ANNA UNIVERSITY
CENTRE FOR DISTANCE EDUCATION

M.Sc. COMPUTER SCIENCE (DISTANCE MODE)REGULATIONS - 2023

CURRICULUM SEMESTER - I

Code No.	Course Title	Credits*	Marks
DCS8101	Computer Organization	4	100
DCS8102	Python Programming	3	100
DCS8103	Advanced Database Technology	4	100
DCS8104	Object Oriented Software Engineering	3	100
DCS8105	Mathematical Foundations of Computer Science	4	100
DCS8111	Python Programming Lab	3	100
DCS8112	Advanced Database Technology Lab	3	100
	TOTAL	**24**	**700**

SEMESTER - II

Code No.	Course Title	Credits*	Marks
DCS8201	Computer Networks	4	100
DCS8202	Advanced Java Programming	3	100
DCS8203	Advanced Data Structures and Algorithms	4	100
DCS8204	Operating System	4	100
E1	Elective I	3	100
DCS8211	Advanced Java Programming Lab	3	100
DCS8212	Advanced Data Structures and Algorithms Lab	3	100
	TOTAL	**24**	**700**

SEMESTER - III

Code No.	Course Title	Credits*	Marks
DCS8301	Web Design	4	100
DCS8302	Data Warehousing and Data Mining	4	100
DCS8303	Mobile Application Development	3	100
DCS8304	Object Oriented Analysis and Design	4	100
E2	Elective II	3	100
DCS8311	Software Development Lab	3	100
DCS8312	Mobile Application Development Lab	3	100
	TOTAL	**24**	**700**

SEMESTER - IV

Code No.	Course Title	Credits*	Marks
E3	Elective III	3	100
E4	Elective IV	3	100
DCS8411	Project Work	12	400
	TOTAL	**18**	**600**
	Total No. of Credits and Marks	**90**	**2700**

*Each credit is equivalent to 30 hours of student study comprising of all learning activities.

ELECTIVE - I

Code No.	Course Title	Credits*	Marks
DCS8001	Open Source Systems	3	100
DCS8002	Soft Computing	3	100
DCS8003	Cryptography and Network Security	3	100

ELECTIVE - II

Code No.	Course Title	Credits*	Marks
DCS8004	Cloud Computing Technologies	3	100
DCS8005	Ethical Hacking and Cyber Forensics	3	100
DCS8006	Software Testing and Quality Assurance	3	100

ELECTIVE - III

Code No.	Course Title	Credits*	Marks
DCS8007	Social Network Analysis	3	100
DCS8008	Data Science	3	100
DCS8009	Big Data Analytics	3	100

ELECTIVE - IV

Code No.	Course Title	Credits*	Marks
DCS8010	Artificial Intelligence	3	100
DCS8011	E-Commerce	3	100
DCS8012	Machine Learning	3	100

ANNA UNIVERSITY
CENTRE FOR DISTANCE EDUCATION

MSC (DISTANCE MODE)

REGULATIONS – 2023

SYLLABUS I TO IV SEMESTERS

DCS8101 COMPUTER ORGANIZATION CREDIT: 4

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- Master the binary and hexadecimal number systems including computer arithmetic.
- Design and implement digital systems with basic gates and other components using combinational and sequential circuits.
- Be familiar with the Von Neumann architecture and the functional units of the processor and addressing modes, instruction sets.
- Be familiar with the memories and cache subsystem.
- Be familiar with different ways of communicating with I/O devices and standard I/O interfaces.

COURSE OUTCOMES

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

- To have a thorough understanding of the basic structure and operation of a digital computer.
- Design and realize digital systems with basic gates and other components using combinational and sequential circuits.
- To study the Von Neumann architecture and the functional units of the processor and addressing modes, instruction sets.
- To study the hierarchical memory system including cache memories and virtual memory.
- To study the different ways of communicating with I/O devices and standard I/O Interfaces.

UNIT I Digital systems, binary numbers, octal, hexadecimal conversions, signed binary numbers, complements, logic gates, Boolean algebra, K-maps, standard forms, NAND-NOR implementation.

UNIT II Combinational circuits, adder, subtractor, ALU design, decoder, encoder, multiplexers, Sequential circuits: latches, flip-flops, registers, memories, up- down counters.

UNIT III Von-neumann architecture, processor: definition, structure, category, technology, ALU concept, stored programs, fetch execute cycle, instruction formats, clock rate instruction rate, pipeline, current processors, multi core processors.

UNIT IV Physical memory, addressing, virtual memory, address translation, paging, cache, L1,L2,L3 cache memories, cache mapping, LRU replacement.

UNIT V Data transfer, Serial and Parallel data transfer, Full duplex- half duplex interaction, Bus interface, Programmed I/O, Polling, Interrupt driven I/O, Hardware interrupt mechanism, Interrupt vectors, Multi-level of interrupts, DMA, buffer chaining, operation chaining.

REFERENCE BOOKS:

1. Marris mano, “Digital design” PHI/Pearson fourth edition 2006 Essentials of Computer Architecture Douglas E.Comer Pearson sixth edition 2012.
2. Morris Mano, “Digital Design”, Prentice Hall of India, Fourth Edition 2010.
3. Carl Hamacher, Zvonko Vranesic, SafwatZaky and Naraig Manjikian, “Computer organization andEmbedded Systems”, Sixth Edition, Tata McGraw Hill, 2012.
4. William Stallings, “Computer Organization & Architecture– Designing for Performance” 9th Edition2012.

DCS8102 PYTHON PROGRAMMING CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To develop Python programs with conditionals and loops.
- To use Python data structures – lists, tuples, dictionaries.
- To define Python functions and use function calls.
- To develop Python programs with OOP’s concepts.
- To do input/output with files in Python.

COURSE OUTCOMES

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

- Develop algorithmic solutions to simple computational problems
- Represent compound data using Python lists, tuples, dictionaries.
- Decompose a Python program into functions.
- Structure simple OOPs concepts in Python programs for solving problems.
- Read and write data from/to files in Python Programs.

UNIT I **PYTHON BASICS:** Introduction to Python Programming – Python Interpreter and InteractiveMode– Variables and Identifiers - Arithmetic Operators - Values and Types - Statements.Operators – Boolean Values – Operator Precedence – Expression – Conditionals:If-ElseConstructs – Loop Structures/Iterative Statements – While Loop – For Loop – BreakStatement-Continue statement - Function Call and Returning Values - Parameter Passing – Local and GlobalScope – Recursive Functions.

UNIT II **DATA TYPES IN PYTHON:** Lists, Tuples, Sets, Strings, Dictionary, Modules: Module Loading and Execution – Packages – Making Your OwnModule – The Python Standard Libraries.

UNIT III **MODULES, PACKAGES:** Modules: Introduction – Module Loading and Execution – Packages – Making Your Own Module – The Python Libraries for data processing, data mining and visualization NUMPY, Pandas, Mat plot lib, Plotly.

UNIT IV **OBJECT ORIENTED PROGRAMMING IN PYTHON:** Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence.

UNIT V **FILE HANDLING AND EXCEPTION HANDLING:** Files: Introduction – File Path – Opening and Closing Files – Reading and Writing Files –File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions

REFERENCE BOOKS:

1. ReemaThareja, "Python Programming using Problem Solving Approach", Oxford University Press, First edition, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff,O'Reilly Publishers, 2016.
3. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python3.2, Network Theory Ltd., First edition, 2011.
4. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press, 2013.
5. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, First Edition, 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., First edition,2011.
7. Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, second edition, 2012.

DCS8103 ADVANCED DATABASE TECHNOLOGY CREDIT: 4

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- Understand the importance of Modeling an Entity Relationship Diagram, Map the Entity RelationshipDiagram to Relations and Database Normalization.
- Gain Knowledge on Designing Parallel Databases and Distributed Databases.
- Understand the Basics of XML Databases, Web Databases, Active Databases and Temporal Databases.
- Gain Basic Knowledge on MongoDB NoSQL Database.
- Understand the Basics of Data Warehousing and Data Mining.

COURSE OUTCOMES

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

- Design a Relational Database for an Enterprise.
- Design a Parallel Database and Distributed Database for an Enterprise.
- Apply Knowledge of XML Database, Web Database, Active Database and Temporal Database forMaintaining Data of an Enterprise.
- Model a Data Warehouse and Integration of a Data Mining System with A Data Warehouse.

UNIT I **RELATIONAL MODEL** :Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Relational Algebra – Structured Query Language – Database Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Fourth Normal Form – Fifth Normal Form.

UNIT II **PARALLEL AND DISTRIBUTED DATABASES**: Parallel Databases – I/O Parallelism – Inter-Query and Intra-Query Parallelism – Inter-Operation and Intra-Operation Parallelism – Distributed Database Architecture – Distributed Data Storage – Distributed Transactions – Distributed Query Processing - Distributed Transaction Management – ACID Properties – Concurrency Control.

