FACULTY OF ENGINEERING

Scheme of Instruction & Examination(AICTE Model Curriculum) and Syllabi

B.E. V and VI Semesters of Four Year Degree Program in (B.E.)Computer Science and Engineering – AI &DS

(w.e.f: 2022-23)

Issued by

Dean, Faculty of Engineering Osmania University, Hyderabad – 500 007

2022

Chairperson, BoS **Dean, FoE OU**

SCHEME OF INSTRUCTION & EXAMINATION
B.E.V- SEMESTER
(Artificial Intelligence and Data Science)

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs. / W	CIE	SEE	Duration in Hrs.	
Theory Courses										
1.	PC501AD	Software Engineering	3	0	-	3	30	70	3	3
2.	PC502AD	Database Management System	3	0	-	3	30	70	3	3
3.	PC503AD	Artificial Intelligence	3	0	-	3	30	70	3	3
4.	PC504AD	Automata languages & Computation	3	-	-	3	30	70	3	3
5.	PC505AD	Forecasting Techniques	3	-	-	3	30	70	3	3
6.	PE-I	Professional Elective-I	3	-	-	3	30	70	3	3
Practical/Laboratory Courses										
7.	PC551AD	Artificial Intelligence Lab	-	-	2	2	25	50	3	1
8.	PC552AD	DBMS Lab			2	2	25	50	3	1
9.	PW553AD	Mini Project	-	-	4	4	25	50	3	2
Total			20	00	08	32	280	640		22

Professional Elective–I	
Course Code	**Course Title**
PE511AD	Artificial Neural Networks
PE512AD	Computer Vision
PE513AD	Distributed system
PE514AD	Web Technologies
PE515AD	Foundation of Cryptography
PE516AD	Internet of Things

PC: Professional Core PE: Professional Elective MC: Mandatory Course
OE: Open Elective SI: Summer Internship L: Lecture
T: Tutorial P: Practical D: Drawing
CIE: Continuous Internal Evaluation SEE:Semester End Evaluation (Univ. Exam)

SCHEME OF INSTRUCTION & EXAMINATION
B.E. VI – SEMESTER
(Artificial Intelligence and Data Science)

S. No	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs./Wk	CIE	SEE	Duration	
Theory Courses										
1.	PC601AD	Machine Learning	3	0	-	3	30	70	3	3
2.	PC602AD	Big Data Analytics	3	0	-	3	30	70	3	3
3.	PC603AD	Cloud Computing	3	0	-	3	30	70	3	3
4.	PE-II	Professional Elective-II	3	-	-	3	30	70	3	3
5	PE–III	Professional Elective-III	3	-	-	3	30	70	3	3
6	OE-I	Open Elective-I	3			3	30	70	3	3
Practical/Laboratory Courses										
7	PC654AD	Machine Learning Lab	-	-	2	2	25	50	3	1
8	PC655AD	BDA Lab	-	-	2	2	25	50	3	1
9	SI671AD	Summer Internship*	-	-	-	-	25	25	-	2
Total			15	0	4	22	280	620		22

Professional Elective–II	
Course Code	**Course Title**
PE621AD	Data Visualization
PE622AD	Human Computer Interaction
PE623AD	Soft Computing
PE624AD	Scripting Languages
PE625AD	Block chain Technology
PE626AD	Design Thinking

Professional Elective–III	
Course Code	**Course Title**
PE631AD	Information RetrievalSystems
PE632AD	Cognitive Science& Analytics
PE633AD	Quantum Computing
PE634AD	Web Services
PE635AD	Cyber Security
PE636AD	Open source tools

Open Elective-I		
Sl. No	**Code**	**Name of the Subject**
1	OE601EE	Electrical Energy Conservation and Safety (Not for EEE & EIE Students)
2	OE602EE	Reliability Engineering(Not for EE & EIE students)
3	OE611AE	Automobile Engineering (Not for Auto. Engg students)
4	OE611ME	Entrepreneurship (Not for Mech Engg & Prod. Engg)
5	OE601EG	Soft Skills & Interpersonal Skills
6	OE602MB	Human Resource Development and Organizational Behaviour
7	OE601LW	Cyber Law and Ethics
8	OE601CE	Disaster Mitigation (Not for Civil Engg. Students)
9	OE601CS	OOPS using Java(not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
10	OE602CS	Data Structure and Algorithm(not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
11	OE601AS	Principles of AI(not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
12	OE601AL	Principles of Machine Learning(Not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
13	OE601DS	Principles of Data Science(Not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
14	OE601CB	Principles of IOT(Not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
15	OE601IT	Operating Systems(Not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
16	OE601 EC	Principles of Electronic Communication (Not for ECE students)
17	OE602 EC	Digital system design using verilog HDL (Not for ECE students)

AS- *Artificial Intelligence & Data Science*
AE- *Automobile Engineering*
AL-*Artificial Intelligence & Machine Learning*
CB- *IoT, Cyber Security & Block Chain*
CE-*Civil Engineering*
CS-*Computer Science*
DS- *Data Science*
EC-*Electronics and Communication Engg.*
EE- *Electrical Engineering*
EG-*English*
IT-*Information Technology*
LW-*Law*
MB-*Business Management*
ME-*Mechanical Engineering*

SCHEME OF INSTRUCTION & EXAMINATION
B.E. V - SEMESTER
(Artificial Intelligence and Data Science)

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			L	T	D/P	Contact Hrs /	CIE	SEE	Duration in	
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Course Code	Course Title
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PE512AD	Computer Vision
PE513AD	Distributed system
PE514AD	Web Technologies
PE515AD	Foundation of Cryptography
PE516AD	Internet of Things

SOFTWARE ENGINEERING

Course Code: PC501AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives

- To introduce the basic concepts of software development- processes from defining a product to shipping and maintaining that product
- To impart knowledge on various phases, methodologies and practices of software development
- To understand the importance of testing in software development and study various testing strategies and software quality metrics

Course Outcomes

Students will be able to:

1. Define different software development processes and their usability in different problem domains.
2. Explain the process of requirements collection, analyzing, and modeling requirements for effective understanding and communication with stakeholders.
3. Building the analysis models and design engineering concepts.
4. Develop the architecture of real world problems towards developing a blueprint for implementation.
5. Understand the concepts of testing, debugging and quality assurance.

UNIT-I

Introduction to Software Engineering: A generic view of Process: Software Engineering, Process Framework, CMM Process Patterns, and Process Assessment.
Process Models: Prescriptive Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, the Unified Models, Personal and Team Process Models, Process Technology, Product and Process.
An Agile view of Process: Introduction to Agility and Agile Process, Agile Process Models.

UNIT-II

Software Engineering Principles: SE Principles, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment.
System Engineering: Computer-based Systems, The System Engineering Hierarchy, Business Process Engineering, Product Engineering, System Modeling.
Requirements Engineering: A Bridge to Design and Construction, Requirements Engineering Tasks, Initiating Requirements Engineering Process, Eliciting Requirements, Developing Use- Cases, Building the Analysis Model, Negotiating Requirements, Validating Requirements.

UNIT-III

Building the Analysis Model: Requirements Analysis Modeling Approaches, Data Modeling Concepts, Object-Oriented Analysis, Scenario-based Modeling, Flow-oriented Modeling, Class-based Modeling, Creating a Behavioral Model.
Design Engineering: Design within the context of SE, Design Process and Design Quality, Design Concepts, The Design Model, Pattern-based Software Design.

UNIT-IV

Creating an Architectural Design: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design.
Modeling Component-Level Design: Definition of Component, Designing Class-based Components,

conducting Component-level Design, Object Constraint Language, Designing Conventional Components.
Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

UNIT-V

Testing: Strategies: A Strategic Approach to Conventional Software Testing, Test Strategies for O-Software.
Tactics: Software Testing Fundamentals, Black-box and White-box Testing, Basis PathTesting, Control Structure Testing, O-O Testing Methods.
Debugging: Debugging Techniques, the Art of Debugging.
Product Metrics: A Framework for Product Metrics, Metrics for each phase of software development.
Software Quality: Definition, **Quality Assurance:** Basic Elements, Formal Approaches, Statistical Software qıality Assurance, Software Reliability, ISO9000 Quality Standards, SQA Plan.

Suggested Books:

1. Roger S. Pressman, *Software Engineering: A Practitioner's Approach*, 7th Edition, McGrawHill, 2009

2. Ali Behforooz and Frederick J. Hudson, *Software Engineering Fundamentals*, OxfordUniversity Press, 1996

3. Pankaj Jalote, *An Integrated Approach to Software Engineering*, 3rd Edition, Narosa PublishingHouse, 2008

DATABASE MANAGEMENT SYSTEMS

Course Code: PC502AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives

- Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques.
- Enable students to model ER diagrams for any customized application
- Inducting appropriate strategies for optimization of queries.
- Provide knowledge on concurrency techniques
- Demonstrate the organization of Databases

Course Outcomes

Students will be able to:

1. Understand the basics of database management system
2. Define queries for preserving the integrity of the database
3. Build ER models for database
4. Organize the data to prevent redundancy
5. Pose queries to retrieve the information from the database

UNIT-I

Introduction:

Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators, Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations

UNIT-II

Introduction to SQL:

Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization. Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.

UNIT-III

Database Design and the E-R Model:

Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues. Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.

UNIT-IV

Query Processing:

Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions. Query optimization: Overview, Transformation of Relational Expressions,

Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.

UNIT-V

Transaction Management:

Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements. Concurrency Control: Lock-based Protocols, Deadlock Handling, Multiple granularity, Timestamp-based Protocols, and Validation-based Protocols. Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm,Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical UndoOperations.

Suggested Books:

1. A. Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019
2. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA
3. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, StevenMorris, Peter Robb, Cengage Learning.
4. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH

ARTIFICIAL INTELLIGENCE

Course Code: PC 503AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives

- Understand the importance of the field of AI by discussing its history and various applications.
- Learn about one of the basic applications of A.I, search state formulations.
- Learn methods of expressing knowledge by a machine with appropriate reasoning and different mathematics involved behind it.
- Learn how to reason when an agent has only uncertain information about its task.
- Know various supervised and unsupervised learning algorithms.

