KKR & KSR INSTITUTE OF TECHNOLOGY & SCIENCES

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Vinjanampadu, Guntur , Andhra Pradesh. INDIA -522 017.

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DEPARTMENT OF CSE

M.Tech (AI & ML) COURSE STRUCTURE & SYLLABUS

SEMESTER - I

SNo	Subject Code	Course Category	L	T	P	C	IM	EM	TM
1	20AM1T01	Advanced Data Structures & Algorithms	3	0	0	3	25	75	100
2	20AM1T02	Machine Learning	3	0	0	3	25	75	100
3	20AM1E0X	**Elective Course – I**	3	0	0	3	25	75	100
4	20AM1E0X	**Elective Course -II**	3	0	0	3	25	75	100
5	20GR1M01	Research Methodology and IPR	2	0	0	2	25	75	100
6	20GSXA06	**Audit Courses (AC)-I**	2	0	0	0	---	---	---
7	20AM1L02	Advanced Data Structures & Algorithms Lab	0	0	2	2	25	75	100
8	20AM1L02	Machine Learning Techniques Lab	0	0	2	2	25	75	100
			Total			**18**	**175**	**525**	**700**

SEMESTER-II

S.No.	Subject Code	Course Category	L	T	P	C	IM	EM	TM
1	20AM2T01	Deep Learning	3	0	0	3	25	75	100
2	20AM2T02	Full Stack Technologies	3	0	0	3	25	75	100
3	20AM2E0X	**Elective Course – III**	3	0	0	3	25	75	100
4	20AM2E0X	**Elective Course -IV**	3	0	0	3	25	75	100
5	20AM2P01	Mini Project with Seminar	0	0	0	2	100	--	100
6	20GS2A01	**Audit Courses (AC)-II**	2	0	0	0	---	---	---
7	20AM2L01	Deep Learning Lab	0	0	2	2	25	75	100
8	20AM2L02	Full Stack Technologies Lab	0	0	2	2	25	75	100
			Total			**18**	**250**	**450**	**700**

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SEMESTER-III

S.No.	Subject Code	Course Category	L	T	P	C	IM	EM	TM
1	20AM3E0X	**Elective Course -IV**	3	0	0	3	25	75	100
2	20AM3OX	**Open Elective Course**	3	0	0	3	25	75	100
3	20AM3P01	Dissertation Phase-I/Industrial Project[#, $]	0	0	20	10	100	--	100
			Total			**16**	**150**	**150**	**300**

SEMESTER-IV

SNo	Subject Code	Course Category	L	T	P	C	IM	EM	TM
1	120AM4P01	Dissertation Phase-II	0	0	32	16	100	100	200
			Total			**16**	**100**	**100**	**200**

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Professional Elective - I		**Professional Elective - II**	
Subject Code	**Name of the Subject**	**Subject Code**	**Name of the Subject**
20AM1E01	Distributed Database	20AM1E04	Cloud Computing
20AM1E02	Introduction to Data Science	20AM1E05	Parallel computing
20AM1E03	Data Mining Techniques	20AM1E06	Hadoop & Big Data
Professional Elective - III		**Professional Elective - IV**	
20AM2E01	Artificial Neural Networks	20AM2E04	Artificial Intelligence
20AM2E02	Soft Computing	20AM2E05	Principles of Cyber Security
20AM2E03	Digital Image Processing	20AM2E06	Social Network Analytics
Professional Elective - IV			
20AM3E01	Natural Language Processing		
20AM3E02	NoSQL Databases		
20AM3E03	Robotics and Intelligent Systems		
20AM3E04	MOOCs-1 through NPTEL/SWAYAM/COURSER A 12 Week Program related to the programme		
Open Elective Course			
20AM3O01	Internet of Things (IoT)		
20AM3O02	Reinforcement Learning		
20AM3O03	Recommender Systems		
20AM3O04	MOOCs-2 through NPTEL/SWAYAM/COURSERA - Any 12 week course on Engineering/ Management/ Mathematics offered by other than parent department		

List of Audit Course

S. No	Subject
1	English for Research Paper Writing
2	Disaster Management
3	Sanskrit for Technical Knowledge
4	Value Education
5	Constitution of India
6	Pedagogy Studies
7	Stress Management by yoga
8	Personality Development Through Life Enlightenment Skills

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DEPARTMENT OF CSE

I Year - I Semester	Advanced Data Structures & Algorithms 20AM1T01	L	T	P	C
		3	0	0	3

Course Objectives:

From the course the student will learn

- Single Linked, Double Linked Lists, Stacks, Queues, Searching and Sorting techniques, Trees, Binary trees, representation, traversal, Graphs- storage, traversal.
- Dictionaries, ADT for List, Stack, Queue, Hash table representation, Hash functions, Priority queues, Priority queues using heaps, Search trees.
- AVL trees, operations of AVL trees, Red- Black trees, Splay trees, comparison of search trees.

Course Outcomes:

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

- Ability to write and analyze algorithms for algorithm correctness and efficiency
- Master a variety of advanced abstract data type (ADT) and data structures and their Implementation
- Demonstrate various searching, sorting and hash techniques and be able to apply and solve problems of real life
- Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees
- Ability to compare various search trees and find solutions for IT related problems

UNIT I: Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists- Algorithms. **Stacks and Queues**: Algorithm Implementation using Linked Lists.

UNIT II: Searching-Linear and Binary, Search Methods, **Sorting**-Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort. **Trees**- Binary trees, Properties, Representation and Traversals (DFT, BFT), Expression Trees (Infix, prefix, postfix). **Graphs**-Basic Concepts, Storage structures and Traversals.

UNIT III: Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, **Open Addressing**-Linear Probing, Double Hashing.

UNIT IV: Priority queues- Definition, ADT, Realizing a Priority Queue Using Heaps, Definition, Insertion, Deletion .**Search Trees**- Binary Search Trees, Definition, ADT, Implementation, **Operations**- Searching, Insertion, Deletion.

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UNIT V: Search Trees- AVL Trees, Definition, Height of AVL Tree, Operations-, Insertion, Deletion and Searching, Introduction to Red-Black and Splay Trees, B-Trees, Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees.