UNIT III **XML DATABASES, WEB DATABASES, ACTIVE DATABASES AND TEMPORAL DATABASES**: XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open Database Connectivity – Java Database Connectivity – Accessing Relational Database using PHP – Event Condition Action Model – Design and Implementation Issues for Active Databases – Temporal Databases – Interpreting Time in Relational Databases.

UNIT IV **NoSQL DATABASES**: NoSQL Database vs.SQL Databases- CAP Theorem –Migrating from RDBMS to NOSQL – MongoDB – CRUD Operations- MongoDB Sharding – MongoDB Replication – Web Application Development using MongoDB with PHP and Java.

UNIT V **DATA WAREHOUSING AND DATA MINING**: Data Warehouse – Characteristics – Three Tier Architecture – Data Cube – Online Analytical Processing vs. Online Transaction Processing – Online Analytical Processing Operations – Star Schema – Snow Flake Schema – Fact Constellation Schema – Data Mart – Data Mining – Apriori Algorithm for Association Rule Mining – Decision Tree Induction using Information Gain for Classification – k-Means Clustering.

REFERENCE BOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Seventh Edition, Pearson Education, 2016.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Seventh Edition, McGraw Hill Education 2020.
3. Brad Dayley, “Teach Yourself NoSQL with MongoDB in 24 Hours”, Sams Publishing, 2014
4. Jiawei Han, Jian Pei and Hanghang Tong, Data Mining Concepts and Techniques, Fourth Edition, Morgan Kaufmann Publishers, 2022.

DCS8104 OBJECT ORIENTED SOFTWARE ENGINEERING CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To understand the phases in object oriented software development
- To gain fundamental concepts of requirements engineering and analysis.
- To know about the different approach for object oriented design and its methods
- To learn about how to perform object oriented testing and how to maintain software
- To provide various quality metrics and to ensure risk management.

COURSE OUTCOMES

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

- Able to identify the appropriate process model to develop the object oriented software
- Gain knowledge about requirement elicitation and analyzing techniques
- Able to choose and design suitable UML diagrams and methods
- Able to apply correct testing methods and maintain software systems.
- Able to estimate the object oriented application by applying metric data.

UNIT I **SOFTWARE DEVELOPMENT LIFE CYCLE:** Introduction – Object Orientation - Object Oriented Methodologies – Terminologies - Software Development Life Cycle – Conventional SoftwareLife Cycle Models – Build and Fix Model – Waterfall Model – Prototyping Model – Iterative Enhancement Model – Spiral Model – Extreme Programming - Object Oriented Software Life Cycle Models – Selection of Software Development Life Cycle Models.

UNIT II **OBJECT ORIENTED REQUIREMENTS ELICITATION & ANALYSIS:** Software Requirement - Requirements Elicitation Techniques – Initial Requirements Document – Use Case Approach – Characteristics of a Good Requirement – SRS Document – Requirements Change Management – Object Oriented Analysis : Identification of Classes and Relationships, Identifying State and Behavior – Case Study LMS - Managing Object Oriented Software Engineering: Projection Selection and Preparation – Product Development Organization – Project Organization and Management – Project Staffing.

UNIT III **OBJECT ORIENTED SOFTWARE DESIGN:** Object Oriented Design – Interaction Diagrams – Sequence Diagram – Collaboration Diagrams – Refinement of Use Case Description – Refinement of Classes and Relationships – Construction of Detailed Class Diagram – Development of Detailed Design & Creation of Software Design Document - Object Oriented Methods : Object Oriented Analysis (OOA / Coad-Yourdon), Object Oriented Design (OOD/Booch) , Hierarchical Object Oriented Design (HOOD), Object Modeling Technique (OMT), Responsibility – Driven Design Case Studies : Warehouse Management System, Telecom.

UNIT IV **OBJECT ORIENTED TESTING AND MAINTENANCE:** Software testing: Software Verification Techniques – Object Oriented Checklist: - Functional Testing – Structural Testing – Class Testing – Mutation Testing – Levels of Testing – Static and Dynamic Testing Tools - Software Maintenance – Categories – Challenges of Software Maintenance – Maintenance of Object Oriented Software – Regression Testing.

UNIT V **SOFTWARE QUALITY & METRICS:** Need of Object Oriented Software Estimation – Lorenz and Kidd Estimation – Use Case Points Method – Class Point Method – Object Oriented Function. Point – Risk Management – Software Quality Models – Analyzing the Metric Data – Metrics for Measuring Size and Structure – Measuring Software Quality - Object Oriented Metrics.

REFERENCE BOOKS:

1. Yogesh Singh, RuchikaMalhotra, “Object – Oriented Software Engineering”, PHI Learning Private Limited ,First edition,2012.
2. Ivar Jacobson. Magnus Christerson, PatrikJonsson, Gunnar Overgaard, “Object Oriented Software Engineering, A Use Case Driven Approach”, Pearson Education, Seventh Impression, 2009.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, “Object Oriented Analysis & Design with Applications, Third Edition, Pearson Education,2010.
4. Roger S. Pressman, “Software Engineering: A Practitioner’s Approach, Tata McGraw-Hill Education,8 th Edition, 2015.
5. Rod Stephens,"Beginning Software Engineering", 2nd Edition, Wiley, 2022.

DCS8105 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE CREDIT: 4

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To introduce mathematical logic
- To learn Combinatorics concepts.
- To learn the counting techniques, Algebraic structures.
- Understand Propositions, tautologies and inference rules.
- Able to formulate problems and apply testing of hypothesis.

COURSE OUTCOMES

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

- Understand mathematical logic.
- To develop analytical solutions for logical problems.
- Equipped with counting techniques to Solve combinatorial problems.
- Comprehend the algebraic structure.
- Understand the Inference concepts.

UNIT I **LOGIC:** Statements - Connectives - Truth Tables - Normal Forms - Predicate Calculus – Inference -Theory for Statement Calculus.

UNIT II **COMBINATORICS:** Permutations and Combinations - Mathematical Induction - Pigeonhole principle - Principle of Inclusion and Exclusion - Recurrence relations - Solution by generating functions and characteristics equations.

UNIT III **NUMBER THEORY:** Prime numbers - Divisibility - GCD algorithm - Chinese Reminder Theorem - Modular arithmetic - Fundamental theorem of arithmetic - Cryptography - Computational Complexity.

UNIT IV **ALGEBRAIC STRUCTURES:** Groups - Cyclic group - Permutation group (Sn and Dn) - Substructures - Homomorphism - Cosets and Lagrange’s Theorem - Normal Subgroups - Rings and Fields (definition and examples).

UNIT V **LATTICES:** Partial order relation – Posets - Hasse diagram - Lattices - Special Lattices.

REFERENCE BOOKS:

1. Trembley.J.P. and Manohar R., “Discrete Mathematical Structures with Applications to ComputerScience”, Tata McGraw – Hill Publishing Company Limited, New Delhi. Reprinted in 2017.
2. Grimaldi R.P. and Ramana B.V., “Discrete and Combinatorial Mathematics”, Pearson Education,Reprinted in 2019.
3. Hopcroft J.E. and Ullman J.D., “Introduction to Automata, Languages and Computation”, NarosaPublishing House, 2006.

DCS8111 PYTHON PROGRAMMING LABORATORY CREDIT: 3

OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

OUTCOMES:

On completion of the course, students will be able to:

- Develop algorithmic solutions to simple computational problems
- Develop and execute simple Python programs.
- Implement programs in Python using conditionals and loops for solving problems..
- Deploy functions to decompose a Python program.
- Process compound data using Python data structures.
- Utilize Python packages in developing software applications.

EXPERIMENTS:

- Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
- Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
- Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
- Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
- Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
- Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
- Implementing programs using written modules and Python Standard Libraries (pandas, numpy.Matplotlib, scipy)
- Implementing real-time/technical applications using File handling. (copy from one file to another,word count, longest word)

- Implementing real-time/technical applications using Exception handling. (divide by zero error,voter’s age validity, student mark range validation).

DCS8112 ADVANCED DATABASE TECHNOLOGY LAB CREDIT: 3

OBJECTIVES:

The student should be able:

- Gain Knowledge on Data Definition Language, Data Manipulation Language and TransactionControl Language.
- Understand the Types of Joins, Aggregate Functions, Nested Queries, Creating Views andCreating Stored Procedures.
- Gain Basic Knowledge on Implementing Distributed, XML and Temporal Databases.
- Gain Basic Knowledge on Accessing and Updating a Relational Database using PHP and Java.
- Gain Basic Knowledge on Accessing and Updating a MongoDB NoSQL Database using PHP.