Course Outcomes

After completion of course, students would be able to:

1. Formalize a problem in the language/framework of different AI methods.
2. Illustrate basic principles of AI in solutions that require problem solving, search,Inference.
3. Represent natural language/English using Predicate Logic to build knowledge through various representation mechanisms.
4. Demonstrate understanding of steps involved in building of intelligent agents, expert systems, Bayesian networks.

   Differentiate between learning paradigms to be applied for an application.

UNIT – I

Problem Solving & Search: Introduction- What is intelligence? Foundations of artificial intelligence (AI). History of AI, Structure of Agents.
Problem Solving - Formulating problems, problem types, states and operators, state space.
Search Strategies. - Informed Search Strategies- Best first search, A* algorithm, heuristic functions, Iterative deepening A*.
Adversarial Search/ Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning.

UNIT – II

Knowledge, Reasoning &Planning: Reasoning - Knowledge based agent, Propositional Logic, Inference, Predicate logic (first order logic), Resolution
Structured Knowledge Representation – Frames, Semantic Nets
Planning - A Simple Planning Agent, Form Problem Solving to Planning, Basic representation of plans, partial order planning, hierarchical planning.

UNIT – III

Expert Systems, Reasoning with Uncertainty: Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Applications. **Uncertainty -** Basic probability, Bayes rule, Belief networks, Inference in Bayesian Networks**,** Fuzzy sets, and fuzzy logic: Fuzzy logic system architecture, membership function.
Decision Making- Utility theory, utility functions.

UNIT – IV

Learning: Machine-Learning Paradigms: Introduction, Machine Learning Systems, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees
Artificial Neural Networks: Introduction, Artificial Neural Networks, Single-Layer Feed-Forward Networks, Multi-Layer Feed-Forward Networks
Reinforcement learning: Learning from rewards, Passive and Active reinforcement

learning,Applications.

UNIT – V

Communicating & Perceiving: Introduction to NLP- Progress & applications of NLP, Components of NLP, Grammars, Parsing.
Automatic Speech Recognition (ASR) – Speech Processing, Ex: DRAGON, HARPY,

Suggested Books:

1. Stuart Russell and Peter Norvig. *Artificial Intelligence – A Modern Approach*, 3rd Edition, Pearson Education Press, 2009.
2. Kevin Knight, Elaine Rich, B. Nair, *Artificial Intelligence*, 3rd Edition, McGraw Hill,2008.
3. Nils J. Nilsson, *The Quest for Artificial Intelligence*, Cambridge University Press, 2009.

AUTOMATA LANGUAGES AND COMPUTING

Course Code: PC504AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives

The course will introduce the students to

- Develop a formal notation for strings, languages and machines.
- Design finite automata to accept a set of strings of a language.
- Design context free grammars to generate strings from a context free language and convert them into normal forms.
- Identify the hierarchy of formal languages, grammars and machines.
- Understand to differentiate between computability and non-computability and Decidability and undecidability.

Course Outcomes

After completion of course, students would be able to:

1. Write a formal notation for strings, languages, and machines.
2. Design finite automata to accept a set of strings of a language.
3. Design context free grammars to generate strings of context free languages.
4. Understand the turing machine computation.
5. Distinguish between computability and non-computability and Decidability and undecidability.

UNIT-I

Introduction: Finite state automata, Non-deterministic finite state automata, FA with ϵ - transitions, Regular expressions, Applications of FA, Properties of regular sets, Pumping Lemma, Closure properties, Myhill-Nerode Theorem, Minimization of FA.

UNIT-II

Context Free Grammars and Languages: Derivations, Parse-trees, Ambiguity in Grammars and Languages. Pushdown Automata–Definitions, The languages of PDA, Equivalence of PDAs and CFGs, Deterministic Pushdown Automata.

UNIT-III

Properties of CFLs: Normal forms for CFGs, Pumping Lemma, Closure properties, Deterministic Context Free Languages, Decision properties.

UNIT IV

Turing Machines: Introduction, Computational Languages and Functions, Techniques for construction of Turing machines. Modifications of TM, TM as enumerator, Restricted TM.

UNIT V

Undecidability: Recursive and Recursively enumerable languages, UTM and undecidable problem, Rice Theorem, Post's correspondence problem. Chomsky's Hierarchy– Regular grammars, Unrestricted grammar, CSL, Relationship between classes of languages.

Suggested Books:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, *Introduction to Automata Theory, Languages, and Computation,* 3rd Edition, Pearson EducationAsia,2007
.
2. John Martin, *Introduction toLanguagesandTheTheoryofComputation*,3rd Edition, Tata McGrawHill,2013.

FORECASTING TECHNIQUES

Course Code: PC505AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives:
- To Learn Basics concepts of Time series Analysis and Forecasting
- To learn about Regression Models based on Time Series
- To learn Non-Stationary and multivariate time series.

Course Outcomes:
Student will able to
1. Knowledge of basic concepts in time series analysis and forecasting
2. Understanding the use of time series models for forecasting and the limitations of the methods.
3. Ability to criticize and judge time series regression models.
4. Distinguish the ARIMA modelling of stationary and non-stationary time series
5. Compare with multivariate times series and other methods of applications

Unit I:
Introduction of time series analysis:
Introduction to Time Series and Forecasting -Different types of data-Internal structures of time series, Models for time series analysis-Autocorrelation and Partial autocorrelation. Examples of Time series Nature and uses of forecasting-Forecasting Process-Data for forecasting – Resources for forecasting

Unit II:
Statistics background for forecasting:
Graphical Displays -Time Series Plots - Plotting Smoothed Data - Numerical Description of Time Series Data - Use of Data Transformations and Adjustments-General Approach to Time Series Modeling and Forecasting, Evaluating and Monitoring Forecasting Model Performance.

Unit III:
Time series regression model:
Introduction - Least Squares Estimation in Linear Regression Models - Statistical Inference in Linear Regression- Prediction of New Observations - Model Adequacy Checking - Variable Selection Methods in Regression - Generalized and Weighted Least Squares- Regression Models for General Time Series Data Exponential Smoothing-First order and Second order.

Unit IV:
AutoRegressive Integrated Moving Average (arima) models:
Autoregressive Moving Average (ARMA) Models - Stationarity and Invertibility of ARMA Models - Checking for Stationarity using Variogram- Detecting Nonstationarity - Autoregressive Integrated Moving Average (ARIMA) Models - Forecasting using ARIMA - Seasonal Data - Seasonal ARIMA Models- Forecasting using Seasonal ARIMA Models Introduction - Finding the "BEST" Model -Example: Internet Users Data- Model Selection Criteria - Impulse Response Function to Study the Differences in Models - Comparing Impulse Response Functions forCompeting Models .

Unit V:
Multivariate time series models and forecasting Multivariate Time Series Models and Forecasting - Multivariate Stationary Process- Vector ARIMA Models - Vector AR (VAR) Models - Neural Networks and Forecasting -Spectral Analysis - Bayesian Methods in Forecasting.

Suggested Books:

1. Introduction To Time Series Analysis And Forecasting, 2nd Edition, Wiley Series In Probability And Statistics, By Douglas C. Montgomery, Cheryl L. Jen(2015) https://b-ok.cc/book/2542456/2fa941
2. Master Time Series Data Processing, Visualization, And Modeling Using Python Dr. Avishek Pal Dr. Pks

Prakash (2017) https://b-ok.cc/book/3413340/2eb247

3. Time Series Analysis And Forecasting By ExampleSorenBisgaardMurat Kulahci Technical University Of Denmark Copyright c 2011 By John Wiley & Sons, Inc. All Rights Reserved. https://b-ok.cc/book/1183901/9be7ed

Reference Books:

1. Peter J. Brockwell Richard A. Davis Introduction To Time Series And Forecasting Third Edition.(2016). https://b-ok.cc/book/2802612/149485

2. Multivariate Time Series Analysis and ApplicationsWilliam W.S. Wei Department of Statistical Science Temple University, Philadelphia, PA, SA This edition first published 2019 John Wiley & Sons Ltd. https://b-ok.cc/book/3704316/872fbf

3. Time Series Analysis by James D Hamilton Copyright c 1994 by prince town university press. https://b-ok.cc/book/3685042/275c71

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Professional Elective-I

ARTIFICIAL NEURAL NETWORKS

Course Code: PE511AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives:
The objective of this course is to provide students with a basic understanding of the fundamentals and applications of artificial neural networks

Course Outcomes:
Student will able to
1. Understand the similarity of Biological networks and Neural networks
2. Perform the training of neural networks using various learning rules.
3. Understand the concepts of perceptrons
4. Understand the concepts of forward and backward propagations.
5. Understand and Construct the Hopfield models.

UNIT I
Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks
Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT II
Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron – Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

UNIT III
Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and DecisionRule, Computer Experiment, Feature Detection

UNIT IV
Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, NetworkPruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT V

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification,Hopfield models

Suggested Books:

1. Neural Networks a Comprehensive Foundations, Simon S Haykin, PHI Ed.
2. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.
3. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003
4. Neural Networks -James A Freeman David M S Kapura Pearson Ed., 2004.
5. Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd 2005

COMPUTER VISION

Course Code: PE512AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives:

- To educate the basics of Image processing system and image filtering techniques.
- To provide knowledge about binary shape analysis and object labeling methods.
- To impact knowledge about pattern matching and object location models.
- To make the students to understand various aspects of 3-D vision model.
- To make the students familiar with real time pattern recognition systems.

Course Outcomes:

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

1. Implement computer graphics techniques required for computer vision.
2. Apply the concepts of visible and illumination methods.
3. Design and implement pattern matching techniques
4. Implement 3D vision techniques.
5. Develop computer vision algorithms.

UNIT-I:

Nature of Vision:

Images and imaging operations: Introduction – Image Processing operations- Basic image filtering operations: Noise suppression by Gaussian smoothing- Median filters- Color in image filtering – Corner and interest point detection.

UNIT-II

Binary shape analysis:

Connectedness- Object labeling- Size filtering- Distance functions –Skeleton and thinning. Boundary pattern analysis: Boundary tracking – Centroidal profiles- Occlusion problems.

