basics, Module Packages, Advanced Module Topics; Classes and OOP -Class, Operator Overloading, Class Designing; Exceptions and Tools – Exception Basics, Exception Coding Details, Exception Objects, Designing With Exceptions, Parallel System Tools

UNIT II

GUI PROGRAMMING:N Graphical User Interface - Python gui development options, Adding Widgets, GUI Coding Techniques, Customizing Widgets; Internet Programming - Network Scripting, Client-Side scripting, Pymailgui client, server-side scripting, Pymailcgi server; Tools and Techniques -databases and persistence, data structures, text and language, python/c integration

UNIT III

PANDAS AND NUMPYNNUMPY BASICS - Fast Element wise array functions, Multidimensional Array, Data Processing using arrays, file i/o with arrays; Pandas - Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics, Handling Missing Data, Hierarchical Indexing

UNIT III

DATA PREPROCESSING: Data Loading, Storage, and FileFormats -Reading and Writing data in text format, binary data formats, interacting with html and web apis, interacting with databases; Data Wrangling: Clean, Transform, Merge, Reshape - Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation, String Manipulation; Data Aggregation

UNIT IV

GROUP OPERATIONS – Group by Mechanics, Data Aggregation, Groupby Operations and Transformations, Pivot Tables and Cross-Tabulation

DATA VISUALIZATION: A Brief matplotlib API Primer, Plotting FunctionsNin pandas, Time Series, Financial and Economic Data Applications

UNIT V

RESEARCH-BASED STUDY:N The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of latest research published in IEEE/ACM transactions, SCI/SCIE/Web of Science/SCOPUS indexed journals and Tier-1 conference of this area. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered.

TEXT-BOOKS

1. Python For Data Analysis (O Reilly, Wes Mckinney)
2. Rakshith Vasudev, Introduction to Numpy -1 : An absolute beginners guide to Machine Learning and Data science., 2017.

REFERENCE-BOOKS

1. Python: The Complete Reference, Martin C. Brown, McGraw Hill Education
2. Head First Python, Paul Barry, O′Reilly
3. Learning Python , OReilly, Mark Lutz
4. Programming Python, OReilly, Mark Lutz

4.

CS-605	MACHINE LEARNING	L T P	Cr
		3 0 0	3

OBJECTIVES

- To understand and apply both supervised and unsupervised machine learning algorithms to detect and characterize patterns in real-world data.
- To understand complexity of machine learning algorithms, their limitations and open-issues

COURSE OUTCOMES

After completion of course, students would be able to:

CO1: Understand the fundamentals of machine learning.
CO2: Analyze the performance of machine learning algorithms, and effect of parameters.
CO3: Develop an understanding what is involved in learning models from data.
CO4: Understand a wide variety of learning algorithms.
CO5: Apply principles and algorithms to evaluate models generated from data.
CO6: Apply the algorithms to a real-world problem.

UNIT I

INTRODUCTION TO MACHINE LEARNING: Learning - Types of machine learning - Supervised learning - The brain and the neurons, Linear Discriminants -Perceptron - Linear Separability -Linear Regression - Multilayer perceptron – Examples of using MLP - Back propagation of error. Problems, data, and tools, Visualization tools, Artificial Neural Networks, Regression Techniques, Linear regression, SSE, gradient descent, closed form, normal equations, features, Overfitting and complexity, training, validation, test data,

UNIT II

CLASSIFICATION ALGORITHMS: Maximum-Likelihood estimation; Maximum a posteriori estimation; Naïve Bayes and Bayesian classifiers; K-nearest neighbour method; Support Vector Machines; Algorithms for clustering: K-means, Hierarchical and other methods, Ensemble Classifiers: Need and usefulness of ensemble classifiers; Bagging; Boosting, Random forests; Decorate; Vote; Stacking. Decision trees - Constructing decision trees - Classification of regression trees - Regression example - Probability and Learning: Turning data into probabilities - Some basic statistics - Gaussian mixture models - Nearest Neighbor methods.

UNIT III

ANALYSIS: The k-Means algorithm - Vector Quantization's - Linear Discriminant Analysis - Principal component analysis - Factor Analysis - Independent component analysis - Locally Linear embedding – Isomap - Least squares optimization - Simulated annealing.

UNIT IV

OPTIMIZATION TECHNIQUES: The Genetic algorithm - Genetic operators - Genetic programming - Combining sampling with genetic programming - Markov Decision Process - Markov Chain Monte Carlo methods: sampling - Monte carlo -Proposal distribution.

UNIT V

RESEARCH-BASED STUDY: The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of latest research published in IEEE/ACM transactions, SCI/SCIE/Web of Science/SCOPUS indexed journals and Tier-1 conference of this area. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered.