EXPERIMENTS IN THE FOLLOWING TOPICS:

- Data Definition Language - Create - Alter - Drop - Enforcing Primary Key and Foreign Key Constraints - Data Manipulation Language - Insert - Delete - Update -Transaction Control Language – Commit – Rollback – Save Points.
- Cartesian Product - Equi Join - Left Outer Join - Right Outer Join - Full Outer Join.
- Set Operations - Creating Views - Creating Sequence - Indexing-Aggregate Functions - Analytic Functions – Nested Queries.
- Creating Triggers and Stored Procedures.
- Distributed Database Implementation.
- XML Database Implementation.
- Temporal Database Implementation.
- Accessing and Updating a Relational Database using PHP.
- Accessing and Updating a Relational Database using JDBC.
- MongoDB - CRUD Operations
- Accessing and Updating MongoDB using PHP

Exercises 1 to 9 should be implemented using a Relational Database (Oracle / MySQL / PostgreSQL). Exercises 10 and 11 should be implemented using MongoDB NoSQL Database.

OUTCOMES:

Upon completion of this course, the student should be able to:

- Create a Relational Database Enforcing Integrity Constraints and perform Data Manipulation Language Operations.
- Create Views and Stored Procedures.

- Implement Distributed, XML and Temporal Databases.
- Accessand Update a Relational Database using PHP and Java.
- Accessand Update a MongoDB NoSQL Database using PHP

DCS8201 COMPUTER NETWORKS CREDIT: 4

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- Understand data communication techniques.
- To know network Fundamentals.
- To know network layer functions.
- Understand transport layer and its functions.
- Explore network applications in various domains.

COURSE OUTCOMES

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

- Trace the flow of information from one node to another node in the network.
- Identify the component required to build different types of networks.
- Understand the division of network functionalities in network layers.
- Identify solution for each functionality in transport layer.
- Choose the required functionality at each layer for given application.

UNIT I INTRODUCTION: Communication model – Data communications and Networking – Data transmission concepts and terminology – Transmission media –Data Encoding Techniques –Digital Data communication Techniques- Data link Control Protocols.

UNIT II NETWORK FUNDAMENTALS: Protocol architecture – OSI – TCP/IP – LAN Architecture – Topologies – MAC – Ethernet, Fast Ethernet, Token ring, FDDI, Wireless LANS : 802.11/ WiFi
/ Bluetooth / WiMAX.

UNIT III NETWORK LAYER: Network layer functions – Switching concepts – Circuit switching networks – Packet Switching – Routing – Internetworking concepts – IP – Unreliable connectionless delivery – Datagrams – Routing IP datagrams – ICMP.

UNIT IV TRANSPORT LAYER: Transport layer functions – User Datagram Protocol – Transmission Control Protocol – Reliable Delivery Service – Connection Establishment – Flow Control – Congestion Control – Queuing disciplines – Congestion Avoidance.

UNIT V APPLICATIONS: Domain Name System(DNS) – Telnet – rlogin – FTP – SMTP – MIME –IMAP – HTTP – SNMP – Security.

REFERENCE BOOKS:

1. Larry L. Peterson & Bruce S. Davie, “Computer Networks - A systems Approach”, 5th Edition, MorganKaufmann, 2012.
2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, Sixth Edition,Addison-Wesley, 2013.
3. William Stallings, “Data and Computer Communications”, Tenth Edition, PHI, 2014.
4. Andrew S.Tanenbaum, “Computer Networks”, Tata McGraw Hill, 5th Edition, 2011.

DCS8202 ADVANCED JAVA PROGRAMMING CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To get familiar with the concept of packages, interface.
- Able to understand Inheritance and Exception handling in java.
- To learn the concept of Graphical User Interface (GUI).
- Student will be able to develop web application using Java Servlet and Java Server Pages technology.
- To learn database connectivity and network programming.

COURSE OUTCOMES

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

- Identify classes, objects, members of a class and the relationships among them needed for a findingthe solution to specific problem.
- Use the Java language for writing well-organized, complex computer programs with both commandline and graphical user interfaces.
- Identify and describe common abstract user interface components to design GUI in Java using Applet& AWT along with response to events.
- Apply Servlets and JSP for creating Web based applications using JDBC.
- Design and Develop various application by integrating any of Servlets, JSPs, Swing and Applet usingDatabase.

UNIT I DATA TYPES, VARIABLES AND ARRAYS: Primitive Types-Literals-Variables-Type Conversion and Casting- Arrays. Operators: Arithmetic- Bitwise-Relational- Boolean-Logical – Assignment-Conditional. Control Statements: Selection statements- Iteration Statements- Jump Statements. Classes and Methods: Fundamentals- Declaring objects- Methods- Constructors-Overloading Methods- Recursion – Nested and Inner Classes-Command Line Arguments.

UNIT II INHERITANCE: Basics-Super Class- Method Overriding- Abstract Classes. Packages and Interfaces: Packages- Access Protection – Importing Packages- Interfaces. Exception Handling: Fundamentals – Types – Try and Catch – Throw – throws- Finally – Built in Exceptions.

UNIT III THE APPLET CLASS: Basics – Architecture – Applet Skeleton – Display Methods – Status Window- Passing Parameters. Event Handling: Event Model – Classes – Key Event Class- Event Listener Interfaces. AWT: Window Fundamentals – Working with frame windows- Graphics- Working with color- working with fonts. AWT controls – Labels-Buttons- Check Box- Choice Controls – Lists- Scroll Bars – Text Field- Text Area.

UNIT IV SERVLET FUNDAMENTALS: Servlet overview and Architecture- Servlet Basics- Servlets and HTML- servlet Sessions- Servlets, Java database connectivity (JDBC) and Inter Servlet Communications. JSP Fundamentals: JSP Overview and Architecture – JSP Implicit Objects – JSP Standard Actions- Handling JSP Errors – Custom JSP Tag Libraries.

UNIT V USING RELATIONAL DATABASES: Introduction – JDBC Drivers for RDBM Systems-

Using java.sql API, Using javax.sql API – connection pooling. Network Programming: Introduction – Working with URLs – Working with Sockets – Remote Method Invocation.

REFERENCE BOOKS:

1. Herbert Schildt, “Java the Complete Reference”, Oracle Press, TMH Company Ltd, New Delhi, 9thEdition, 2017.
2. James goodwill, “ Developing Java Servlets: Web applications with servlets and JSP”, 2nd Edition,SAMS Publishers, USA
3. Joe Wiggles worth and Paula McMillan, “Java Programming Advanced Topics”, 3rd Edition, TMH,2009.
4. Alan Grid, “Java Programming”, Via Etenea Limited, 2020.
5. John Dean, Raymond Dean, “Introduction to Programming with JAVA- A Problem Solving Approach”,Tata McGraw Hill, 2012.
6. Ralph Bravaco, Shai Simonson, “Java Programming: From the Ground Up”, Tata McGraw Hill, 2012.
7. Herbert Schildt, Dale Skrien, “Java Fundamentals – A Comprehensive Introduction”, Tata McGrawHill, 2013.

DCS8203 ADVANCED DATA STRUCTURES AND ALGORITHMS CREDIT: 4

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- Understand and apply linear data structures-List, Stack and Queue.
- Apply data structures and algorithms in real time applications.
- Understand the graph algorithms.
- Learn different algorithm analysis techniques.
- Analyze the efficiency of an algorithm.

COURSE OUTCOMES

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

- Implement a program using stack, queue, linked list data structures
- Design and Implement Tree data structures and Sets
- Apply the Graph Data structure and to find shortest path among the several possibilities
- Perform analysis of various algorithms
- Analyze and design algorithms to appreciate the impact of algorithm design in practice.

UNIT I LINEAR DATA STRUCTURES: Introduction - Abstract Data Types (ADT) – Stack – Queue – Circular Queue - Double Ended Queue - Applications of stack – Evaluating Arithmetic Expressions - Other Applications - Applications of Queue - Linked Lists - Singly Linked List - Circularly Linked List - Doubly Linked lists – Applications of linked list – Polynomial Manipulation.

UNIT II NON-LINEAR DATA STRUCTURES: Binary Tree – expression trees – Binary tree traversals – applications of trees – Huffman Algorithm - Binary search tree - Balanced Trees - AVL Tree - B-Tree - Splay Trees - Heap- Heap operations- -Binomial Heaps - Fibonacci Heaps- Hash set.

UNIT III GRAPHS: Representation of graph - Graph Traversals - Depth-first and breadth-first traversal - Applications of graphs - Topological sort – shortest-path algorithms - Dijkstra's algorithm – Bellman-Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal'salgorithms.

UNIT IV ALGORITHM DESIGN AND ANALYSIS: Algorithm Analysis – Asymptotic Notations - Divide andConquer – Merge Sort – Quick Sort - Binary Search - Greedy Algorithms – Knapsack Problem
– Dynamic Programming – Optimal Binary Search Tree - Warshall's Algorithm for Finding Transitive Closure.