UNIT-III

Pattern Matching Techniques:

Graph – theoretic approach to object location, possibilities for saving computation, Using generalized Hough transform for feature collation, generalizing the maximal Clique and the other approaches, relational descriptors, Search.

UNIT-IV

3D- Vision and variety of methods – shape and shading- Photometric stereo- Shape and texture. Motion: Introduction, Optical Flow, Interpretation of optical flow fields, using focus of expansion to avoid collision, time-to- adajacency analysis, difficulties with optical flow method, stereo from motion, Kalman filter.

UNIT-V

Real-time pattern recognition systems:

Case study on locations of cereals and insects, Surveillance, In-Vehicle vision systems.

Suggested Books:

1. Hearn D and Baker M.P., "Computer Graphics", Second Edition, PHI, 1998.

2. E. R. Davies, "Computer and Machine Vision: Theory, Algorithms, Practicalities", Fourth edition, Academic Press, 2012.

3. Foley J.D., Vandam A., Feiner SK., Hughes JF., "Computer Graphics Principles and Practice", Addison-Wesley Publishing Company, 1993.

4. David A. Forsyth, Jean Ponce, " Computer vision: A Modern Approach", 2nd Edition, Pearson, 2012.

5. Bernd Jahne, Horst HauBecker, "Computer Vision and Applications: A Guide for Students and Practitioners", Academic Press, 2000.

DISTRIBUTED SYSTEMS

Course Code: PE513AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives:

- To learn the concept and issues of distributed systems in detail.
- To study architectures and working of distributed file systems.
- To understand the processes in distributed system and communication.
- To make students understand how names are assigned in distributed systems.
- To learn examples of distributed file systems.

Course Outcomes:

Student will able to

1. Understand the problems and issues associated with distributed systems.
2. Understand how coordination occurs in distributed systems.
3. How replicas are handled in distributed systems and consistency is maintained.
4. How security is implemented in distributed systems.
5. Understand design trade-offs in large-scale distributed systems

UNIT-I

Introduction:
What is Distributed Systems?, Design Goals, Types of Distributed System.
Architectures: Architectural Styles, Middleware Organization, System Architectures, Example Architectures.

UNIT – II

Processes:
Threads, Virtualization, Clients, Servers, Code migration. Communication: Foundations, Remote Procedure Call, Message-Oriented Communication, Multicast Communication.

UNIT – III

Naming:
Names, Identifiers and Addresses, Flat Naming, Structured Naming, and AttributeBased Naming.
Coordination: Clock Synchronization, Logical Clocks, Mutual Exclusion, Election Algorithms, Location System, Distributed event matching, Gossip-based coordination.

UNIT – IV

Consistency and Replication:
Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, and Consistency Protocols.
Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, and Recovery.
Security: Introduction to security, Secure channels, Access control, Secure naming, Security management.

UNIT – V

Distributed File Systems:
Introduction, File service architecture, Case study: Sun Network File System, Case study: The Andrew File System, Enhancements and further developments.
Distributed Multimedia Systems: Introduction, Characteristics of multimedia data, Quality of service management, Resource management, Stream adaptation,
Case studies: Tiger, BitTorrent and End System Multicast.
Designing Distributed Systems: GOOGLE CASE STUDY Introduction, Overall architecture and design

philosophy, Underlying communication paradigms,Data storage and coordination services, Distributed computation services.

Suggested Books:

1. Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems, PHI 2nd Edition, 2009.
2. R. Hill, L. Hirsch, P. Lake, S. Moshiri, Guide to Cloud Computing, Principles and Practice ,Springer, 2013.
3. R. Buyya, J. Borberg, A. Goscinski, Cloud Computing-Principles and Paradigms, Wiley, 2013.

WEB TECHNOLOGIES

Course Code: PE514AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives

- Familiarize the tags of HTML.
- Understand different Client Side Scripting.
- Learn -specific web services of server side Programming.
- Connect different applications using PHP & XML.
- Connect XHTML, Java Scripting, Servlet Programming, Java Server Pages.

Course Outcomes

After completion of course, students would be able to:

1. Construct a basic website using HTML and Cascading Style Sheets.
2. Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
3. Develop server side programs using Servlets and JSP.
4. Construct simple web pages in PHP and represent data in XML format.
5. Utilize AJAX and web services to develop interactive web applications.

UNIT-I

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT-II

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects, -Regular Expressions- Exception Handling-Validation-Built-in Objects-Event Handling - DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL.

UNIT-III

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST Actions-Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages- JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT-IV

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in Functions-Form Validation- Regular Expressions - File handling – Cookies - Connecting to Database. XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSLand XSLT Transformation, News Feed (RSS and ATOM).

UNIT-V

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

Suggested Books:

1. Deitel and Deitel and Nieto, —Internet and World Wide Web - How to Program‖, Prentice Hall, 5thEdition, 2011.
2. Web Technologies, Uttam K. Roy, Oxford Higher Education., 1st edition, 10th impression, 2015.
3. The Complete Reference PHP by Steven Holzner, MGH HILL Education, IndianEdition, 2008.

FOUNDATION OF CRYPTOGRAPHY

Course Code: PE515AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives:

- Build a solid mathematical basis to understand foundations of cryptography
- Formally understand the notions related to security authentication and privacy.
- Provide a rigorous treatment of the emerging and key subject - security.

Course Outcomes

Students will gain an understanding of cryptosystems widely used to protect data security on the internet, and be able to apply the ideas in new situations as needed.

1. Understand the basics of cryptography
2. Define various functions used for computation
3. Understand about the Zero-Knowledge proof system
4. Understand different encryption schemes
5. Apply the digital signatures and perform the authentication

UNIT- I

Basic functions of cryptography - Encryption Schemes ,Digital Signatures ,Fault Tolerant Protocols and Zero-Knowledge Proofs The Computational Model: P , NP , and NP- Completeness, Probabilistic Polynomial Time, Non-Uniform Polynomial Time

UNIT- II

Computational Difficulty : One-Way Functions Definitions, Strong One- Way Functions, Weak One-Way Functions, Universal One-Way Function, Trapdoor One-Way Permutations
Computational Indistinguishability: Definition, Relation to Statistical Closeness, Indistinguishability by Repeated Experiments, Indistinguishability by Circuits

UNIT – III

Zero-Knowledge Proof Systems: Zero-Knowledge Proofs, Perfect and Computational Zero-Knowledge, An Example (Graph Isomorphism in PZK) Zero-Knowledge with Respect to Auxiliary Inputs.

UNIT – IV

Encryption Schemes: Private-Key versus Public-Key Schemes, The Syntax of Encryption Schemes, Semantic Security, Indistinguishability of Encryptions, Stream-Ciphers,
Preliminaries: Block-Ciphers

UNIT- V

Digital Signatures and Message Authentication: Attacks and security, Variants Constructions of Message AuthenticationSchemes: Applying a pseudorandom function to the document.

Suggested Books:

1. Oded Goldreich, Foundations of Cryptography (two volumes) Cambridge university Press, 2001, 2004
2. J.Katz, Y.Lindell, Introduction to Modern Cryptography, Chapman Hall, USA 2007.
3. Wen Bo Mao, Modern cryptography - Theory and practice, Prentice Hall, USA, 2003
4. Khairol Amali Bin Ahmad , Khaleel Ahmad , Uma N. Dulhare ,Functional Encryption ,EAI/Springer
5. Innovations inCommunication and Computing,1st ed. 2021 Edition

INTERNET OF THINGS

Course Code: PE516AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives

- To study the fundamentals about IoT
- To study about IoT Access technologies
- To study the design methodology and different IoT hardware platforms.
- To study the basics of IoT Data Analytics and supporting services.
- To study about various IoT case studies and industrial applications.

Course Outcomes

The students will be able to

1. Understand the basics of IoT.
2. Implement the state of the Architecture of an IoT.
3. Understand design methodology and hardware platforms involved in IoT.
4. Understand how to analyze and organize the data.
5. Compare IOT Applications in Industrial & real world.

UNIT I:

Fundamentals of IoT- Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II:

IoT Protocols- IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, **Application Transport Methods:** SCADA, Application Layer Protocols: CoAP and MQTT.

UNIT III:

Design and development- Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details

UNIT IV:

Data analytics and supporting services:
Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M
Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

UNIT V:

Case studies/industrial applications:
IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments, Industry 4.0 concepts.

Suggested Books:

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, GonzaloSalgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017

2. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015

3. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill HigherEducation

ARTIFICIAL INTELLIGENCE LAB

Course Code: PC 551 AD
Instruction: 2 periods per week
CIE: 25 marks
Credits : 1

Duration of SEE: 3 hours
SEE: 50 marks

Course Objectives:

- To study the applications of AI and agent based approach to AI.
- To study first-order predicate calculus, logical reasoning and problem solving using Prolog language.
- To study and discuss various techniques and algorithms of AI used in general problem solving, optimization problems, constraint satisfaction problems, and game programming.
- To familiarize students with various sub-areas of AI, such as expert systems, natural language processing and machine learning.

Course Outcomes:

After completing this course, the student will be able to:

1. Explain artificial intelligence, its characteristics and its application areas.
2. Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems.
3. Select and apply appropriate algorithms and AI techniques to solve complex problems.
4. Design and develop an expert system by using appropriate tools and techniques

List of Experiments:

1. Write a program to implement Uninformed search techniques:
   a. BFS
   b. DFS

2. Write a program to implement informed search techniques
   a. Greedy Best first search
   b. A* algorithm

3. Study of Prolog, its facts, and rules.
   a. Write simple facts for the statements and querying it.
   b. Write a program for Family-tree.

