Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Enhance the Software Project Management skills.
2. Develop functioning software which benchmarks to the international standards.

Topics Covered

Unit I **9**

Evolution and impact of Software engineering, software life cycle models: Waterfall, prototyping, Evolutionary and Spiral models. Feasibility study, Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification.

Unit II **9**

Basic issues in software design, modularity, cohesion, coupling and layering, function-oriented
software design: DFD and Structure chart, object modeling using UML, Object-oriented software development, user interface design. Coding standards and Code review techniques

Unit III **9**

Fundamentals of testing, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, White box and black box testing, Alpha and Beta Testing of Products, Test coverage analysis and test case design techniques, mutation testing, Static and dynamic analysis, Software reliability metrics.

Unit IV **9**

Software Maintenance and Software Project Management, Software as an evolutionary entity, need for maintenance, categories of maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Books & References:

1. R. S. Pressman, "Software Engineering - A practitioners approach", III Edition, McGraw Hill International editions, 1992.
2. IAN Sommerville, “Software Engineering”, Pearson Education Asia, VI Edition, 2000.
3. Pankaj Jalote, “An Integrated Approach to software Engineering”, Springer Verlag, 1997.

MCA-123 INTRODUCTION TO COMPUTER NETWORK

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand the concepts of communication architecture and protocols
2. Identify different types of communication mediums and techniques
3. Define and identify different types of multiplexing, data encoding, modulation, and switching techniques
4. Illustrate different standards of Local Area Network in terms of technologies and hardware used
5. Illustrate network addressing and analysis techniques
6. Understand the Wide Area Network technologies
7. Understand the network routing concepts
8. Understand the internetworking concepts and architectures
9. Understand the TCP/IP protocols and design architectures

Topics Covered

Unit-I **9**

Introductory Concepts: Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer- transmission, switching methods, LAN Inter connection devices, Integrated services digital networks.

Unit-II **9**

Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, Ethernet, FDDI, Data Link Layer- basic design issues, error correction & detection algorithms, elementary data link layer protocols, sliding window protocols, error handling, High Level Data Link Control

Unit-III **9**

Network Layer: Packet switched networks – IP – ARP – RARP –DHCP – ICMP – Queuing discipline – Routing algorithms,congestion control algorithms, internetworking, TCP/IP protocol, IP addresses, IPv4 and IPv6.

Unit-IV **9**

Transport Layer: Design issues, connection management, Internet Transport Protocol (UDP), Transmission Control Protocol. (TCP) -Adaptive Retransmission - Congestion control ,Congestion avoidance – QoS.
Application Layer: Domain Name System,Electronic mail **(Email),** File Transfer Protocol, Hyper Text Transfer Protocol, Introduction to Cryptography and Network Security (DES, RSA algorithms), Communication Security (IPSec, Firewalls).

EXPERIMENTS:

1. To create scenario and study the performance of CSMA/CD protocol through simulation.
2. To create scenario and study the performance of token bus and token ring protocols through simulation.
3. Implementation of Error detection and correction algorithms.
4. Implementation and study of 1-bit sliding window viz., stop and wait protocol.
5. Implementation and study of Go back-N protocol.
6. Implementation and study of selective repeat protocol.
7. To get the MAC or Physical address of the system using Address Resolution Protocol.
8. Implementation of distance vector routing algorithm.
9. Implementation of link state routing algorithm.
10. To write a client-server application for chat using TCP.
11. To write a C program to develop a DNS client server to resolve the given hostname.

Books & References:

1. Data Communication and Networking by Forouzan TMH
2. A. S Tanenbaum, Computer Networks, 4th, Edition", Pearson education
3. Data and Computer Communication by W. Stallings, Macmillan Press
4. Computer Networks & Internet with Internet Applications by Comer Pearson Education
5. Computer Networks with Internet Protocols by W Stallings, Pearson Education
6. Local and Metropolitan Area Networks by W Stallings, VIth edition, Pearson Education

MCA-124 INTRODUCTION TO WEB TECHNOLOGY

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Identify common design mistakes when creating a web based application.
2. Discuss the process of editing a web page using text editors and web page editors
3. Cover commonly used HTML tags and discuss how this knowledge is important to a web designer

Introduction to soft computing, Applications of Artificial Neural Networks, fuzzy logic, genetic algorithms and other soft-computing techniques, their strengths and weaknesses, artificial neural networks: over view of history, Mathematical Models of Neurons, ANN architecture.