UNIT V ADVANCED ALGORITHM DESIGN AND ANALYSIS: Backtracking – N-Queen's Problem - Branch and Bound – Assignment Problem - P & NP problems – NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem-Amortized Analysis.

REFERENCE BOOKS:

1. Jean Paul Tremblay and Paul G. Sorensen. “An Introduction to Data Structures with Applications”, 2nd Edition, Tata McGraw Hill, New Delhi, 2017.

2. Peter Drake, “Data Structures and Algorithms in Java”, 4 th Edition, Pearson Education 2014.
3. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", 3 rd Edition,PHI Learning Private Ltd, 2012.
4. V. Aho, J. E. Hopcroft, and J. D. Ullman, “Data Structures and Algorithms”, 1 st Edition, PearsonEducation, 2007.
5. Michael T.Goodrich, “Algorithm Design: Foundations, Analysis and Internet Examples”, 2 nd Edition,Wiley India Pvt. Ltd, 2006.

DCS8204 OPERATING SYSTEM CREDIT: 4

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- Learn the Operating System basics.
- Study the process management of Operating system.
- Gain knowledge in the storage management.
- To learn I/O systems of Operating system.
- To learn file systems and networking.

COURSE OUTCOMES

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

- Ability to discuss on the basics of OS.
- In depth knowledge in process management.
- In depth knowledge in memory management
- In depth knowledge in I/O Management of various operating systems.
- To explore the case studies with various operating systems.

UNIT I OPERATING SYSTEMS OVERVIEW: Operating system – Types of Computer Systems - Computer-system operation – I/O structure – Hardware Protection - System components – System calls – System programs – System structure - Process concept – Process scheduling
– Operations on processes – Cooperating processes – Inter process communication – Communication in client-server systems - Multithreading models – Threading issues.

UNIT II PROCESS MANAGEMENT: Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling – Real time scheduling – Algorithm Evaluation – Process Scheduling Models - The critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors - System model – Deadlock characterization – Methods for handling deadlocks – Recovery from deadlock.

UNIT III STORAGE MANAGEMENT: Memory Management – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual Memory: Background
– Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing.

UNIT IV I/O SYSTEMS: File concept – Access methods – Directory structure – File-system mounting – Protection - Directory implementation – Allocation methods – Free-space management - Disk scheduling – Disk management – Swap-space management.

UNIT V CASE STUDY: The Linux System - History – Design Principles – Kernel Modules – Process Management – Scheduling – Memory management – File systems – Input and Output – Inter process Communication – Network Structure – Security – Windows 7 - History – Design Principles – System Components – Environmental subsystems – File system – Networking.

REFERENCE BOOKS:

1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, “Operating System Concepts”, NinthEdition, John Wiley and Sons Inc 2012.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Fourth Edition, Addison Wesley, 2007.

3. Gary Nutt, “Operating Systems”, Second Edition, Addison Wesley, 2001.
4. H M Deital, P J Deital and D R Choffnes, “Operating Systems”, Pearson Education, 2004.

DCS8211 ADVANCE JAVA PROGRAMMING LABORATORY CREDIT: 3

COURSE OBJECTIVES

- Design and develop GUI applications using Abstract Windowing Toolkit (AWT) and Event Handling.
- Design and develop Web applications
- Designing applications using pre-built frameworks.
- Design interactive web pages using JSP and Servlets.

COURSE OUTCOMES

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

- Create the Internet Programming, using Java Applets.
- Apply exception handling concepts in JAVA programs.
- Create a full set of UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT).
- Learn to access database through Java programs, using Java Data Base Connectivity (JDBC)
- Create dynamic web pages, using Servlets and JSP.
- Invoke the remote methods in an application using Remote Method Invocation (RMI).

LIST OF EXPERIMENTS:

1. Create UI applications using Java Applets
2. Create a full set of UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT) & Swings
3. Apply event handling on AWT.
4. Implement servlet concepts.
5. Create Dynamic Web pages using JSP.
6. Invoke the remote methods in an application using Remote Method Invocation (RMI).
7. Create web applications using Java Data Base Connectivity (JDBC)

DCS8212 ADVANCED DATA STRUCTURES AND ALGORITHM LAB CREDIT: 3

COURSE OBJECTIVES

- Design ADT concepts.
- To know applications of binary tree.
- Design and develop graph applications.

COURSE OUTCOMES

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

- To develop applications of binary tree.
- To implement merge sort and quick sort concept.
- To develop graph applications using Java.

LIST OF EXPERIMENTS:

1. Create stack and queue operations using Java.
2. To implement Linked List concepts using Java.
3. To implement Binary Search.
4. To implement merge sort and quick sort.
5. To implement AVL Trees using Java.
6. To implement Splay Trees using Java.
7. To implement Red black Trees using Java.
8. To implement Graphs using Java.

DCS8301 WEB DESIGN CREDIT: 4

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- To understand and practice embedded dynamic scripting on client-side Internet Programming
- To understand and practice web development techniques on client-side.
- The objective is to enable the students to understand the Organizational Behaviour, and Organizational Change and dynamic of groups.

COURSE OUTCOMES

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

- Create a basic website using HTML and Cascading Style Sheets.
- Create websites with complex layouts.
- Add interactivity to websites using simple scripts.
- Design rich client presentation using AJAX.
- Add business logic to websites using PHP and databases.

UNIT I INTRODUCTION TO WWW: Understanding the working of Internet-Web Application Architecture-Brief history of Internet-Web Standards – W3C-Technologies involved in Web development – Protocols-Basic Principles involved in developing a website-Five Golden Rules of Web Designing.

UNIT II UI DESIGN: HTML Documents-Understanding markup languages-Structure of HTML Documents-Markup Tags-Basic markup tags-Working with Text-Working with Images-Hyperlinks -Images-Tables-List-SVG-Advanced HTMLIframes-HTML5 Video and Cascading Style Sheet, Pseudo selectors Understanding the box model - Margins, padding and border – Inline and block elements -Structuring pages using Semantic Tags.

UNIT III WEB PAGE LAYOUTS WITH CSS3: Positioning with CSS – Positions, Floats, z-index-Layouts with Flexbox -Responsive web design with media queries-Advanced CSS Effects – Gradients, opacity, box-shadow-CSS3 Animations – Transforms and Transitions-CSS Frameworks – Bootstrap.

UNIT IV JAVA SCRIPT: Basic JavaScript syntax-JavaScript Objects and JSON-Understanding the DOM-JavaScript Events and Input validation-Modifying CSS of elements using JavaScript- JavaScript Local Storage and Session Storage-Cross domain data transfer with AJAX-Using JQuery to add interactivity-JQuery Selectors-JQuery Events-Modifying CSS with JQuery - Adding and removing elements with JQuery-AJAX with JQuery-Animations with JQuery (hide, show, animate, fade methods, Slide Method).

UNIT V SERVER-SIDE PROGRAMMING WITH PHP: PHP basic syntax-PHP Variables and basic data structures-Using PHP to manage form submissions-File Handling -Cookies and Sessions with PHP-Working with WAMP and PHPMYADMIN-Establishing connectivity with MySQL using PHP.

REFERENCE BOOKS:

1. David Flanagan, “JavaScript: The Definitive Guide”, 7thEdition, O’Reilly Publications,2020.
2. Danny Goodman, “Dynamic HTML: The Definitive Reference: A Comprehensive Resource forXHTML, CSS, DOM, JavaScript” , O’Reilly Publications, 3 rd Edition,2007.
3. Robin Nixon; “Learning PHP, MySQL, JavaScript & CSS: A Step-by-Step Guide to Creating DynamicWebsites”, O’Reilly Publications, 2 nd Edition,2018.
4. Keith J Grant; “CSS in Depth”, Manning Publications. 1st edition,2018.
5. Elizabeth Castrol, “HTML5 & CSS3 Visual Quick start Guide”, Peachpit Press, 7 th Edition, 2012.
6. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, “Internet and WorldWideWeb -How to Program”, Fifth Edition, Pearson Education, 2012.

DCS8302 DATA WAREHOUSING AND DATA MINING CREDIT: 4

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- Expose the students to the concepts of Data warehousing Architecture and Implementation.
- Understand Data mining principles and pre-process techniques.
- Expose the students to the concepts of Association Rule Mining Techniques.
- Study the overview of classification and predictions in data mining.
- Identify the major categorization of clustering techniques in Data mining.

COURSE OUTCOMES

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

- Able to construct the multidimensional data modeling.
- Evolve the importance of data preprocessing.
- Discover the knowledge imbibed in the high dimensional system.
- Experiment Ensemble Methods of various classification algorithms.
- Evaluate various mining techniques on complex data objects.
-

UNIT I DATA WAREHOUSE: Data Warehousing - Operational Database Systems vs Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.