4. Write a program to train and validate the following classifiers for given data (scikit-learn):
   a. Decision Tree
   b. Multi-layer Feed Forward neural network

5. Text processing using NLTK
   a. Remove stop words
   b. Implement stemming
   c. POS (Parts of Speech) tagging

In addition to the above programs, students should be encouraged to study implementations of oneof the following

- Game bot (Tic Tac toe, 7 puzzle)
- Expert system (Simple Medical Diagnosis)
- Text classification
- Chat bot

Database Management Systems LAB

Course Code: PC 551 AD
Instruction: 2 periods per week
CIE: 25 marks
Credits : 1

Duration of SEE: 3 hours
SEE: 50 marks

Course Objectives:

- To implement the basic knowledge of SQL queries and relational algebra.
- To construct database models for different database applications.
- To apply normalization techniques for refining of databases.
- To practice various triggers, procedures, and cursors usingPL/SQL.
- To design and implementation of a database for an organization

Course Outcomes:

After completing this course, the student will be able to:

1. Design database for any real world problem
2. Implement PL/SQL programs
3. Define SQL queries
4. Decide the constraints

Investigate for data inconsistency

CREATION OF TABLES

1. Create a table called Employee with the following structure.

Name	Type
Empno	Number
Ename	Varchar2(20)
Job	Varchar2(20)
Mgr	Number
Sal	Number

   a. Add a column commission with domain to the Employee table.
   b. Insert any five records into the table.
   c. Update the column details of job
   d. Rename the column of Employ table using alter command.
   e. Delete the employee whose empno is19.

2. Create department table with the following structure.

Name	Type
Deptno	Number
Deptname	Varchar2(20)
location	Varchar2(20)

   a. Add column designation to the department table.
   b. Insert values into thetable.
   c. List the records of emp table grouped bydeptno.
   d. Update the record where deptno is9.
   e. Delete any column data from thetable

3. Create a table called Customertable

Name	Type
Cust name	Varchar2(20)
Cust street	Varchar2(20)
Cust city	Varchar2(20)

a. Insert records into thetable.
b. Add salary column to thetable.
c. Alter the table columndomain.
d. Drop salary column of the customertable.
e. Delete the rows of customer table whose ust_city is „hyd".
f. Create a table called branchtable.

Name	Type
Branch name	Varchar2(20)
Branch city	Varchar2(20)
asserts	Number

4. Increase the size of data type for asserts to the branch.
a. Add and drop a column to the branch table.
b. Insert values to the table.
c. Update the branch name column
d. Delete any two columns from the table

5. Create a table called sailor table

Name	Type
Sid	Number
Sname	Varchar2(20)
rating	Varchar2(20)

e. Add column age to the sailor table.
f. Insert values into the sailor table.
g. Delete the row with rating>8.
h. Update the column details of sailor.
i. Insert null values into the table.

6.Create a table called reserves table

Name	Type
Boat id	Integer
sid	Integer
day	Integer

j. Insert values into the reservestable.
k. Add column time to the reservestable.
l. Alter the column day data type todate.
m. Drop the column time in thetable.
n. Delete the row of the table with somecondition.

QUERIES USING DDL AND DML

1. a. Create a user and grant all permissions to theuser.
   b. Insert the any three records in the employee table and use rollback. Check the result.
   c. add primary key constraint and not null constraint to the employeetable.
   d. Insert null values to the employee table and verify theresult.
2. a. Create a user and grant all permissions to theuser.
   b. Insert values in the department table and usecommit.
   c. Add constraints like unique and not null to the departmenttable.
   d. Insert repeated values and null values into thetable.
3. a. Create a user and grant all permissions to theuser.
   b. Insert values into the table and use commit.
   c. Delete any three records in the department table and use rollback.
   d. Add constraint primary key and foreign key to thetable.
4. a. Create a user and grant all permissions to theuser.
   b. Insert records in the sailor table and usecommit.
   c. Add save point after insertion of records and verify save point.
   d. Add constraints not null and primary key to the sailortable.
5. a. Create a user and grant all permissions to theuser.
   b. Use revoke command to remove userpermissions.
   c. Change password of the usercreated.
   d. Add constraint foreign key and notnull.
6. a. Create a user and grant all permissions to the user.
   b. Update the table reserves and use savepoint and rollback.

c. Add constraint primary key , foreign key and not null to the reserves table
d. Delete constraint not null to the table column

QUERIES USING AGGREGATE FUNCTIONS

1. a. By using the group by clause, display the enames who belongs to deptno 10 alongwithaveragesalary.
   b. Display lowest paid employee details under eachdepartment.
   c. Display number of employees working in each department and their departmentnumber.
   d. Using built in functions, display number of employees working in each department and their department name from dept table. Insert deptname to dept table and insert deptname foreach row, do the required thing specified above.
   e. List all employees which start with either B or C.
   f. Display only these ename of employees where the maximum salary is greater than or equalto 5000.
2. a. Calculate the average salary for each differentjob.
   b. Show the average salary of each job excludingmanager.
   c. Show the average salary for all departments employing more than threepeople.
   d. Display employees who earn more than thelowest salary in department 30
   e. Show that value returned by sign (n)function.
   f. How many days between day of birth to currentdate
3. a. Show that two substring as singlestring.
   b. List all employee names, salary and 15% rise insalary.
   c. Display lowest paid emp details under eachmanager
   d. Display the average monthly salary bill for eachdeptno.
   e. Show the average salary for all departments employing more than twopeople.
   f. By using the group by clause, display the eid who belongs to deptno 05 along withaverage salary.
4. a. Count the number of employees in department20
   b. Find the minimum salary earned byclerk.
   c. Find minimum, maximum, average salary of allemployees.
   d. List the minimum and maximum salaries for each jobtype.
   e. List the employee names in descendingorder.
   f. List the employee id, names in ascending order byempid.
5. a. Find the sids ,names of sailors who have reserved all boats called"INTERLAKE
   Find the age of youngest sailor who is eligible to vote for each rating level with at least twosuch sailors.
   b. Find the sname , bid and reservation date for eachreservation.
   c. Find the ages of sailors whose name begin and end with B and has at least 3characters.
   d. List in alphabetic order all sailors who have reserved redboat.
   e. Find the age of youngest sailor for each ratinglevel.
6. a. List the Vendors who have delivered products within 6 months from orderdate.
   b. Display the Vendor details who have supplied both Assembled and Subparts.
   c. Display the Sub parts by grouping the Vendor type (Local or NonLocal).
   d. Display the Vendor details in ascendingorder.
   e. Display the Sub part which costs more than any of the Assembledparts.
   f. Display the second maximum cost Assembledpart

PROGRAMS ON PL/SQL

1. a. Write a PL/SQL program to swap two numbers.
   b. Write a PL/SQL program to find the largest of three numbers.
2. a. Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
   b. Write a PL/SQL program to find the sum of digits in a given number.
3. a. Write a PL/SQL program to display the number in reverse order.
   b. Writea PL/SQL program to check whether the given number is prime or not.
4. a. Write a PL/SQL program to find the factorial of a given number.
   b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius and area.
5. a. Write a PL/SQL program to accept a string and remove the vowels from the string. (When „hello" passed to the program it should display „Hll" removing e and o from the worldHello).
   b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less thanor equal to 10. Else display an error message. Otherwise Display the remainder in words.

PROCEDURES AND FUNCTIONS

1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.
2. Accept year as parameter and write a Function to return the total net salary spent for a given year.
3. Create a function to find the factorial of a given number and hence financer.
4. Write a PL/SQL block o pint prime Fibonacci series using local functions.
5. Create a procedure to find the lucky number of a given birthdate.
6. Create function to the reverse of given number

TRIGGERS

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values:

   CUSTOMERS table:

ID	NAME	AGE	ADDRESS	SALARY
1	Alive	24	Khammam	2000
2	Bob	27	Kadappa	3000
3	Catri	25	Guntur	4000
4	Dena	28	Hyderabad	5000
5	Eeshwar	27	Kurnool	6000
6	Farooq	28	Nellore	7000

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database. Passenger(Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) NotNULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) NotNULL);
   a. Write a Insert Trigger to check the Passport_id is exactly six digits or not.
   b. Write a trigger on passenger to display messages „1 Record is inserted", „1 record is deleted", „1 record is updated" when insertion, deletion and updation are done on passenger respectively.
3. Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can raised before insert, updateor delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETE occurs.
4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.
5. Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and time of delete.
6. Create a transparent audit system for a table CUST_MSTR. The system must keep track of therecords that are being deleted or updated

PROCEDURES

1. Create the procedure for palindrome of given number.
2. Create the procedure for GCD: Program should load two registers with two Numbers and thenapply the logic for GCD of two numbers. GCD of two numbers is performed by dividing the greater number by the smaller number till the remainder is zero. If it is zero, the divisor is theGCD if not the remainder and the divisors of the previous division are the new set of two numbers. The process is repeated by dividing greater of the two numbers by the smaller number till the remainder is zero and GCD is found.
3. Write the PL/SQL programs to create the procedure for factorial of given number.
4. Write the PL/SQL programs to create the procedure to find sum of N natural number.
5. Write the PL/SQL programs to create the procedure to find Fibonacci series.
6. Write the PL/SQL programs to create the procedure to check the given number is perfect ornot

CURSORS

1. Write a PL/SQL block that will display the name, dept no, salary of fist highest paid employees.
2. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock bythe quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item master table.
3. Write a PL/SQL block that will display the employee details along with salary using cursors.
4. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
5. To write a Cursor to find employee with given job anddeptno.
6. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the „employee" table are updated. If none of the employee"s salary are updated we getamessage 'None of the

salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in „employee" table

CASE STUDY GENERAL HOSPITAL

AGeneralHospitalconsistsofanumberofspecializedwards(suchasMaternity,Pediatric,Oncology, etc.). Each ward hosts a number of patients, who were admitted on the recommendation of their ownGP and confirmed by a consultant employed by the Hospital. On admission, the personaldetails of every patient are recorded. A separate register is to be held to store the information ofthe tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leadingconsultants for a number of patients, not necessarily from the same ward. For the above case study, do the following.