TEXT-BOOKS

1. Machine Learning: An Algorithmic Perspective by Stephen Marsland, Chapman and Hall/CRC.
2. T. Mitchell, Machine Learning, McGraw Hill.
3. M. Gopal, Applied Machine Learning, McGraw Hill.
4. Sutton R. S. and Barto, A. G., Reinforcement Learning: An Introduction, The MIT Press (2017).

REFERENCE-BOOKS

1. Introduction to Machine Learning by Ethem Alpaydin, PHI Learning.
2. M. Evangelia, Supervised and Unsupervised Pattern Recognition, CRC Press.
3. C. Bishop, Neural Networks for Pattern Recognition, Oxford University Press.
4. G. James, D. Witten, T. Hastie, R. Tibshirani, Introduction to Statistical Learning, Springer.

CS-605	MACHINE LEARNING	L T P	Cr
		3 0 0	3

OBJECTIVES

- To understand and apply both supervised and unsupervised machine learning algorithms to detect and characterize patterns in real-world data.
- To understand complexity of machine learning algorithms, their limitations and open-issues

COURSE OUTCOMES

After completion of course, students would be able to:

CO1: Understand the fundamentals of machine learning.
CO2: Analyze the performance of machine learning algorithms, and effect of parameters.
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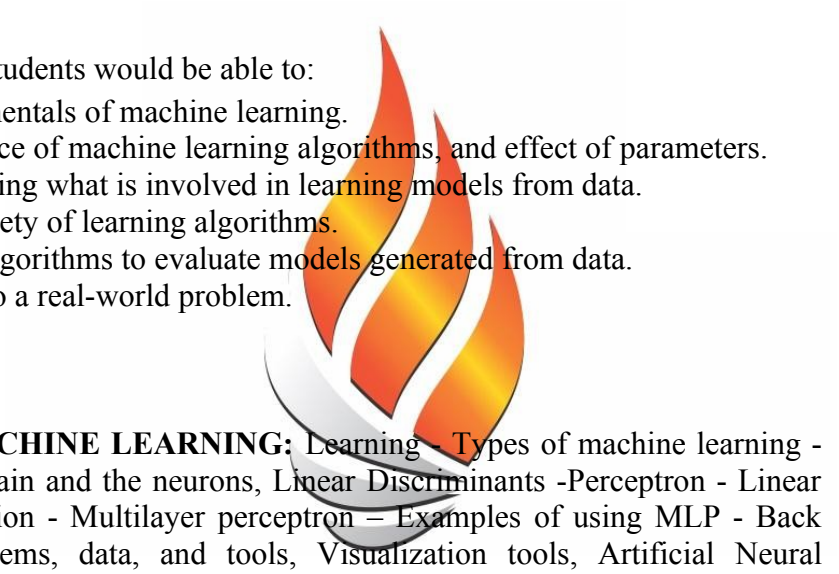
CO4: Understand a wide variety of learning algorithms.
CO5: Apply principles and algorithms to evaluate models generated from data.
CO6: Apply the algorithms to a real-world problem.



UNIT I

INTRODUCTION TO MACHINE LEARNING: Learning - Types of machine learning - Supervised learning - The brain and the neurons, Linear Discriminants -Perceptron - Linear Separability -Linear Regression - Multilayer perceptron – Examples of using MLP - Back propagation of error. Problems, data, and tools, Visualization tools, Artificial Neural Networks, Regression Techniques, Linear regression, SSE, gradient descent, closed form, normal equations, features, Overfitting and complexity, training, validation, test data,

UNIT II

CLASSIFICATION ALGORITHMS: Maximum-Likelihood estimation; Maximum a posteriori estimation; Naïve Bayes and Bayesian classifiers; K-nearest neighbour method; Support Vector Machines; Algorithms for clustering: K-means, Hierarchical and other methods, Ensemble Classifiers: Need and usefulness of ensemble classifiers; Bagging; Boosting, Random forests; Decorate; Vote; Stacking. Decision trees - Constructing decision trees - Classification of regression trees - Regression example - Probability and Learning: Turning data into probabilities - Some basic statistics - Gaussian mixture models - Nearest Neighbor methods.

UNIT III

ANALYSIS: The k-Means algorithm - Vector Quantization's - Linear Discriminant Analysis - Principal component analysis - Factor Analysis - Independent component analysis - Locally Linear embedding – Isomap - Least squares optimization - Simulated annealing.

UNIT IV

OPTIMIZATION TECHNIQUES: The Genetic algorithm - Genetic operators - Genetic programming - Combining sampling with genetic programming - Markov Decision Process - Markov Chain Monte Carlo methods: sampling - Monte carlo -Proposal distribution.