UNIT II DATA MINING & DATA PREPROCESSING: Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT III ASSOCIATION RULE MINING: Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint-Based Association Mining.

UNIT IV CLASSIFICATION & PREDICTION: Classification vs Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods
– Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT V CLUSTERING: Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering HighDimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

REFERENCE BOOKS:

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition, Elsevier,Reprinted 2011.
2. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter

Economy Edition, Prentice Hall of India, 2006.

3. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hallof India, 2006.

4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

DCS8303 MOBILE APPLICATION DEVELOPMENT CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To learn the characteristics of mobile applications.
- Understand the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.
- To learn development and programming of mobile application.
- To learn the latest tools used to develop mobile app.

COURSE OUTCOMES

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

- To design and implement the user interfaces of mobile applications.
- To design the mobile applications that is aware of the resource constraints of the mobile devices.
- To develop advanced mobile applications that accesses the databases and the web.
- To develop useful mobile applications in the current scenario using Google Android and Eclipse simulator.

UNIT I INTRODUCTION - Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools – Mobile devices Profiles.

UNIT II USER INTERFACE - Generic UI Development – VUIs and Mobile Applications – Text to Speech techniques – Designing the right UI – Multimodal and Multichannel UI – Gesture based UIs – Screen Elements and Layouts – Voice XML – Java API.

UNIT III APPLICATION DESIGN - Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking

– Plug ins and rules of thumb for using DLLs – Concurrency and Resource Management – Look and feel.

UNIT IV APPLICATION DEVELOPMENT - Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based services – Packaging and Deployment – Security and Hacking.

UNIT V TOOLS - Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI tool kit interfaces – Event handling and Graphics services – Layer Animation.

REFERENCE BOOKS:

1. Zigurd Mednieks, Laird Dornin, G,Blake Meike and Masumi Nakamura ¯Programming Android, O'Reilly, 2011.
2. Reto Meier, ¯Professional Android 2 Application Development, Wrox Wiley, 2010.
3. Alasdair Allan, ¯iPhone Programming, O'Reilly, 2010.
4. Wei-Meng Lee, ¯Beginning iPhone SDK Progrmming with Objective-C, Wrox Wiley, 2010.

5. Poslad, ¯Ubiquitous Computing: Smart Devices, Environments and Interactions, Wiley, 2009.

DCS8304 OBJECT ORIENTED ANALYSIS AND DESIGN CREDIT: 4

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- Understand the basics of object oriented analysis and design.
- Learn UML models and tools.
- Learn to analysis the business objects.
- To apply design process to various applications.
- Learn basic testing strategies applied on it.

COURSE OUTCOMES

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

- To know understand object behavior and its methods.
- Familiarize with the topics of object oriented System analysis.
- Implement use case models.
- Apply UML to design various applications.
- Explore test plan and derive test cases.

UNIT I INTRODUCTION: An overview – Object basics – Object state and properties – Behavior – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Metaclasses – Object oriented system development life cycle.

UNIT II METHODOLOGY AND UML: Introduction – Survey – Rumbugh, Booch, Jacobson methods – Patterns – Frameworks – Unified approach – Unified modeling language – Static and Dynamic models – UML diagrams – Class diagram – Usecase diagrams – Dynamic modeling – Model organization – Extensibility.

UNIT III OBJECT ORIENTED ANALYSIS: Identifying Usecase – Business object analysis – Usecase driven object oriented analysis – Usecase model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility.

UNIT IV OBJECT ORIENTED DESIGN: Design process – Axions – Colollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface.

UNIT V SOFTWARE QUALITY: Quality assurance – Testing strategies – Object orientation testing – Test cases – Test Plan – Debugging principles – Usability – Satisfaction – Usability testing – Satisfaction testing.

REFERENCE BOOKS:

1. Ali Bahrami, “Object Oriented System Development”, McGraw Hill International Edition, Secondreprint 2008.
2. Craig Larman, “Applying UML and Patterns”, 2nd Edition, Pearson, 2002.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”,

Addison Wesley Long man, 1999.

4. Bernd Bruegge, Allen H. Dutoit, “Object Oriented Software Engineering using UML, Patterns andJava”, Pearson 2004.

DCS8311 SOFTWARE DEVELOPMENT LAB CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- Understand project planning
- Able to Analysis and Design Application
- Able to Implement and Test Software.

COURSE OUTCOMES

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

- Able to Draw DFD and UML Diagrams
- Able to Write programs for Design
- Generate and Execute Test cases.

EXPERIMENTS IN THE FOLLOWING TOPICS

1. Apply the following to typical application problems:
2. Project Planning
3. Software Requirement Analysis
4. Software Estimation
5. Software Design
6. Data Modelling & Implementation
7. Software Testing
8. Software Debugging

A possible set of applications may be the following:

a. Library System

b. Student Marks Analyzing System

c. Text Editor.

d. Create a dictionary.

e. Telephone dictionary.

f. Simulator Software for Parallel Processing Operation.

g. Inventory System.

DCS8312 MOBILE APPLICATION DEVELOPMENT LAB CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To know about various platforms and tools available for developing mobile applications.
- To realize the differences between developing conventional applications and mobile applications.
- To learn programming skills in J2ME and Android SDK.
- To study about micro browser based applications to access the Internet using Sun Java Toolkit.

COURSE OUTCOMES

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

- Develop useful mobile applications for the current scenario in mobile computing and pervasivecomputing.

EXPERIMENTS IN THE FOLLOWING TOPICS:

1. Survey of Mobile Application Development Tools.
2. Form design for mobile applications.
3. Applications using controls.
4. Graphical and Multimedia applications.
5. Data retrieval applications.
6. Networking applications.

Gaming application:

(Perform the experiments from 2 to 7 in J2ME and Android SDK framework)

Micro browser based applications using WAP, WML and WML scripts

(Perform experiments in 8 using Sun Java Wireless toolkit).

ELECTIVES

DCS8001 OPEN SOURCE SYSTEMS CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To understand open-source licenses and learn the implications for users, developers and thesoftware community.
- To become familiar with and become adapt using the tools of open source development.
- To learn GNU and practice open-source programming techniques.

COURSE OUTCOMES

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

- Understands the importance of open source and how it can be used in efficient manure.
- Gain knowledge on Linux.
- Configure Hardware using open source tools
- Get experience with GNU Libraries.
- Understand various system software tools.

UNIT I Overview of Free/Open Source Software - Definition of FOSS & GNU - History of GNU/Linux and the free software movement -Advantages of free software and GNU/Linux -Licensing - Types of licensing, Intellectual Proprietary Right, Commercial License vs. Open source license- Open Source Licensing, Contract and Copyright Law: Basic principles of copyright law, contract and copyright, open source software licensing, Issues with copyrights and patents, warranties.

UNIT II Linux OS Installation and Hardware Configuration - Configure disk partitions & file systems and install a GNU/Linux distribution -Basic shell commands - Logging in, Listing files, editing files, copying/moving files, viewing file contents, changing file modes and permissions, process management User and group management -File ownerships and permissions.

UNIT III Configuring additional hardware -Sound cards -Displays & display cards-Network cards-Modems -USB drives -CD writers -The OS boot up process -Performing everyday tasks using GNU / Linux - Accessing the Internet -Playing music - Editing documents and spreadsheets - Sending and receiving email -Copy files from disks and over the network -Playing games - Writing CDs -X Window system configuration and utilities -Configure X windows -Detect display devices - Installing software -From source code as well as using binary packages - Setting up email servers Using postfix -(SMTP services) -Courier (IMAP & POP3 services) - Squirrel mail (web mail services).

UNIT IV GNU compiler tools - The C compiler (gcc) and the C++ compiler (g++) - Linking againstobject archives (.a libraries) and dynamic shared object libraries (.so libraries) - Generating statically linked binaries and libraries -Generating dynamically linked libraries - Using the GNU debugging tools -Gdb to debug programs -Graphical debuggers like ddd - Memory debugging/profiling libraries mpatrol and valgrind.

UNIT V Application Programming -Basics of the X Windows server architecture -Qt programming - Gtk+ programming - Execution Environment - Programming GUI applications with localisation support, Open Source Equivalent of existing commercial software.

REFERENCE BOOKS:

1. N. B. Venkateshwarlu (Ed), “Introduction to Linux: Installation and Programming”, B S Publishers;2005.
2. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, “Linux in a Nutshell”, Sixth Edition,Oreilly Media, 2009.

DCS8002 SOFT COMPUTING CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- The primary objective of this course is to provide an introduction to the basic principles, techniques,and applications of soft computing.
- Upon successful completion of the course, students will have an understanding of the basic areas ofSoft Computing including Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms.
- Provide the mathematical background for carrying out the optimization associated with neural networklearning.
- Aim of this course is to develop some familiarity with current research problems and researchmethods in Soft Computing by working on a research or design project.