Text Books:

1. Data Structures: A Pseudo Code Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon and Cengage
2. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press

Reference Books:

1. Data Structures and Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.
2. Data Structures and Algorithms, 3/e, Adam Drozdek, Cengage
3. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E.V.Prasad and S Chand & Co, 2009

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DEPARTMENT OF CSE

I Year - I Semester	Machine Learning 20AM1T02	L	T	P	C
		3	0	0	3

Course Objectives:

Machine Learning course will

- Develop an appreciation for what is involved in learning from data.
- Demonstrate a wide variety of learning algorithms.
- Demonstrate how to apply a variety of learning algorithms to data.
- Demonstrate how to perform evaluation of learning algorithms and model selection.

Course Outcomes:

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

- Domain Knowledge for Productive use of Machine Learning and Diversity of Data. Demonstrate on Supervised and Computational Learning
- Analyze on Statistics in learning techniques and Logistic Regression Illustrate on Support Vector Machines and Perceptron Algorithm
- Design a Multilayer Perceptron Networks and classification of decision tree

Unit I: Introduction: Towards Intelligent Machines Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

Unit II: Supervised Learning: Rationale and Basics: Learning from Observations, Bias and Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.

Unit III: Statistical Learning: Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.

Unit IV: Support Vector Machines (SVM): Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly seperable data, Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, and Regression by Support vector Machines.

Learning with Neural Networks: Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error correction delta rule.

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Unit V: Multilayer Perceptron Networks and error back propagation algorithm, Radial Basis Functions Networks. **Decision Tree Learning**: Introduction, Example of classification decision tree, measures of impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning the tree, strengths and weakness of decision tree approach.

Textbooks:

1. Applied Machine Learning,1st edition, M.Gopal, McGraw Hill Education,2018
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC) 1st Edition-2014

Reference Books:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William WHsieh, Cambridge Univ Press. *1* edition (August 31, 2009)
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley &SonsInc., 2nd Edition-2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.
4. Machine Learning by Peter Flach , Cambridge-1st Edition 2012

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DEPARTMENT OF CSE

I Year - I Semester	Distributed Database 20AM1E01	L	T	P	C
		3	0	0	3

Course Objectives: The aim of this module is to build on the previous background of database systems by Deepening the understanding of the theoretical and practical aspects of the database technologies, showing the need for distributed database technology to tackle deficiencies of the centralized database systems and finally introducing the concepts and techniques of distributed database including principles, architectures, design, implementation and major domain of application

Course Outcomes:

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

- Identify the introductory distributed database concepts and its structures.
- Describe terms related to distributed object database design and management.
- Produce the transaction management and query processing techniques in DDBMS.
- Relate the importance and application of emerging database technology.

Unit I: Introductory concepts and design of (DDBMS)

Data Fragmentation; Replication; and allocation techniques for DDBMS; Methods for designing and implementing DDBMS, designing a distributed relational database; Architectures for DDBMS: cluster federated, parallel databases and client server architecture.

Unit II: Query processing & Transaction Management

Overview Of Query Processing: Query processing problem; Objectives of Query Processing; Complexity of Relational Algebra operations; characterization of Query processors; Layers of Query Processing Introduction To Transaction Management: Definition of Transaction, Properties of Transaction, types of transaction ; Distributed Concurrency Control: Serializability theory; Taxonomy of concurrency control mechanisms; locking bases concurrency control algorithms.

Unit III: Distributed Object Database Management systems

Fundamental Object concepts and Object models; Object distribution design; Architectural issues; Object management; Distributed object storage; Object query processing

Unit IV: Current trends & developments related to Distributed database applications technologies Distributed Object/component-based DBMS; Database Interoperability including CORBA; DCOM and Java RMI; Distributed document-based systems; XML and Workflow management.

Unit V: Emerging related database technologies

Parallel Database; Mobile database; Multimedia Database; Spatial Database and Web Databases

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Text Books:

1. Distributed Databases - Principles and Systems; Stefano Ceri; Guiseppe Pelagatti; Tata McGraw Hill; 1985.
2. Fundamental of Database Systems; Elmasri & Navathe; Pearson Education; Asia
3. Database System Concepts; Korth & Sudarshan; TMH
4. Principles of Distributed Database Systems; M. Tamer Özsu; and Patrick Valduriez Prentice Hall

Reference Books:

1. Data Base Management System; Leon & Leon; Vikas Publications
2. Introduction to Database Systems; Bipin C Desai; Galgotia

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DEPARTMENT OF CSE

I Year - I Semester	Introduction To Data Science 20AM1E02	L	T	P	C
		3	0	0	3

Course Objectives:

- Provide you with the knowledge and expertise to become a proficient data scientist.
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
- Produce Python code to statistically analyse a dataset;
- Critically evaluate data visualizations based on their design and use for communicating stories from data;

Course Outcomes: After completion of course, students would be able to:

- Explain how data is collected, managed and stored for data science;
- Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists
- Implement data collection and management scripts using MongoDB

UNIT – I Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

UNIT – II Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data Sources

UNIT-III Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

UNIT-IV Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

UNIT-V Applications of Data Science, Technologies for visualization, Bokeh (Python). Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

References

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

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I Year - I Semester	Data Mining Techniques 20AM1E03	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand data mining concepts.
- To learn about various data preprocessing techniques.
- To learn about data warehousing.
- To learn about various data mining functionalities such as association rule mining, clustering, classification and outlier analysis.

UNIT - I Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT - II Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Usage of Data Warehousing Online Analytical Processing and Mining Data Cube Computation: Efficient Methods for simple Data Cube Computation (Full Cube, Iceberg Cube, Closed Cube and Shell Cube), Discovery Driven exploration of data cubes, Attribute-Oriented Induction for data characterization and its implementation

UNIT - III Mining Frequent Patterns, Associations and Correlations: Basic Concepts, The Apriori algorithm for finding frequent itemsets using candidate generation, Generating association rules from frequent itemsets, Mining frequent itemsets without candidate generation, Mining various kinds of Association Rules, Correlation Analysis

UNIT - IV Classification and Prediction: Description and comparison of classification and prediction, preparing data for Classification and Prediction Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation Prediction, linear and non-linear regression, evaluating accuracy of a Classifier or a Predictor

UNIT - V Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, k-means and k-mediods methods, CLARANS, Agglomerative and divisive hierarchical clustering, chameleon dynamic modeling, DBSCAN, Grid based clustering method: STING, Conceptual Clustering, Constraint-Based Cluster Analysis, Outlier Analysis.