Unit II **9**

Introduction to artificial neural network : Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Competitive learning networks, Kohonenself organizing networks, Hebbian learning; Hopfield Networks,

Unit III **9**

Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Fuzzy Equations.

Unit IV **9**

Genetic algorithms(Gas), Evolution strategies(Ess), Evolutionary programming(EP), Genetic Programming(GP),Selecting, crossover, mutation, schema analysis, analysis of selection algorithms; convergence; Markov & other stochastic models.

Books & References:

1. N. P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press.
2. Siman Haykin, Neural Netw0rks, Prentice Hall of India
3. S. Rajshekharan& G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India.
4. Neuro-Fuzzy and Soft computing", Jang, Sun, Mizutani, Pearson
5. Neural networks: a comprehensive foundation", Haykin,
6. Genetic Algorithms", Goldberg,
7. Fuzzy Sets & Fuzzy Logic", G.J. Klir& B. Yuan, PHI.
8. Soft Computing, Sivanandan, PHI
9. Anderson J.A., "An Introduction to Neural Networks", PHI, 1999
10. Hertz J. Krogh, R.G. Palmer, "Introduction to the Theory of Neural Computation", Addison- Wesley, California,
11. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.

MCA-129 ALGORITHMS DESIGN AND ANALYSIS

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
5. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
6. Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Analyze randomized algorithms. Compare between different data structures. Pick an appropriate data structure for a design situation.
7. Explain what an approximation algorithm is, and the benefit of using approximation algorithms. Be familiar with some approximation algorithms.
8. Understand concept of sorting networks

Topics Covered

Unit I **9**

Introduction: Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time- Counting sort, Radix Sort, Bucket Sort, Medians and order statistics. Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching.

Unit II **9**

Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms. Dynamic programming with examples such as, Multistage Graphs, Knapsack, All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem.

Unit III **9**

Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets, Amortized Analysis.Advanced Data Structure: Red Black Trees, Augmenting Data Structure, B-Tree, Binomial Heap, Fibonacci Heap, and Data Structure for Disjoint Sets, priority Queues, mergeable heaps, concatenable queues

Unit IV **9**

Selected Topics: String Matching, Text processing- Justification of text, Sorting Network, Theory of NP-completeness, Approximation algorithms and Randomized algorithms, Matrix Operations, Polynomials and FFT, Number Theoretic Algorithms

Books & References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.
3. Ellis Horowitz and SartajSahni, Fundamentals of Computer Algorithms, Computer Science Press, Maryland, 1978
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
6. Knuth, D.E , Fundamentals of Algorithms: The Art of Computer Programming Vol,1985

MCA-136 INTRODUCTION TO WIRELESS & MOBILE COMPUTING

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Demonstrate the energy management in wireless mobile networks.
2. Outline knowledge on Mobile IP.
3. Be familiar with the network protocol stack
4. Learn the basics of mobile telecommunication system
5. Be exposed to Ad-Hoc networks
6. Gain knowledge about different mobile platforms and application development

Topics Covered

Unit-1: **9**

Introduction to Electromagnetic Spectrum, modulation techniques, Mobile telephone systems, Cellular systems development and GSM/CDMA Standards, HSCSD and GPRS.

Managing Console I/O Operations, Windows Forms, Error Handling.
Advanced Features Using C#: Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#,

Unit-IV **9**
Unsafe Mode, Graphical Device interface with C#, .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic.