COURSE OUTCOMES

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

- Describe human intelligence and AI
- Discuss the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- Relate with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems
- Describe with genetic algorithms and other random search procedures useful while seeking globaloptimum in self-learning situations
- Develop some familiarity with current research problems and research methods in Soft ComputingTechniques..

UNIT I Introduction to soft computing - brief description of separate theories, Introduction to biological and artificial neural network, Classification algorithms- Decision Trees, Bayesian classifier - Neural Networks and Probabilistic Reasoning.

UNIT II Basic concepts of neural networks, Neural network architectures, Learning methods, Supervised and un- supervised learning, Architecture of a back-propagation network, Applications.

UNIT III Fundamentals of fuzzy sets and fuzzy logic theory, fuzzy inference principle, Examples of use of fuzzy logic in control of real-world systems.

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

UNIT V AI Search Algorithm-Predicate calculus- rules of interface - Semantic networks - frames – objects -Hybrid models, Applications -Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Colour Recipe Prediction.

REFERENCE BOOKS:

1. Jang J.S.R.,Sun C.T and Mizutami E - Neuro Fuzzy and Soft Computing Prentice hall, New Jersey,1998.

2. Munakata, T.: Fundamentals of the New Artificial Intelligence, Springer-Verlag New York, Inc., 1998.
3. Goldberg, Introduction to Genetic Algorithms.
4. Jang, Nero-Fuzzy & Soft Computing, Pearsons.
5. Cordón, O., Herrera, F., Hoffman, F., Magdalena, L.: Genetic Fuzzy systems, World Scientific Publishing Co. Pte. Ltd., 2001.
6. Kecman, V.: Learning and Soft Computing, The MIT Press, 2001.
7. Nih.J.Ndssen Artificial Intelligence, Harcourt Asia Ltd., 1998.

DCS8003 CRYPTOGRAPHY AND NETWORK SECURITY CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over in secure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for network security to protect against the threats in the networks.
- To Understand Intruders and detection Techniques.

COURSE OUTCOMES

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

- Provide security of the data over the network.
- Do research in the emerging areas of cryptography and network security.
- Implement various networking protocols.
- Protect any network from the threats in the world.
- To protect from intruders and Virus Threats.

UNIT I Introduction - Security trends – Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies – Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography-Foundations of moderncryptography:perfectsecurity–informationtheory-productcryptosystem–cryptanalysis.

UNIT II Symmetric Encryption and Message Confidentiality – Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Chipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. Public-key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures, Key Management.

UNIT III Authentication Applications - Kerberos, x.509 Authentication Service, Public-Key Infrastructure. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME.

UNIT IV IP Security- IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations. Web Security: Web Security Considerations, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3.

UNIT V Intruders - Intruders, Intrusion Detection, Password Management. Malicious Software: Virus and Related Threats, Virus Counter measures, Distributed Denial of Service Attacks. Firewalls: Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

REFERENCE BOOKS:

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata McGraw Hill, (2007) , Reprint (2015).

2. Stallings William, “Cryptography and Network Security-Principles and Practice (2017).
3. WilliamStallings, “Network Security Essentials Applications and Standards”, Third Edition, PearsonEducation, (2008).
4. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms And Protocols”, WileyPublications, (2003).
5. Charles Pfleeger, “Security in Computing”, 4th Edition, Prentice Hall Of India, (2006).
6. Ulysess Black,” Internet Security Protocols”,Pearson Education Asia,(2000).
7. Charlie Kaufman And Radia Perlman, Mike Speciner, “Network Security,Second Edition, PrivateCommunication In Public World”, PHI(2002).
8. Bruce Schneier And Neils Ferguson, “Practical Cryptography”,First Edition,Wiley Dreamtech India PvtLtd,(2003).
9. Douglas R Simson, “Cryptography–Theory and Practice”, First Edition, CRC Press, (1995).

DCS8004 CLOUD COMPUTING TECHNOLOGIES CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To understand the basic concepts of Distributed systems.
- To learn about the current trend and basics of Cloud computing.
- To be familiar with various Cloud concepts.
- To expose with the Server, Network and storage virtualization.
- To be aware of Microservices and DevOps.

COURSE OUTCOMES

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

- Upon completion of the course, the students will be able to.
- Use Distributed systems in Cloud Environment.
- Articulate the main concepts, key technologies, strengths and limitations of Cloud computing.
- Identify the Architecture, Infrastructure and delivery models of Cloud computing.
- Install, choose and use the appropriate current technology for the implementation of Cloud.
- Adopt Microservices and DevOps in Cloud environment.

UNIT I DISTRIBUTED SYSTEMS

Introduction to Distributed Systems – Characterization of Distributed Systems – Distributed Architectural Models
-Remote Invocation – Request-Reply Protocols – Remote Procedure Call – Remote Method Invocation – Group Communication – Coordination in Group Communication – Ordered Multicast – Time Ordering – Physical ClockSynchronization – Logical Time and Logical Clocks.

UNIT II INTRODUCTION TO CLOUD COMPUTING

Cloud Computing Basics – Desired features of Cloud Computing – Elasticity in Cloud – On demand provisioning
- Applications – Benefits – Cloud Components: Clients, Datacenters & Distributed Servers – Characterization of Distributed Systems – Distributed Architectural Models - Principles of Parallel and Distributed computing - Applications of Cloud computing – Benefits – Cloud services – Open source Cloud Software: Eucalyptus, OpenNebula, Open stack, Aneka, Cloudsim.

UNIT III CLOUD INFRASTRUCTURE.

Cloud Architecture and Design – Architectural design challenges – Technologies for Network based system -NIST Cloud computing Reference Architecture – Public, Private and Hybrid clouds – Cloud Models : IaaS, PaaS and SaaS – Cloud storage providers.

UNIT IV CLOUD ENABLING TECHNOLOGIES

Service Oriented Architecture - Web Services – Basics of Virtualization – Emulation – Types of Virtualization – Implementation levels of Virtualization – Virtualization structures – Tools & Mechanisms – Virtualization of CPU, Memory & I/O Devices – Desktop Virtualization – Server Virtualization – Google App Engine – Amazon AWS -Federation in the Cloud.

UNIT V MICROSERVICES

Defining Micro services - Emergence of Micro service Architecture – Design patterns of Micro services – TheMini web service architecture – Micro service dependency tree – Challenges with Micro services - SOA vs Micro service – Micro service and API – Deploying and maintaining Micro services.

REFERENCE BOOKS:

1. Kai Hwang, Geoffrey C. Fox & Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, First Edition, 2012.
2. Andrew S. Tanenbaum & Maarten Van Steen, “Distributed Systems - Principles and Paradigms”, Second Edition, Pearson Prentice Hall, 2006.
3. Thomas Erl, Zaigham Mahood & Ricardo Puttini, “Cloud Computing, Concept, Technology & Architecture”, Prentice Hall, Second Edition, 2013.
4. Richard Rodger, “The Tao of Micro services”, ISBN 9781617293146, Manning Publications, First Edition, December 2017.
5. Magnus Larsson, “Hands-On Micro services with Spring Boot and Spring Cloud: Build and deploy micro services using spring cloud, Istio and kubernetes”, Packt Publishing Ltd, First Edition, September 2019.
6. Jim Lewis, “DEVOPS: A complete beginner’s guide to DevOps best practices”, ISBN13:978-1673259148, ISBN-10: 1673259146, First Edition, 2019.

DCS8005 ETHICAL HACKING AND CYBER FORENSICS CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To understand the hacking techniques of computer forensics.
- To learn about data recovery methods.
- To identity the threats in computer forensics.

COURSE OUTCOMES

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

- To apply the principles of computer forensics for security.
- To implement the data recovery methods.
- To manage threats and the tactics.

UNIT I Foundation for Ethical Hacking-Ethical Hacking in Motion-Hacking Network Hosts-HackingOperating Systems-Hacking Applications.

UNIT II Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types ofVendor and Computer Forensics Services.

UNIT III Data Recovery – Evidence Collection and Data Seizure – Duplication and Preservation ofDigital Evidence – Computer Image Verification and Authentication.

UNIT IV Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events -Networks.

UNIT V Fighting against Macro Threats – Information Warfare Arsenal – Tactics of Military – Tactics ofTerrorist and Rogues – Tactics of Private Companies.

REFERENCE BOOKS:

1. John R. Vacca, “Computer Forensics”, Firewall Media, 2004.
2. Kevin Beaver, “Hacking For Dummies”, John Wiley & Sons,2012George F Luger, “Artificial Intelligence, structures and strategies for complex problem solving”, Pearson Education, Delhi, 2001.
3. Chad Steel, “Windows Forensics”, Wiley India, 2006.
4. Majid Yar, “Cybercrime and Society”, Sage Publications, 2006
5. Robert M Slade, “Software Forensics”, Tata McGrawHill, 2004.