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Text Books:

1. Data Mining – Concepts and Techniques - Jiawei Han, Micheline Kamber and Jian Pei, 3rd edition, Morgan Kaufmann Publishers, ELSEVIER.

2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

References:

1. Data Warehousing in the Real World – Sam Aanhory & Dennis Murray Pearson Edn Asia.

2. Insight into Data Mining, K. P. Soman, S. Diwakar, V. Ajay, PHI, 2008.

3. Data Warehousing Fundamentals – Paulraj Ponnaiah Wiley student Edition

4. The Data Warehouse Life cycle Tool kit – Ralph Kimball Wiley student edition

5. Building the Data Warehouse By William H Inmon, John Wiley & Sons Inc, 2005.

6. Data Mining Introductory and advanced topics –Margaret H Dunham, Pearson education

7. Data Mining Techniques – Arun K Pujari, 2nd edition, Universities Press.

8. Data Mining, V. Pudi and P. Radha Krishna, Oxford University Press.

9. Data Mining: Methods and Techniques, A.B. M Shawkat Ali and S. A. Wasimi, Cengage Learning.

10. Data Warehouse 2.0, The Architecture for the next generation of Data Warehousing, W.H. Inmon, D. Strauss, G. Neushloss, Elsevier, Distributed by SPD.

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DEPARTMENT OF CSE

I Year - I Semester	Cloud Computing 20AM1E04	L	T	P	C
		3	0	0	3

Pre-Requisites: Computer Networks, Web Programming

Course Objectives:

- The student will also learn how to apply trust-based security model to real-world security problems.
- An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures.
- Students will learn the basic Cloud types and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model.

Course Outcomes:

After completion of course, students would be able to:

- Identify security aspects of each cloud model Develop a risk-management strategy for moving to the Cloud
- Implement a public cloud instance using a public cloud service provider
- Apply trust-based security model to different layer

UNIT – I Introduction to Cloud Computing: Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing

UNIT – II Cloud Computing Architecture: Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments,
CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model Cloud Deployment Models: Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise

UNIT - III Security Issues in Cloud Computing: Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security Identity and Access Management: Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management

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UNIT - IV Security Management in the Cloud Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS Privacy Issues Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations

UNIT - V Audit and Compliance Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud Advanced Topics Recent developments in hybrid cloud and cloud security.

References:

1. Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton, Publication Date: November 2, 2009.
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice), Tim Mather, ISBN-10: 0596802765, O'Reilly Media, September 2009.

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I Year - I Semester	Parallel Computing 20AM1E05	L	T	P	C
		3	0	0	3

Course Objective:
Students will demonstrate an understanding of concepts, algorithms, and design principles underlying parallel computing, develop algorithm design and implementation skills, and gain practical experience in programming large scale parallel machines.

Course Outcomes: After the completion of the course,student will be able to

- Describe different parallel architectures; inter-connect networks, programming models, and algorithms for common operations such as matrix-vector multiplication.
- Develop an efficient parallel algorithm to solve it.
- Analyze a parallel algorithm time complexity as a function of the problem size and number of processors.
- Analyze parallel code performance, determine computational bottlenecks, and optimize the performance of the code. Implement parallel algorithm using MPI, OpenMP, pthreads, or a combination of MPI and OpenMP.

UNIT I: History- Introduction, Modern Scientific Method, Evolution of Supercomputing , Modem Parallel Computers, Seeking Concurrency, Data Clustering, Programming Parallel Computers. Parallel Architectures: Introduction, Interconnection Networks, Processor Arrays, Multiprocessors, Multi computers, Flynn's Taxonomy

UNIT II: Parallel Algorithm Design- Introduction, The Task/Channel Model, Foster's Design Methodology, Boundary Value Problem ,Finding the Maximum, The n-Body Problem, Adding Data Input, Message-Passing ProgrammingIntroduction, The Message-Passing Model, The Message-Passing Interface , Circuit Satisfiability, Introducing Collective Communication, Benchmarking Parallel Performance.

UNIT III: The Sieve of Eratosthenes-Introduction, Sequential Algorithm, Sources of Parallelism, Data Decomposition options, Developing the Paralle1 Algorithm, Analysis of Parallel Sieve Algorithm, Documenting the Parallel Program, Benchmarking, Improvements, Performance Analysis- Introduction, Speedup and Efficiency, Amdahl's Law, Gustafson-Barsis's Law, The Karp-Flatt Metric, The Iso-efficiency Metric.

UNIT IV: Matrix Multiplication, Introduction, Sequential Matrix Multiplication, Row wise Block-Striped Parallel Algorithm, Cannon's Algorithm, Solving Linear Systems, Back Substitution, Gaussian Elimination, Iterative Methods, Sorting Introduction, Quick sort, A Parallel Quick sort Algorithm, Hyper quick sort Algorithm, Parallel Sorting by Regular Sampling.

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UNIT V: Shared-Memory Programming – Introduction, The Shared-Memory Model, Parallel for Loops, Declaring Private Variables, Critical section, Reductions, Performance Improvements, More General Data Parallelism, Functional Parallelism, Combining MPI and OpenMP -Introduction, Conjugate Gradient Method, Jacobi Method.

Text Books:

1. Parallel Programming in C with MPI and OpenMP Michael J, Quinn Oregon State University.

Reference books:

1. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things 1st Edition, Kai Hwang , Jack Dongarra, Geoffrey C. Fox

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DEPARTMENT OF CSE

I Year - II Semester	Hadoop & Big Data 20AM1E06	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand about big data
- To learn the analytics of Big Data
- To Understand the MapReduce fundamentals

UNIT - I Big Data Analytics: What is big data, History of Data Management; Structuring Big Data; Elements of Big Data; Big Data Analytics; Distributed and Parallel Computing for Big Data; Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; Basically Available Soft State Eventual Consistency (BASE); Open source Analytics Tools.