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

CASE STUDY: CAR RENTAL COMPANY

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special creditcard facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal detailssuch as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons.) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Studentsare free to choose any module they wish but the following rules must be observed: Some modulesrequire pre-requisites modules and some degree programs have compulsory modules. The database is also to contain some information about studentsincludingtheirnumbers,names,addresses,degreestheyreadfor,andtheirpastperformance i.e. modules taken and examination results. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.
3. Create the logical data model i.e., ER diagrams.
4. Comprehend the data given in the case study by creating respective tables with primarykeys and foreign keys wherever required.
5. Insert values into the tables created (Be vigilant about Master- Slave tables).
6. Display the Students who have taken M.Sc course
7. Display the Module code and Number of Modules taught by each Lecturer.
8. Retrieve the Lecturer names who are not Module Leaders.
9. Display the Department name which offers „English „module.
10. Retrieve the Prerequisite Courses offered by every Department (with Department names).
11. Present the Lecturer ID and Name who teaches „Mathematics".
12. Discover the number of years a Module is taught.

13. List out all the Faculties who work for „Statistics" Department.
14. List out the number of Modules taught by each Module Leader.
15. List out the number of Modules taught by a particular Lecturer.
16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and itsname).
17. Update the credits of all the prerequisite courses to 5. Delete the Module „History" from the Moduletable.

Suggested Books:

1. RamezElmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
2. Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

Mini Project

Course Code: PW 553 AD
Instruction: 4 periods per week
CIE: 25 marks
Credits : 2

Duration of SEE: 3 hours
SEE: 50 marks

Course Objectives

- To enhance practical and professional skills.
- To familiarize tools and techniques of systematic literature survey anddocumentation
- To expose the students to industry practices and team work.
- To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes

After completing the course, the student will be able to

1. Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to the real-world problems.
2. Evaluate different solutions based on economic and technical feasibility
3. Effectively plan a project and confidently perform all aspects of project management
4. Demonstrate effective coding, written, presentation and oral communication skills

The students are required to carry out mini projects in any of the areas such as Data Structures, Foundationof Data Science, Artificial Intelligence, Database Management Systems, Operating Systems, Design and Analysis of Algorithms, Software Engineering, Computer Networks

Problems Statements are suggested to be taken from Smart India Hackathon (SIH) Portal invitedfrom the Ministries *I* PSUs *I* MNCs *I* NGOs to be worked out through.

The project could be classified as hardware, software, modeling, simulation etc. The project should involve one or many elements of techniques such as analysis, design, and synthesis.

The department will appoint a project coordinator who will coordinate the following:

- Grouping of students (maximum of 3 students in a group)
- Allotment of projects and project guides.
- All projects allotment is to be completed by the 4th week of the semester so that the students get sufficient time for completion of the project.
- Disseminate guidelines given by monitoring committee comprising of senior faculty members to the students and their guides. Session marks are to be awarded by the monitoring committee.
- Common norms will be established for the final presentation and documentation of the project report by the respective departments.

Students are required to submit a presentation and report on the mini project at the end of the semester.

SCHEME OF INSTRUCTION & EXAMINATION
B.E. VI - SEMESTER
(Artificial Intelligence and Data Science)

S.No	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact	CIE	SEE	Duration In	
Theory Courses										
1.	PC601AD	Machine Learning	3	0	-	3	30	70	3	3
2.	PC602AD	Big Data Analytics	3	0	-	3	30	70	3	3
3.	PC603AD	Cloud Computing	3			3	30	70	3	3
4.	PE-II	Professional Elective-II	3	0	-	3	30	70	3	3
5.	PE–III	Professional Elective-III	3	-	-	3	30	70	3	3
6	OE-I	Open Elective-I	3	-	-	3	30	70	3	3
Practical/Laboratory Courses										
7	PC654AD	Machine Learning Lab	-	-	2	2	25	50	3	1
8	PC655AD	BDA Lab	-	-	2	2	25	50	3	1
9	SI671AD	Summer Internship*	-	-	-	-	25	25	-	2
Total			15	0	6	21	280	620		22

Professional Elective–II	
Course Code	**Course Title**
PE621AD	Data Visualization
PE622AD	Human Computer Interaction
PE623AD	Soft Computing
PE624AD	Scripting Languages
PE625AD	Blockchain Technology
PE626AD	Design Thinking

Professional Elective–III	
Course Code	**Course Title**
PE631AD	Information RetrievalSystems
PE632AD	Cognitive Science &Analytics
PE633AD	Quantum Computing
PE634AD	Web Services
PE635AD	Cyber Security
PE636AD	Open Source Tools

Open Elective-I		
Sl. No	**Code**	**Name of the Subject**
1	OE601EE	Electrical Energy Conservation and Safety (Not for EEE & EIE Students)
2	OE602EE	Reliability Engineering(Not for EE & EIE students)
3	OE611AE	Automobile Engineering (Not for Auto. Engg students)
4	OE611ME	Entrepreneurship (Not for Mech Engg & Prod. Engg)
5	OE601EG	Soft Skills & Interpersonal Skills
6	OE602MB	Human Resource Development and Organizational Behaviour
7	OE601LW	Cyber Law and Ethics
8	OE601CE	Disaster Mitigation (Not for Civil Engg. Students)
9	OE601CS	OOPS using Java(not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
10	OE602CS	Data Structure and Algorithm(not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
11	OE601AS	Principles of AI(not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
12	OE601AL	Principles of Machine Learning(Not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
13	OE601DS	Principles of Data Science(Not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
14	OE601CB	Principles of IOT(Not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))
15	OE601IT	Operating Systems(Not CSE,IT,AI&DS,AI&ML,DS,(IOT, Cybersecurity, Blockchain))

Machine Learning

Course Code: PC601AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives:

- To learn the concepts of machine learning and types of learning along with evaluation metrics.
- To study various supervised learning algorithms.
- To learn ensemble techniques and various unsupervised learning algorithms.
- To explore Neural Networks and Deep learning basics.
- To learn reinforcement learning and study applications of machine learning..

Course Outcomes:

After completing this course, the student will be able to:

1. Extract features that can be used for a particular machine learning approach in various applications.
2. Compare and contrast pros and cons of various machine learning techniques and to get an insightwhen to apply particular machine learning approach.
3. Understand different machine learning types along with algorithms.
4. Understand how to apply machine learning in various applications.

Apply ensemble techniques for improvement of classifiers

UNIT-I

Introduction: Representation and Learning: Feature Vectors, Feature Spaces, Feature Extraction and Feature Selection, Learning Problem Formulation
Types of Machine Learning Algorithms:
Parametric and Nonparametric Machine Learning Algorithms, Supervised, Unsupervised, Semi-Supervised and Reinforced Learning.
Preliminaries: Overfitting, Training, Testing, and Validation Sets, The Confusion Matrix, Accuracy Metrics: Evaluation Measures: SSE, RMSE, R2, confusion matrix, precision, recall, F-Score, Receiver Operator Characteristic (ROC) Curve. Unbalanced Datasets. some basic statistics: Averages, Variance and Covariance, The Gaussian, the bias-variance tradeoff.

UNIT-II

Supervised Algorithms Regression: Linear Regression, Logistic Regression, Linear Discriminant Analysis. Classification: Decision Tree, Naïve Bayes, K-Nearest Neighbors, Support Vector Machines, evaluation of classification: cross validation, hold out.

UNIT-III

Ensemble Algorithms: Bagging, Random Forest, Boosting
Unsupervised Learning: Cluster Analysis: Similarity Measures, , categories of clustering algorithms, k-means, Hierarchical, Expectation-Maximization Algorithm, Fuzzy c-means algorithmUNIT-IV
Neural Networks: Multilayer Perceptron, Back-propagation algorithm, Training strategies, Activation Functions, Gradient Descent for Machine Learning, Radial basis functions, Hopfield network, Recurrent Neural Networks.

UNIT-V

Reinforcement Learning: overview, example: getting lost, State and Action Spaces, The Reward Function, Discounting, Action Selection, Policy, Markov decision processes Q- learning, uses of Reinforcement learning Applications of Machine Learning in various fields: Text classification, Image Classification, Speech Recognition.

Suggested Books:

1. Stephen Marsland, Machine Learning: An Algorithmic Perspective, Second Edition Chapman & Hall/Crc Machine Learning & Pattern Recognition) (2014)Tom Mitchell, Machine Learning, McGraw-Hill Science/Engineering/Math; (1997).

2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning: DataMining, Inference, and Prediction. Second Edition, Springer Series in Statistics.(2009).

4. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

5. Uma N. Dulhare , Khaleel Ahmad , Khairol Amali Bin Ahmad , Machine Learning and Big Data:Concepts, Algorithms, Tools and Applications, Scrivener publishing,Wiley,2020

6. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer. (2006)

BIG DATA ANALYTICS

Course Code: PC602AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives

- Understand the Big Data Platform and its Use cases
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs
- Provide hands on Hodoop Eco System
- Apply analytics on Structured, Unstructured Data.
- Exposure to Data Analytics with R.

Course Outcomes

After completing this course, the student will be able to:

1. Identify Big Data and its Business Implications.
2. List the components of Hadoop and Hadoop Eco-System
3. Manage Job Execution in Hadoop Environment
4. Develop Big Data Solutions using Hadoop Eco System
5. Analyze Big Insights, Big Data Recommendations and Apply Machine Learning Techniques using R.

UNIT I :

Introduction to big data and hadoop

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analyzing Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Info sphere Big Insights and Big Sheets.

UNIT II :

HDFS(Hadoop Distributed File System)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro andFile-Based Data structures.

UNIT III:

Map Reduce

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, MapReduce Types and Formats, Map Reduce Features.

UNIT IV :

Hadoop Eco System

Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, UserDefined Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables,Querying Data and User Defined Functions.

Hbase :HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.Big SQL : Introduction.

UNIT V:

Data Analytics with R

Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. BigData Analytics with Big R.