Books & References:
1. Wiley, "Beginning Visual C# 2008",Wrox
2. Fergal Grimes, "Microsoft .Net for Programmers". (SPI)
3. Balagurusamy, "Programming with C#", (TMH)
4. Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
5. Shibi Parikkar, "C# with .Net Frame Work", Firewall Media

MCA-138 ARTIFICIAL INTELLIGENCE PRINCIPLES & TECHNIQUES

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To learn the basics of designing intelligent agents that can solve general purpose problems
2. To learn the basics of designing intelligent agents that can represent and process knowledge
3. To learn the basics of designing intelligent agents that can plan and act
4. To learn the basics of designing intelligent agents that can reason under uncertainty
5. To learn the basics of designing intelligent agents that can learn from experiences

Topics Covered

Unit I **9**
Introduction The Foundations of Artificial Intelligence The History of Artificial Intelligence Intelligent Agents Agents and Environments Good Behavior The Nature of Environments The Structure of Agents Solving Problems by Searching Problem-Solving Agents Searching for Solutions Infrastructure for search algorithms Measuring problem-solving performance . Uninformed Search Strategies Informed (Heuristic) Search rategies Greedy best-first search .A* search Heuristic Functions Local Search Algorithms and Optimization Problem Local Search in Continuous Spaces Searching with Nondeterministic Actions Searching with Partial Observations Online Search Agents and Unknown Environments

Unit II **9**
Adversarial Search Games Optimal Decisions in Games Alpha--Beta Pruning Imperfect Real-Time Decisions Stochastic Games Partially Observable Games State-of-the-Art Game Programs Alternative Approaches Defining Constraint Satisfaction Problems Constraint Propagation: Inference in CSPs. Backtracking Search for CSPs Variable and value ordering Interleaving search and inference Intelligent backtracking: Looking backward Local Search for CSPs The Structure of Problems Knowledge, reasoning, and planning Logical Agents Propositional vs. First-Order Inference Backward Chaining ... Forward Chaining ... Unification and Lifting

Unit III **9**
Planning and Acting in the Real Worl Definition of Classical Planning Algorithms for Planning as State-Space Search Planning Graphs Classical planning as Boolean satisfiability . Representing temporal and resource constraints. Planning and Acting in Nondeterministic Domains. Knowledge Representation Acting under Uncertainty Probabilistic Reasoning Time and Uncertainty

Unit IV **9**
Forms of Learning Supervised Learning, Decision Trees Evaluating and Choosing the Best Hypothesis A Logical Formulation of Learning Statistical Learning with Complete Data Natural Language Processing

Books & References:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education, 2012.
2. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press, 2012.
3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2012
4. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998

PE1 & PE2

MCA-152 DATA WAREHOUSING & DATA MINING

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Approach business problems data-analytically by identifying opportunities toderive business value from data.
2. know the basics of data mining techniques and how they can be applied to extractrelevant business intelligence

Topics Covered

Unit I **9**

Introduction to Data Mining: Motivation for Data Mining, Data Mining-Definition &Functionalities, Classification of DM systems, DM task primitives, Integration of a DataMining system with a Database or a Data Warehouse, Major issues in Data Mining. Data Warehousing .Overview of concepts like star schema, fact and dimension tables, OLAP operations, From OLAP to Data Mining. Data Pre processing: Why? Descriptive Data Summarization, Data Cleaning: Missing Values, Noisy Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Data Discretization and Concept hierarchy generation for numerical and categorical data.

Unit II **9**

Mining Frequent Patterns, Associations, and Correlations: Market Basket Analysis, Frequent Item sets, Closed Item sets, and Association Rules, Frequent Pattern Mining, Efficient and Scalable Frequent Item set Mining Methods, The Apriori Algorithm for finding Frequent Item sets Using Candidate Generation, Generating Association Rules from FrequentItem sets, Improving the Efficiency of Apriori, Frequent Itemsets without Candidate Generation using FP Tree, Mining Multilevel Association Rules, Mining Multidimensional Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining. Issues regarding Classification and prediction: Classification methods: Decision tree, Bayesian Classification, Rule based Prediction: Linear and non linear regression Accuracy and Error measures, Evaluating the accuracy of a Classifier or Predictor.