UNIT - II Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics; Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

UNIT - III Understanding MapReduce Fundamentals and HBase : The MapReduce Framework; Techniques to Optimize Map Reduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop : Introduction of HDFS, Architecture, HDFC Files, File system types, commands, org.apache.hadoop.io package, HDF, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBase in Operations Programming with HBase; Installation, Combining HBase and HDFS

UNIT - IV Big Data Technology Landscape and Hadoop: NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors; HDFC (Hadoop Distributed File System), HDFC Daemons, read, write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN.

UNIT - V Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets; Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools;

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Text Books:

1. Big Data and Analytics, Seema Acharya, Subhasinin Chellappan, Wiley publications.
2. Big Data, Black BookTM , DreamTech Press, 2015 Edition.
3. Business Analytics 5e , BY Albright |Winston

Reference Books:

1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence –Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss, Shaku Atre, "Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

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DEPARTMENT OF CSE

I Year - I Semester	Research Methodology and IPR 20GR1M01	L	T	P	C
		2	0	0	2

UNIT 1:

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 2:

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 3:

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 4:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT 5:

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.

REFERENCES:

(1) Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
(2) Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
(3) Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
(4) Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
(5) Mayall, "Industrial Design", McGraw Hill, 1992.
(6) Niebel, "Product Design", McGraw Hill, 1974.
(7) Asimov, "Introduction to Design", Prentice Hall, 1962.
(8) (8) Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
(9) T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

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DEPARTMENT OF CSE

I Year - I Semester	**Advanced Data Structures & Algorithms Lab** 20AM1L02	**L**	**T**	**P**	**C**
		0	**0**	**2**	**2**

Course Objectives:

From the course the student will learn

- Knowing about oops concepts for a specific problem.
- Various advanced data structures concepts like arrays, stacks, queues, linked lists, graphs and trees.

Course Outcomes:

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

- Identify classes, objects, members of a class and relationships among them needed for a specific problem.
- Examine algorithms performance using Prior analysis and asymptotic notations.
- Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
- Apply and analyze functions of Dictionary

Experiment 1:

Write a java program to perform various operations on single linked list

Experiment 2:

Write a java program for the following

a) Reverse a linked list

b) Sort the data in a linked list

c) Remove duplicates

d) Merge two linked lists

Experiment 3:

Write a java program to perform various operations on doubly linked list.

Experiment 4:

Write a java program to perform various operations on circular linked list.

Experiment 5:

Write a java program for performing various operations on stack using linked list.

Experiment 6:

Write a java program for performing various operations on queue using linked list.

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Experiment 7:
Write a java program for the following using stack
a) Infix to postfix conversion.
b) Expression evaluation.
c) Obtain the binary number for a given decimal number.

Experiment 8:
Write a java program to implement various operations on Binary Search Tree Using Recursive and Non-Recursive methods.

Experiment 9:
Write a java program to implement the following for a graph.
a) BFS b) DFS

Experiment 10:
Write a java program to implement Merge & Heap Sort of given elements.

Experiment 11:
Write a java program to implement Quick Sort of given elements.

Experiment 12:
Write a java program to implement various operations on AVL trees.

Experiment 13:
Write a java program to perform the following operations:
b) Insertion into a B-tree b) Searching in a B-tree

Experiment 14:
Write a java program to implementation of recursive and non-recursive functions to Binary tree Traversals

Experiment 15:
Write a java program to implement all the functions of Dictionary (ADT) using Hashing

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I Year - I Semester	Machine Learning Techniques Lab 20AM1L02	L	T	P	C
		0	0	2	2

Course Objectives:

This course will enable students to

- To learn and understand different Data sets in implementing the machine learning algorithms.
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes(COs): At the end of the course, student will be able to

- Implement procedures for the machine learning algorithms
- Design Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real world problems

Experiment-1:

Exercises to solve the real-world problems using the following machine learning methods:
a) Linear Regression
b) Logistic Regression.

Experiment-2:

Write a program to Implement Support Vector Machines.

Experiment-3:

Exploratory Data Analysis for Classification using Pandas and Matplotlib.

Experiment-4:

Implement a program for Bias, Variance, and Cross Validation.

Experiment-5:

Write a program to simulate a perception network for pattern classification and function approximation.

Experiment-6:

Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-7:

Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

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Experiment-8:
Write a program to implement the naïve Bayesian classifier for Iris data set. Compute the accuracy of the classifier, considering few test data sets.

Experiment-9:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-10:
Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k- Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-11:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

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I Year - II Semester	Deep Learning 20AM2T01	L	T	P	C
		3	0	0	3

Course Objectives:

- The objective of this course is to cover the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short term memory cells and convolutional neural networks.
- The course also requires students to implement programming assignments related to these topics.

COURSE OBJECTIVE

- To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- Explore supervised and unsupervised learning paradigms of machine learning.

COURSE OUTCOMES

After completion of course, students would be able to:

- To explore Deep learning techniques and various feature extraction strategies.
- To mathematically understand the deep learning approaches and paradigms
- To apply the deep learning techniques for various applications

UNIT I: Basics- Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability. Convergence theorem for Perceptron Learning Algorithm.

UNIT II: Feedforward Networks- Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, autoencoders.

Deep Neural Networks: Difficulty of training deep neural networks, Greedy layerwise training.

UNIT III: Better Training of Neural Networks- Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization).

UNIT IV: Recurrent Neural Networks- Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs

Convolutional Neural Networks: LeNet, AlexNet.

Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

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UNIT V: Recent trends- Variational Autoencoders, Generative Adversarial Networks, Multi-task Deep Learning, Multi-view Deep Learning

Applications: Vision, NLP, Speech (just an overview of different applications in 2-3 lectures)

Textbooks

1. Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

References:

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007

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DEPARTMENT OF CSE

I Year - II Semester	Artificial Intelligence 20AM2E04	L	T	P	C
		3	0	0	3

Course Objectives :

- Gain a historical perspective of AI and its foundations.
- Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool. Experiment with a machine learning model for simulation and analysis.
- Explore the current scope, potential, limitations, and implications of intelligent systems.