Suggested Books:

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O"reily Media, 2012.
2. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
4. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
5. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
6. Anand Rajaraman and Jefrey David Ulman, "Mining of Massive Datasets", Cambridge University Press,2012.
7. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with AdvancedAnalytics", John Wiley & sons, 2012.
8. Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007.
9. Pete Warden, "Big Data Glossary", O"Reily, 2011.
10. Michael Mineli, Michele Chambers, AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
11. ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press, 2012

CLOUD COMPUTING

Course Code: PC603AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives

- To understand the concept of cloud computing
- To understand the various issues in cloud computing.
- To familiarize themselves with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

Course Outcomes

After completing this course, the student will be able to

1. Define Cloud Computing and related concepts and describe the characteristics, advantages, risks and challenges associated with cloud computing.
2. Explore virtualization technique.
3. Understand various database management mechanisms
4. Explore characterize various cloud service models, cloud deployment models
5. Illustrate the use of various cloud services available online

Unit - I:

Introduction - Historical Development -System Models for Distributed and Cloud Computing; Cloud Computing Architecture – The Cloud Reference Model – Cloud Characteristics – Cloud Deployment Models: Public, Private, Community, Hybrid Clouds, Challenges and Risks,Cloud Delivery Models: IaaS, PaaS, SaaS.

Unit - II:

Virtual Machines& Cloud Computing Mechanism: Levels of Virtualization, Virtualization Structures//Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Cloud Infrastructure Mechanism: Cloud Storage, Cloud Usage Monitor

UNIT – III:

State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System

UNIT- IV:

Cloud Security and Trust Management, Data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, CryptDb: Onion Encryption layersDET, RND, OPE, JOIN, SEARCH, HOM, and Homomorphic Encryption.

Unit –V:

Case Studies: Google App Engine (GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services (AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack

Suggested Books:

1. Thomas Erl, ZaighamMahood, Ricardo Puttini, ―Cloud Computing, Concept, Technology andArchitecture‖,Prentice Hall, 2013.
2. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
3. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ". James F. Ransome,CRC Press 2009
4. Raluca Ada Popa, Catherine M.S. Redfield, NickolaiZeldovich, and Hari Balakrishnan, "CryptDB: ProtectingConfidentiality with encrypted Query Processing", 23rd ACM Symposium on Operating Systems Principles

   (SOSP 2011), Cascais, Portugal October 2011.
5. A Fully Homomorhic Encryption Scheme, Craig Gentry, September 2009.
6. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in theVirtual Data Center", Auerbach Publications, 2006.

PROFESSIONAL ELECTIVE-II

DATA VISUALIZATION

Course Code: PE621AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives

- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization,
- To learn key techniques of the visualization process
- A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

Course Outcomes

By the completion of this course, learners will be able to:

1. Design and create data visualizations.
2. Conduct exploratory data analysis using visualization.
3. Craft visual presentations of data for effective communication.
4. Use knowledge of perception and cognition to evaluate visualization design alternatives.
5. Design and evaluate color palettes for visualization based on principles of perception.

Unit I:

Introduction of visual perception, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Unit II:

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two andmulti-dimensional data, text and text documents.

Unit III:

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

Unit IV:

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information,GIS systems, collaborative visualizations, evaluating visualizations

Unit V:

Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.

Suggested Books:

1. Ward, Grinstein Keim, "Interactive Data Visualization: Foundation, Techniques, and Applications". Natick: A K Peters Ltd.
2.E. Tufte, "The Visual Display of Quantitative Information", Graphics Press.

3. Dirken Jos, "Expert Data Visualization", Packt Publishing Ltd.
4. Stephanie Evergreen, "Effective Data Visualization: The right chart for the right data", SAGE publications.
5. Claus. O Wilke, "Fundamentals of data visualization: A primer on making informative and compelling figures", O'Reilly.

HUMAN COMPUTER INTERACTION

Course Code: PE622AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives:

- To gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design in general
- To be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation.
- To be familiar with a variety of both conventional and non-traditional user interface paradigms

Course Outcomes

After completing this course, the student will be able to

1. Understand the basic concepts of HCI.
2. Understand the design process of Human Computer Interaction.
3. Design windows required for interaction
4. Ability to apply HCI and principles to interaction design.
5. Ability to design certain tools for blind or PH people

UNIT – I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT – II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions. Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT- III

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT- IV

HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction

UNIT- V

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge

of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

Suggested Books:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Units 1, 2, 3

2. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education Units 4,5

SOFT COMPUTING

Course Code: PE623AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives

- Familiarize with soft computing concepts
- Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
- Familiarize the ANN
- Learn the concepts of Genetic algorithm and its applications
- Acquire the knowledge of Rough Sets.

Course Outcomes

After completing this course, the student will be able to

1. Identify the difference between Conventional Artificial Intelligence to Computational Intelligence
2. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems
3. Understand the advanced neural networks and its applications
4. Perform various operations of genetic algorithms, Rough Sets.

Comprehend various techniques to build model for various applications

UNIT-I

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.

UNIT-II

Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and FuzzyReasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT-III

Neural Networks: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT-IV

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, GeneticAlgorithm Cycle, Fitness Function, Applications of Genetic Algorithm

UNIT-V

Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

Suggested Books:

1. J.-S.R. Jang, C.-T Sun, E. Mizutani, Neuro-Fuzzy and Soft Computing, Pearson Education, 2015.

2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PrenticeHall, 1995. 4. MATLAB Toolkit Manual

3. Timothy J. Ross,,Fuzzy Logic with Engineering Applications (3rd Edn.), Willey, 2010.

4. Nikola K. Kasabov ,Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering, , MIT Press, 1998.

5. David E. Goldberg , Genetic Algorithms In Search, Optimization And Machine Learning, Pearson Education, 2002.

6. Randy L. Haupt and sue Ellen Haupt, Practical Genetic Algorithms, John Willey & Sons, 2002.

7. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 2nd edition, Wiley India,2008

8. Simon Haykin, Neural Networks and Learning Machines, (3rd Edn.), PHI Learning, 2011.

SCRIPTING LANGUAGES

Course Code: PE624AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives:

- This course introduces the script programming paradigm.
- Introduces scripting languages such as Perl, Ruby and TCL
- Learning TCL.

Course Outcomes:

After completing this course, the student will be able to

1. Comprehend the differences between typical scripting languages and typical system and application programming languages.
2. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriatelanguage for solving a given problem.
3. Acquire programming skills in scripting language.
4. Understand the concepts of Advanced Perl
5. Understand about TCL and TK tootkits

UNIT- I

Introduction:
Ruby, Rails, the structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web services RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling.

UNIT-II

Extending Ruby:
Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

UNIT-III

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT-IV

Advanced Perl
Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT-V

TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet

aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.
TK: TK-Visual Tool Kits, Fundamental Concepts of TK, TK by example, Events and Binding, Perl-TK.

Suggested Books:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O"Reilly.
3. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second edition.
4. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee andB.Ware (Addison Wesley) Pearson Education.
5. Perl by Example, E. Quigley, Pearson Education.
6. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O"Reilly, SPD.
7. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
8. Perl Power, J.P. Flynt, Cengage Learning.

BLOCKCHAIN TECHNOLOGY

Course Code: PE625AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives:

- Understand how block chain systems (mainly Bitcoin and Ethereum) work.
- To securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

Course Outcomes:

After completing this course, the student will be able to

1. Understand the distributed databases
2. Explain about the blockchain technology
3. Explain Nakamoto consensus.
4. Learn about the cryptocurrency
5. Design, build, and deploy a distributed application.

UNIT – I

Basics: Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete.
Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

UNIT – II

Blockchain: Introduction, Advantage over conventional distributed database, Block chain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Block chain application, Soft & Hard Fork, Private and Public block chain.

UNIT – III

Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

UNIT – IV

Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum -Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Side chain, Name coin

UNIT – V

Cryptocurrency Regulation: Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.
Applications: Internet of Things, Medical Record Management System, Domain Name

Service, and future of Block chain.

Case study: Naive Blockchain construction, Memory Hard algorithm - Hash cash implementation, Direct Acyclic Graph, Play with Go-Ethereum, Smart Contract Construction, Toy application using Block chain, Mining puzzles

Suggested Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Gold feder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.

2.Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System.

3. DR.GavinWood,"ETHEREUM:ASecureDecentralizedTransactionLedger,"Yellow paper.2014.

4. Nicola Atzei, Massimo Bartoletti, and TizianaCimoli, A survey of attacks on Ethereum smart contracts.

DESIGN THINKING

Course Code: PE626AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives

- To familiarize students with design thinking concepts and principles
- To ensure students can practices the methods, processes and tools of design thinking.
- To ensure students can apply the design thinking approach and have ability to model real worldsituations.
- To enable students to analyze primary and secondary research in the introduction to designthinking

Course Outcomes

After completing this course, the student will be able to

1. Understand the basics of Design thinking
2. Learn the steps involved in design process.
3. Understand the different phases of deign thinking
4. Generate ideas and find solutions.
5. Use tools for generation of ideas

UNIT-I:

DESIGN THINKING FOR INNOVATION:
Introduction to Design Thinking, Understanding the principles of Design thinking, Business ModelInnovation, Challenges Best-Suited for Design Thinking, Product Life Cycle

UNIT-II:

PROCESS OF DESIGN: Introduction - Design Process - Four Step - Five Step - Twelve Step - Creativity and Innovation in Design Process - Design limitation, Creative Thinking, Lean Canvas Model and other Business Models

UNIT-III:

PHASES IN DESIGN THINKING : Understand, Observe, Define, Ideate, Prototype, Test, Reflect. Problem Statement, Empathy, The 5 Whys, stakeholder map, Empathy map, personas, peer observation, Trend analysis

UNIT-IV:

SOLUTION/IDEA GENERATION : Story Telling, Context mapping, Critical items diagram, Brain stroming, Matrix and Voting methods, Analogies, benchmarking, Utility maps

UNIT-V:

TOOLS AND TECHNIQUES FOR PROTOTYPE AND TEST:

Types of Prototype, Exploration Map, Blueprint, MVP, Testing Sheets, Solution Feedback Capturing Tools, Structured Usability Testing, A/B Testing, Design Thinking Applications Case Studies.

Suggested Books :

1. An AVA Book, "Design Thinking", AVA Publishing, 2010.

2. David Ralzman, "History of Modern Design", 2nd edition, Laurence King Publishing Ltd., 2010.

3. The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods – Micheal Lewrick, Patrick Link, Larry Leifer , Wiley Publishing

4. Design Thinking for Dummies – Wiley

5. Tom Kelley, Jonathan Littman, "Ten Faces in Innovation", Currency Books, 2006

6. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, "Engineering Design: A Systematic Approach", 3rd edition, Springer, 2007.