UNIT V

RESEARCH-BASED STUDY: The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of latest research published in IEEE/ACM transactions, SCI/SCIE/Web of Science/SCOPUS indexed journals and Tier-1 conference of this area. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered.

TEXT-BOOKS

5. Machine Learning: An Algorithmic Perspective by Stephen Marsland, Chapman and Hall/CRC.
6. T. Mitchell, Machine Learning, McGraw Hill.
7. M. Gopal, Applied Machine Learning, McGraw Hill.
8. Sutton R. S. and Barto, A. G., Reinforcement Learning: An Introduction, The MIT Press (2017).

REFERENCE-BOOKS

5. Introduction to Machine Learning by Ethem Alpaydin, PHI Learning.
6. M. Evangelia, Supervised and Unsupervised Pattern Recognition, CRC Press.
7. C. Bishop, Neural Networks for Pattern Recognition, Oxford University Press.
8. G. James, D. Witten, T. Hastie, R. Tibshirani, Introduction to Statistical Learning, Springer.

CS-609	ELECTIVE II (NATURAL LANGUAGE PROCESSING)	L T P	Cr
		3 0 0	3

OBJECTIVES

- To explain the leading trends and systems in natural language processing.
- To understand the concepts of morphology, syntax, semantics and pragmatics of the language.
- To recognize the significance of pragmatics for natural language understanding.
- To enable students to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

COURSE OUTCOMES (COS):

After completion of course, students would be able to:

CO1: Understand fundamentals of Natural Language Processing.
CO2: Model linguistic phenomena with formal grammars.
CO3: Design, implement and analyze Natural Language Processing algorithms.
CO4: Understand approaches to syntax, semantics and discourse generation in natural language processing.
CO5: Apply NLP techniques to design real world NLP applications, such as machine translation, text categorization, text summarization, information extraction, etc.
CO6: Implement proper experimental methodology for training and evaluating empirical NLP systems.

UNIT I

INTRODUCTION: History of NLP; Generic NLP system; Levels of NLP; Knowledge in language processing problem; Ambiguity in natural language; Stages in NLP; Challenges of NLP; Role of machine learning; Brief history of the field; Applications of NLP: Machine translation, Question answering system, Information retrieval, Text categorization, text summarization & Sentiment analysis.

UNIT II

WORDS & WORD FORMS: Morphology analysis survey of English morphology, inflectional morphology & derivational morphology; Regular expressions; Finite automata; Finite state transducers (FST); Morphological parsing with FST; Lexicon free FST, Porter stemmer, N-Grams, N-gram language model, N-gram for spelling correction.

UNIT III

SYNTAX PASSING: Part-of-Speech tagging (POS); Lexical syntax tag set for English (Penn Treebank); Rule based POS tagging; Stochastic POS tagging; Issues: Multiple tags & words, unknown words, class-based n-grams, HM Model ME, SVM, CRF; Context Free Grammar; Constituency; Context free rules & trees; Sentence level construction; Noun Phrase; Coordination; Agreement; Verb phrase & sub categorization.

UNIT IV

SEMANTIC ANALYSIS: Attachment for fragment of English sentences, noun phrases, verb phrases, prepositional phrases; Relations among lexemes & their senses; Homonymy, Polysemy based disambiguation & limitations, Robust WSD; Machine learning approach and

dictionary-based approach.

UNIT V

DISCOURSE, APPLICATIONS AND CASE STUDIES: Discourse reference resolution; Reference phenomenon; Syntactic & semantic constraints on co reference; Preferences in pronoun interpretation; Algorithm for pronoun resolution; Text coherence; Discourse structure. Implementation of applications like Machine translation, Information retrieval, Question answers system, Categorization, Summarization; Sentiment analysis; Case Studies and recent researches in Natural Language Processing

TEXT-BOOKS

1. Géron, Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'Reilly.
2. T. Siddiqui, Natural Language Processing and Information Retrieval, Oxford University Press.
3. S. Bird, Natural Language Processing with Python, 1st edition, O'Reilly

REFERENCE-BOOKS

1. D. Rao and B. McMahan, Natural Language Processing with PyTorch: Build Intelligent
2. Language Applications Using Deep Learning, O'Reilly.
3. D. Jurafsky and J. Martin, Speech and Language Processing, 2nd edition, Prentice Hall.
4. Kao, Natural Language Processing and Text Mining, Elsevier.
5. James, Natural Language Understanding, 2nd edition, Pearson

CS-653	DATA SCIENCE USING PYTHON LAB	L T P	Cr
		0 0 4	2

COURSE OUTCOMES

CO1 To Access the .txt file by using Python Libraries.
CO2 Demonstrate the output of data in .txt file.
CO3 Practical Knowledge of Data Analysis, Understanding structured and unstructured data
CO4 Importing and Exporting Data, Basic Insights from Datasets, Cleaning and Preparing the Data

Implementation of Exploratory data analysis, Statistical techniques, Evaluation methods, Machine Learning and Data Science techniques will be done using Python.