Course Outcomes(COs): At the end of the course, student will be able to

- Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
- Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
- Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing.
- Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
- Solve problems with uncertain information using Bayesian approaches.

UNIT-I:

Introduction to artificial intelligence: Introduction , history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI, **Problem solving: state-space search and control strategies:** Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening a*, constraint satisfaction

UNIT-II:

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha-beta pruning, two-player perfect information games, **Logic concepts:** Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic

UNIT-III:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames, **advanced knowledge representation techniques:**

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Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web.

UNIT-IV:

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory ,

UNIT-V:

Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

Text Books:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach, 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence- 3rd ed, Rich, Kevin Knight, Shiv Shankar B Nair, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, 5th ed, George F Lugar, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

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I Year - II Semester	Artificial Neural Networks 20AM2E01	L	T	P	C
		2	0	0	2

Course Objective:

- The main objective of this course is to provide the student with the basic understanding of neural networks fundamentals,
- Program the related algorithms and Design the required and related systems Course Outcomes:
- Demonstrate ANN structure and activation Functions
- Define foundations and learning mechanisms and state-space concepts
- Identify structure and learning of perceptions
- Explain Feed forward, multi-layer feed forward networks and Back propagation algorithms
- Analyze Radial Basis Function Networks, Theor Regularization and RBF networks

UNIT-I: Introduction and ANN Structure, Biological neurons and artificial neurons. Model of an ANN. Activation functions used in ANNs. Typical classes of network architectures.

UNIT-II: Mathematical Foundations and Learning mechanisms.Re-visiting vector and matrix algebra, State-space concepts, Concepts of optimization, Error-correction learning. Memorybased learning, Hebbian learning. Competitive learning.

UNIT-III: Single layer perceptrons, Structure and learning of perceptrons, Pattern classifier, introduction and Bayes' classifiers, Perceptron as a pattern classifier, Perceptron convergence. Limitations of a perceptrons.

UNIT-IV: Feed forward ANN, Structures of Multi-layer feed forward networks. Back propagation algorithm, Back propagation - training and convergence, Functional approximation with back propagation. Practical and design issues of back propagation learning.

UNIT-V: Radial Basis Function Networks, Pattern separability and interpolation, Regularization Theor Regularization and RBF networks.RBF network design and training. Approximation properties of RBF.

Text Books:

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.

Reference Books:

1. Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997

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I Year - II Semester	Soft Computing 20AM2E02	L	T	P	C
		3	0	0	3

Course Objectives:

- Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

Course Outcomes:

- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
- To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations
- Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
- Reveal different applications of these models to solve engineering and other problems.

UNIT-I: Fuzzy Set Theory: Introduction to Neuro – Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If- Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Surgeon Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.

UNIT-II: Optimization: Derivative based Optimization, Descent Methods, The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing and Random Search – Downhill Simplex Search.

UNIT-III: Artificial Intelligence: Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning under Uncertainty Basic knowledge Representation Issues Knowledge acquisition, Heuristic Search: Techniques for Heuristic search Heuristic Classification State Space Search: Strategies Implementation of Graph Search based on Recursion Patent directed Search Production System and Learning.

UNIT-IV: Neuro Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems, Architecture – Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks –

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Neuro Fuzzy Spectrum.

UNIT-V: Applications Of Computational Intelligence: Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Color Recipe Prediction.

Text Books:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.

Reference Books:

1. Elaine Rich & Kevin Knight, Artificial Intelligence, Second Edition, Tata Mcgraw Hill Publishing Comp., 2006, New Delhi.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.

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DEPARTMENT OF CSE

I Year - II Semester	Digital Image Processing 20AM2E03	L	T	P	C
		3	0	0	3

Course Objectives:

- Describe and explain basic principles of digital image processing.
- Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
- Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
- Assess the performance of image processing algorithms and systems.

Course Outcomes:

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

- Demonstrate the components of image processing
- Explain various filtration techniques.
- Apply image compression techniques.
- Discuss the concepts of wavelet transforms.
- Analyze the concept of morphological image processing.

UNIT I: Introduction: Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. **Image Enhancement Techniques**: Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image subtraction, image averaging.

UNIT II: Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters, Homomorphism is filtering. **Image Restoration & Reconstruction**: Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering, Minimum mean square Error filtering, constrained least square filtering, Geometric mean filter, Image reconstruction from projections. Color Fundamentals, Color Models, Color Transformations.

UNIT III: Image Compression: Redundancies- Coding, Interpixel, Psycho visual; Fidelity, Source and Channel Encoding, Elements of Information Theory; Loss Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization, Entropy coding, LZW coding; Image Compression Standards-JPEG, JPEG 2000, MPEG; Video compression.

UNIT IV: Wavelet Based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding.

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UNIT V: Image Segmentation: Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds; Introduction to morphological operations; binary morphology- erosion, dilation, opening and closing operations, applications; basic gray-scale morphology operations; Feature extraction; Classification; Object recognition.

Digital Image Watermarking: Introduction, need of Digital Image Watermarking, applications of watermarking in copyright protection and Image quality analysis.

Text Books:

1. Digital Image Processing. 2nd ed. Gonzalez, R.C. and Woods, R.E. India: Person Education, (2009)

Reference Books:

1. Digital Image Processing. John Wiley, Pratt, W. K, (2001)
2. Digital Image Processing, Jayaraman, S., Veerakumar, T. and Esakkiranjan, S. (2009),Tata McGraw- Hill

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I Year - II Semester	Full Stack Technologies 20AM2T02	L	T	P	C
		3	0	0	3

Course Objectives:

From the course the student will learn

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.
- Write backend code in Python/Java, PHP languages and Writing optimized front end code HTML and JavaScript.
- Understand, create and debug database related queries and Create test code to validate the applications against client requirement.
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution.

Course Outcomes(COs): At the end of the course, student will be able to

- Identify the Basic Concepts of Web & Markup Languages
- Develop web Applications using Scripting Languages & Frameworks
- Creating & Running Applications using JSP libraries
- Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng-form
- Working with the Files in React JS and Constructing Elements with Data

UNIT – I: HTML

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols - The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML an Introduction to HTML, History, Versions, Basic, XHTML Syntax and Semantics Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-HTML 5.0.