7. The field guide to human centered design by Design Kit.

PROFESSIONAL ELECTIVE -III

INFORMATION RETRIEVAL SYSTEMS

Course Code: PE631AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives

- To provide the knowledge on information retrieval system capabilities.
- To introduce different computational search problems and evaluate search engines.
- To introduce different applications of informational retrieval techniques in theinternet or web environment.
- To discuss about information visualization and system evaluation.

Course Outcomes

After completing this course, the student will be able to

1. Understand various functionalities and capabilities of Information Retrieval System.
2. Gain knowledge on cataloging and data structure methodology for IRS.
3. Differentiate various clustering algorithms and indexing.
4. Differentiate various user search techniques and system search techniques.

Understand the concepts of information visualization and text search.

UNIT-I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.
Boolean Retrieval: An example information, Building an inverted index, processing Boolean queries, the extended Boolean model versus ranked retrieval.
The term vocabulary and postings lists: Document delineation and character sequence decoding, determining the vocabulary of terms, Faster postings list intersection via skip pointers, Positional postings, and Phrase queries.
Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, spelling correction.

UNIT-II

Index construction: Hardware basics, blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing, Other types of indexes.
Index compression: Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression.
Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction.
Scoring, term weighting and the vector space model: Parametric and zone indexes, Term frequency and weighting, the vector space model for scoring, and Variant tf-idf functions.

UNIT-III

Evaluation in information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance.
Relevance feedback and query expansion: Relevance feedback and pseudo relevance feedback, Global methods for query reformulation.

UNIT-IV

Text classification and Naive Bayes: The text classification problem, Naive Bayes text classification, The Bernoulli model, Properties of Naive Bayes, and Feature selection.
Vector space classification: Document representations and measures of relatedness in vector spaces, Rocchio classification, k- nearest neighbour, Linear versus nonlinear classifiers.
Hierarchical clustering: Hierarchical agglomerative clustering, Centroid clustering, Divisive clustering.

UNIT-V

Matrix decompositions and Latent semantic indexing: Linear algebra review, Term-document matrices and singular value decompositions, Low-rank approximations, Latent semantic indexing.
Websearch basics: Background and history, Web characteristics, Advertising as the economic model,

Suggested Books:

1. Christopher D. Manning, Prabhakar Raghavan, HinrichSchütze, An Introduction to Information Retrieval, Cambridge University Press, Cambridge, England,2008.

2. David A. Grossman, Ophir Frieder, Information Retrieval–Algorithms and Heuristics, Springer, 2nd Edition (Distributed by Universities Press), 2004.

3. Gerald J Kowalski, Mark T Maybury. Information Storage and Retrieval Systems, Springer,2000

COGNITIVE SCIENCE AND ANALYTICS

Course Code: PE632AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives:

- To study the basic concepts and approaches in the field of cognitive science
- To apply the concepts of planning, reasoning and learning models in cognitive applications
- To analyze language and semantic models of cognitive process.

Course Outcomes:

Student will be able to:

1. Understand the basic concept of cognitive science
2. Learn and understand the learning model and apply the same to appropriate real worldapplications.
3. Apply reasoning methodology to real world applications
4. Understand and apply declarative and logic models
5. Envisage the concept of cognitive learning and acquire knowledge in language processing and understanding

Unit I:

Introduction to Cognitive Science

Fundamental Concepts of cognitive science – Computers in Cognitive Science – Applied Cognitive Science – The Interdisciplinary Nature of Cognitive Science – Artificial Intelligence: Knowledge representation, semantic networks, frames, conceptual dependency, scripts, Ontology-Understanding, Common Sense Reasoning.

Unit II:

Planning and Learning Methods

Planning – Situation Logic- Learning in Cognitive Systems- Rote Learning – Learning by Examples - Incremental Concept Learning – Inductive Learning - Classification Techniques – Statistical Reasoning- Bayesian Classification- Bayesian Networks- Concept Learning- Version,Spaces - Discrimination Trees.

Unit III:

Reasoning methods

Reasoning by analogy – Explanation based reasoning – Case based reasoning- Constraint Satisfaction-Constraint Propagation- Temporal reasoning – Temporal Constraint Networks- Spatial reasoning-Visual Spatial reasoning- Meta reasoning – Learning by correcting mistakes-AI ethics

Unit IV :

Cognitive Modeling

Declarative/ logic-based computational cognitive modelling - connectionist models of cognition – Bayesian models of cognition - Cognitive Models of Memory and Language - Computational models

Of episodic and semantic memory - modelling psycholinguistics (with emphasis on lexical semantics) - towards deep understanding - modelling the interaction of language, memory and learning.

Unit V:

Modeling Paradigm

Modelling Select Aspects of Cognition Classical models of rationality - symbolic reasoning and decision making under uncertainty - Formal models of inductive generalization causality - Categorization and similarity analysis.

Suggested Books:

1. José Luis Bermúdez, "Cognitive Science: An Introduction to the Science of the Mind",Cambridge University Press, New York, 2014.
2. Mallick, Pradeep Kumar, Borah, Samarjeet," Emerging Trends and Applications in Cognitive Computing", IGI Global Publishers, 2019.
3. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition,Tata McGraw-Hill Education, 2012.

QUANTUM COMPUTING

Course Code: PE633AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives:

- This course teaches the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory.

Course Outcomes:

- By the end of this course, the student is able to

1. Understand about the quantum.
2. Understand the basics of Quantum Computing
3. Learn algorithms used in quantum computing
4. Understand performance, security and scalability involved in computing
5. Learn different models of quantum computing

UNIT I

Introduction: Quantum Measurements Density Matrices, Positive-Operator Valued Measure, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement,Quantum Gates and Circuits.

UNIT II

Quantum Basics and Principles: No cloning theorem & Quantum Teleportation, Bell's inequality and its implications, Quantum Algorithms & Circuits.

UNIT III

Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover's Search Algorithm, Quantum Fourier Transform, Shore's Factorization Algorithm.

UNIT IV

Performance, Security and Scalability: Quantum Error Correction: Fault tolerance; Quantum Cryptography, Implementing Quantum Computing: issues of fidelity; Scalability in quantum computing.

UNIT V

Quantum Computing Models: NMR Quantum Computing, Spintronics and QED MODEL,Linear Optical MODEL, Nonlinear Optical Approaches; Limits of all the discussed approaches, Future of Quantum computing.

Suggested Books:

1) Eric R. Johnston, Nic Harrigan, Mercedes and Gimeno-Segovia "Programming Quantum Computers: Essential Algorithms And Code Samples, SHROFF/ O'Reilly.
2) Dr. Christine Corbett Moran, Mastering Quantum Computing with IBM QX: Explore the world of quantum computing using the Quantum Composer and Qiskit, Kindle Edition Packt
3) V.K Sahni, Quantum Computing (with CD), TATA McGrawHill.

WEB SERVICES

Course Code: PE634AD
Instruction: 3 periods per week
CIE: 30 marks
Credits : 3

Duration of SEE: 3 hours
SEE: 70 marks

Course Objectives:

- To Understand Web Services and implementation model for SOA
- To Understand the SOA, its Principles and Benefits
- To Understand XML concepts
- To Understand paradigms needed for testing Web Services
- To explore different Test Strategies for SOA-based applications

Course Outcomes:

After completing this course, the student will be able to

1. Understand the basics of Web Services.
2. Learn about web service architecture.
3. Understand the XML
4. Identify and select the appropriate framework components in creation of web serviceSolution
5. Implement UDDImodel

UNIT- I

Evolution and Emergence of Web Services – Evolution of distributed computing. Coredistributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM,MOM, Challenges in Distributed Computing, Introduction to Web Services – The definition ofweb services, basic operational model of web services, tools and technologies enabling webservices, benefits and challenges of using web services.

UNIT-II

Web Service Architecture – Web services Architecture and its characteristics, corebuilding blocks of web services, standards and technologies available forimplementing web services, web services communication, basic steps ofimplementing web services.

UNIT-III

Brief Over View of XML – XML Document structure, XML namespaces, Definingstructure in XML documents, Reuse of XML schemes, Document navigation andtransformation. SOAP : Simple Object Access Protocol, Inter-application communicationand wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAPenvelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA,Reliable messaging,

UNIT-IV

Describing Web Services – WSDL introduction, non functional service description,WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDLtools, WSDL port type, limitations of WSDL.

UNIT-V

Registering and Discovering Services : The role of service registries, Service discovery,Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model,Interfaces, UDDIImplementation.

Suggested Books:

1. Web Services & SOA Principles and Technology, Second Edition, Michael P.Papazoglou.

2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India

3.Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson education.

4. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.

5. Building web Services with Java, 2nd Edition, S. Graham and others, Pearson Education.

6. Java Web Services, D.A. Chappell & T. Jewell, O‟Reilly, SPD.

CYBER SECURITY

Course Code: PE635AD

Instruction: 3 periods per week — Duration of SEE: 3 hours
CIE: 30 marks — SEE: 70 marks
Credits : 3

Course Objectives:

- To learn about Cyber and Offence
- To learn Cyber security tools and Method
- To learn Social media protection

Course Outcomes:

After completing this course, the student will be able to

1. Understand basic Cyber crime and security issues.
2. Ability to identify information Cyber crime devices and cyber offenses.
3. Ability to understand the current legal issues towards information security.
4. Understand about cyber security tools and social media protection
5. Understand various organizational implications

UNIT – I

Introduction to Cybercrime: Introduction, Cyber crime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT – II

Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT – III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT – IV

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT – V

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Suggested Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole andSunil Belapure, Wiley INDIA.
2. B.B.Gupta,D.P.Agrawal,HaoxiangWang,ComputerandCyberSecurity:Principles,Algorithm, Applications, and Perspectives, CRC Press, ISBN
3. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRCPress.
4. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&FGroup.

OPEN SOURCE TOOLS

Course Code: PE636AD

Instruction: 3 periods per week — Duration of SEE: 3 hours

CIE: 30 marks — SEE: 70 marks

Credits : 3

Course objectives:

- To understand the difference between open source software and commercial software.
- To Understand and develop the web applications using open source web technologies likeApache, MySql and PHP (LAMP/XAMP).