LIST OF EXPERIMENTS

Experiment 1: Write a Python Program to Find the Sum of the Series: 1 + 1/2 + 1/3 + .. + 1/N.

Experiment 2: Write a Python Program to Split the array and add the first part to the end.

Experiment 3: Write a Python Program to Create a List of Tuples with the First Element as the number and Second Element as the Square of the Number.

Experiment 4: Write a Python program to count number of vowels using sets in given string.

Experiment 5: Write a program to implement permutation of a given string using inbuilt function.

Experiment 6: Write a python program to sort list of dictionaries by values in Python – Using lambda function.

Experiment 7: Write a Python Program for following sorting: i. Quick Sort ii. Heap Sort

Experiment 8: Write a Python Program to Reverse a String Using Recursion.

Experiment 9: Write a Python Program to Count the Number of Words in a Text File.

Experiment 10: Write a Python Program to Read the Contents of a File in Reverse Order.

Experiment 11: Write a program to Merge and Join DataFrames with Pandas in Python.

Experiment 12: Write a program to implement Merge and Join DataFrames with Python Pandas.

Experiment 13: Write a Python Program to Append the Contents of One File to Another File.

Experiment 14: How to install and Load CSV files to Python Pandas.

Experiment 15: Write a program to implement Data analysis and Visualization with Python. using pandas.

Experiment 16: Write a program to Implement Plotting Functions in python pandas.

Syllabus

Of

M.Tech(CS)

2nd year

4th Semester

CS-614B	CRYPTOGRAPHY & CYBER SECURITY	L	T	P	Credit
		3	0	0	3

OBJECTIVES

- In depth understanding of the Cryptographic Techniques.
- To apply cryptographic techniques in computer systems.
- To learn threats and risks within context of the cyber security architecture.
- Student should learn and Identify security tools and hardening techniques.
- To learn types of incidents including categories, responses and timelines for response.

COURSE OUTCOMES

After completion of course, students would be able to:

CO1: Analyse and compare symmetric-key encryption public-key encryption schemes based on different security models.

CO2: Apply cyber security architecture principles.

CO3: Distinguish system and application security threats and vulnerabilities.

CO4: Describe risk management processes and practices.

CO5: Identify security tools and hardening techniques.

UNIT I

SYMMETRIC KEY ENCRYPTION: Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, **Symmetric Cyphers:** Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Stream Ciphers, Block Ciphers, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, Block Cipher Modes of Operation.

UNIT II

ASSYMETRIC KEY ENCRYPTION: Public-Key Encryption: Introduction to Number Theory, Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Principles of Public-Key Cryptosystems, The RSA Algorithm, Key Management, Diffie-Hellman Key Exchange,

MESSAGE AUTHENTICATION AND HASH FUNCTIONS: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and Macs,

HASH AND MAC ALGORITHMS: Secure Hash Algorithm, HMAC,

DIGITAL SIGNATURES AND AUTHENTICATION PROTOCOLS: Digital Signatures, Authentication Protocols, Digital Signature Standard.

UNIT III

CYBER SECURITY: Introduction to Cyber security: Cyber security objectives, Cyber security roles, Differences between Information Security & Cyber security, **Cyber security Principles:** Confidentiality, integrity, &availability Authentication & non-repudiation, **Incident Response:** Incident categories, Incident response **Incident recovery and Operational security protection:** Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management.

UNIT IV

SYSTEM SECURITY: Threat Detection and Evaluation (DE): Monitoring, Vulnerability Management, Security Logs and Alerts, Monitoring Tools and Appliances. **Analysis:** Network traffic Analysis, packet capture and analysis, **Introduction to backdoor System and security:** Introduction to metasploit, Backdoor, demilitarized zone(DMZ), Digital Signature, Brief study on Harding of operating system.

UNIT V

RESEARCH-BASED STUDY: The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of latest research published in IEEE/ACM transactions, SCI/SCIE/Web of Science/SCOPUS indexed journals and Tier-1 conference of this area. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered.

TEXT-BOOKS

1. William Stallings, "Cryptography and Network Security": Principles and Standards", Prentice Hall India, 5 th Edition, 2007.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security: Private Communication in a public world", Prentice Hall India, 2nd Edition, 2011.

REFERENCE-BOOKS

1. Eric Cole, "Network Security Bible", John Wiley & Sons, 31-Mar-2011.

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