UNIT – II: Cascading Style Sheets (CSS)

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout beyond the Normal Flow-CSS3.0, Boot strap basics, Boot strap CSS3, Introduction to Java Script, Jscript basics, JScripts objects, JSON, Don.

UNIT – III: Jscript

Separating Programming and Presentation: JSP Technology, Introduction to JSP and Servlets-Running JSP Applications, Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model- View-Controller Paradigm- Mongo DB, JQuery, Mean stack Fundamentals

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UNIT – IV: Angular Js

Introducing AngularJS, Starting Out with AngularJS, Basic AngularJS, Directives and Controllers, AngularJS Modules, Creating First Controller, working with and Displaying, Arrays, more Directives, working with ng-repeat, Unit Testing in AngularJS, Forms, Inputs, and Services, Working with ng-model, Working with Forms, Leverage Data-Binding and Models, Form Validation and States, Error Handling with Forms, ngModelOptions, Nested Forms with ng-form, Other Form Controls.

UNIT – V: React JS

Introduction to React, Obstacles and Roadblocks, keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories

Text Books:

1.Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007
3. AngularJS: Up and Running Enhanced Productivity with Structured Web Apps By Brad Green, Shyam Seshadri Publisher: O'Reilly Media

Reference Books:

1. Learning React Functional Web Development with React and Redux By Alex Banks, Eve Porcello Publisher: O'Reilly Media
2. Head First Java, 2nd Edition by Bert Bates, Kathy Sierra Publisher: O'Reilly Media, Inc

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DEPARTMENT OF CSE

I Year - II Semester	Principles Of Cyber Security 20AM2E05	L	T	P	C
		3	0	0	3

Course Objectives:

- 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: At the end of the course, student will be able to

- Apply cyber security architecture principles.
- Describe risk management processes and practices.
- Appraise cyber security incidents to apply appropriate response
- Distinguish system and application security threats and vulnerabilities.
- Identify security tools and hardening techniques

UNIT–I: 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.

UNIT–II: Information Security (IS) within Lifecycle Management-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, **Risks & Vulnerabilities-**Basics of risk management**,** Operational threat environments**,** Classes of attacks.

UNIT–III: 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: Threat Detection and Evaluation (DE): Monitoring- Vulnerability Management, Security Logs and Alerts, Monitoring Tools and Appliances**. Analysis-** Network traffic Analysis, packet capture and analysis

UNIT–V: Introduction to backdoor System and security-Introduction to metasploit, Backdoor, demilitarized zone(DMZ),Digital Signature, Brief study on Harding of operating system.

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Text Books:

1. NASSCOM: Security Analyst Student Hand Book Dec 2015.
2. Information Security Management Principles Updated Edition by David Alexander, Amanda Finch, David Sutton ,Published by BCS, June 2013.

Reference Books:

1. CSX- cyber security fundamentals 2 nd edition, Published by ISACA, Cyber security, Network Security, Data Governance Security.

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DEPARTMENT OF CSE

I Year - II Semester	Social Network Analytics 20AM2E06	L	T	P	C
		3	0	0	3

Course Objectives:

- The learning objective of the course Social Network Analysis is to provide students with essential knowledge of network analysis applicable to real world data, with examples from today's most popular social networks.

Course Outcomes:

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

- Demonstrate social network analysis and measures.
- Analyze random graph models and navigate social networks data
- Apply the network topology and Visualization tools.
- Analyze the experiment with small world models and clustering models.
- Compare the application driven virtual communities from social network Structure.

UNIT I: Social Network Analysis:

Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT II: Random graph models:

Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT III:

Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT IV: Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The ErdosRenyi Model, Clustering Models.

UNIT V: Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

Text Books:

1. S. Wasserman and K. Faust. Social Network Analysis: Methods and Applications (Cambridge, Cambridge University Press, 1994)
2. D. Easley and J. Kleinberg, Networks, Crowds and Markets: Reasoning about a highly connected world

Reference Books:

1. Social Network Data Analytics, Aggarwal, Charu C. (Ed.), Springer Publisher, 2011

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DEPARTMENT OF CSE

I Year - II Semester	Full Stack Technologies Lab 20AM2L02	L	T	P	C
		0	0	2	2

Course Objectives:

From the course the student will

- Learn the core concepts of both the frontend and backend programming course.
- Get familiar with the latest web development technologies.
- Learn all about SQL and Mongo databases.
- Learn complete web development process.

Course Outcomes(COs): At the end of the course, student will be able to

- Identify the Basic Concepts of Web & Markup Languages
- Develop web Applications using Scripting Languages & Frameworks
- Creating & Running Applications using JSP libraries
- Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng- form
- Working with the Files in React JS and Constructing Elements with Data

List of Experiments:

1. Implementation of 'get' and 'post' methods.
2. CSS implementation in colors, boarder padding.
3. CSS3 implementation button frames tables, navigation bars.
4. Create registration and login forms with validations using Jscript query.
5. Jscript to retrieve student information from student database using database connectivity.
6. Angular Js data binding
7. Angular JS directives and Events
8. Using angular Js fetching data from MySQL.
9. Using React Js creating constructs data elements.
10. Using React Js implementations DoM
11. Invoking data using Jscript from Mongo DB.
12. Create an Online fee payment form using JSCript and MangoDB

Reference/ Preferred Text Books:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007
3. Angular JS: Up and Running Enhanced Productivity with Structured Web Apps By Brad Green, Shyam Seshadri Publisher: O'Reilly Media
4. Learning React Functional Web Development with React and Redux By Alex Banks, Eve Porcello Publisher: O'Reilly Media
5. Head First Java, 2nd Edition by Bert Bates, Kathy Sierra Publisher: O'Reilly Media, Inc

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DEPARTMENT OF CSE

I Year - II Semester	Deep Learning Lab 20AM2L01	L	T	P	C
		0	0	2	2

Course Objectives:

From the course the student will learn

- Describe supervised and unsupervised learning differences.
- Describe the data science life cycle.
- Use machine Take data science into production.
- Introducing data science, with a focus on the job outlook and market Requirements.
- Hands-on Applied Statistics Concepts using Python.
- Graphics and Data Visualization Libraries in Python.
- Machine Learning algorithms, Models and Case Studies with Python.