Course Outcomes:

After completion of the course, student should be able to:

1. Understand the difference between open source software and commercial software
2. Identify, install and run Linux operating system.
3. Install and manage applications.
4. Identify, install open source web technologies Apache, MySql, PHP.
5. Develop web applications using LAMP and Write session control PHP code for a website

UNIT I

OPEN SOURCE: Introduction to Open Source – Open Source vs. Commercial Software – What is Linux? - Free Software – Where I can use Linux? Linux Kernel – Linux Distributions

UNIT II

LINUX: Introduction to Linux Essential Commands - Filesystem Concept - Standard Files
1. The Linux Security Model - Vi Editor - Partitions creation – Shell Introduction
2. String Processing - Investigating and Managing Processes - Network Clients - Installing Application

UNIT III

APACHE: Apache Explained - Starting, Stopping, and Restarting Apache - Modifying the Default Configuration - Securing Apache - Set User and Group - Consider Allowing Access to Local Documentation - Don't Allow public html Web sites - Apache control with .htaccess

UNIT IV

MYSQL: Introduction to MYSQL - The Show Databases and Table - The USE command - Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.

UNIT V

PHP: Introduction- General Syntactic Characteristics - PHP Scripting - Commenting your code -

Primitives, Operations and Expressions - PHP Variables - Operations and Expressions Control Statement - Array - Functions - Basic Form Processing - File and Folder Access - Cookies - Sessions - Database Access with PHP - MySQL - MySQL Functions - Inserting Records - Selecting Records - Deleting Records - Update Records.

Suggested Books:

1. James Lee and Brent Ware ,"Open Source Web Development with LAMP using Linux, Apache,MySQL, Perl and PHP", , Dorling Kindersley(India) Pvt. Ltd, 2008.

2. Eric Rosebrock, Eric Filson ,"Setting Up LAMP: Getting Linux, Apache, MySQL, and PHP andworking Together", Published by John Wiley and Sons, 2004.

MACHINE LEARNING LAB

Course Code: PC655AD
Instruction: 2 periods per week
CIE:25 marks
Credits : 1

Duration of SEE: 3 hours
SEE: 50 marks

Course Objectives

- Demonstration of different classifiers on different data.
- Demonstrate ensembling of classifiers for solving real world problems.
- Make use of real world data to implement machine learning models.

Course Outcomes

After completing this course, the student will be able to:

1. Apply machine learning algorithms: dataset preparation, model selection, model building etc.
2. Evaluate various Machine Learning approaches.
3. Use scikit-learn, Keras and Tensorflow to apply ML techniques.
4. Design and develop solutions to real world problems using ML techniques.
5. Apply unsupervised learning and interpret the results

LIST OF EXPERIMENTS:

1. **Basic Data Preprocessing**
   a. Installation of python environment/Anaconda IDE for machine learning: installing python modules/Packages like scikit-learn, Keras and Tensorflow etc.
   b. Programs involving pandas, Numpy and Scipy libraries.

2. **Programs for classification**
   1. Build models using linear regression and logistic regression and apply it to classify a new instance
   2. Write a program to demonstrate the following classifiers. Use an appropriate data set for building the model. Apply the model to classify a new instance.
      a) Decision tree
      b) K nearest neighbour
      c) Naïve bayes
      d) Support vector machine

3. **Demonstration of Clustering algorithms using**
   a. k-means

   b.Hierarchical algorithms (agglomerative etc).Interpret the clusters obtained.

4. Demonstrate ensemble techniques like boosting, bagging, random forests etc.

5. Build a classifier, compare its performance with an ensemble technique like random forest.

6. Evaluate various classification algorithms performance on a dataset using various measures like True Positive rate, False positive rate, precision, recall etc.

7. Demonstrate GA for optimization (minimization or maximization problem).

8. Case study on supervised/unsupervised learning algorithm

Suggested Books:

1. Tom M. Mitchell, Machine Learning, Mc Graw Hill Education, 1997.
2. Sebastian Raschka, Python Machine Learning, PACKT Publishing, 2015.
3. Ian. H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, 2nd Edition, Elsevier Publication, 2005.
4. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques,Morgan Kaufmann Publishers, 3rd Edition, 2012.

BIG DATA ANALYTICS LAB

Course Code: PC655AD

Instruction:2 periods per week — Duration of SEE: 3 hours
CIE: 25 marks — SEE: 50 marks
Credits : 1

Course Objectives

- To provide the knowledge to setup a Hadoop Cluster
- To impart knowledge to develop programs using MapReduce Technique
- To learn file handling in HDFS
- To introduce Pig, PigLatin and HiveQL to process big data
- To learn machine learning operations using Mahout Hadoop
- To introduce NoSQL databases

Course Outcomes

After completing this course, the student will be able to:

1. Understand Hadoop working environment
2. Work with big data applications in multi node clusters
3. Write scripts using Pig to solve real world problems
4. Write queries using Hive to analyse the datasets
5. Model and build a recommendation system using Mahout Hadoop and Apply big data and echo system techniques for real world

List of Experiments to be performed

1. Understanding and using basic HDFS commands
2. Word count application using Mapper Reducer on single node cluster
3. Analysis of Weather Dataset on Multi node Cluster
4. Working with files in Hadoop file system: Reading, Writing and Copying
5. Writing User Defined Functions/Eval functions for filtering unwanted data in Pig
6. Retrieving user login credentials from /etc/passwd using Pig Latin
7. Working with HiveQL.
8. Writing User Defined Functions in Hive
9. Perform classification & clustering in Mahout Hadoop
10. Building a Mahout Recommendation System on a Hadoop Cluster

Suggested Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, April 2015.Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.

SUMMER INTERNSHIP

Course Code: SI671AD

Instruction: Duration of SEE: 3 hours

CIE: 25 marks SEE: 25 marks

Credits : 2

Course Objectives:

The student should be made to:

- To give an experience to the students in solving real life practical problems with all its constraints.
- To give an opportunity to integrate different aspects of learning with reference to real life problems.
- To enhance the confidence of the students while communicating with industry engineers and give an opportunity for useful interaction with them and familiarize with work culture and ethics of the industry.

Course Outcomes:

Student will be able to:

1. Able to design/develop a small and simple product in hardware or software.
2. Able to complete the task or realize a pre-specified target, with limited scope, rather than takingup a complex task and leave it.
3. Able to learn to find alternate viable solutions for a given problem and evaluate these alternatives with reference to pre-specified criteria.
4. Able to implement the selected solution and document the same.

Summer Internship is introduced as part of the curricula for encouraging students to work on problems of interest to industries. A batch of two or three students will be attached to a person from an Industry *I* R & D Organization *I* National Laboratory for a period of 4 weeks. This will be during the summer vacation following the completion of the VI semester course. One faculty member will act as an internal guide for each batch to monitor the progress and interacts with the Industry guide.

After the completion of the project, students will submit a brief technical report on the project executed and present the work through a seminar talk to be orgauized by the department. Award of session marks are based on the performance of the student at the work place and awarded by industry guide and internal guide (25 Marks) followed by presentation before the committee constituted by the department (25 Marks). One faculty member will coordinate the overall activity of Summer Internship.

OPEN ELECTIVE-I

Course Code: OE601AS

Instruction: 3 periods per week — Duration of SEE: 3 hours

CIE: 30 marks — SEE: 70 marks

Credits : 3

Course Objectives

- To learn the difference between optimal reasoning and human like reasoning.
- To understand the concept of state space representation.
- To understand heuristic and exhaustive search.
- To introduce the concept of Machine Learning

Course Outcomes

After completing this course, the student will be able to:

1. Understand the basics of AI and knowledge representation using appropriate technique.
2. Apply AI techniques for problem solving using various search and game playing algorithms.
3. Interpret architectures of different intelligent agents and Expert Systems.
4. Interpret probabilistic and logical reasoning for knowledge and analyze different Machine Learning approaches.
5. Recognize basics of Artificial Neural Networks and Natural Language Processing

UNIT I

Introduction: History, Foundations of AI, Sub areas of AI, Objectives and Applications of AI.

Intelligent Agent: Agents and Environments and the Structure of Agents.

Solving Problem by Searching: Introduction, General Problem Solving.

Uninformed Search Strategies: Breadth First Search and Depth First Search.

Informed (Heuristic) Search Strategies: Heuristic Function, A* Algorithm and Hill Climbing.

UNIT II

Game Playing: Optimal Decisions in Games, the Minimax Algorithm, Alpha-Beta Pruning, Constraint Satisfaction Algorithm.

Logic Concepts: Introduction, Propositional Logic, Predicate Logic, Unification Algorithm, Natural Deduction System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic.

UNIT III

Knowledge Representation: Introduction, Approaches to Knowledge Representation,Knowledge Representation using Semantic Networks and Extended Semantic Networks,Knowledge Representation using Frames.

Expert System and Applications: Introduction, Phases in Building Expert Systems,Expert System Architecture, Expert Systems Vs Traditional Systems, Application of Expert Systems, List of Shells and Tools.

UNIT IV

Uncertainty Measure – Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Dempster-Shafer Theory.

Machine Learning: Introduction. Machine Learning Systems. Supervised, Unsupervised Learning and Reinforcement Learning, Learning Decision Trees, Clustering, Support Vector Machines.

UNIT V

Artificial Neural Networks: Introduction, Artificial Neural Networks, Single- Layer FeedForward Networks, Multi-Layer Feed-Forward Networks, Recurrent Networks, Design Issues of Artificial Neural Networks.

Advanced Knowledge Representation Techniques: Case Grammars, Semantic Web.

Natural Language Processing: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers.

Suggested Books:

1. Russell and Norvig, Artificial intelligence, A Modern Approach, Pearson Education,3rd Edition. 2014.

2. Rich, Knight and Nair, Artificial intelligence, Tata McGraw Hill, 3rd Edition 2009.

3. Deepak Khemani, A First Course in Artificial Intelligence, McGraw-Hill Education,2013

4. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 2011D, Samanta, Classic Data Structures, 2nd Edition, PHI.