Unit III **9**

Cluster Analysis: Types of Data in cluster analysis, Categories of clustering methods, Partitioning methods K-Means, K-Mediods Hierarchical Clustering-Agglomerative and Divisive Clustering, BIRCH and ROCK methods, DBSCAN, Outlier Analysis stream data Classification, Clustering Association Mining in stream data. Mining Sequence Patterns in Transactional Databases

Unit IV **9**

Spatial Data and Text Mining: Spatial Data Cube Construction and Spatial OLAP, Mining Spatial Association and Co-location Patterns, Spatial Clustering Methods, spatial Classification and Spatial Trend Analysis. Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Text Mining Approaches Web mining introduction, Web Content Mining, Web Structure Mining, Web Usage mining, Automatic Classification of web Documents. Data mining for business Applications like

Project Scheduling: Basic concepts, project scheduling, defining a task set and task network, scheduling, earned value analysis. Risk Management: Reactive V/S proactive Risk Strategies, software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management.
Project Monitoring and Control: Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality,Risk-Related Monitoring.

Books & References:

1) Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice",Pearson
2) Erich Gamma,"Design Patterns".
3) R. S. Pressman, "Software Engineering".
4) Pankaj Jalote, Software project management in practice, Addison-Wesley
5) B. Hughes & M. Cotterell, "Software Project Management", TMH

MCA-161 PROGRAMMING IN PYTHON

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Write basic and advance Python programs
2. Write conditional and iterative statements in Python
3. Create arrays and use array methods in Python
4. Use various standard Python modules
5. Create functions and implement recursion in Python
6. Create and use Python classes and objects
7. Write code for Constructors, Destructors, Inheritance, Polymorphism and Exception handling
8. Write code for file handling and various file operations
9. Solve various real time problems using Python
10. Solve problems of Data Science and Machine Learning with Python

Topics Covered

UNIT I: Programming Basics and Decision Making **9**

Introduction: Key features and applications of Python, Python Editors and Compilers (Interpreters), Using different offline and online Python IDE, Interacting with Python programs, **Data types:** Numeric, Boolean, Strings, Lists, Sets, Tuples, Dictionary; **Variables:** Declaration and initialization; **Simple Statements**: Taking inputs from user, Displaying outputs, **Other concepts:** Operators, Expressions, Indentation, Comments, Casting; **Conditional statements:** If…Else

UNIT II: Control Flow and Other Programming Concepts **9**

Iterative statements: For Loops, While Loops, Break, Continue; **Array:** Looping Array elements, Array methods; **Functions:** Local and Global Variables, Built-in functions, User defined functions, Declaration of a function, Defining the function, Calling of the function, Functions with arguments, Recursion

UNIT III: OOP and File Handling **9**

Object Oriented Programming: Classes and objects, attributes and methods, constructors and destructors, inheritance, polymorphism, **Exception Handling:** Try…Except; **Management of text files:** Type of files, various file operations on text files, creating a text file, opening a file, closing a file, reading a text file, writing into a text file, copying a file to another file

UNIT IV: Advance Concepts **9**

Problem solving: Use of Python to solve real time problems, How Python helps to research problems, Creating various types of graphs corresponding to any data to show different kinds of results and analysis; **Data Analysis:** Understanding problems of data science and machine learning, Creating codes for data analysis problems in Python, Other advance programs

Books & References:

1. Alex Martelli, "Python in a Nutshell"
2. Allen Downey, "Think Python"
3. Ken Lambert, "Fundamentals of Python: First Programs"
4. Willi Richert, Luis Pedro Coelho, "Building Machine Learning Systems with Python"
5. Cody Jackson ,"Learning to Program Using Python"
6. Ljubomir Perkovic, "Introduction to Computing Using Python"
7. https://www.w3schools.com/python/default.asp
8. https://www.w3resource.com/python/python-tutorial.php
9. https://www.geeksforgeeks.org/python-tutorial/
10. https://www.geeksforgeeks.org/python-programming-language/

EXPERIMENTS:

1. Writing codes using simple statements, operators and expressions
2. Writing codes using conditional
3. Writing codes using iterative statements
4. Writing programs for creating arrays, looping array elements and using array methods
5. Writing programs to use various standard modules
6. Writing codes to create functions and implement recursion
7. Writing object oriented codes for Constructors, Destructors, Inheritance, Polymorphism and Exception handling
8. Write codes for various file operations
9. Developing codes for solving various real time problems
10. Developing codes for solving problems of Data Science and Machine Learning
11. Writing codes to create various types of graphs corresponding to any data
12. Writing other advance programs in Python