Course Outcomes:

- Use Deep Learning techniques to build concise representations of the meanings of words in all significant languages
- Use Voice Recognition application using
- Develop a feed forward, convolution and recurrent neural networks.
- Experiment with AI and data visualization techniques
- Examine Object Recognition application

Get Familiarity with popular deep learning frame works such as Tensor Flow, PyTorch, Keras, etc.. For applications like

Experiments

1. Implement Face Recognition application using any one of frame works
2. Implement Voice Recognition application using any one of frame works
3. Implement Object Recognition application using any one of frame works
4. Implement Object Counting application using any one of frame works
5. Implement Sentiment Analysis application using any one of frame works
6. Implement Detection of Fake News application using any one of frame works, etc….

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DEPARTMENT OF CSE

AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Course objectives:

Students will be able to:

Understand that how to improve your writing skills and level of readability Learn about what to write in each section
Understand the skills needed when writing a Title Ensure the good quality of paper at very first- time submission

Syllabus		
Units	**CONTENTS**	**Hours**
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	4
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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DEPARTMENT OF CSE

AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: -Students will be able to:

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Syllabus		
Units	**CONTENTS**	**Hours**
1	**Introduction:** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	**Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts & Famines, Landslides And Avalanches, Man- made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	**Disaster Prone Areas In India :** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases &Epidemics	4
4	**Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5	**Risk Assessment :** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co- Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	4
6	**Disaster Mitigation :**Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4

Suggested Readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

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3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content	Hours
1	Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences	4
2	Order Introduction of roots Technical information about Sanskrit Literature	4
3	Technical concepts of Engineering-Electrical,	4
4	Technical concepts of Engineering - Mechanical.	4
5	Technical concepts of Engineering - Architecture.	4
6	Technical concepts of Engineering – Mathematics.	4

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

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DEPARTMENT OF CSE
AUDIT 1 and 2: VALUE EDUCATION

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus

Unit	Content	Hours
1	Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments	4
2	Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism.Love for nature ,Discipline	4
3	Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking.	4
4	Free from anger, Dignity of labor. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature	4
5	Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women.	4
6	All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively	4

Suggested reading

1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

Course outcomes

Students will be able to 1.Knowledge of self-development

2.Learn the importance of Human values 3.Developing the overall personality

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DEPARTMENT OF CSE
AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus		
Units	**Content**	**Hours**
1	**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working)	4
2	**Philosophy of the Indian Constitution:** Preamble Salient Features	4
3	**Contours of Constitutional Rights & Duties:** Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties.	4
4	**Organs of Governance:** Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions	4

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5	**Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CE of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	4
6	**Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.	4

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

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DEPARTMENT OF CSE

AUDIT 1 and 2: PEDAGOGY STUDIES

Course Objectives:

Students will be able to:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Syllabus		
Units	**Content**	**Hours**
1	**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.	4
2	Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.	4
3	Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?	4
4	Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.	4
5	Professional development: alignment with classroom practices and follow-up support Peer support Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes	4
6	**Research gaps and future directions** Research design Contexts Pedagogy Teacher education Curriculum and assessment Dissemination and research impact.	4

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Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

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DEPARTMENT OF CSE

AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

Syllabus

Unit	Content	Hours
1	Definitions of Eight parts of yog. (Ashtanga)	5
2	Yam and Niyam. Do`s and Don't's in life. Ahinsa, satya, astheya, bramhacharya and aparigraha	5
3	Yam and Niyam. Do`s and Don't's in life. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	5
4	Asan and Pranayam Various yog poses and their benefits for mind & body	5
5	Regularization of breathing techniques and its effects-Types of pranayam	4

Suggested reading

2. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami YogabhyasiMandal, Nagpur

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DEPARTMENT OF CSE

AUDIT 1 and 2*:* PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Syllabus

Unit	Content	Hours
1	Neetisatakam-Holistic development of personality Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)	4
2	Neetisatakam-Holistic development of personality Verses- 52,53,59 (dont's) Verses- 71,73,75,78 (do's)	4
3	Approach to day to day work and duties. Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,	4
4	Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.	4
5	Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18	4
6	Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63	4

Suggested reading

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students

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II Year - I Semester	Natural Language Processing 20AM3E01	L	T	P	C
		3	0	0	3

Course Outcomes:

After completion of this course

- Demonstrate a given text with basic Language features
- To design an innovative application using NLP components
- Explain a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types ofNLP applications.

UNIT I:

INTRODUCTION: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II:

WORD LEVEL ANALYSIS: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III:

SYNTACTIC ANALYSIS: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

UNIT IV:

SEMANTICS AND PRAGMATICS: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods

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UNIT V:

DISCOURSE ANALYSIS AND LEXICAL RESOURCES: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm– Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, Word Net, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2 Edition, Daniel Jurafsky, James H. Martin -Pearson Publication,2014.
2. Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein andEdward Loper, OReilly Media,2009

Reference Books:

1. Language Processing with Java and Ling Pipe Cookbook, 1 Atlantic Publisher,2015.
2. Handbook of Natural Language Processing, Second, Nitin Indurkhya and Fred J. Damerau,Chapman and Hall/CRC Press, 2010.Edition
3. Natural Language Processing and Information Retrieval, 3Tiwary, Oxford University Press,2008.

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DEPARTMENT OF CSE

II Year - I Semester	NOSQL Databases 20AM3E02	L	T	P	C
		3	0	0	3

Course Outcomes: On completion of this course, the student will be able to

- Enumerate different features of NOSQL Databases
- Compare different data models
- Design a Key-Value Database for a real world problem
- Design a Document Database for a real world problem
- Design a Graph Database for a real world problem

UNIT-I:

Introduction to NoSQL. The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters,The Emergence of NoSQL.

Aggregate Data Models, Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases.