DCS8006 SOFTWARE TESTING AND QUALITY ASSURANCE CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To know the behavior of the testing techniques and to design test cases to detect the errors in thesoftware.
- To get insight into software testing methodologies
- To understand standard emerging areas in testing
- To learn about the software quality models.
- To understand the models and metrics of software quality and reliability.

COURSE OUTCOMES

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

- choose the software testing techniques to cater to the need of the project.
- identify the components of software quality assurance systems.
- apply various software testing strategies.
- design and develop software quality models.
- make use of statistical methods in software quality.

UNIT I Basic concepts and Preliminaries – Theory of Program Testing – Unit Testing – Control Flow Testing – Data Flow Testing – System Integration Testing.

UNIT II Software Test Plan-Components of Plan - Types of Technical Reviews - Static and Dynamic Testing- – Software Testing in Spiral Manner - Information Gathering - Test Planning - Test Coverage - Test Evaluation -Prepare for Next Spiral - Conduct System Test - Acceptance Test
– Summarize Testing Results.

UNIT III Test Process Assessment – Test Automation Assessment - Test Automation Framework – Nonfunctional Testing – SOA Testing – Agile Testing – Testing Center of Excellence – Onsite/Offshore Model - Modern Software Testing Tools – Software Testing Trends – Methodology to Develop Software Testing Tools.

UNIT IV Software quality -Verification versus Validation- Components of Quality Assurance – SQA Plan – Quality Standards – CMM – PCMM – CMMI – Malcolm Baldrige National Quality Award.

UNIT V Role of Statistical Methods in Software Quality – Transforming Requirements intoTest Cases – Deming's Quality Principles – Continuous Improvement through Plan Do Check Act (PDCA).

REFERENCE BOOKS:

1. William E.Lewis, "Software Testing and Continuous Quality Improvement", 3rdEdition, AuerbachPublications, 2011.
2. Kshirasagar Naik and Priyadarshi Tripathy, "Software Testing and Quality Assurance Theory andPractice", 2nd Edition, John Wiley & Sons Publication, 2011.

3. Ron Patton, “Software Testing”, 2nd Edition, Pearson Education, 2007.
4. Glenford J. Myers, Tom Badgett, Corey Sandler, “The Art of Software Testing”, 3rd Edition, John

Wiley & Sons Publication, 2012.

5. Paul C. Jorgensen, “Software Testing, A Craftman’s Approach”, CRC Press Taylor & Francis Group,Fourth Edition, 2018.

DCS8007 SOCIAL NETWORK ANALYTICS CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To gain knowledge about social networks, its structure and their data sources.
- To study about the knowledge representation technologies for social network analysis.
- To analyse the data left behind in social networks.
- To gain knowledge about the community maintained social media resources.
- To learn about the visualization of social networks.

COURSE OUTCOMES

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

- Up on completion of the course, the students will be able to:
- Explain the basic principles behind network analysis algorithms.
- Model and represent knowledge for social semantic Web.
- Use extraction and mining tools for analyzing Social networks.
- Discuss about community maintained social media resources.
- Develop personalized visualization for Social networks.

UNIT I The development of Semantic Web – Emergence of the Social Web – The Development of Social Network Analysis – Basic Graph Theoretical Concepts of Social Network Analysis – Electronic Sources for Network Analysis – Electronic Discussion Networks, Blogs and Online Communities, Web-based Networks.

UNIT II Ontology-based knowledge Representation – Ontology languages for the Semantic Web: RDF and OWL– Modeling Social Network Data – Network Data Representation, Ontological Representation of Social Individuals and Relationships –Aggregating and Reasoning with Social Network Data.

UNIT III Detecting Communities in Social Network – Evaluating Communities –Methods for Community Detection – Applications of Community Mining Algorithms – Tools for detecting communities – Application: Mining Facebook - Exploring Facebook's social Graph API – Analyzing social graph connections.

UNIT IV Community Maintained Resources – Supporting technologies for community maintained resources– User motivations-Location based social interaction – location technology-mobile location sharing – Social Information Sharing and social filtering – Automated recommendersystem.

UNIT V Visualization of Social Networks - Node-Edge Diagrams – Random Layout – Force-Directed Layout – Tree Layout - Matrix Representations –Matrix and Node-Link Diagrams – Hybrid Representations – Visualizing Online Social Networks.

REFERENCE BOOKS:

1. Matthew A. Russell,"Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+,Githuband more", O'REILLY, Third Edition, 2018.

2. CharuAggarwal, "Social Network Data Analytics," Springer, First Edition, 2014.

3. Jennifer Golbeck, "Analyzing the social web", Waltham, MA: Morgan Kaufmann (Elsevier), FirstEdition, 2013.
4. BorkoFurht, “Handbook of Social Network Technologies and Applications”, Springer, First Edition,2010.
5. Peter Mika, “Social Networks and the SemanticWeb”, Springer, First Edition, 2007.
6. Stanley Wasserman and Katherine Faust, “Social network analysis: methods and applications”,Cambridge University Press, First Edition, 1999.

DCS8008 DATA SCIENCE CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To know the fundamental concepts of data science and analytics.
- To learn fundamental data analysis using R.
- To understand various data modeling techniques.
- To learn the basic and advanced features of open source big data tools and frameworks.
- To study various analytics on stream data.

COURSE OUTCOMES

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

- On completion of the course, the students will be able to:
- Convert real world problems to hypothesis and perform statistical testing.
- Perform data analysis using R.
- Design efficient modeling of very large data and work with big data platforms..
- Implement suitable data analysis for stream data.
- Write efficient Map Reduce programs for small problem solving methods.

UNIT I Introduction to Data Science – Data Science Process – Exploratory Data analysis – Big data: Definition, Risks of Big Data, Structure of Big Data -Web Data: The Original Big Data – Evolution Of Analytic Scalability – Analytic Processes and Tools – Analysis versus Reporting – Core Analytics versus Advanced Analytics- Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Introduction to DataVisualization.

UNIT II Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis – Bivariate Analysis: Correlation – Regression Modeling: Linear and Logistic Regression – Multivariate Analysis - Graphical representation of Univariate, Bivariate and Multivariate Analysis in R: Bar Plot, Histogram, Box Plot, Line Plot, Scatter Plot, LatticePlot, Regression Line, Two-Way cross Tabulation.

UNIT III Bayesian Modeling – Support Vector and Kernel Methods – Neuro – Fuzzy Modeling – Principal Component Analysis - Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS Vs MongoDB, Mongo DB Database Model, Data Types and Sharding – Data Modeling in HBase: Defining Schema – CRUD Operations.

UNIT IV Introduction to Hadoop: Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Introduction to MapReduce –Running Algorithms Using MapReduce – Introduction to HBase: HBase Architecture, HLog and HFile, Data Replication – Introduction to Hive, Spark and Apache Sqoop.

UNIT V Introduction To Streams Concepts – Stream Data Model and Architecture – Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream - Estimating Moments - Counting Oneness in a Window - Decaying Window.

REFERENCE BOOKS:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams withAdvanced Analytics”, JohnWiley & sons, First Edition, 2013.

2. Umesh R Hodeghatta, UmeshaNayak, “Business Analytics Using R – A Practical Approach”, Apress,First Edition, 2017.
3. J. Leskowec, AnandRajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, CambridgeUniversity Press, Second Edition, 2014.
4. NishantGarg, “HBase Essentials”, Packt, First Edition, 2014.
5. Rachel Schutt, Cathy O'Neil, “Doing Data Science”, O'Reilly, First Edition,2013
6. Foster Provost, Tom Fawcet, “Data Sciencefor Business”, O'Reilly, First Edition, 2013.
7. Bart Baesens, “Analytics in a Big DataWorld: The Essential Guide to Data Science and its Applications”, Wiley, First Edition, 2014.

DCS8009 BIG DATA ANALYTICS CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.

COURSE OUTCOMES

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

- Work with big data tools and its analysis techniques
- Analyze data by utilizing clustering and classification algorithms
- Learn and apply different mining algorithms and recommendation systems for large volumes of data
- Perform analytics on data streams
- Learn NoSQL databases and management.

UNIT I Introduction to Big Data:

Types of Digital Data: Classification of Digital Data, Introduction to Big Data: Characteristics of data-Evolution of Big data-Challenges of Big data-Other Characteristics of Data Which are not Definitional Traits of Big Data-Why Big Data?-Are we Just an Information Consumer or Do we also produce Information?-Traditional Business Intelligence (BI) versus Big Data – A Typical Data Warehouse Environment – A Typical Hadoop Environment – What is New Today? – What is changing in the Realms of Big Data?