MCA-162 CLOUD COMPUTING

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand basics of cloud, fog and edge computing
2. To understand various issues and challenges in cloud computing

Topics Covered

Unit-I **9**

Introduction: Basics of the emerging cloud computing paradigm, cloud computing history and evolution, cloud enabling technologies, practical applications of cloud computing for various industries, the economics and benefits of cloud computing **Cloud Computing Architecture:** Cloud Architecture model, Types of Clouds: Public Private & Hybrid Clouds, Resource management and scheduling, QoS (Quality of Service) and Resource Allocation, Clustering

Unit-II **9**

A Classification of Cloud Implementations- Amazon Web Services - IaaS, The Elastic Compute Cloud (EC2), The Simple Storage Service (S3), The Simple Queuing Services (SQS), VMware vCloud - IaaS, vCloud Express, Google AppEngine - PaaS, The Java Runtime Environment

Unit-III **9**

Cloud Computing delivery Models: Cloud based services: Iaas , PaaS and SaaS Infrastructure as a Service (IaaS):Introduction to IaaS, Resource Virtualization i.e. Server, Storage and Network virtualization Platform as a Service (PaaS):Introduction to PaaS, Cloud platform & Management of Computation and Storage, Azure, Hadoop, and Google App. Software as a Service (SaaS):Introduction to SaaS, Cloud Services, Web services, Web 2.0, Web OS Case studies related

to IaaS, PaaS and SaaS

Unit-IV **9**

The Python Runtime Environment- The Datastore, Development Workflow, Windows Azure Platform - PaaS, Windows Azure, SQL Azure, Windows AzureAppFabric, Salesforce.com - SaaS / PaaS, Force.com, Force Database - the persistency layer, Data Security, Microsoft Office Live - SaaS, LiveMesh.com, Google Apps - SaaS, A Comparison of Cloud Computing Platforms, Common Building Blocks.

Books & References:

1.The Complete Cornerstone Guide to Cloud Computing Best Practices, Second Edition, Gerard Blokdijk, Ivanka Menken by Emereo Pty Ltd, 2009
2.Cloud Computing: A practical Approach Anthony Velte, Toby Velte and Robert Elsenpeter by Tata McGrawHill
3.Cloud Computing Principles and Paradigms, Rajkumar Buyya, James Broberg and Goscinski by John Wiley and Sons
4.Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski, Cloud Computing: Principles and Paradigms, 2011
5.Michael Miller, Cloud Computing, 2008
6.Judith Hurwitz, Robin Bllor, Marcia Kaufmann, Fern Halper, Cloud cOmputing for Dummies, 2009

MCA-163 ADVANCED CONCEPTS IN DATABASE SYSTEMS

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand advance concepts of database
2. To understand OLAP, P2P etc.

Topics Covered

Unit I **9**

Database modeling (relational, object-oriented models, web models). Object-oriented/object-relational databases. Active database systems (i.e., databases and rule management). Distributed databases

Unit II **9**

On-line Analytic Processing (OLAP). Query optimization. New data types: unstructured, textual, etc. Databases and the WWW. XML databases

Unit III **9**

Multimedia database systems. Temporal and spatial databases. Stream management systems, Continuous query processing , Schema evolution managers Middle layer engines. Sensor database systems.

Unit IV **9**

P2P technology. Heterogeneous databases and data integration. Mobile/Disconnected databases. Data management problems and solutions for non-traditional applications, such as E-commerce, engineering, internet, intranet, etc.

Books & References:

1. Raghu Ramakrishnan and Johannes Gehrke, DATABASE MANAGEMENT SYSTEMS McGraw-Hill Publisher, third Edition Pub date: 2002,
2. Fundamentals of Database Systems, R. Elmasri, and S. Navathe, Benjamin Cummings.
3. Principles of Data and Knowledge Base Systems, Volume 1, J.D. Ullman, Computer Science Press.
4. Database System Concepts, 2nd Edition, H.F. Korth and A. Silberschatz, McGraw-Hill.
5. A First Course in Database Systems, J. Widom and J. D. Ullman, Prentice-Hall.