UNIT-II:

More Details on Data Models, Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication, Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums

UNIT-III :

Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets.

UNIT-IV:

Document Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

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UNIT-V :

Column-Family Stores, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters. Graph Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services Recommendation Engines.

TextBooks:

1. Sadalage, P. & Fowler, M., NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. (1st Ed.). Upper Saddle River, NJ: Pearson Education, In, 2012.

Reference Books:

1. Gauravvaish, Getting started with NoSQL , PACKT publishing, ISBN: 978184969488
2. Redmond, E. & Wilson, J., Seven Databases in Seven Weeks: A Guide to Modern Databases and theNoSQL Movement (1st Ed.), 2012
3. Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978- 1934356920 ISBN-10: 1934356921

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DEPARTMENT OF CSE

II Year - I Semester	Robotics And Intelligent Systems 20AM3E03	L	T	P	C
		3	0	3	3

Course Outcomes:

- Enumerate the fundamentals of robotics and Artificial Intelligence (AI).
- Demonstrate how to setting up a Robot.
- Discuss about the practical Robot Design Process.
- Discuss Object Recognition Using Neural Networks and Supervised Learning

UNIT-I:

Foundation for Advanced Robotics and AI: The basic principle of robotics and AI, What is AI and what is it not, The example problem, Artificial intelligence and advanced robotics techniques, Introducing the robot and our development environment, Software components (ROS, Python, and Linux), Robot control systems and a decision-making framework, The robot control system – a control loop with soft real-time control

UNIT-II:

Setting Up Your Robot: Technical requirements, What is a robot, Robot anatomy, Subsumption architecture, Software setup, Hardware, Assembling the tracks,Mounting the tracks, Arm base assembly, Wiring.

UNIT-III:

A Concept for a Practical Robot Design Process, A systems engineering-based approach to robotics, Use cases, The problem –put away the toys, Project goals, Decomposing hardware needs, Breaking down software needs

UNIT-IV:

Object Recognition Using Neural Networks and Supervised Learning :Technical requirements, The image recognition process, The image recognition training and deployment process – step by step, The convolution neural network process, Build the toy/not toy detector

UNIT-V:

Picking up the Toys: Technical requirements, Task analysis, Summary of robot arm learning process, Teaching the robot arm, Version one – action state reinforcement learning, Adaptive learning rate, Q- learning implementation, Google's SAC-X, Amazon Robotics Challenge

Text Books:

1. Francis X. Govers, Artificial Intelligence for Robotics: Build intelligent robots that perform humantasks using AI techniques, PACKT
2. J. J. Craig, Introduction to Robotics, Addison Wesley Publishers, 2005

Reference Books:

1. M. Negnevitsky, Artificial Intelligence – A guide to intelligent systems Addison-Wesley, 2005

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DEPARTMENT OF CSE

II Year - I Semester	Internet Of Things 20AM3O01	L	T	P	C
		3	0	3	3

Course Outcomes (COs): At the end of the course, student will be able to

- Explain in a concise manner how the general Internet as well as Internet of Things work.
- Understand constraints and opportunities of wireless and mobile networks for Internet ofThings.
- Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- Develop prototype models for various applications using IoT technology

UNIT I:

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT II:

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High- level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III:

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices

UNIT IV:

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT V:

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

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Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw HillHigher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly

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DEPARTMENT OF CSE

II Year – I Semester	Reinforcement Learning 20AM3O_02	L	T	P	C
		3	0	0	3

Course Outcomes:

- Enumerate the elements of Reinforcement Learning
- Solve the n-armed Bandit problem
- Compare different Finite Markov Decision Process
- Discuss about Monte Carlo Methods in solving real world problems
- List the Applications and Case Studies of Reinforcement Learning

UNIT-I

The Reinforcement Learning Problem: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe, Summary, History of Reinforcement Learning.

UNIT-II

Multi-arm Bandits: An n-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, Trackinga Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandits, Associative Search (Contextual Bandits)

UNIT-III

Finite Markov Decision Processes: The Agent–Environment Interface, Goals and Rewards, Returns, Unified Notation for Episodic and Continuing Tasks, The Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation

UNIT-IV

Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling, Incremental Implementation, Off-Policy Monte Carlo Control, Importance Sampling on Truncated Returns

UNIT-V

Applications and Case Studies: TD-Gammon, Samuel's Checkers Player, TheAcrobot, Elevator Dispatching, Dynamic Channel Allocation, Job-Shop Scheduling

Text Books:

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning-An Introduction",2nd Edition,The MIT Press,2018
2. Marco Wiering , Martijn van Otterlo Reinforcement Learning: State-of-the-Art (Adaptation,Learning, and Optimization (12)) 2012th Edition

Reference Books:

1. Vincent François-Lavet , Peter Henderson , Riashat Islam, An Introduction to DeepReinforcement Learning (Foundations and Trends(r) in Machine Learning) , 2019

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II Year - I Semester	Recommender Systems 20AM3O_03	L	T	P	C
		3	0	0	3

Course Objectives:

This course covers the basic concepts of recommender systems, including personalization algorithms, evaluation tools, and user experiences

Course Outcomes:

- Describe basic concepts behind recommender systems
- Explain a variety of approaches for building recommender systems
- Describe system evaluation methods from both algorithmic and users' perspectives
- Describe applications of recommender systems in various domains

UNIT-I:

Introduction: Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses, covariance matrices, Understanding ratings,Applications of recommendation systems, Issues with recommender system

UNIT-II:

Collaborative Filtering: User-based nearest neighbor recommendation, Item-based nearest neighbor recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems.

UNIT-III:

Content-based recommendation: High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

Knowledge based recommendation: Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders

UNIT-IV:

Hybrid approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies.

UNIT-V:

Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centred metrics.**Recommender Systems and communities:** Communities, collaboration and recommender systems in personalized web search, Social tagging recommender systems, Trust and recommendations.

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Text Books:

1. Jannach D., Zanker M. andFelFering A., Recommender Systems: An Introduction, CambridgeUniversity Press(2011), 1st ed.
2. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011),1sted.

References:

1. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems ForLearning, Springer(2013), 1st ed.