UNIT II Analytics Basics:

Where do we Begin? - What is Big Data Analytics? - What Big Data Analytics Isn't? - Why this Sudden Hype Around Big Data Analytics? - Classification of Analytics - Greatest Challenges that Prevent Business from capitalizing on Big Data - Top Challenges Facing Big Data - why is Big Data Analytics Important? - What kind of Technologies are we looking Toward to Help Meet the Challenges Posed by Big Data? – Data Science – Data Scientist… Your New Best Friend – Terminologies Used in Big Data Environments - Basically Available Soft State Eventual Consistency (BASE) - Few Top Analytics Tools.

UNIT III Big Data Technologies:

The Big Data Technology Landscape: NoSQL (Not Only SQL) - Hadoop, Introduction to Hadoop: Introducing Hadoop - Why Hadoop? - Why not RDBMS? - RDBMS versus Hadoop - Distributed Computing Challenges - History of Hadoop - Hadoop Overview - Use Case of Hadoop - Hadoop Distributors - HDFS(Hadoop Distributed File System) - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN(Yet another Resource Negotiator) - Interacting with Hadoop Ecosystem.

UNIT IV Introduction to MAPREDUCE Programming:

Introduction - Mapper - Reducer - Combiner - Partitioner - Searching - Sorting - Compression, Introduction to Hive: What is Hive? - Hive Architecture - Hive Data Types - Hive File Format - Hive Query Language (HQL) - RCFile Implementation - SerDe - User - Defined

Function (UDF).

UNIT V Analytical Algorithms:

Introduction to Machine Learning: Introduction to Machine Learning – Machine Learning Algorithms.

REFERENCE BOOKS:

1. Big Data and Analytics, Seeme Acharya, and Subhashini Chellappan, Wiley India Pvt.Ltd. First Edition-2015.
2. Big Data – Principles and best practices of scalable real-time data systems, Nathan Marz, and JamesWarren, Manning Publication CP.,USA-2015.
3. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Bart Baesens,Wiley India Pvt.Ltd-2015.
4. Big Data, Data Mining and Machine Learning, Jared Deamn, Willey India Pvt.Ltd-2015.

DCS8010 ARTIFICIAL INTELLIGENCE CREDIT: 3

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To know the underlying structure behind intelligence mathematically.
- To know the logical implications in computational intelligence.
- To know the automated learning techniques.
- To study the techniques of Knowledge Representation.
- To explore Artificial Intelligence techniques in real-time scenarios.

COURSE OUTCOMES

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

- Understand the search techniques.
- Apply the search techniques to real-time problems.
- Apply the reasoning techniques to real world problems.
- Understand the representation of knowledge.
- Understand the learning techniques.
- Apply AI techniques in developing real world applications.

UNIT I INTELLIGENT AGENTS AND KNOWLEDGE REPRESENTATION: Agents and Environments - Good Behavior: The concepts of Rationality - The Nature of Environments -The Structure of Agents - Knowledge Representation - Object Oriented Approach - Semantic Nets – Frames – Semantic Web – Ontology.

UNIT II SEARCH TECHNIQUES: Problem Solving by Search - Uninformed Search - Searching with Costs - Informed State Space Search - Heuristic Search: - Problem Reduction Search - Game Search – Constraint Satisfaction Problems.

UNIT III REASONING WITH LOWER ORDER LOGICS: Logical Agent - Proposition Logic - Syntax and Semantics - Theorem Proving - Model Checking - Inference in First Order Logic.

UNIT IV ARTIFICIAL INTELLIGENCE PLANNING: Classical Planning - Partial Order Planning - Graph Plan and SAT Plan - Hierarchical Planning - Planning and Acting in NondeterministicDomains – Multiagent Planning.

UNIT V LEARNING TECHNIQUES: Logical Formulation of Learning - Knowledge in Learning - Explanation-Based Learning - Learning using Relevance Information - Inductive Logic Programming - Statistical Learning - Learning with Complete Data - Learning with Hidden Data – Applications.

REFERENCE BOOKS:

1. Stuart J. Russell, Peter Norvig, “Artificial Intelligence - A Modern Approach”, Third Edition, PearsonEducation, 2015.
2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill, 2008.

3. Dheepak Khermani, “A First Course in Artificial Intelligence”, McGraw-Hill, 2013.

DCS8011 **E-COMMERECE** **CREDIT: 3**

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- Able to Understand
- the TCP/IP networks
- Electronic payment systems
- E-Security principles.

COURSE OUTCOMES

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

- XML and Web Databases
- Implement Electronic payment systems
- Implement E-Security systems.

UNIT I INTRODUCTION: Infrastructure for Electronic Commerce - Networks - Packet Switched Networks - TCP/IP Internet protocol - Domain name Services - Web Service Protocols - Internet applications - Utility programs - Markup Languages - Web Clients and Servers - Intranets and Extranets - Virtual private Network.

UNIT II CORE TECHNOLOGY: Electronic Commerce Models - Shopping Cart Technology - Data Mining - Intelligent Agents – Internet Marketing - XML and E-Commerce.

UNIT III ELECTRONIC PAYMENT SYSTEMS: Real world Payment Systems - Electronic Funds Transfer - Digital Payment -Internet Payment Systems – Micro Payments - Credit Card Transactions – Mobile Marketing and Advertisement - Case Studies.

UNIT IV SECURITY: Threats to Network Security - Public Key Cryptography - Secured Sockets Layer - Secure Electronic Transaction - Network Security Solutions - Firewalls.

UNIT V INTER/INTRA ORGANIZATIONS ELECTRONIC COMMERCE: EDI - EDI application in business - legal, Security and Privacy issues - EDI and Electronic commerce - Standards - Internal Information Systems - Macro forces - Internal commerce - Workflow Automation and Coordination - Customization and Internal commerce - Supply chain Management.

REFERENCE BOOKS:

1. Ravi Kalakota and Andrew B Whinston , Frontiers of Electronic commerce, Pearson Education, 2003.
2. Brian E.Mennecke, Troy J.Strader, “Mobile Commerce: (Soft Cover):Technology,Theory and Applications”, Idea group Inc., IRM Press,2003.
3. Pete Loshin, Paul A Murphy, Electronic Commerce, 2nd Edition, Jaico Publishers, 1996.
4. David Whiteley, e - Commerce : Strategy, Technologies and Applications - McGraw Hill, 2000.

DCS8012 **MACHINE LEARNING** **CREDIT: 3**

COURSE OBJECTIVES

Upon Completion of the course, the students should be able to:

- To understand the concepts of Machine Learning.
- To appreciate supervised learning and their applications.
- To appreciate the concepts and algorithms of unsupervised learning.
- To understand the theoretical and practical aspects of Probabilistic Graphical Models.
- To appreciate the concepts and algorithms of advanced learning.

COURSE OUTCOMES

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

- Design a learning model appropriate to the application.
- Design a Neural Network for an application of your choice.
- Implement Probabilistic Discriminative and Generative algorithms for an application of your choiceand analyze the results.
- Use a tool to implement typical Clustering algorithms for different types of applications.
- Design and implement an HMM for a Sequence Model type of application.
- Identify applications suitable for different types of Machine Learning with suitable justification.

UNIT I INTRODUCTION: Machine Learning- Machine Learning Process- Preliminaries for Machine Learning algorithms – Turning data into Probabilities and Statistics for Machine Learning- Probability theory – Probability Distributions – Decision Theory.

UNIT II SUPERVISED LEARNING: Linear Models for Regression – Linear Models for Classification- Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models – Decision Tree Learning – Bayesian Learning, Naïve Bayes – Ensemble Methods, Bagging, Boosting, Neural Networks , Multi-layer Perceptron – Deriving Back Propagation - Support Vector Machines.

UNIT III UNSUPERVISED LEARNING: Clustering- K-means – EM Algorithm- Mixtures of Gaussians – Dimensionality Reduction – Linear Discriminant Analysis - Principal Components Analysis –Locally Linear Embedding – Isomap.

UNIT IV PROBABILISTIC GRAPHICAL MODELS: Graphical Models – Undirected Graphical Models – Markov Random Fields – Directed Graphical Models –Bayesian Networks – Conditional Independence properties – Markov Random FieldsHidden Markov Models – Conditional Random Fields(CRFs).

UNIT V ADVANCED LEARNING: Sampling-Basic Sampling methods, Monte Carlo, Gibbs Sampling – Computational Learning Theory – Mistake Bound Analysis – Reinforcement learning – Markov Decision processes, Deterministic and Non-deterministic Rewards and Actions, Temporal Difference Learning Exploration.

REFERENCE BOOKS:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.

2. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Chapman and Hall, CRC

Press, Second Edition, 2014.

3. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
4. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.